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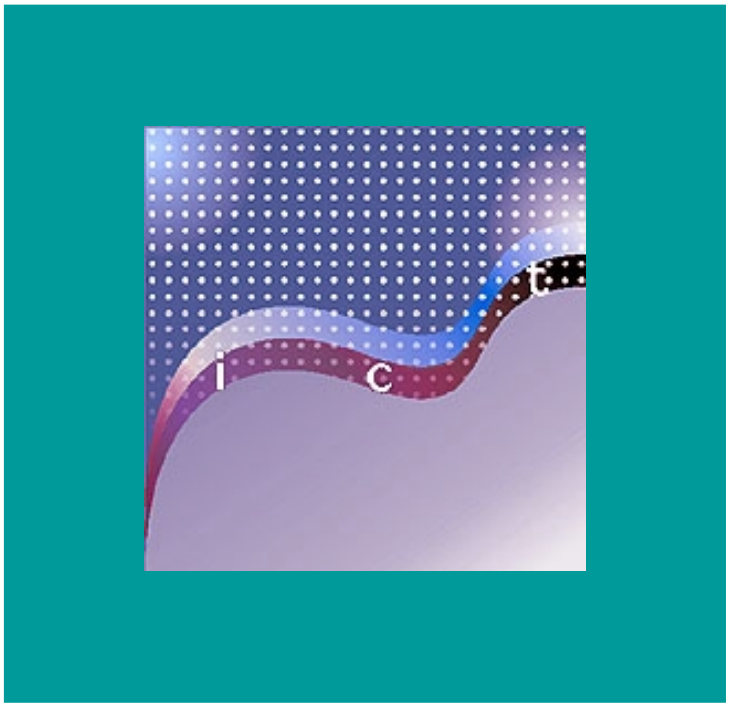

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Foreword

Few manifestations of the power of human creativity have so extensively and so quickly transformed society as the rise of the Internet and other information and communication technologies (ICT) over the past decade. Dramatic as the changes may be, the process of assimilating and learning from them has only just begun.

ICT can improve education, health, governance and trade. They are dramatically changing social and economic relationships and interactions, giving people, businesses and governments the tools with which to devise more productive, more inclusive and more development-friendly societies and economies. For the moment, however, we are still grappling with the painful reality that those who stand to benefit most from the advances of the ICT revolution are also those who have the least access to the technology behind it.

The United Nations is strongly committed to doing its part to enhance the ability of developing countries to realize the full potential of ICT in stimulating and supporting development. We are working with Governments and partners in industry, civil society and academia to bring ICT applications to education, health, natural disaster management and many other key realms of human endeavour and well-being. E-commerce and e-business are among the most promising of those applications, capable of offering new ways to participate in global markets, new possibilities for diversifying national economies, and new and better jobs for young people.

This third edition of the E-Commerce and Development Report, published by the United Nations Conference on Trade and Development, identifies some of the implications that the growth of the digital economy may have for developing countries. It aims to provide practitioners and policy makers with a better understanding of the options available to them in leading sectors of developing-country economies. It is also meant to contribute to the debates at the World Summit on the Information Society and efforts to create a truly inclusive information society that serves and empowers all people. Above all, if it helps developing countries to adopt and take advantage of new digital technologies, this report will have served its purpose.

Kofi A. Annan

Secretary-General of the United Nations

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List of abbreviations

A

ADR	alternative dispute resolution
ADSL	asymmetric digital subscriber line
APEC	Asian-Pacific Economic Cooperation
ASEAN	Association of South-East Asian Nations

B

BPO	business process outsourcing
BSD	Berkeley Software Distribution
B2B	business-to-business
B2C	business-to-consumer
B2G	business-to-government

C

CAD	computer-aided design
CAM	computer-aided manufacturing
CD	compact disc
CD-ROM	compact disc read-only memory
CFC	Common Fund for Commodities
CNC	computer numerical control
CRM	customer relationship management

D

DRM	digital rights management
DSL	digital subscriber line

E

ECLAC	Economic Commission for Latin America and the Caribbean
EDI	electronic data interchange
ERP	enterprise resource planning
ESCAP	Economic and Social Commission for Asia and the Pacific

F

FDI	foreign direct investment
FOSS	Free and Open Source Software
FOSSFA	Free and Open Source Software Foundation for Africa
FSF	Free Software Foundation

FTP	file transfer protocol

G

GATS	General Agreement on Trade in Services
GDP	gross domestic product
GIS	geographical information systems
GNI	gross national income
GNP	gross national product
GNU	GNU is not UNIX
GPL	General Public License
GUI	graphical user interface

H

HRD	human resources development
HTTP	hypertext transfer protocol

I

ICANN	Internet Corporation for Assigned Names and Numbers
ICC	International Chamber of Commerce
ICO	International Coffee Organization
ICT	information and communication technologies
IDE	integrated development environment
IML	information markup language
IP	Internet protocol
ISDN	integrated services digital network
ISP	Internet service provider
IT	information technology
ITC	UNCTAD/WTO International Trade Centre
ITES	information-technology-enabled services
ITU	International Telecommunication Union

J

JIT	just-in-time (production)
J2EE	Java 2 Platform Enterprise Edition

K

Kbps	kilobits per second

M

MDG	Millennium Development Goals

N

NGO	non-governmental organization
NRI	networked readiness index

O

ODR	online dispute resolution
OECD	Organisation for Economic Co-operation and Development
OSD	Open Source Definition
OSFS	open-source and free software
OSI	Open Source Initiative

P

PC	personal computer
PDA	personal digital assistant

R

R&D	research and development

S

SBTC	skill-biased technological change
SCAA	Specialty Coffee Association of America
SIC	standard international classification
SME	small and medium-size enterprise
SSL	secure sockets layer (protocol)

T

3G	third-generation (wireless technology)
TCO	total cost of ownership
TNC	transnational corporation

U

UDRP	Uniform Dispute Resolution Policy (of ICANN)
UNCITRAL	United Nations Commission on International Trade Law
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
USO	universal service obligation

V

VoIP	voice-over Internet protocol
VSAT	Very Small Aperture Terminal

W

Wi-Fi	wireless fidelity
WIPO	World Intellectual Property Organization
WSIS	World Summit on the Information Society
WTO	World Trade Organization

X

XML	extensible markup language

Explanatory Notes

The term dollars ($) refers to United States dollars unless otherwise stated. The term billion means 1,000 million.

Two dots (..) indicate that the data are not available or are not separately reported.

A hyphen (-) indicates that the amount is nil or negligible.

Because of rounding, details and percentages do not necessarily add up to totals.

OVERVIEW

It is now widely accepted by policy makers, enterprises and society at large that information and communications technologies (ICT) are at the centre of an economic and social transformation that is affecting all countries. ICT and globalization have combined to create a new economic and social landscape. They have brought fundamental changes in the way enterprises and economies as a whole function.

The importance that society attaches to ICT is illustrated by the large number of initiatives, especially at the international level, aimed at enhancing the development and adoption of ICT. This is particularly noteworthy on the eve of the World Summit on the Information Society (WSIS), the first UN summit ever devoted to ICT. This and other initiatives, such as the G8 DOT Force (Digital Opportunity Task Force), the UN ICT Task Force and a host of other regional and national ICT programmes, are evidence of the importance that society attaches to ICT. These initiatives are undoubtedly motivated by the important role of ICT in realizing the Millennium Development Goals (MDG), particularly in the area of poverty alleviation.

While there is general agreement that ICT affect all sectors of society and the economy, their role as an enabler for economic development and growth deserves particular attention. As UNCTAD's E-Commerce and Development Report 2003 shows, there is now growing agreement about the positive contribution of ICT to productivity growth. Through the application of ICT firms will become more competitive, new markets will be accessed and new employment opportunities created. All of this will result in the generation of wealth and sustainable economic growth.

The impact of ICT on firms' and industries' performance and competitiveness is achieved through increased information flows, which result in knowledge transfer as well as improved organization. In particular, ICT have become important tools for improving productive capacity and increasing international competitiveness by reducing the transaction costs involved in the production and exchange of goods and services, increasing the efficiency of management functions, and enabling firms to exchange and access more information.

While ICT improve productivity in existing productive activities, they also make possible the emergence of new activities such as online outsourcing of services and the production of different types of ICT goods. These activities enable countries, including developing ones, to diversify their economies, enhance their export competitiveness and produce high-value-added services that boost the local economy.

Despite the wide range of benefits that can be brought about by ICT, the development and adoption of ICT by developing countries have so far been limited. Reasons for this have been amply documented. They include lack of awareness of what ICT could offer, insufficient telecommunications infrastructure and Internet connectivity, expensive Internet access, absence of adequate legal and regulatory frameworks, shortage of requisite human capacity, failure to use local language and content, and lack of entrepreneurship and a business culture open to change, transparency and democracy.

The objective of the E-Commerce and Development Report is to provide information about developments in the area of e-commerce and ICT, particularly as they relate to developing countries. The report identifies areas where the application of ICT can make an impact on developing countries' enterprises and economies. By critically reviewing the latest developments in ICT and the knowledge economy and examining their implications for developing countries, it provides an analytical and empirical basis for appropriate decision making by policy makers in the field of ICT and e-business. The report should also be seen as a contribution to the debate concerning economic development at the forthcoming WSIS.

As a premise, the report recognizes the positive role of ICT in the development process. Taking into account the constraints that developing countries face in adopting e-commerce and ICT, the report focuses on policies and strategies to address those constraints. The material presents the state of the art in e-commerce and ICT and discusses how it can be applied to developing countries. It also contains case studies of industries and other economic activities as well as regulatory issues. In all instances, specific recommendations are made to developing countries in order to

enhance their understanding of the issues and their ability to adopt e-commerce and ICT.

The choice of subjects in the report is not intended as an indication of their importance relative to other issues concerning ICT and economic development. Also, the current issue should be considered in conjunction with the two previous issues (2001 and 2002). Together, the three issues as well as future ones are intended to contribute to an ongoing comprehensive study of ICT and economic development.

1. Recent Internet trends: access, usage and business applications

The report observes that revolutionary visions of the Internet's role in the economy, as well as the disappointment that followed their failure to become a reality, are giving way to a more nuanced but strongly positive assessment of the Internet's impact on business performance. Many of the promised economic benefits of the Internet seem to be materializing. Noting this, enterprises are preparing for e-business: while overall investment in IT has decreased by 6.2 per cent since 2001, e-business budgets are estimated to have risen by as much as 11 per cent in 2002. In 2003 annual growth in e-business investment fell to 4 per cent, but this rate was twice as fast as the growth in overall IT investment

The report shows that the number of Internet users in the world reached 591 million in 2002, although the annual rate of growth slowed to 20 per cent. At the end of 2002, developing countries had 32 per cent of the world's Internet users, while North America and Europe accounted for as many as 89 per cent of the world's Internet hosts. The average African Internet user still enjoys about 20 times less bandwidth capacity than the average European user, and 8.4 times less than a North American one.

Even if e-readiness in developing countries is lower than in the high-income regions of the world, a number of relatively advanced ICT adopters have been identified in all regions of the world, and no developing country seems to have regressed in its integration into the digital economy. Public policies that support the extension of the information society are among the factors explaining the relative advantage enjoyed by early ICT adopters among the developing countries. Meanwhile, the majority of developing countries face limitations on the development of their e-economy stemming largely from low income levels, low literacy rates, lack of payment systems that can support online transactions, and cultural resistance to online trade.

The report notes that almost all official estimates of e-commerce activity refer to the high-income market economies. Quoting data from surveys compiled by the Organisation for Economic Co-operation and Development (OECD) concerning its member countries for 2000-2001, the report says that the share of Internet users buying online was highest in the Nordic countries, the United Kingdom and the United States, where 38 per cent of users had made purchases online; it was lowest in Mexico, where fewer than 0.6 per cent had done so. The share of sales to households in total Internet sales ranged from a maximum of about 30 per cent (Finland and Luxembourg) to a minimum of about 1 per cent (Singapore). Internet retail sales remain a small part of total retail figures (around 1.5 per cent in the United States and the European Union), although many more consumers use the Internet to research purchases that they later make in stores. Estimates of total online retail sales for 2002 were $43.47 billion for the United States ($73 billion including travel), $28.29 billion for the European Union, $15 billion for the Asia-Pacific region, $2.3 for Latin America and as little as $4 million for Africa.

As regards business-to-business (B2B) e-commerce transactions, official US statistics show the dominance of B2B transactions in the total of e-commerce. In 2001, annual B2B online sales in the United States amounted to $995 billion, or 93.3 per cent of all US e-commerce. Private-sector estimates of the value of B2B trade in the European Union put it at between nearly $185 billion and $200 billion for the year 2002. In Central and Eastern Europe, some projections show that B2B e-commerce will amount to around $4 billion in 2003. In the Asia-Pacific region, it should grow rapidly, from about $120 billion in 2002 to around $200 billion in 2003 and $300 billion by 2004. In Latin America $6.5 billion worth of online B2B transactions are forecast for 2002 and $12.5 billion for 2003, although far more optimistic estimates are also available. According to 2001 forecasts, African B2B e-commerce in 2002 was expected to amount to $0.5 billion in 2002 and $0.9 billion in 2003, with South Africa accounting for 80 to 85 per cent of these amounts.

Broadband Internet access may accelerate the growth of Internet traffic and change the way people and businesses use the Internet. In the business-to-consumer (B2C) arena, broadband subscribers are more likely to engage in e-commerce; they therefore tend to account for a fast-increasing share of traffic and online expenditure. From the point of view of broadband's influence on the organization of enterprises or on B2B transactions, although a number of initiatives aim at building new business models around broadband, no application of it has emerged with an impact on the functioning of markets or the management of companies that is substantially different from the effects of earlier commercial applications of the Internet. However, businesses buy much more online content than consumers do, and broadband makes such content more accessible, easier to use and therefore more sellable, especially to small and medium-size enterprises (SMEs). Broadband allows several users to share an Internet connection, which can reduce the cost of every individual connection, an important consideration for SMEs. For larger enterprises, the ability to centralize data and applications in a single storage facility while enabling many users in distant locations to access and use sizeable amounts of information may facilitate the adoption of new forms of organization.

The report suggests that as e-business becomes part of the everyday experience of the majority of people, security in all its dimensions is becoming crucially important. Security concerns affect developed and developing countries alike. Reasonable protection against Internet-generated risks can be obtained through a combination of software, hardware and risk management strategies that take into account all potential sources of liability.

The report also discusses the development of Web services, a technology that allows automated interaction over the Internet between computers managing different business processes. Web services represent a major emerging trend whose potential for becoming an important factor of change derives from the fact that it lies at the junction of several developments, some of which are changing business organization and interaction and others which could give a new direction to the future of computing.

Web services can have a dramatic impact on the efficiency of processes such as inventory control and routine purchasing. They can also be extremely useful for the integration of disparate IT systems. For this potential to materialize, the interoperability of Web services developed on competing platforms is essential.

However, despite their potential to improve the efficiency of business transactions, Web services cannot substitute for human intervention in the creation of business relationships. While simple Web services can be put in place at relatively low cost, large-scale implementations can be challenging with the technology's current degree of maturity. In the medium term, Web services will introduce considerable changes in the way businesses use IT, but this will not happen as a one-off revolution. Rather, it will be a cumulative, if fairly rapid, process through which the technology will permeate the structure of enterprises and industries.

2. ICT, the Internet and economic performance

The report suggests that the world economy is becoming an ICT-based economy. By lowering transaction costs, the Internet removes distance-related barriers that have traditionally determined the location of service providers and goods producers. At the same time, available evidence on productivity gains related to the use of ICT is still highly concentrated in a small group of developed countries, led by the United States, and in selected emerging economies like Singapore and the Republic of Korea. Even in those countries, the debate about the size of the impact of ICT on productivity is still continuing. The discussion on the impact of ICT on productivity and economic growth rates, particularly in the United States, has far-reaching policy implications in both developed and developing countries.

The report reviews the literature on the economic impact of ICT and indicates the range of views on the subject. Many studies conclude that the impact of ICT on capital deepening, labour productivity and total factor productivity is positive and even considerable, and that it underpins the continuation of productivity growth in the United States and other selected countries with a high level of penetration of ICT and particularly the Internet. The impact of ICT has been examined at the firm and industry levels, with studies covering samples of large firms, indus-

tries and different time periods, as well as various countries and regions.

The report concludes that, while there is still little systematic empirical evidence regarding the economic consequences of ICT in developing nations, these countries can learn a great deal from the available evidence. The discussion on the impact of ICT makes suggestions that reinforce recommendations contained in other chapters of the report. In particular, it is suggested that Governments foster an improved understanding of best practices in the use of ICT so that optimal choices can be made regarding the most efficient use of ICT. Also, Governments should support the development of infrastructure that will provide greater access to low-cost, high-bandwidth Internet connections and the use of affordable software and should play a leading role in addressing skill deficiencies in the workforce through training and education. The report also recommends the promotion of collaboration in addressing the development and adoption of ICT, including public-private partnerships, alliances and consortia.

3. ICT strategies for development

The report observes that, despite the positive trends, and despite the important opportunities that the knowledge economy offers for developing countries' growth and development, most enterprises in developing countries are still excluded for the reasons mentioned earlier. As a result, the gap between developed and developing countries' use of ICT remains wide.

In order to tackle these difficulties, since the late 1990s, an increasing number of developing countries have followed the example of developed countries and launched their own national ICT programmes and strategies. These cover a broad range of policy areas, such as awareness raising, infrastructure building, telecommunications deregulation, education and labour force training, changes in legislation, and e-government. In this connection, UNCTAD has organized a number of workshops and conferences to address the subject of national policies and strategies for the development of ICT and e-commerce in developing countries.

The report draws from the various inputs provided to these meetings, describes key areas and sectors of policy action, looks at best practices based on experiences from developed and developing countries, and makes suggestions regarding the implementation of these strategies. Thailand's national ICT strategy is presented as an example of a developing country's strategy for developing its information society.

The report introduces a model framework for the formulation of a national ICT strategy, outlining all concerned sectors and policy areas. Within this general framework, it focuses primarily on e-business policies and certain crosscutting policies - such as those related to developing telecommunications infrastructure or IT literacy and skills - that affect the information economy and the adoption of ICT by the business sector. This focus is based on the understanding that ICT as an enabler for economic development and growth deserves particular attention in national development frameworks. Through the application of ICT, firms will become more competitive, new markets will be accessed and new employment opportunities created. All of this will result in wealth generation, thus ensuring future sustainable economic growth.

The report suggests that experience from countries has demonstrated that elements and priorities of national ICT strategies might differ between developed and developing countries. In many countries, there is still widespread lack of awareness about using the Internet in business. Therefore, enhancing awareness and public understanding about the benefits of ICT is often an important starting point in a developing country's policy planning. Other priority areas for developing countries are basic access to ICT, low-cost hardware and software, and the use of local-language Web sites. Furthermore, in many developing countries a lack of local Internet content leads most people to purchase online from foreign sites (mainly in developed countries) rather than local or even regional sites.

Formulating and implementing national ICT strategies is perhaps the biggest challenge policy makers face. Given the complexity and cross-cutting nature of ICT, a holistic approach is essential to a national e-strategy, as far as both sectors and stakeholders are concerned. It is difficult to create awareness at the political level or to adopt a state-of-the-art regulatory framework unless the elements of an ICT strategy are

rooted in the reality of the national economy. Therefore, stakeholders from all areas of society and economy should be involved.

Developing the right policy framework for the deployment of ICT involves many difficulties. People must be trained on how to use ICT and exploit commercially the information and knowledge they make available; regulatory frameworks need to be established to provide enterprises and consumers with confidence in the security of the Internet; financing needs to be available, both for infrastructure (including foreign direct investment) and SME development; and local content needs to be created in order for small businesses and underprivileged people to go online. While awareness raising is important, in some countries e-business will take time to establish itself, and people will start using the technologies only when they have experienced their immediate benefits. In places with a management or business culture that is open to and ready for change, the use of new tools and the digitization of business processes will advance more quickly.

The report recommends that Governments in both developed and developing countries play an important role in promoting and facilitating the development of the information society and economy. Above all, Governments should lead by example by adopting e-government practices. Experiences show that in many developed countries that have enjoyed fast growth in ICT, government has been closely involved in promoting ICT development. Governments play an important role as leaders, especially at the earliest stages, by providing vision, raising awareness and making ICT development a national priority.

Governments should play an active role without substituting for private-sector initiative; instead they should focus on facilitating the entry of smaller, underprivileged players into the marketplace. Government intervention is particularly needed for connecting rural and remote areas, which are usually left out by the private sector, and in areas related to education and legal and regulatory issues. Governments also have a role to play in integrating SMEs into the information economy.

Notwithstanding the important role of government in initiating and implementing national ICT strategies, experience shows that the private sector has been the most innovative player and the major driving force behind e-business and ICT deployment. An ICT strategy that combines public intervention with private-sector initiative in a mutually supportive manner is the only viable option.

Finally, an important aspect of ICT strategies and programmes is the need for a comprehensive approach that integrates ICT into the country's broader development strategies and policies. Linking ICT policies with other development policies (e.g. in the areas of education, trade and investment) yields benefits from synergies between different elements and ensures a more broad-based diffusion of ICT.

4. Free and open-source software: implications for ICT policy and development

Examining a relatively new subject, the report notes that a significant development facilitated by the Internet has been the growth of free and open-source software (FOSS). This development challenges preconceptions about how software should be produced and distributed and has important development implications.

FOSS is software whose source code has been made public. The source code is the instructions that constitute a particular software application, such as a word processor or a database. The report argues that opening the source code to public scrutiny is much more than a technical issue: it allows collaborative development in software production, easier integration with other programmes that can be produced by independent programmers, and customization of software to meet the commercial, regulatory, cultural and linguistic requirements of users. By contrast, closed-source or proprietary software requires a significant upfront investment in license fees and is not always adaptable to local concerns. Also, its use may not adequately support the development of local ICT skills. OSFS should be seen as more than simply a different kind of product. It is a different kind of process for building, maintaining and changing the rules that govern information flows. It changes the perception of how software is written and who can change it under what conditions, and the freedoms and responsibilities associated with this process. FOSS not only enables but, more important, empowers peoples and nations to manage their ICT development.

The report shows that FOSS offers many other benefits to developing countries. Experience so far has shown that open-source environments often produce reliable, secure and upgradable software at a comparably low cost to users. FOSS provides an improved approach to security issues and to the need for public and open standards. It eliminate the national-level economic loss resulting from duplication of software development.

The use of FOSS can have an anti-monopolistic effect on the IT market and industry in a country and globally. Its anti-restrictive nature allows anyone to provide IT services and thus reduces barriers to entry. While some FOSS programmes may acquire a dominant market share, no particular institution or business can use them to build a monopoly market position for itself. FOSS may help create a better-qualified IT industry and more skilled employees, which leads to job creation. The increasing adoption of FOSS by major corporations and institutions in the developed world is creating export opportunities for customized software from nascent IT industries in developing countries. Finally, FOSS may provide an improved approach to security issues, because FOSS code applications are transparent: if a security flaw is found it, can be linked to the code causing it and fixed.

To take advantage of these benefits, the report recommends that developing countries consider adopting FOSS as a means of bridging the digital divide. To implement the adoption of FOSS, developing countries should formulate and implement appropriate policies on human resources development and training and e-government in the area of software development and related fields.

5. Business process outsourcing services for economic development

The report examines the opportunities offered by business process outsourcing (BPO) to developing countries. The expansion of BPO services in developing countries is a result of the development of ICT in these countries combined with increasing demand from enterprises in developed countries (mainly the United States and in Europe) wishing to outsource non-core business functions at low cost. Outsourcing involves contracting a service provider to completely manage, deliver and operate one or more of a client's functions (e.g. data centres, networks, desktop computing and software applications). The report discusses trends and issues, and it highlights key prerequisites that enable developing countries to attract and sustain outsourced services.

Outsourcing has existed for decades, especially in manufacturing, as a way of reducing costs. The earliest outsourcing ventures, principally by large enterprises, were in the area of IT services. Now, with advances in network technology, high-speed data networks, and increased bandwidth capacity, outsourcing has expanded to include a wide range of management services, so that enterprises are now able to offload entire business functions. BPO services are available in areas such as finance, insurance, health care, human resources, mortgage, credit cards, asset management, customer care and sales and marketing.

The report shows that the market for BPO is expanding, with some sources projecting that the value of BPO will reach the range of $300 to $585 billion in the next two years. Almost half of the Fortune 500 companies are known to be outsourcing services; most of these companies are located in the United States or Europe. While India is a leading provider of outsourced services, other examples of countries providing such services are Bangladesh, Brazil, China, the Philippines, Romania, Russia, Singapore, Thailand, Venezuela and Viet Nam. The report quantifies some of the benefits that India, for example, derives as a supplier of BPO. It also gives case studies of BPO service providers in several developing countries, including least developed countries. In this connection it is noteworthy that some BPO services are transacted between developing countries.

The report notes that BPO services vary in terms of their complexity, ranging from basic administrative functions such as data entry or billing services to more complex tasks that require decision making and problem solving. The level of skills required to provide BPO rises as the complexity of the task increases.

The report identifies a number of factors that are critical for the success of BPO in the service-supplying country. These include the availability of adequate Internet infrastructure and access, political stability, strong government support, adequate investment resources, the availability of an educated and skilled labour force and proficiency in the client's primary language. Other factors include compatibility in culture and mindset between the client and the service

supplier. Geographical proximity is also important, as it allows the client to make regular physical contact with the service provider.

The report states that, in order to attract BPO services, developing countries need to ensure that these critical factors are present. Enterprises and Governments should strive to provide training to meet the demands of BPO services. To enter the BPO business, enterprises should start with basic, low-risk services and then move into more complex services as they accumulate experience and skills. BPO service providers need to have an Internet presence, and they should establish offices in clients' countries and develop partnerships with major global outsourcers in order to establish themselves in the business. Governments in developing countries should promote the growth of BPO services by facilitating the provision of an adequate telecommunications infrastructure and access, establishing a supportive legal and regulatory framework and providing fiscal incentives.

6. Marketing developing-country agricultural exports via the Internet

The report examines the scope for using ICT and e-commerce in the marketing of agricultural commodities exported by developing countries. Using coffee and tea as case studies, it addresses the following key questions: Is use of the Internet to market agricultural products a viable business model? What are the relevant real-world experiences? What are the experiences and lessons learnt so far in developing countries? What specific recommendations can be made to developing countries?

Agricultural exports play a key role in the economies of many developing countries, as sources of both income and employment. The prices of these commodities tend to be quite volatile and have occupied the attention of many developing countries and, indeed, the international community. The commodities' marketing chain involves many intermediaries, with the result that the export earnings are shared by a multitude of traders and processors, and producers receive only a small share of the final consumer price.

One way to improve producers' earnings is to reduce the number of intermediaries. It has been thought that use of the Internet can enable producers to obtain more information about markets and to arrange direct marketing that would bypass some of the intermediaries. Also, the Internet can allow producers to reach global markets at reduced transaction costs. The Internet is already being used to trade agricultural commodities in a number of developed countries, especially in the United States, where it is used to trade products such as cotton, grain, meat and dairy products, to name a few. The Internet has also been used in developing countries to market commodities such as coffee and tea, although still on a small scale.

The report observes that various types of online marketing models are used for agricultural commodities. E-markets and online auctions are widely used in agricultural export marketing. In the past few years, e-markets have been established for a wide range of commodities such as cotton, grain, soybeans, wood products, cattle, dairy products and a variety of other food products. While online auctions follow the same basic procedures as floor-based offline auctions, they provide benefits over the traditional format in terms of convenience, flexibility and cost reduction.

Some developing countries have taken the initiative in using ICT and e-commerce to market their agricultural exports. For example, the online auctions for speciality coffee held annually in Brazil, Guatemala and Nicaragua illustrate the successful integration of ICT and traditional marketing to achieve improvements in export marketing for coffee. The pioneering efforts of Kenyan entrepreneurs in organizing online auctions for coffee have proved that online marketing can be done using fairly inexpensive technology. Internet-based marketing of tea has started in India, although it is still in a very preliminary stage.

Use of the Internet to market agricultural commodities such as coffee and tea in developing countries is a relatively new business model. The marketing structures of both tea and coffee demonstrate that concerted efforts need to be made to address the possible obstacles created by market domination by large multinational companies – domination that prevents farmers from accessing importers directly and thus using the Internet for direct transactions with them. Governments, international organizations and donors can provide the support that is essential for providing the initial resources and trust required to establish online marketing ventures. At the regional level, farmers need to be organized into cooperatives or trade associations that will provide the capacity and critical mass for supporting online marketing.

7. Online dispute resolution: e-commerce and beyond

The report explores online dispute resolution (ODR), a regulatory development that is assuming increasing importance. It looks at the history of ODR, its nature and use in different contexts, and the role it can play in fostering the trusting relationships that are necessary for e-commerce to grow in developing countries. In addition, it considers the growth of ODR adoption in new environments such as government and other arenas where new tools are needed for responding to more complex multi-party disputes.

One of the main challenges facing e-commerce is how to resolve cross-border disputes in the electronic business environment. Distances between parties, linguistic and cultural differences, difficulties in determining the applicable law and competent jurisdiction, and enforcement of judgements are among the main obstacles that can significantly increase the cost of doing business online. Given that traditional dispute settlement mechanisms may not provide effective redress in e-commerce transactions, there is a need to consider alternative dispute resolution (ADR) mechanisms that can provide speedy, low-cost redress for claims arising from online interactions. When ADR takes place using computer-mediated communication in an online environment, it is referred to as online dispute resolution. Both e-disputes and bricks-and-mortar disputes can be resolved using ODR.

The report identifies the main forms of ADR – arbitration, mediation and negotiation – as processes effective in settling disputes out of court and in a manner that is less formal than litigation in court. During the past two decades, use of ADR has greatly expanded. Indeed, in commercial disputes ADR processes are used much more often than court litigation.

The report observes that e-commerce is an arena that has already demonstrated both a need for new dispute resolution approaches and the fact that new approaches are possible. Just as offline business is supported by an infrastructure that provides dispute resolution options when disputes occur, the online environment is building an infrastructure with an array of dispute resolution options that take into account the special qualities of cross-border transactions in which much of the exchange is electronic in nature.

The Internet, by being both disruptive and facilitative, is the source of the problem and also the source of the solution. All the numerous and novel ways of interacting online in commercially productive ways allow disputes to occur, thus heightening the need for dispute resolution systems that can assist disputants who may be at a great distance from one another.

The report concludes that, because ODR is a process that can contribute to building trust, it is particularly needed in situations where new relationships are being formed and existing institutions for legal recourse are lacking or inefficient.

Early online marketplaces assumed that users would not require anything beyond heightened convenience and lower costs and prices. It has now become apparent that the presence of dispute resolution is an asset that users will also consider as they assess the risks of participating in a new marketplace or environment. This is particularly important when the location or identity of the seller is unfamiliar or the item being sold lacks a well-known brand. Dispute resolution, as a result, is a process to which countries focused on expanding emerging e-commerce activities should pay particular attention.

The report observes that, although ODR is still in its infancy and/or non-existent in a vast majority of developing countries, it has the potential to grow and to provide fair and inexpensive adjudication of disputes arising out of online transactions. The report recommends that developing countries wishing to promote and facilitate ODR as an alternative to national litigation consider on a priority basis the question of education and awareness building among merchants and consumers regarding the impact and increasing importance of ADR/ODR in resolving commercial disputes. Countries should also ensure that national legislation recognizes the validity and enforceability of electronic transactions and facilitates the use of out-of-court dispute settlement schemes. Countries should consider acceding to the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards, which allows the enforcement of foreign arbitral awards. Countries are also encouraged to promote voluntary adherence by e-businesses to trustmarks and reliability programmes, and to give attention to cultural and linguistic differences affecting the provision of ODR services.

Chapter 1

RECENT INTERNET TRENDS: ACCESS, USAGE AND BUSINESS APPLICATIONS

The disappointment created by the failure of many dot-coms in 2000 and 2001 seems to be giving way to a more positive assessment of the Internet's impact on the performance of enterprises. The trend started in the United States, by far the largest economy among the leading adopters of e-business, but is now spreading to other economies. However, this renewed confidence in the capacity of technology to improve business operations is manifested in more nuanced ways than the overly optimistic visions of sweeping, revolutionary change that prevailed in the late 1990s.

The realities of the business cycle have imposed themselves, putting to rest the idea that information and communication technologies (ICT) would in the future spare economies the need for more or less painful adjustment of macroeconomic imbalances. At the same time, more realistic expectations about the economic benefits of the Internet – that it can help enterprises cut costs, generate more income and generally be more efficient – seem to be coming true.

These statements refer not only to the most obviously Internet-related enterprises (for example, at the end of 2002, 40 per cent of surviving dot-coms and 70 per cent of online retailers in the United States were reporting profits; see *Business Week* 2003, Forrester Research 2003b) but also to the "traditional" sector – that is, enterprises in industry and services sectors that until now conducted nearly all of their business offline. Indeed, the Internet's impact on productivity (an issue explored in chapter 2 of this report) affects the economy as a whole mostly through the changes that use of the Internet and other ICT applications is introducing in the conduct of business operations.

There is mounting evidence of the gains that enterprises derive from adopting e-business. For example, a survey (Varian et al. 2002) of the impact of Internet use on a sample of some 2,000 corporations in the United States showed that the corporations achieved accumulated savings of $155.2 billion and revenue increases of $443.9 billion between 1998 and 2001. The same study surveyed 634 corporations in France, Germany and the United Kingdom, where the Internet-generated savings amounted to $8.3 billion and the additional revenue to $79 billion. By 2010 the accumulated savings for the US sample of enterprises alone are expected to rise to $528.3 billion, and the accumulated additional revenues are projected to be $1,551.9 billion. A sign that enterprises believe preparing themselves for e-business pays off is the fact that, while investment in information technology (IT) in general decreased by 6.2 per cent in 2002, e-business budgets (for projects in areas such as customer relationship management, procurement, supply chain management, electronic payment and settlement, and enterprise application integration) rose an estimated 11 per cent; in 2003 growth in e-business investment fell to 4 per cent, but this rate was twice as high as the growth in overall IT investment.[1] Chapter 2 of this report discusses in detail the evidence of the impact of ICT on productivity.

In this broad context, the current chapter surveys the most salient aspects of the Internet's expansion and its adoption by enterprises around the world, as well as of the effects that the Internet and other ICT have on the operation of enterprises, especially in terms of e-commerce activity. This chapter also briefly examines the implications for economic development of a number of technology-related trends concerning Internet use by individuals and the adoption of e-business practices by enterprises. Some trends (e.g. the spread of broadband) may have an expansionary effect on the economy, while others (e.g. security concerns) may be holding it back. Other topical questions – such as those related to the policy framework for the promotion of e-business for development, the increasing social and economic importance of open-source software, and the development of business process outsourcing – are only mentioned here, since they are discussed in detail in chapters 3, 4 and 5.

A. Internet access, readiness and use

1. Measuring access and use

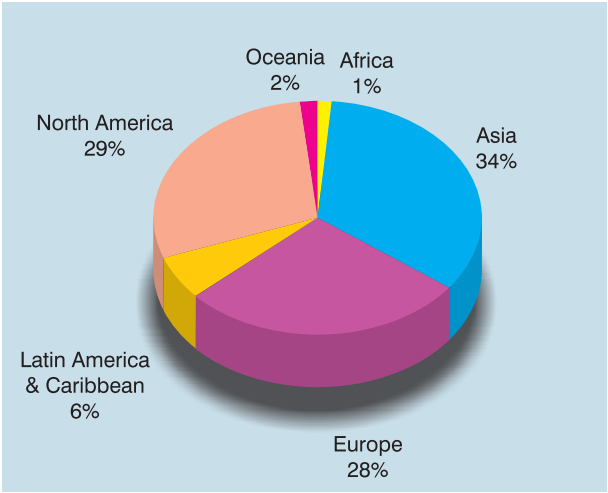
The number of Internet users cannot by itself give a full picture of the extent of ICT diffusion and adoption across an economy.[2] Reasonable levels of Internet penetration are a necessary condition, although not a sufficient one, for the development of e-business. While a high number of Internet users does not necessarily mean a high rate of e-business activity, it can be argued that if citizens find it difficult to use the Internet (i.e. if access is scarce or language represents an important barrier), then the technological conditions for the adoption of ICT by businesses are probably not being met. In addition, access is by no means the only bottleneck in the development of a digital economy. The latter also requires, among other things, changes in the legal framework, in the managerial culture of enterprises, and in consumer attitudes and habits. Many of the trends affecting these issues are not easy to capture in figures obtainable through objective statistical methodologies. In the absence of sufficiently comparable and truly global information about the *intensity* of Internet use, as opposed to the mere absolute number of people with access, estimates of the number of users provide a straightforward, objective – even if imperfect – indication of whether the foundations of a "digital economy" – for example, awareness, access, experience and trust – are present in a society. The recent evolution in the global number of Internet users is presented in tables 1.1 and 1.2, which use data from the International Telecommunication Union (ITU). Chart 1.1 shows the distribution of Internet users among regions of the world. Disaggregated information is provided for a variable number of countries in each region. These countries have been selected on the basis of either the weight of their economies in the respective region or the above-average performance growth in their number of Internet users.

Table 1.1
Internet users (thousands) by region, 2000-2002

	2002	2001	2000	% change 2001-2002	% change 2000-2001
Africa	7 943	6 510	4 559	22.0	42.8
Asia	201 079	150 472	109 257	33.6	37.7
Europe	166 387	143 915	110 824	15.6	29.9
Latin America & Caribbean	35 459	26 163	17 673	35.5	48.0
North America	170 200	156 823	136 971	8.5	14.5
Oceania	10 500	9 141	8 248	14.9	10.8
Developing countries	189 882	135 717	93 161	39.9	45.7
Developed countries	401 686	357 307	294 371	12.4	21.4
World	**591 567**	**493 024**	**387 531**	**20.0**	**27.2**

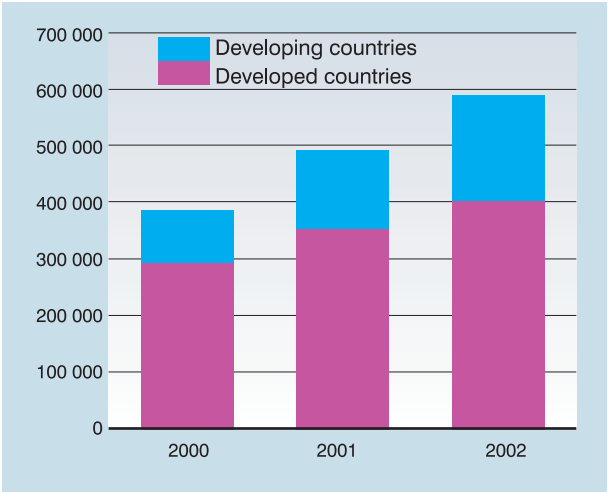
Source: ITU (2003a) and UNCTAD calculations.

Chart 1.1
Internet users by region, 2002



Source: UNCTAD elaboration of ITU (2003a).

Chart 1.2
Internet users (thousands), 2000–2002



Source: UNCTAD elaboration of ITU (2003a)..

Table 1.2
Internet users (thousands), selected countries, 2000-2002

	2002	2001	2000	% change 2001-2002	% change 2000-2001
Africa	**7 943**	**6 510**	**4 559**	**22.01**	**42.81**
Algeria	500	200	150	150.00	33.33
Egypt*	600	600	450	..	33.33
Kenya*	500	500	200	..	150.00
Morocco	500	400	200	25.00	100.00
Nigeria	200	115	80	73.91	43.75
South Africa	3 100	2 890	2 400	7.27	20.42
Togo	200	150	100	33.33	50.00
Tunisia	506	400	250	26.38	60.00
Zimbabwe	500	100	50	400.00	100.00
Others	1 337	1 155	679	15.76	70.21
Latin America & Caribbean	**35 459**	**26 163**	**17 673**	**35.53**	**48.04**
Argentina	4 100	3 650	2 600	12.33	40.38
Brazil	14 300	8 000	5 000	78.75	60.00
Chile*	3 102	3 102	2 537	..	22.26
Colombia	1 982	1 154	878	71.75	31.44
Mexico	4 663	3 636	2 712	28.27	34.04
Peru*	2 000	2 000	800	..	150.00
Venezuela	1 274	1 153	820	10.58	40.55
Others	4 037	3 469	2 325	16.37	49.18
North America	**170 200**	**156 823**	**136 971**	**8.53**	**14.49**
United States	155 000	142 823	124 000	8.53	15.18
Canada	15 200	14 000	12 971	8.57	7.93

Table 1.2 (*continued*)

	2002	2001	2000	% change 2001-2002	% change 2000-2001
Asia	**201 079**	**150 472**	**109 257**	**33.63**	**37.72**
China	59 100	33 700	22 500	75.37	49.78
Hong Kong (China)	2 919	2 601	1 855	12.21	40.22
India	16 580	7 000	5 500	136.86	27.27
Indonesia*	4 000	4 000	2 000	..	100.00
Israel	2 000	1 800	1 270	11.11	41.73
Japan	57 200	48 900	38 000	16.97	28.68
Korea, Rep. of	26 270	24 380	19 040	7.75	28.05
Malaysia*	6 500	6 500	4 000	..	62.50
Philippines*	2 000	2 000	1 540	..	29.87
Singapore	2 247	1 700	1 300	32.18	30.77
Taiwan P. of China	8 590	7 820	6 260	9.85	24.92
Thailand	4 800	3 536	2 300	35.75	53.74
Others	8 873	6 534	3 692	35.80	77.00
Europe	**166 387**	**143 915**	**110 824**	**15.61**	**29.86**
France	18 761	15 653	8 460	19.86	85.02
Germany	35 000	30 800	24 800	13.64	24.19
Italy	17 000	15 600	13 200	8.97	18.18
Netherlands	8 590	7 900	7 000	8.73	12.86
Poland*	3 800	3 800	2 800	..	35.71
Russia	6 000	4 300	2 900	39.53	48.28
Spain	7 856	7 388	5 486	6.33	34.67
Sweden	5 125	4 600	4 048	11.41	13.64
Turkey	4 900	4 000	2 000	22.50	100.00
United Kingdom	24 000	19 800	15 800	21.21	25.32
Others	35 355	30 074	24 330	17.56	23.61
Oceania	**10 500**	**9 141**	**8 248**	**14.87**	**10.83**
Australia	8 400	7 200	6 600	16.67	9.09
New Zealand	1 908	1 762	1 515	8.29	16.30
Others	192	179	133	7.43	34.97
Developing countries	**189 882**	**135 717**	**93 161**	**39.91**	**45.68**
Developed countries	**401 686**	**357 307**	**294 371**	**12.42**	**21.38**
World	**591 567**	**493 024**	**387 531**	**19.99**	**27.22**

Source: ITU (2003a) and UNCTAD calculations.

The global number of Internet users continued to grow in 2002, reaching 591 million people at year's end. The annual rate of growth, however, slowed from 27.3 per cent to 20 per cent. This trend was visible in all regions except Oceania, where the rate of growth of the Internet population increased from 10.8 per cent to 14.9 per cent. Developing countries continue to experience faster growth in the number of Internet users, partly because of their demographic patterns (younger populations, faster overall population growth). At the end of 2002, developing countries had 32 per cent of the world's Internet users, up from 28 per cent in 2001. If current trends continue, Internet users in developing countries could constitute 50 per cent of the world total in the next five years. Chart 1.2 shows the evolution from 2000 to 2002 in developed and developing countries' respective shares of Internet users.

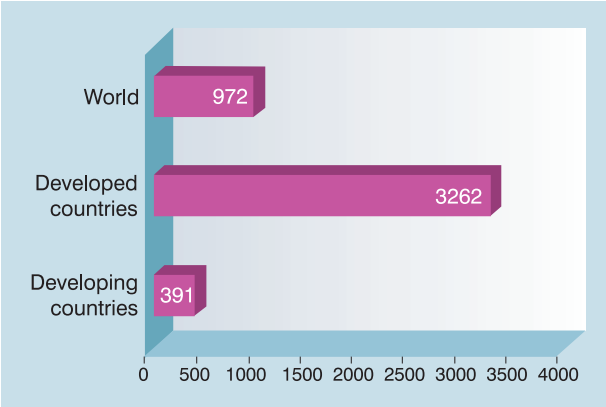
Table 1.3
Internet users per 10,000 people, by region, 2000-2002

	2002	2001	2000	% change 2001-2002
Africa	100	83	59	20.61
Asia	558	416	307	33.88
Europe	2 079	1 799	1 391	15.59
Latin America & Caribbean	669	499	342	34.06
North America	5 322	4 982	4 401	6.84
Oceania	3 330	2 939	2 694	13.32
Developing countries	391	280	195	39.67
Developed countries	3 262	2 914	2 416	11.94
World	**972**	**812**	**647**	**19.70**

Source: ITU (2003a) and UNCTAD calculations.

Slightly less than 10 per cent of the world's population had access to the Internet by the end of 2002. Yet, while in developed countries about one-third of the population uses the Internet, in the developing world the corresponding figure is eight times lower (see tables 1.3 and 1.4 and chart 1.3). Wide differences persist within each group of countries. Countries with comparable income levels, such as Nigeria and Togo,[3] may show Internet penetration rates that vary by as much as a factor of 25. Colombia and Mexico, on the other hand, have identical Internet penetration rates but vastly different per-capita incomes.[4] Similar contrasts can be found in every region of the world (e.g. between Chile and Venezuela, Estonia and Poland, Bahrain and Kuwait) and are also evident when one considers more sophisticated measures of the development of the information society.[5] Even

Chart 1.3
Internet users per 10,000 people, 2002



Source: UNCTAD elaboration of ITU (2003a).

Table 1.4
Internet users per 10,000 people, selected countries, 2000–2002

	2002	2001	2000
Africa	**100**	**83**	**59**
Algeria	160	65	49
Egypt*	93	93	71
Kenya*	160	160	65
Mauritius	1 487	1 316	729

Table 1.4 (*continued*)

	2002	2001	2000
Morocco	169	137	70
Nigeria	17	10	7
South Africa	682	649	549
Togo	427	322	216
Tunisia	515	412	261
Zimbabwe	430	87	44
Others	26	22	14
Latin America & Caribbean	**669**	**499**	**342**
Argentina	1 120	1 008	725
Brazil	822	466	294
Chile*	2 014	2 014	1 668
Colombia	458	270	207
Mexico	458	362	274
Peru*	766	766	312
Venezuela	504	468	339
Others	376	325	221
North America	**5 322**	**4 982**	**4 401**
Canada	4 839	4 666	4 357
United States	5 375	5 015	4 406
Asia	**558**	**416**	**307**
Bahrain	2 475	2 034	630
Brunei Darussalam*	1 023	1 023	904
China	460	257	173
Hong Kong (China)	4 309	3 868	2 784
India	159	68	54
Indonesia*	191	191	97
Israel	3 014	2 766	2 026
Japan	4 493	3 842	2 994
Korea, Rep. of	5 519	5 211	4 140
Kuwait*	879	879	685
Lebanon	1 171	776	913
Macao (China)	2 627	2 254	1 364
Malaysia*	2 731	2 731	1 719
Philippines*	256	256	201

Table 1.4 (*continued*)

	2002	2001	2000
Singapore	5 397	4 115	3 236
Taiwan Prov. of China	3 825	3 490	2 810
Thailand	776	577	379
United Arab Emirates	3 674	3 148	2 604
Others	100	71	36
Europe	**2 079**	**1 799**	**1 391**
Austria	4 094	3 870	3 325
Denmark	4 652	4 295	3 921
Estonia	4 133	3 005	2 721
Finland	5 089	4 303	3 723
France	3 138	2 638	1 437
Germany	4 237	3 736	3 015
Iceland	6 076	5 993	5 979
Italy	3 011	2 689	2 304
Netherlands	5 304	4 905	4 379
Norway	5 048	4 638	4 348
Poland*	984	984	725
Russia	409	293	197
Slovenia	4 008	3 008	1 508
Spain	1 931	1 827	1 367
Sweden	5 731	5 163	4 558
Turkey	728	604	306
United Kingdom	4 062	3 296	2 644
Others	1 168	973	756
Oceania	**3 330**	**2 939**	**2 694**
Australia	4 272	3 714	3 445
New Zealand	4 844	4 612	4 013
Developing countries	**391**	**280**	**195**
Developed countries	**3 262**	**2 914**	**2 416**
World	**972**	**812**	**647**

* 2001
Source: ITU (2003a) and UNCTAD calculations.

allowing for the influence of problems in the statistical measurement of Internet penetration, it is clear that, while developing countries face many common challenges in their efforts to participate in the information society, other factors such as levels of awareness, the vitality of civil society, and the priority that government, business and other social agents give to these challenges (as well as the explicit or implicit policy choices they make) matter as much as, if not more than, the availability of financial resources. These are some of the issues explored in chapter 3.

Equality between men and women (or, rather, the lack of it) is an important aspect to consider in any analysis of a society's Internet access in a development context.[6] As ICT and the Internet become more widely used business instruments, differences in men and women's opportunities to access information will increasingly aggravate existing gaps in their levels of income and welfare, and more generally in their capacity to contribute to and benefit from economic and social development. Table 1.5 shows data on female participation in Internet use for selected developed and developing countries. In general, there seems to be no relationship between a country's level of economic development and women's share in the total number of Internet users. Two developing countries rank among the five most egalitarian countries, which have achieved virtually equal participation or are close to it. At the other end of the table, three developed countries rank among the five with the lowest score. However, the results of the exercise would probably have been much less encouraging if the sample had included a larger number of developing countries, particularly from Africa and the Middle East, where women tend to represent less than the 35 per cent of the total Internet user population they have reached in Indonesia, the last country included in table 1.5.

Table 1.5
Percentage of women among Intenet users, selected countries, 2002

United States 1a	51	Luxembourg 1a	42
Canada	51	Venezuela 1	42
Hong Kong (China) 1	49	Brazil 2a	42
Thailand 1b	49	Poland 3	42
Iceland 1a	49	Mexico 3	42
Australia 2a	48	Israel 2a	42
Sweden 1	48	Japan 2a	41
Chile 1b	47	Philippines 2	41
Singapore 1b	47	Netherlands 2a	41
New Zealand 2a	46	South Africa 2a	40
Finland	46	China 1	39
Rep. of Korea	45	Belgium 2a	39
Ireland	45	Switzerland 1	39
Denmark	45	France 2a	39
Czech Republic 3	45	Italy 2a	37
Taiwan P. of China 2a	44	Germany 2a	37
Spain 1	43	Malaysia 3	36
Norway 2a	43	Indonesia 1b	35
Austria 2a	43	Luxembourg 1a	42
Argentina 1b	43	Venezuela 1	42
United Kingdom 2a	43		

Note: 1 = national source; 2 = Nielsen//NetRatings; 3 = TNS; a = 2001; b = 2000
Source: ITU (2003b)

Table 1.6
Internet hosts (thousands) by region, 2000–2002

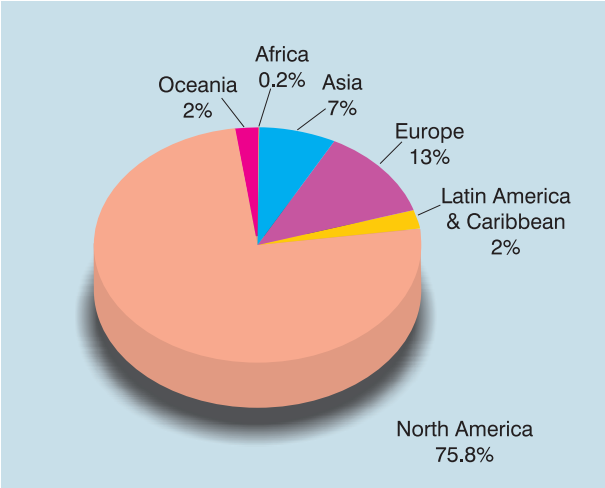
	2002	2001	2000	% change 2001-2002	% change 2000-2001
Africa	281	274	217	2.68	25.92
Asia	10 803	10 809	7 172	-0.05	50.70
Europe	18 363	15 325	12 533	19.83	22.27
Latin America & Caribbean	3 412	3 413	1 968	-	73.40
North America*	109 084	109 084	82 931	-	31.54
Oceania	3 035	2 732	1 973	11.09	38.48
Developing countries	**7 279**	**7 212**	**12 392**	**0.93**	**-41.81**
Developed countries	**137 700**	**134 424**	**94 402**	**2.44**	**42.39**
World	**144 979**	**141 636**	**106 795**	**2.36**	**32.62**

*2001
Source: ITU (2003) and UNCTAD calculations.

While the ITU data (tables 1.6 and 1.7) seem to indicate a drastic slowdown in the growth of the number of Internet hosts in 2002, according to the Internet Domain Survey, sponsored by the Internet Software Consortium, the total number of hosts around the world increased by 16.48 per cent between January 2002 and January 2003 (Internet Software Consortium 2003).[7] This is considerably less than the 34 per cent increase that the same survey detected from January 2001 to January 2002, but points to the Internet's continued rapid growth.

Internet hosts are even more markedly concentrated in the developed world than are users. Chart 1.4 shows the distribution of Internet hosts among the world's regions. North America and Europe account for as much as 89 per cent of all the Internet hosts in the world. Contrary to the trend in the number of users, the number of Internet hosts is growing faster in the developed countries than in the developing world. However, it is in the concentration of Internet hosts relative to populations that the difference between the developed and the developing world is most dramatic. While in 2002 the number of Internet users per 10,000 people was 53 times larger in North America than in Africa, in the same year the proportion between the numbers of Internet hosts per 10,000 people living in those two regions was 984 to 1. In other words, the relatively few people who use the Internet in developing countries compete among themselves for access to a proportionally much smaller number of computers connected to the Internet, and they have access to little locally hosted Internet content.[8] It must be noted, however, that hosting content in a server located in a developed country may be the best option for some enterprises in developing countries: for example, it may be preferable to host information about a tourist destination on a server located in or near the countries where the potential tourists reside.

Chart 1.4
Internet hosts by region, 2002



Source: UNCTAD elaboration of ITU (2003a).

Table 1.7
Internet hosts per 10,000 people, by region, 2000–2002

	2002	2001	2000	% change 2001-2002	% change 2000-2001
Africa	4	3	3	1.44	22.61
Asia	30	30	20	-0.20	48.51
Europe	230	192	157	19.91	21.75
Latin America & Caribbean	65	66	38	-0.60	72.08
North America*	3 465	3 465	2 665	..	30.03
Oceania	956	877	643	8.98	36.33
Developing countries	15	15	25	-0.15	-40.96
Developed countries	1 124	1 067	855	5.42	24.77
World	238	233	179	2.08	30.74

*2001
Source: ITU (2003) and UNCTAD calculations

The Netcraft Web Server Survey complements the information provided by the ITU with specific information about the evolution in terms of World Wide Web servers in 2002. In May 2003 this survey obtained responses from 40,936,076 sites worldwide, an increase of 15.17 per cent since December 2002, following a 3.12 per cent decrease in the number of hostnames in 2002 (Netcraft.com 2003).[9] Other indicators collected by Netcraft (table 1.8) point to the Web's rapid growth in terms of active sites, whose number grew 17 per cent in 2002. The number of Internet protocol (IP) addresses using some kind of scripting language also increased 52.1 per cent, indicating higher levels of interactivity and a richer experience for users.[10] Similarly, the 14 per cent increase in the number of sites using the secure sockets layer (SSL) protocol points to the continued expansion of business-oriented sites, which require secure transaction capabilities.[11] Another interesting trend detected by the Netcraft survey was a decrease in 2002 in the number of hostnames in the United States, while Europe, Asia and the Pacific region registered an increase of over 4 million hosts. This geographical diversification of the Web may be related to a delocalization of sites previously hosted in the United States but owned by companies from other countries.

Table 1.8
The World Wide Web in 2002

	January 2002	December 2002	% growth
Hostnames	36 689 008	35 543 105	-3.12
Active sites	14 134 142	16 629 876	17.66
IP addresses	3 801 101	4 007 918	5.44
IP addresses using scripting languages	612 420	931 468	52.10
SSL servers	153 072	174 745	14.16

Source: Netcraft (2003).

Table 1.9
International Internet bandwidth (Mbps), by region, 2000–2002[a]

	2002	2001	2000
Africa	2 118	1 231	649
Asia	78 584	51 044	22 965
Europe	909 159	675 348	232 317
Latin America	26 287	15 893	2 785
North America	381 904	272 187	112 222

[a] *The data represent Internet bandwidth (not traffic) connected across international borders as of mid-year. Domestic routes are not included.*
Source: TeleGeography (2002).

International Internet bandwidth, which had doubled every year for at least a decade, slowed its growth to 40 per cent in 2002, from 122 per cent in 2001 (TeleGeography 2002). The deceleration affected all regions of the world. It was most visible in Latin America (where bandwidth growth fell from 471 per cent in 2001 to 65 per cent), followed by Europe (with a fall from 191 per cent growth in 2001 to 35 per cent in 2002), North America (from 143 per cent to 40 per cent growth), Asia (from 122 per cent to 55 per cent) and Africa, where international bandwidth growth, at 72 per cent, was the fastest in the world but still down from the 90 per cent growth it had experienced in 2001. A combination of the private sector's reluctance to make new investments in the context of existing excess capacity and the general economic situation, on the one hand, and capacity reductions in corporate networks on the other seems to account for the global slowdown in bandwidth expansion. Excessive capacity brought down prices in the major North American and European markets, where they have fallen drastically for the last three years, although as of mid-2003 there were signs that prices might stabilize.

International bandwidth availability (tables 1.9 and 1.10) is especially important for developing countries because, given the relative scarcity of locally generated content, a large part of Internet traffic in developing countries (between 70 and 80 per cent by most estimates) tends to be international. A rough estimate of the availability of international bandwidth in each region can be made by comparing the information in tables 1.1 and 1.9. Despite the relatively fast growth of the last three years, the average African Internet user still enjoys about 20 times less capacity than the average European user, and 8.4 times less than a North American one. Even these rather grim overall figures hide the virtual digital isolation of some of the poorest African countries, where the international bandwidth available can be measured in terms of kilobits per second (Kbps) and may correspond to the

Table 1.10
Mbps of international Internet bandwidth per 1,000 users, by region

	2002	2001	2000
Africa	0.27	0.19	0.14
Asia	0.39	0.34	0.21
Europe	5.46	4.69	2.10
Latin America & Caribbean	0.74	0.61	0.16
North America	2.24	1.74	0.82

Source: UNCTAD elaboration of data from ITU (2003a) and TeleGeography (2002).

needs of a midsize European or US enterprise. Whatever limited international links are available tend to connect to the United States or Europe, with only a handful of African countries (mostly in southern Africa, and more recently in West Africa) having established links with their neighbours. This forces a high percentage of intra-African Internet traffic to flow through expensive intercontinental circuits. The deployment of Very Small Aperture Terminal (VSAT)[12] technology across the continent (provided that its potential is not undone by inadequate regulatory action) and the establishment of new submarine cable links could greatly improve the availability of bandwidth in a number of countries. The situation in Asia and Latin America, although generally better than in Africa, also continues to seriously limit these regions' participation in the global information economy.

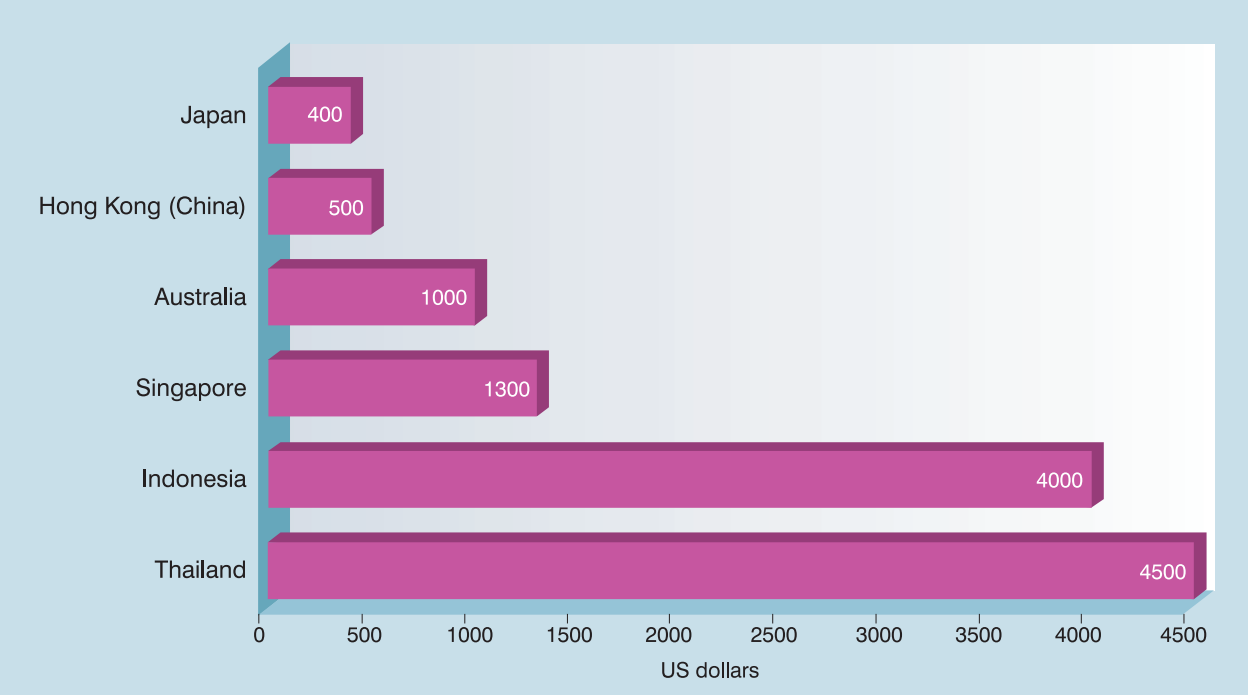
In general, improvement in bandwidth availability and a parallel decline in prices tend to be associated with a regulatory environment that promotes competition. Bandwidth scarcity may reflect the high cost of connecting small, low-income (and therefore low-usage) or landlocked markets to the Internet backbone.[13] In other cases, the consequences of the lack of economies of scale can be aggravated by public or private monopolies or other anti-competitive arrangements[14] that can lead to limited bandwidth availability and comparatively high charges. High international bandwidth costs can also be determined by international charging practices whereby developing-country Internet service providers ISPs) must pay the full cost of an Internet connection with a developed country.[15] Since for many ISPs in developing countries the cost of international bandwidth represents a very large component of their total costs, they have to pass it on to their subscribers (see chart 1.5); in the end, such arrangements imply that developing-country users subsidize developed-country users' access to information hosted in the developing country.

2. Assessing e-readiness

The preceding discussion dealt with aspects of the material base of the digital economy that are relatively easy to present in quantitative terms. However, countries' preparedness to take part in the global information society cannot be evaluated without complementing this category of data with other indicators that capture information about qualitative aspects of countries' economic, legal and policy framework. Various academic institutions, private organizations and

Chart 1.5

Cost of a 1 Mbps international half-circuit in selected Asia-Pacific countries (in US dollars)



Source: Gartner (2003).

commercial publishers issue e-readiness indicators that synthesize this information into e-readiness indexes. Two recent examples are the *Global Information Technology Report 2002–2003* published by the World Economic Forum and INSEAD, and the e-readiness rankings of the Economist Intelligence Unit.

The *Global Information Technology Report* (*GITR*) ranks 82 economies according to a Networked Readiness Index (NRI) defined as the "degree of preparation of a nation or community to participate in and benefit from ICT developments" (Dutta, Lanvin and Paua 2003). The NRI, which has a strong policy orientation, measures three dimensions related to ICT: environment, readiness and usage. The environment dimension assesses the extent to which a country's markets, political and legal system, and infrastructure support the development and use of ICT. Readiness relates to the ability of three key economic agents – individuals, firms and government – to capitalize on the use of ICT. The usage dimension measures the incidence of ICT use by these agents.

The Economist Intelligence Unit (EIU) follows a similar approach, although with more emphasis on the economic applications of ICT, and its ranking (ERI), which includes 65 economies, measures "the extent to which a market is conducive to Internet-based opportunities" (Economist Intelligence Unit 2003).

An important consideration in trying to draw general conclusions applicable to developing countries and the relative performance of various regions of the world is the lack of good statistical information about the extent to which the preconditions for ICT adoption exist in certain developing countries. Many developing countries are therefore not included in either of these rankings. Six developing countries, including the lowest-ranking four in the EIU's survey, are not included in the *GITR*, while 21 of the 22 countries not covered by the EIU that are ranked in the *GITR* are developing countries. One should also keep in mind the differences in, among other things, the choice of the variables considered, the techniques used to transform data, and the criteria used to assess qualitative information.

In spite of all these factors, the degree of coincidence in the results of these benchmarking exercises is remarkable. Six of the first 10 countries in both rankings coincide: Canada, Denmark, Finland, Sweden, the United Kingdom and the United States. When the first 15 countries in both lists are considered, the inclusion of Australia, Germany, the Netherlands, Singapore and Switzerland brings the number of overlapping countries to 11. Unsurprisingly, all these countries are high- or middle-income ones. Because the size of the sample is not the same in both surveys, it is not possible to make a similar comparison between the lower ends of both tables. However, although the level of overlapping is significantly smaller, the last 15 places in both rankings are occupied by developing countries. This is not to say that all developing countries show similar scores. In every region, a number of advanced ICT adopters can be identified in both the *GITR* and EIU rankings:

- In Latin America, Brazil and Chile score above the median value in the *GITR*, while only Chile does so in the EIU's smaller sample. (Mexico ranks 31 of 60 and scores 5.56, the median score being 5.565.)

- Among the developing countries in Asia, Singapore, Taiwan Province of China, the Republic of Korea, Hong Kong (China), Malaysia, India and Thailand score above the *GITR*'s median value. The EIU's e-readiness ranking places Hong Kong (China), Singapore, the Republic of Korea and Taiwan Province of China above the ranking's median value.

- Tunisia and South Africa are the only African countries (out of nine) scoring above the median of the *GITR*'s ranking. None of the four African countries listed in the EIU's survey ranks in the top half of the table. South Africa, which ranks 31 in a tie with Mexico, is 0.05 points below the median score.

- Estonia, the Czech Republic, Hungary, Slovenia, Latvia, Poland and the Slovak Republic are the Eastern and Central European countries with scores above the median ranking in the *GITR*. The Czech Republic, Hungary and Poland are the countries in that region that feature in the top half of the EIU's table.

A comparison of NRI and ERI indexes and rankings is presented in table 1.11. Although they generally show similar patterns, some differences emerge. Scores in the ERI show wider spreads, with the scores of the 25 best performers ranging from 8.67 (Sweden) to 6.96 (Israel), while for the NRI the highest score is 5.92 (Finland) and the country ranking 25 (Spain) scores 4.67. Note that the lowest indices are respectively 2.37 (Azerbaijan, ranking 60 in the ERI) and 2.07 (Haiti, ranking 82 in the NRI).

Table 1.11
A comparison between the NRI and the ERI

Country	NRI Score	NRI Rank	ERI Score	ERI Score
Finland	5.92	1	8.38	6
United States	5.79	2	8.43	3
Singapore	5.74	3	8.18	12
Sweden	5.58	4	8.67	1
Iceland	5.51	5	-	-
Canada	5.44	6	8.2	10
United Kingdom	5.35	7	8.43	5
Denmark	5.33	8	8.45	2
Taiwan Prov. of China	5.31	9	7.43	20
Germany	5.29	10	8.15	13
Netherlands	5.26	11	8.4	3
Israel	5.22	12	6.96	25
Switzerland	5.18	13	8.26	8
Republic of Korea	5.1	14	7.8	16
Australia	5.04	15	8.2	9
Austria	5.01	16	8.09	14
Norway	5	17	8.2	7
Hong Kong (China)	4.99	18	8.2	11
France	4.97	19	7.76	19
Japan	4.95	20	7.07	24
Ireland	4.89	21	7.81	15
Belgium	4.83	22	7.78	17
New Zealand	4.7	23	7.78	18
Estonia	4.69	24	..	..
Spain	4.67	25	7.12	23
Italy	4.6	26	7.37	21
Luxembourg	4.55	27	-	..
Czech Republic	4.43	28	6.52	27
Brazil	4.4	29	5.25	36
Hungary	4.3	30	6.23	29
Portugal	4.28	31	7.18	22
Malaysia	4.28	32	5.55	33
Slovenia	4.23	33	..	..
Tunisia	4.16	34	..	..
Chile	4.14	35	6.33	28
South Africa	3.94	36	5.5	32
India	3.89	37	3.95	46
Latvia	3.87	38	-	-
Poland	3.85	39	5.57	30
Slovak Republic	3.85	40	5.47	34
Thailand	3.8	41	4.22	42
Greece	3.77	42	6.83	26
China	3.7	43	3.75	50
Botswana	3.68	44	..	..
Argentina	3.67	45	5.41	35
Lithuania	3.65	46	..	..

Table 1.10 (*continued*)

Country	NRI Score	NRI Rank	ERI Score	ERI Score
Mexico	3.63	47	5.56	31
Croatia	3.62	48	..	..
Costa Rica	3.57	49	..	..
Turkey	3.57	50	4.63	39
Jordan	3.51	51	..	..
Morocco	3.5	52	..	..
Namibia	3.47	53	..	..
Sri Lanka	3.45	54	4.13	44
Uruguay	3.45	55	..	..
Mauritius	3.44	56	..	..
Dominican Republic	3.4	57	..	..
Trinidad and Tobago	3.36	58	..	..
Colombia	3.33	59	4.86	37
Jamaica	3.31	60	..	..
Panama	3.3	61	..	..
Philippines	3.25	62	3.93	47
El Salvador	3.17	63	..	..
Indonesia	3.16	64	3.31	53
Egypt	3.13	65	3.72	51
Venezuela	3.11	66	4.75	38
Peru	3.1	67	4.47	41
Bulgaria	3.03	68	4.55	40
Russian Federation	2.99	69	3.88	48
Ukraine	2.98	70	3.28	54
Viet Nam	2.96	71	2.91	56
Romania	2.66	72	4.15	43
Guatemala	2.63	73	..	..
Nigeria	2.62	74	3.19	55
Ecuador	2.6	75	3.79	49
Paraguay	2.54	76	..	..
Bangladesh	2.53	77	..	..
Bolivia	2.47	78	..	..
Nicaragua	2.44	79	..	..
Zimbabwe	2.42	80	..	..
Honduras	2.37	81	..	..
Haitì	2.07	82	..	..
Countries not listed in the NRI				
Saudi Arabia	..	..	4.1	45
Iran	..	..	3.4	52
Pakistan	..	..	2.74	57
Algeria	..	..	2.56	58
Kazakhstan	..	..	2.52	59
Azerbaijan	..	..	2.37	60

Source: Dutta, Lanvin and Paua (2003) and Economist Intelligence Unit (2003).

The *GITR* relates gross domestic product (GDP) to NRI scores and concludes that low per-capita GDP levels strongly influence NRI scores, that NRI scores improve rapidly with small GDP increases, and that the influence of GDP diminishes quickly beyond $9,000 per capita. As for ICT spending, large spreads are observed in NRI scores at any given levels of ICT expense as a percentage of GDP. The fact that a dollar spent on ICT may yield widely varying results in terms of e-readiness underlines the importance of other variables such as market and regulatory factors. Another point corroborating this is the relatively low ranking of Japan, the world's second leading ICT producer (20 in the NRI and 24 in the ERI).

Public policies supportive of the extension of the information society (including measures to foster competition in the telecommunication sector; support for investment in infrastructure; initiatives to lead by example through e-government projects, IT awareness and skill-building activities; and enhancement of the regulatory environment) are among the factors that explain the relative advantage of these countries. Higher-density population patterns, which facilitate and reduce the cost of infrastructure deployment, and relatively small size also seem to place countries in a better position.

On the other hand, the majority of developing countries face limitations on the development of their e-economy that are difficult to overcome directly through measures designed to promote e-business adoption: low income levels, which limit the potential for growth for any online business as much as for any offline one, and reduce incentives for investment; low literacy levels that make it difficult for many people to benefit from many IT tools; the absence of well-developed payment systems that can support online transactions; and cultural resistance to online trade. These and other obstacles need to be addressed in the wider context of national development strategies. At the same time, the development of the information society in general and of a vibrant digital economy in particular can make a tangible contribution to reaching general development goals. Considerations relevant to the development of e-business should therefore be part and parcel of national development strategies. The issue of how to develop and implement e-strategies specifically geared towards boosting the adoption of e-business practices by the enterprise sector has been the focus of a series of high-level regional events organized by UNCTAD in 2002 and 2003 with the participation of Governments, businesses and civil-society stakeholders.[16] The outcome of this process, among other inputs, serves as a basis for the discussion in chapter 3.

B. Sizing up global e-commerce

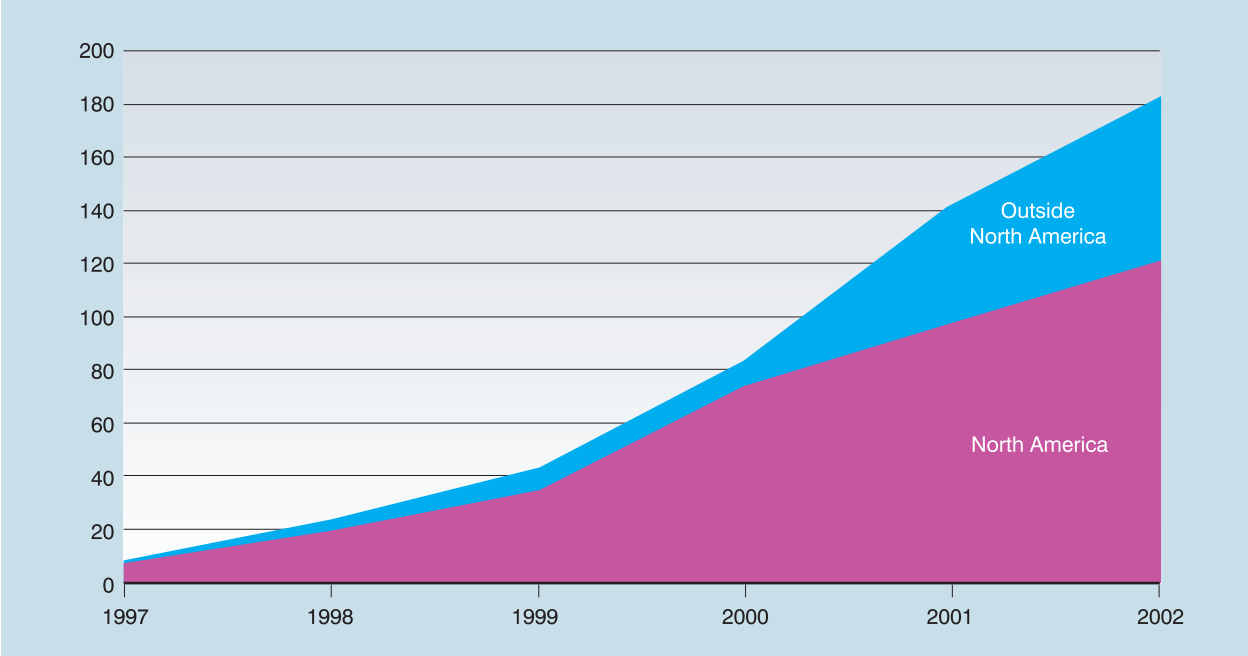
Many dimensions of the physical aspect of the digital economy are relatively easy to measure: the number of computers in use around the world, the bandwidth available to interconnect them, the number of enterprises that use the Internet, and so forth. Some of these dimensions were mentioned in the preceding paragraphs. For example, a physical, measurable manifestation of Internet-mediated social activity is the volume of traffic, the information encoded in binary digits that flows around the Internet.[17] Thus, according to some estimates, Internet traffic may double annually between 2002 and 2007, from 180 petabytes[18] per day to 5,175 petabytes (IDC 2003b).[19] Of this traffic, about 60 per cent is expected to originate from consumers and 40 per cent from business activities (IDC 2003d). This prediction is consistent with research that, contrary to many popular estimates of the growth of Internet traffic in the late 1990s (i.e. that Internet traffic doubled every three or four months), concludes that Internet traffic has been doubling every year since 1997 and that it continues to grow at the same rate (Odlyzko 2003).

The infrastructure used to conduct e-commerce can provide an indirect way to measure its evolution, if not its size in dollar terms. One way to do this is by counting the number of secure servers (those that can handle strong encryption). Chart 1.6 seems to support the idea that the growth of e-commerce continued uninterrupted through the difficulties of 2000 and 2001, and that players from outside North America have an increasingly important role.

Official statistical data concerning e-commerce transactions are unavailable in all but a handful of countries. In the case of the vast majority of developing countries, such data simply do not exist yet, and even in developed countries the picture is sketchy.[20] For the most part, the information available about the amounts involved in e-transactions takes the form of forecasts or estimates published by market research or IT consulting firms that frequently limit their coverage to the largest business-to-consumer (B2C) e-commerce markets. In this regard, little additional information is available that could significantly change the picture of global e-commerce painted by the figures previously published by UNCTAD.[21] The situation is

Chart 1.6

Number of secure servers worldwide with strong encryption[a] (thousands), 1997–2002



[a] Strong encryption implies key lengths longer than 40 bits.
Source: Netcraft (www.netcraft.com).

particularly serious for Africa, where no substantive information to supplement that given in last year's *E-Commerce and Development Report* has been identified. Some of those figures are reproduced here in order to provide the reader with at least a general idea of the size of global e-commerce. Forecasts of the value of global e-commerce in 2003 range between $1,408 billion and $3,878 billion, with growth projections that in the most optimistic scenario put the global volume of e-commerce at $12,837 billion by 2006.[22] Over 95 per cent of these transactions were attributed to e-commerce in developed countries. In some estimates, Africa and Latin America combined accounted for less than 1 per cent of global e-commerce in 2002.The share of business-to-business (B2B) transactions in the total of world e-commerce was commonly calculated around 95 per cent, and the relative importance of B2B and B2C transactions was not expected to change in the medium term.

1. Business-to-consumer E-commerce

Almost all estimates of e-commerce activity emanating from official sources refer to the high-income market economies, and the Organisation for Economic Co-operation and Development has compiled several surveys carried out in this category of countries (OECD 2002). At the time of the surveys (2000–2001 in most cases), the share of Internet users buying online was highest in the Nordic countries, the United Kingdom and the United States, where 38 per cent of users had made purchases online; it was lowest in Mexico, where fewer than 0.6 per cent had done so. The share of sales to households in total Internet sales ranges from a maximum of about 30 per cent (Finland and Luxembourg) to about 1 per cent (Singapore). At the time of the surveys, Internet retail sales were a very small part of total retail trade sales, ranging from 0.1 per cent in France to just over 1 per cent in the United Kingdom.[23]

For more recent information, it is almost always necessary to turn to sources other than official statistics. The following paragraphs present mainly information emanating from consulting and market research firms.

In the more advanced markets of **North America and Europe,** the attitudes of online consumers seem to be converging. In the United States, 22.5 per cent of the households in the 85 largest metropolitan markets made more than five online purchases in 2002 (eMarketer 2003b). In the largest European markets, 20 per

cent of adults bought online in 2002, compared to 14 per cent in 2001. An even larger number of them (41 million) used the Internet to decide on a purchase that they later made in a physical store (Forrester Research 2002d). In terms of expenditure per person, the average buyer in the European Union spent €527 ($498) in 2002 (Forrester Research 2002d), compared to the $717 that US consumers are expected to spend in 2003 (eMarketer 2003a).

In the United States, official figures provided by the US Bureau of the Census indicate that online retail sales in 2002 amounted to $43.47 billion, 25.64 per cent more than in 2001. This increase was all the more remarkable because overall retail sales in the United States grew only 2.9 per cent in 2002. Thus, the share of online retail sales in overall retail grew in 2002 to 1.34 per cent of total retail sales in the United States, up from 1.1 per cent in 2001 (US Census Bureau 2003b).

As it is often the case with e-commerce quantification, estimates of B2C online sales in the United States for 2002 and forecasts for 2003 vary significantly.[24] Table 1.12 summarizes some of these estimates.

For some products, online sales are becoming very significant. 32 per cent of software, 17 per cent of tickets for events and 12 per cent of books were sold online in the United States in 2002 (Forrester Research 2003b). Travel is an important industry in terms of online sales in the United States. A survey in April 2003 indicated that 52 per cent of those surveyed purchased more than half of their travel needs online, and 29 per cent made all their travel arrangements (ticket purchases, car rentals, hotel reservations) online (CyberAtlas 2003b). The number of people buying travel-related services online in the United States rose by 12 per cent in 2002, generating online sales of $22.6 billion (Forrester Research 2002c). According to other sources, 15 per cent of overall travel spending in the United States takes place online (*International Herald Tribune* 2003). Consumers are aware that they have a better chance of finding a good deal for their money via the Internet than via any other means.

In the European Union, e-commerce sales in 2002 are estimated at €30 billion ($28.29 billion at the average exchange rate of 2002). This would represent about 1.6 per cent of total retail, not far from US levels (Forrester Research 2002b). Differences in the trust that consumers in various countries place in the security of online transactions, as well as differences in the numbers of credit card holders, explain the fact that while Germany is the European country with the largest number of Internet shoppers (18 million), its online sales during the 2002 end-of-year season (€2.2 or $2.07 billion) were lower than in the United Kingdom, where consumers spent over €2.6 billion over the same period (Forrester Research 2002d). A study among credit card users in the major European markets showed that all categories of products registered fast growth in online sales in 2002, from 47 per cent for home electronics to 112 per cent for computing and sports. The fastest-growing retail e-commerce sector in Western Europe, according to this study, was air travel, whose online sales are said to have grown by an astonishing 1,236 per cent in a year.[25] Other sources estimate that online travel sales in Europe will represent 5 per cent of the total in 2003 and will grow

Table 1.12
Some estimates of B2C e-commerce in the United States, 2002 (billions of dollars)

	2002	2003
Bizrate.com (Jan. 2003)	47.98	..
eMarketer (April 2003)	45.54	58.23
eMarketer (April 2003 - incl. travel)	70.3	90.1
Forrester (May 2003)	76	96
Jupiter Research (Feb. 2003)	40.4	51.7
US Census Bureau	43.47	..

Note: Data from Forrester Research include travel sales; data from the US Census Bureau do not include travel, financial brokers and dealers, ticket sales agencies or food services.
Source: All as quoted in eMarketer (2003b and 2003d), except Forrester Research (2003b) and US Census Bureau (2003b).

to 20 per cent by 2007 (International Herald Tribune 2003).

Besides the categories of products that are most often bought online, more and more consumers use the Internet to prepare for purchases of many high-value products for which the final transactions still tend to occur offline (e.g. real estate, automobiles). This preparation may include activities such as obtaining information about the product's specifications, reading press and consumer product reviews, comparing prices and applying for loans. Consumption financing is not the only online banking activity consumers are engaging in. In the European Union, 60 million people, representing 18 per cent of the adult population, use online banking (Forrester Research 2003a).

Outside the EU and US markets, little recent quantitative information has been found to supplement the data provided in the 2002 issue of the *E-Commerce and Development Report.* The generalizations made in that report about the circumstances of e-commerce development in various regions therefore remain essentially valid and are not repeated in the following paragraphs, which focus on completing and, when possible, updating that information.

The transition economies of **Eastern Europe** continue to invest in infrastructure, but the necessary conditions for strong growth in e-commerce are still not present in many of the region's countries. However, the circumstances are better in some of the Central European countries (the Czech Republic, Hungary and Poland). Rates of Internet penetration are increasing; IDC forecast that it will reach 17 per cent in the region by the end of 2003 and 27 per cent by 2006. Increased use of the Internet by consumers should help improve B2C e-commerce sales, but in most countries in the region e-commerce, which some estimates put at $400 million in 2003, is expected to remain a very small share of retail sales for the next few years (IDC 2003a).

B2C levels in the **Asia-Pacific** region remain modest in comparison to B2B transactions. According to some estimates, B2C revenues amounted to some $15 billion in 2002 and will total about $26 billion in 2003 (eMarketer 2002a). This would represent about 10 per cent of global B2C online sales. The vast majority of these volumes were generated by Japan, Australia and the Republic of Korea.

In Japan, according to National Statistics Bureau data for 2001, 10.5 per cent of all enterprises were engaged in e-commerce (B2C and/or B2B) through either the Internet or other networks. The sectors most advanced in the adoption of e-commerce were banks and trust banks (59.2 per cent), information services and research (31.6 per cent), retail trade of general merchandise (28 per cent), retail trade of motor vehicles and bicycles (27.5 per cent) and wholesale trade of general merchandise (23.7 per cent). 3.5 per cent of all enterprises used the Internet in sales to consumers. Among those quoted on the Tokyo Stock Exchange in fiscal year 2000, 58.5 per cent had no plans to introduce B2C e-commerce practices, while 20.9 per cent declared that they would do so in the next three years (National Statistics Bureau of Japan 2002).The National Statistics Bureau of Japan has not published monetary estimates of e-commerce activity in the country.[26] The number of people buying online was estimated at 20 million in 2001 (Visa International Service Association 2002).

In the Republic of Korea, the national statistical office reports that total e-commerce transactions amounted to KRW 177.81 trillion ($148.12 billion) in 2002. This represents an increase of 49.4 per cent over 2001. Of this amount, KRW 5,043 billion ($4.2 billion) was B2C e-commerce, an increase of 95.5 per cent over the figures for 2001 (Korea National Statistical Office 2003).

China's large and fast-growing Internet population remains resistant to buying online. Lack of trust and the very limited availability of credit cards are two commonly quoted obstacles. According to an official survey, 11 per cent of Chinese Internet users visit online shopping sites, 3.6 per cent say they use online banks, and 5.5 per cent visit stock trading sites. Although two-thirds of users say they have never bought anything online, 24.7 per cent say they will do so in the next year, and another 42 per cent say they may join them (China Internet Network Information Center 2003). The impact of the outbreak of severe acute respiratory syndrome (SARS) on B2C activity in China is unclear. On the one hand, by slowing down the Chinese economy during the first quarter of 2003, it may have inhibited the expansion of B2C by reducing disposable incomes. On the other hand, SARS provided an incentive for Chinese to go online as they looked for alternative information sources. Text messaging, which in the first months of 2003 was largely related to the SARS epidemic, has been reported as a key source of income for Chinese Internet portals (*Business Week* 2003).

In **Latin America,** market research sources estimate the total of B2C e-commerce at $2.3 billion in 2002 and $4.5 billion in 2003 (E-Consulting 2003). Brazil, Argentina and Mexico remain the largest markets. Bra-

zil, with a much larger and diversified user population, has reached higher maturity as an Internet market and represents between 50 and 60 per cent of all Latin American online retail sales. A 2002 survey found that 85.6 of Brazilian online consumers were satisfied with the services offered by their country's online retailers (IDG Computerworld do Brasil 2003). Most online sales are of CDs and DVDs (26 per cent), books and newspapers (23.2 per cent) and electronic products (7.5 per cent). There are no official estimates of the value of B2C transactions in Brazil. Private sources give estimates for 2002 that range from $308 million (excluding auctions, air travel and car sales) (BCEC and E-Consulting 2003) to $1.4 billion (E-Consulting 2003). A peculiar feature of Brazilian B2C trade is the importance of car sales, which represent about 60 per cent of all online retail sales. Growth predictions for growth in B2C e-commerce range from close to 100 per cent (Brazilian Chamber of E-Commerce) to a more conservative 36 per cent (E-Consulting Corp.). The value of the average purchase grew by 15 per cent in 2002, reaching $78 (BCEC 2003).

In Argentina and Mexico Internet activity is more confined to the higher socioeconomic strata. However, and in spite of the severe difficulties experienced by the Argentinean economy in 2002, the number of Internet users grew there by over 12 per cent, to more than 4 million people, twice as many as read the daily newspapers (D'Alessio/IROL 2003).[27] The number of online buyers increased slightly in 2002 (from 52 to 53 per cent), while the number of people researching online and buying offline fell from 73 per cent to 65 per cent. In 2003 the number of online as well as offline buyers seems to be declining (to 48 and 46 per cent). As in many developing countries, lack of trust is the reason cited most often by those who do not buy online (52 per cent), followed by lack of direct contact with the seller, higher costs, and delivery difficulties (13 per cent).

A sector in which Latin America seems to be performing better than in other industries is online retail banking. Growth in this area has been driven by traditional banks, which have used the online channel to generate customer loyalty and improve their operating margins. Pure online banks have had little success in the region. In some cases, very specific conditions – such as restrictions imposed by the Argentinean authorities on withdrawals from bank accounts – provided an incentive for the use of online banking services, in particular online payments. In other countries, banks have used free Internet access to lure consumers. Two Brazilian banks, Bradesco and Banco do Brasil, have thus achieved more than 4 million online customers each (eMarketer 2002b). In Mexico, the number of online bank users more than tripled from 700,000 in 2000 to 2.4 million in 2001, and it could reach 4.5 million in 2005 (eMarketer 2002b). One reason for the success of Latin American banks' online ventures seems to be the attention they have paid to providing retail customers with multiple ways to access their accounts (Internet, telephone, wireless). However, given that the share of the total population that actually has a bank account is relatively small, the expansion of Latin American online banking may be facing a bottleneck. To achieve their objective of reducing the cost of traditional delivery channels, banks will have to attract even more of their users online and give incentives for more intensive use of their Internet services.

Of the smaller e-commerce markets in Latin America, Chile was among the most dynamic, with some $2.5 billion of e-commerce in 2002, 75 per cent more than in 2001. $40 million of this value (0.2 per cent of Chile's total retail trade) was B2C e-commerce.[28] This represents a 30 per cent increase over 2001 values, and double the amount of Chile's B2C e-commerce in 2000.

The latest available estimates of **African** e-commerce were published in the *E-Commerce and Development Report 2002*. Those figures, which correspond to market research forecasts published in 2001, are $4 million of online retail in 2002, growing to $70.6 million in 2003 (Forrester Research 2001).

2. Business-to-business e-commerce

Official statistical data from the **United States** (table 1.13) confirm the dominance of B2B transactions in that country's e-commerce (US Census Bureau 2003a). In 2001, B2B online sales in the United States amounted to $995 billion, or 93.3 per cent of all e-commerce in that country. E-commerce activity is concentrated in a few industry groups within each sector. The leading adopters are manufacturing, where e-commerce accounted in 2001 for 18.3 per cent of the total value of shipments, and merchant wholesalers, with 10 per cent of total sales. Although B2B e-commerce sales declined in 2001, they fell by only 0.2 per cent, while overall sales decreased by 3.94 per cent. As a result, the share of e-commerce in total B2B trade increased from 14.35 per cent to 14.9 per cent. Once overall B2B transactions recover, the share of online transactions in total B2B trade is expected to grow vigorously, particularly as the integration of Internet-based purchasing systems with companies' back-end systems progresses.

Table 1.13

US B2B shipments, sales, revenues and e-commerce, 2000 and 2001 (billions of dollars)

	2001			2000			% change 2001-2002	
	Total	E-commerce	E-commerce % of total	Total	E-commerce	E-commerce % of total	Total	E-commerce
Total	**6 676**	**995**	**14.90**	**6 950**	**997**	**14.35**	**-3.94**	**-0.20**
Manufacturing	3 971	725	18.26	4 209	756	17.96	-5.65	-4.10
Merchant wholesale	2 705	270	9.98	2 741	241	8.79	-1.31	12.03

Source: US Census Bureau (2003a).

At the time of this writing, no equivalent official figures available for B2B online transactions in the **European Union** have been published. Independent estimates of the value of this trade in the European Union put it at between nearly $185 billion and $200 billion at the end of 2002.[29] Forrester Research forecast approximately $520 billion (the original forecast in euros is €465 billion) for 2003, predicting that the amount would more than double to €945 in 2004 and would reach €2,219 billion in 2006. According to this study, by 2004 B2B e-commerce would represent nearly 10 per cent of all trade between enterprises, a dramatic rate of growth considering that online trade was less than 1 per cent of all B2B trade in Europe in 2001. At the end of the period covered by the forecast, the industries with the highest percentage of B2B e-sales would be electrical equipment (40 per cent), logistics and storage (30 per cent) chemical, rubber and plastics (30 per cent), energy and utilities (28 per cent), mining and metals (27 per cent) and vehicle manufacturing (27 per cent). The largest volumes would concentrate in France, Germany and the United Kingdom, all of which, according to this study, would see at least 26 per cent of their business trade occurring online. In terms of intensity of use, the Nordic countries are expected to be ahead, with 17 per cent of their total B2B trade moving online by 2004, while Italy, Spain and to an even greater extent the other Southern European economies are expected to lag behind. These patterns respond to differences in average annual per-capita IT investment. While Sweden and Denmark spend on IT more than 150 per cent of the EU average of €588 per capita, Italy and Spain invest 57 per cent and 46 per cent of that amount respectively.

In **Central and Eastern Europe** (where 90 per cent of e-commerce takes place in just three countries, the Czech Republic, Hungary and Poland), some projections are that B2B e-commerce will amount to around $4 billion in 2003. This could grow to $17.6 billion by 2006 (IDC 2003a). Although Internet access and use are now fairly common among enterprises in the three countries, particularly among the smaller enterprises use of the Internet clearly remains at a pre-transactional phase.

In the more dynamic economies of the **Asia-Pacific** region, adoption of e-commerce is more and more perceived by enterprises as the natural future of business. Governments in the region tend to prioritize the improvement of infrastructure and upgrading of skills that are necessary to participate effectively in the digital economy. As a consequence, B2B e-commerce should grow rapidly, from about $120 billion in 2002 to around $200 billion in 2003 and $300 billion by 2004 (eMarketer 2002a).

In Japan 8.1 per cent of all enterprises use e-commerce in their business with other enterprises, twice as many as are using e-commerce in their interaction with consumers (National Statistics Bureau of Japan 2002). 4.6 per cent use e-commerce to take orders, 4.2 per cent to place orders, 1.8 per cent for after-sales services and 1.5 per cent for shipping or distribution. Manufacturing, finance and insurance, wholesale and retail trade, general services, and transport and communications are the business sectors making above-average use of B2B e-commerce (National Statistics Bureau of Japan 2002). As for monetary values, which are not estimated by the National Statistics Bureau, a 2001 survey estimated that B2B e-commerce in Japan would reach JPY 34.03 trillion ($281.36 billion) in 2001, JPY 43.95 trillion ($349.89 billion) in 2002 and JPY 61.27 trillion ($516 billion) in 2003 (Electronic Commerce Promotion Council of Japan 2002).

In the Republic of Korea, official statistics indicate that B2B transactions in 2002 amounted to KRW 155,708 billion ($129.71 billion), and e-commerce transactions between businesses and the Government (B2G transactions) amounted to KRW 16,631 billion ($13.85 billion). The combined amount of B2B and B2G e-commerce increased by 48.6 per cent compared to the figures of 2001. Together, B2B and B2G transactions represented 97 per cent of all Korean e-commerce in 2002 (Korea National Statistical Office 2003). 79.4 per cent of the value of B2B e-commerce took place in what the Korean National Statistical Office calls "closed-type" transactions between large corporations and associated suppliers with which they have established a stable trade relationship that is implemented through electronic transactions. Transactions amounting to 94.7 per cent of all B2B e-commerce were carried out over the Internet, which has overtaken all other kinds of electronic networks in the country. Manufacturing, with 75.8 per cent of total B2B e-commerce value, and wholesale and retail trade, with 16.5 per cent, were the two largest B2B sectors.

In China, a survey of a representative sample of enterprises in manufacturing, distribution and finance in several provinces[30] found that 69.5 per cent had a Web site, 28.7 per cent had an extranet accessible by business partners, 21.9 per cent had an extranet which customers could access, and 25 per cent were using electronic data exchange (EDI) (CRITO 2002). After-sales support, advertising and marketing, and exchanges of operational data with customers and suppliers are the most commonly cited uses of the Internet. Of the enterprises surveyed, 23 per cent were selling and 31.3 were buying online. For those who were doing B2B sales online, these sales represented an average of 2.1 per cent of their total sales.

B2B e-commerce in India continues to be concentrated in exports of IT and other business services such as software development and support, call centres, medical record transcription and data mining. India's exports of software and IT services in 2002–2003 reached $9.5 billion, 26.3 per cent more than in 2001–2002 (Nasscom 2003). The Indian IT services industry is a clear success story that has been made possible largely by the adoption of e-business practices. A future challenge for India will be to move its IT services and business process outsourcing (BPO) offerings higher up the value chain, into more lucrative but skill-intensive niches such as research and development or engineering. More extensive information and analysis concerning this industry, both in India and worldwide, is provided in chapter 5.

In **Latin America**, the volume of B2B e-commerce is driven essentially by developments in Brazil, Argentina and Mexico. In the Brazilian market, according to a measurement index that was launched in the first quarter of 2003, the value of all B2B online transactions in the first quarter of 2003 was R$34 billion (approximately $11.6 billion) (BCEC and E-Consulting 2003). This represents a significant departure from previous estimates from the same source that calculated the total value of Latin American B2B e-commerce at $6.5 billion in 2002 and predicted it would reach $12.5 billion in 2003. Of these figures, $3.7 billion in 2002 and a forecast $6.8 billion in 2003 were expected to be generated in Brazil (E-Consulting 2003). In the later estimates, online transactions between businesses and government entities in Brazil were said to amount to $1.2 billion in 2002 and forecast to rise to $2.6 billion in 2003 (E-Consulting 2003). The 30 largest Brazilian companies account for 90 per cent of all Brazilian B2B e-commerce, and therefore for a significant part of all Latin American B2B e-commerce (BCEC and E-Consulting 2003).

The 2002 CRITO survey cited above was also carried out among Brazilian and Mexican businesses. Some information extracted from it is presented in table 1.14 in order to facilitate comparisons between the situations of the two countries. Since the survey was carried out among enterprises in three industries (manufacturing, distribution and finance) that tend to be keener-than-average adopters of e-business practices, it is not surprising that in both cases a fairly sophisticated image of business use of the Internet emerges. Although differences should not be overplayed, the growing importance for some sectors of the Mexican economy of integrating their operations with counterparts in the United States could explain the greater emphasis placed by Mexican users on e-business tools to coordinate operations with partners, while in Brazil cost-cutting and efficiency gains seem to have greater importance. It is worth asking whether export market considerations and the role of foreign-owned firms are playing a greater role in the adoption of B2B e-commerce by Mexico's enterprises, while in Brazil's case competitive pressures in the domestic market could be playing a bigger role.

As for the smaller markets in the region, Chile's B2B e-commerce amounted to $2.47 billion dollars, or 1.6 per cent of all trade between businesses in the country. B2B e-commerce in that country has grown by 75 per cent compared to 2001 and is almost eight times greater than it was in 2000 (Baquia.com 2003). While limited in terms of total sales, in relative terms the

level of adoption of e-commerce practices in Chile could put it on a par with the regional e-commerce champions.

As was indicated in the *E-Commerce and Development Report 2002*, **African** B2B e-commerce in 2002 was forecast to amount to $0.5 billion in 2002 and $0.9 billion in 2003. South Africa was expected to account for 80 to 85 per cent of these amounts (Forrester Research 2001).

Table 1.14

Selected data from CRITO e-commerce survey, Brazil and Mexico (percentages of surveyed companies)

	Brazil	Mexico
Uses...		
Email	100	98.3
Web site	70.7	79
Intranet	37.7	50.9
Extranet	33.2	31.1
Extranet accessible by suppliers/partners	10.7	22.6
Extranet accessible by customers	15.7	16.2
EDI	36.7	58.4
Uses Internet for...		
Marketing/advertising	58.6	72.9
Sales online	28.2	11.8
After-sales customer service and support	23.1	40.2
Purchases online	54.9	64.8
Exchanging operational data with suppliers	51.9	50.1
Exchanging operational data with business customers	49.2	46.7
Formally integrating the same business processes with suppliers or other business partners	48.8	54.8
Sales online		
To other businesses	27.4	24
Mean % of total business sales conducted online (only for those doing B2B sales)	13.4	20.2

Source: CRITO (2002).

C. Some technology trends affecting e-business

The previous sections have outlined the conditions prevailing in various regions of the world with regard to the application of ICT to the activities of enterprises and the extent to which the adoption of e-commerce and e-business manifests itself in quantifiable e-commerce flows. Without aiming to provide exhaustive or even comprehensive coverage of the issues, the following pages will address some aspects of technology use that have been particularly prominent in the e-business arena in recent months and that will probably influence the development of e-business in coming years.

1. The growth of broadband

The intensity with which Internet traffic is growing and is forecast to grow was mentioned above. The spread of broadband Internet access (table 1.15) and related technologies is one reason for this rapid growth.[31] The spread of broadband is not only enabling existing Internet users to exchange information more easily, it is also attracting new users. Some operators report that 30 to 50 per cent of their new broadband subscribers have never had an Internet subscription before (Beardsley, Doman and Edin 2003).

Broadband availability has grown very fast in the past two years. Broadband networks are accessible to almost 320 million households, mostly but not exclusively in high-income market economies (Beardsley, Doman and Edin 2003). Growth in the number of subscribers has not, however, kept pace. Between 55 million (ITU 2003d) and 100 million people (Beardsley, Doman and Edin 2003) worldwide are using broadband Internet access. They are highly concentrated in a small number of countries; six countries have more than 75 per cent of all the subscribers in the world. In relative terms, the Republic of Korea leads the world with more than 21 subscribers per 100 inhabitants. Broadband is progressing fast in several other countries as well. In the United States, for example, broadband may achieve faster adoption than personal computers or mobile phones have (Beardsley, Doman and Edin 2003). In the rest of the world, however, Internet users are not taking up broadband as fast as its promised benefits might warrant. Two dominant technologies have an almost equal share of the world broadband market: DSL (digital subscriber line), with 50 per cent, and cable, with 45 per cent.

Table 1.15
Broadband penetration rates around the world

Economy	Broadband subscribers				Broadband households	
	Total	% change				
	000s	2001-2002	Per 100 inhabitants	% of all subscribers	% of those with Internet	% of all
1 Korea, Rep. of	10 128	24%	21.3	94%	83%	43%
2 Hong Kong (China)	989	38%	14.6	42%	68%	36%
3 Canada	*3 600*	*27%*	11.5	50%*	41%	20%*
4 Taiwan P. of China	2 100	86%	9.4	28%	59%	31%
5 Iceland	25	138%	8.6	21%*	12%	9%*
6 Denmark	462	107%	8.6	19%	24%	16%
7 Belgium	869	90%	8.4	51%	41%	17%
8 Sweden	693	48%	7.7	23%	20%	13%
9 Austria	540	123%	6.6	22%*	28%	14%
10 Netherlands	1 060	127%	6.5	10%	29%	19%
11 United States	*18 700*	*46%*	6.5	18%*	19%	10%
12 Switzerland	455	308%	6.3	5%	9%	4%
13 Japan	7 806	176%	6.1	27%	18%	5%*
14 Singapore	230	73%	5.5	26%	*35%*	*20%*
15 Finland	274	426%	5.3	5%	15%	8%

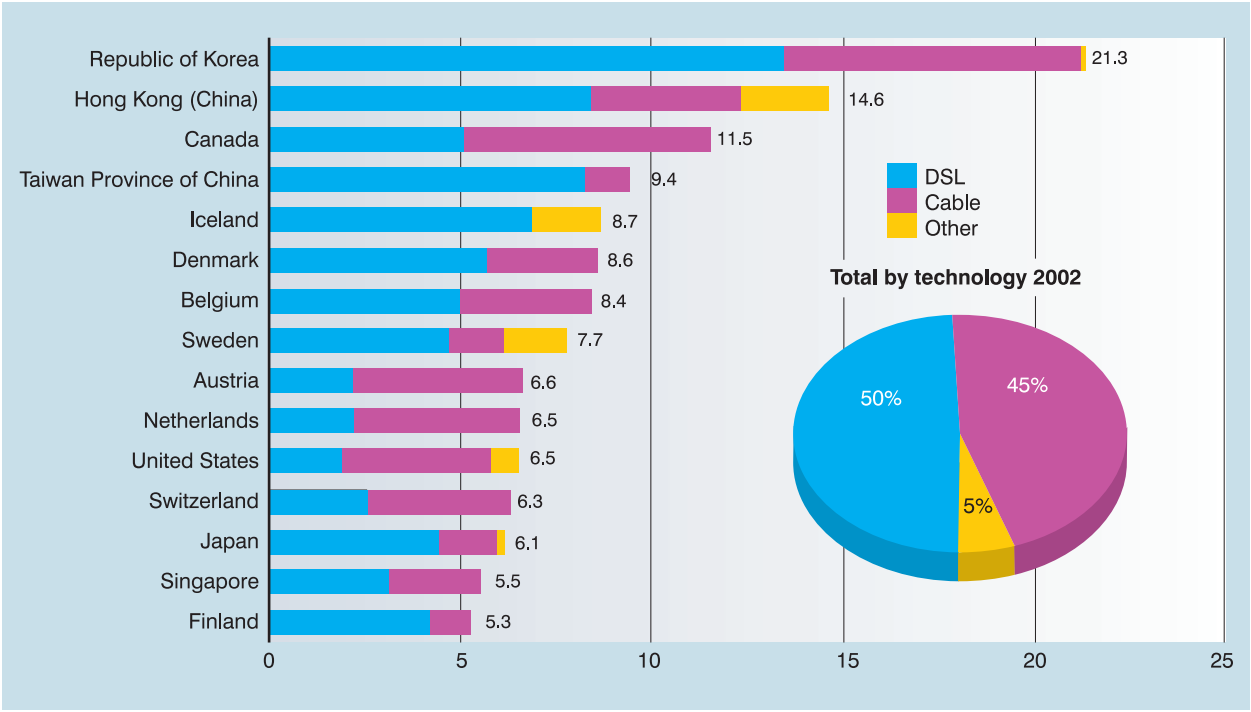
*Note: Values in italics are estimates. *: 2001*
Source: ITU (2003c).

In most countries, where broadband penetration remains below the 10 per cent mark (see chart 1.7) and prices are still fairly high, the short-term impact of this technology on most business operations will remain limited. However, based on current trends, significant penetration levels (above 40 per cent) could be achieved in several markets in three to five years (Beardsley, Doman and Edin 2003), provided that the regulatory environment ensures sufficient competition among providers, both within and across the various technologies used to deliver broadband (e.g. telecommunications and cable television operators). Particularly in developing countries, where DSL may not face competition from cable, fibre optic or wireless technology, it may be advisable for regulators to issue licences for alternative modes of delivery such as fixed wireless. This will give subscribers a wider choice of providers, greater availability and lower prices. Once penetration rates reach levels around 40 to 50 per cent, the impact of broadband access will be felt beyond the Internet industry and may start affecting the operations of businesses in general.

How will the widespread adoption of broadband influence businesses? Fast Internet access is the main reason for subscribers to switch to broadband technologies. Because data flow faster and users waste much less time waiting for Web pages to download, and because their connections are always on, broadband adopters tend to spend significantly more time online. In the B2C arena, the online marketing of products in which purchase decisions require a significant amount of information (i.e. high-value items) may be particularly affected by the spread of broadband. Consumers will be able to seek more information (e.g. by downloading information in multimedia formats), compare more options, or sample digital products. In addition to spending more time online, broadband subscribers are more likely to engage in e-

Chart 1.7

Broadband penetration (subscribers per 100 people), by technology, 2002



Source: ITU (2003d)

commerce and generally have more positive experiences and attitudes regarding online consumption. They therefore tend to account for a fast-increasing share of online traffic and expenditure.[32] Intense downloading and exchanging of software, media products (video, music and games) and other large files seem to be the activities that most clearly distinguish broadband Internet users from dial-up users. The implications for the media-based industries (essentially news and entertainment, but also educational institutions to some extent) could be significant. Subscription services may also benefit from the expansion of broadband, as its "always-on" nature and speed may make more convenient and therefore more valuable the use of services such as online storage, enhanced e-mail, personal information managers and Web publishing.

With regard to broadband's influence on the organization of enterprises or on transactions between businesses, although a number of initiatives aim at building new business models around broadband, no application of it has emerged with an impact on the functioning of markets or on the management of companies that is substantially different from the effects of earlier commercial applications of the Internet.

This is not to say that broadband will have no impact on businesses. Businesses buy much more online content than consumers, and broadband makes such content more accessible, easier to use, and therefore more sellable, especially to small and medium-size enterprises (SMEs). Broadband allows several users to share an Internet connection, which can reduce the cost of every individual connection, an important consideration for SMEs. For larger enterprises, the ability to centralize data and applications in a single storage facility while enabling many users in distant locations to access and use sizeable amounts of information may facilitate the adoption of new forms of organization: for instance, it may help make telecommuting a practicable idea for wider occupational categories (see box 1.1). Data-intensive operations in sectors such as finance or health care may see BPO accelerate when high-speed data transfers are possible between low-cost processing centres and their customers. Online provision of professional and other services may also be facilitated by the possibility of combining fast transfer of a high volume of data with video and voice links.

Other, broader effects on the economy can also be envisioned (ITU 2003d). Besides improving access to information society services (e.g. e-health, e-educa-

tion, e-government) that have indirect but real effects on the productivity of an economy, broadband adoption, like any major new technology, can encourage innovation and thus stimulate economic growth.

2. Security issues

A secure environment is not any more essential for e-business than it is for business in the physical world. Every commercial transaction involves a risk with which participants are normally familiar enough to judge whether the expected returns justify accepting the uncertainty of a potential loss. Even in the presence of considerable risk, if the expected returns are sufficiently high, someone will be willing to take that risk. Online casinos, for example, lure more than a few gamblers who may not be absolute certain about the quality – or, for that matter, the existence – of the regulatory authority that is supposed to supervise them. This being said, since most legitimate industries do not offer extraordinarily high rates of return, a reasonable level of security is needed for the normal conduct of business. In the case of online business, the risk involved in a transaction is generally harder to assess, so for any given level of aversion to risk, higher levels of precaution may be necessary, thus imposing higher costs. As e-business becomes part of the everyday experience of the majority of people, who tend to be more risk-averse than early adopters of technology, security in all its dimensions becomes crucially important. Internet users start to see the Web as a utility that is expected to be operational on a permanent basis and to pose as little risk as water or electricity use. Unfortunately, such levels of security and reliability are not yet available.

Internet security problems can take multiple forms: spam,[33] viruses, Web squatting, fraud, copyright violation, denial of service, unauthorized entry into corporate or personal computers and networks (and

Box 1.1
E-business uses of Wi-Fi

Wi-Fi, or "wireless fidelity", is a technology that uses radio frequencies to provide high-speed Internet connections for devices such as laptop computers and personal digital assistants (PDAs), whose defining feature is mobility. Wi-Fi "hot spots" (places where Wi-Fi-enabled computers can connect to the Internet) are proliferating in airports, railway stations, hotels, cafes and other public spaces, mainly in the United States and Western Europe. Besides its applications for private users, the technology can be useful for people who work on the move and need to connect to their offices. In industries such as manufacturing, logistics and retailing, and thanks to electronic "tags" that can be attached to products or components and beam information about their location or functioning, Wi-Fi can be used to manage various aspects of production and distribution.

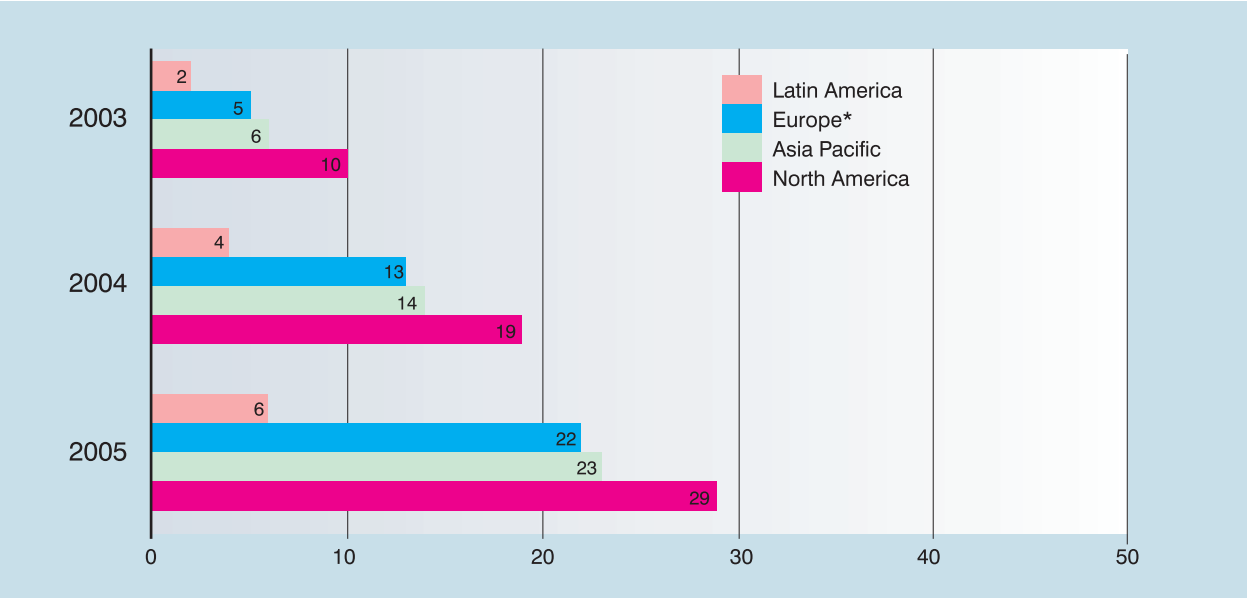
Almost one in five laptops sold in the United States in 2003 are said to be already equipped for Wi-Fi communications, and this is expected to be a standard feature within two years. If this happens, Wi-Fi could become the preferred technology for mobile e-business applications. The main advantage would be that workers with laptops equipped for Wi-Fi could link to systems that businesses already have in place to manage various aspects of their operations (e.g. customer relationship management and enterprise resource planning systems). Wi-Fi's main disadvantages in comparison with 3G (third-generation) mobile telephony are that its reach is limited to a relatively small distance from a "hot spot" (about 300 metres outdoors, about 100 metres in enclosed areas) and that, for the time being, "hot spots" themselves offer rather patchy coverage compared to the networks of telephone operators.

As with other Internet technologies, security concerns (which have been a problem for Wi-Fi) will have to be addressed before these potential business uses of Wi-Fi materialize on a large scale. For a technology whose main selling point is mobility, widely accepted standards are also essential. Both security and standardization could benefit from the announcement early in 2003 that Cisco Systems was prepared to license software designed to make Wi-Fi connections more difficult to break into, and to enhance Wi-Fi's range and other capabilities. The major chip makers and computer firms have agreed to work with Cisco, so that laptops carrying the improved technology could be on the market by the end of the year.

While Wi-Fi technology clearly offers significant benefits to Internet users and strong growth in its use can safely be anticipated, specific business models for its commercial exploitation are only starting to be developed. For developing countries, Wi-Fi technologies represent an opportunity to provide low-cost broadband access that is relatively simple to deploy, at least in urban areas. In the words of Kofi Annan, Secretary-General of the United Nations, "we need to think of ways to bring wireless fidelity applications to the developing world, so as to make use of unlicensed radio spectrum to deliver cheap and fast Internet access" (Annan 2002).

Chart 1.8

Spam growth by region, 2003–2005, per cent rates



[a] Includes Africa and the Middle East.
Source: Adapted from Ferris Research (2003).

theft or manipulation of the information stored in them), privacy infringements, and fraud and harassment, among other possibilities.

Some of these problems have acquired serious dimensions, and spam (unsolicited e-mail) is now proliferating at an alarming rate. By some estimates, in January 2003 about 25 per cent of all e-mails that circulated on the Internet were unsolicited; by March the percentage was over 36 per cent, and the 50 per cent mark could be reached before the end of 2003 (MessageLabs 2003). As Chart 1.8 shows, the majority of spam victims are in North America. As for its origin, 58.4 per cent of spam received in the world in March 2003 came from the United States, followed at a great distance by China (5.6 per cent), the United Kingdom (5.2 per cent), Brazil (4.9 per cent) and Canada (4.1 per cent).

In 2001 the European Commission estimated that spam-related costs amounted to over $9.6 billion worldwide in connection charges alone (MessageLabs 2003). Other, more pessimistic estimates put the overall cost of spam to enterprises worldwide in 2003 at $20.5 billion.[34] A tentative breakdown of the different categories of costs imposed by spam on enterprises could be as follows: 44 per cent of costs corresponds to wasted IT resources (wasted bandwidth and consequent slowdown of traffic and potential disruption of service); 39 per cent is attributable to lost user productivity (the extra time that workers must use to manage their e-mail, which already represents 10 per cent of working time in some occupations); and 17 per cent corresponds to the costs of maintaining help desks.[35] In addition to spammers operating for financial or other profit, often from offshore ISPs, spam is often used to carry out denial of service attacks.[36] A number of techniques are available to combat spam,[37] although spammers are also becoming increasingly sophisticated. In a growing number of countries, Governments are considering or implementing anti-spam legislation.[38]

Spamming has also been associated with other illegitimate uses of the Internet. For example, in order to set up a new e-mail account from which to operate, a spammer may use stolen credit card information. Identity theft has been increasing rapidly in recent years, and resulting losses have been estimated at $221 billion worldwide in 2003, almost three times as much as in 2000. This rise may be attributable to the increased accessibility of personal information, in particular credit card details.[39] For example, in an incident in February 2003 a hacker is reported to have obtained the details of several million credit card accounts in the United States.[40] In this environment, trust in B2C e-commerce may suffer unless measures to address consumers' mounting concerns are taken, including not only stringent technological protection of data but also law enforcement action.

In the first six months of 2003, a total of 91,088 digital attacks around the world were documented by mi2g, a digital risk management company (2003b).[41] This was more than the 87,525 recorded in all of 2002 (*Internetnews.com*, 2003). Symantec Corporation, another Internet security company, found that the number of documented new software vulnerabilities in 2002 was 81.5 per cent higher than in 2001 (Symantec 2003). This last figure may be distorted by the increased resources set aside for identifying vulnerabilities, and by a movement towards more responsible disclosure policies, but it still reflects the vital importance of a reliable and secure e-business infrastructure. Vulnerabilities in Web applications, which have increasing business importance, represent a growing share of new moderate and severe detected vulnerabilities.

Security incidents are not exclusively a problem of developed countries. As chart 1.9 shows, several developing countries rank among the countries that were targeted most often in digital attacks in 2002. The fact that, of the 28 countries where no attack was documented by mi2g in 2002, 21 were African, gives a measure of the technological breach existing between Africa and the rest of the online world.

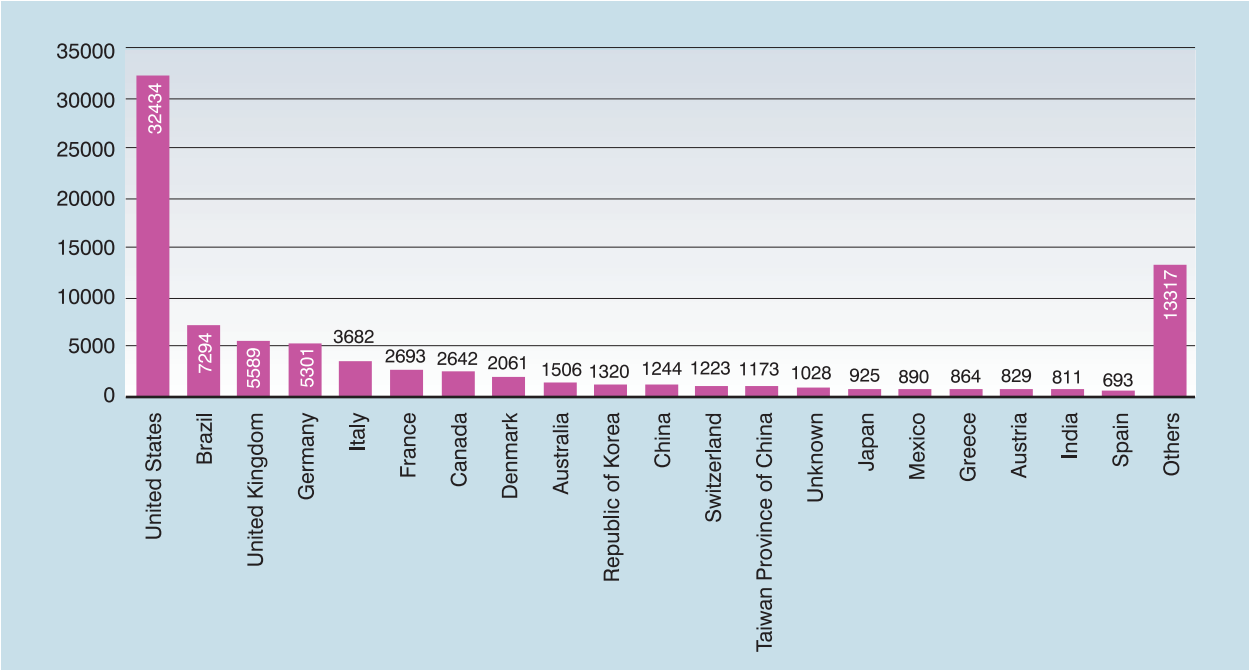
Developing countries are the leading victims of attacks against government online systems (see chart 1.10). However, attacks against government sites are less frequent than those against commercial entities, are driven by political factors, and have few economic consequences. Their most important effect may be that the media attention they attract helps undermine public confidence in the Internet in those countries where awareness of and trust in the Internet seem to be less advanced.

Most digital attacks in 2002 originated in a few countries, and 10 of them accounted for 80 per cent of all attacks detected according to data from Symantec (see chart 1.11). The United States was at the top of the list, followed by the Republic of Korea,[42] China, Germany and France. In terms of attacks per 10,000 Internet users, the picture changes, and the top 10 includes countries in all regions of the world (see chart 1.12 and Symantec 2003). Yet the perception of a need to take action to enhance Internet security is much more acute in the United States – partly as a result of the attacks of 11 September 2001 and concerns about so-called cyberterrorism[43] – than in other regions of the world.

While the private sector has been reluctant to report security breaches (BBC News 2003), it is well aware of the problem. Security applications are commonly quoted as one of the areas where CEOs expect major developments in the medium term, and the IT secu-

Chart 1.9

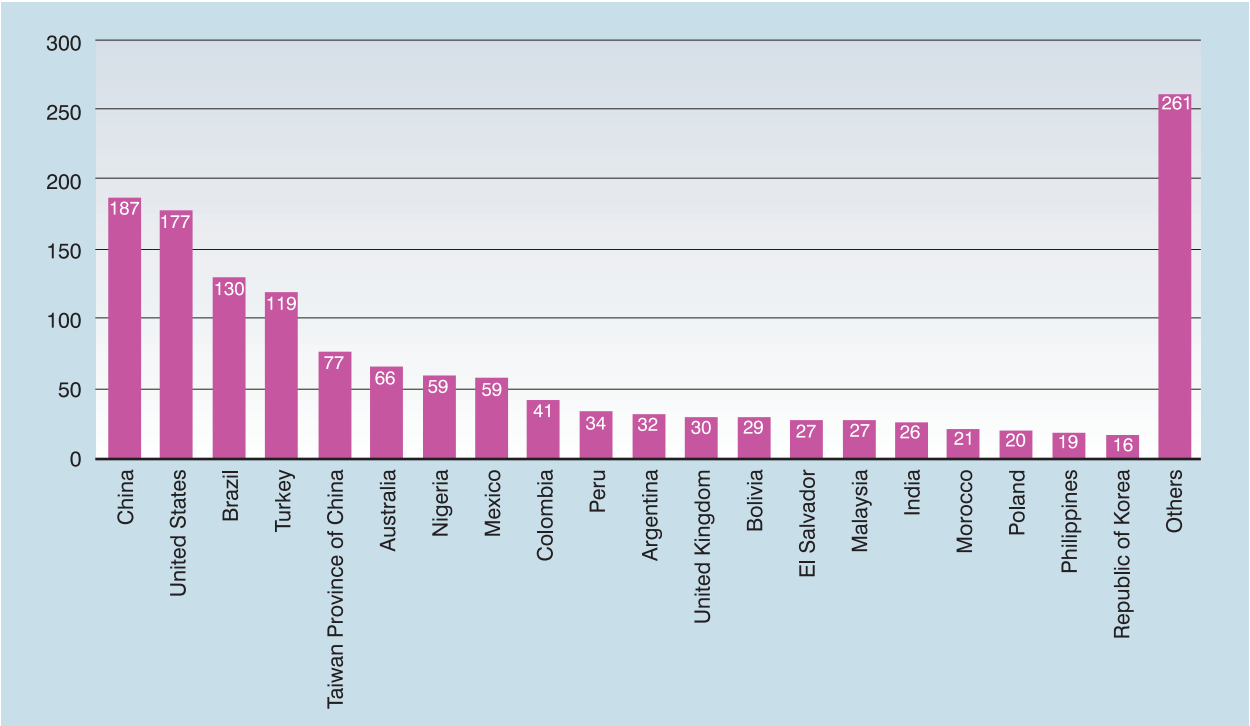
Countries suffering most digital attacks, 2002



Source: mi2g.com (2003a).

Chart 1.10

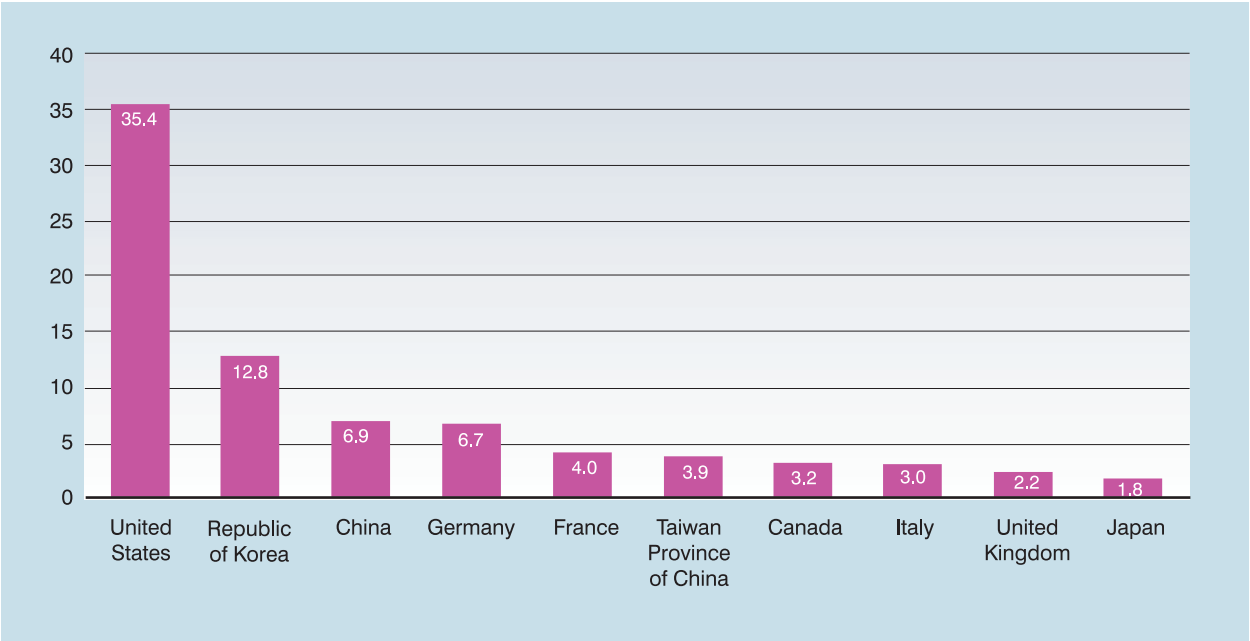
Attacks against government online systems, 2002



Source: mi2g.com (2003a).

Chart 1.11

Top 10 attacking countries (percentage of overall volume), 1 July – 31 December 2002



Source: Symantec (2003).

rity market is expanding fast. Total sales of IT security software, hardware and services are expected to reach $45 billion by 2006, compared to $17 billion in 2001 (IDC 2003b). The development of corporate initiatives in areas such as Web services provides a strong incentive for IT security investment.

Reasonable protection against Internet-generated risks can be achieved through a combination of software, hardware and risk management strategies that contemplate all potential sources of liability arising from interactions with customers, workers, suppliers and the general public. Studies[44] based on reported security incidents assess internal threats as being as severe as external ones. For example, the Asian School of Cyber Laws study *Computer Crime and Abuse Report 2001–02* for India showed that over half of the reported incidents were traced to employees (21 per cent) or former employees (31 per cent). In the end, the question of IT security at the firm level is much more a managerial problem than a technical one. It has to do with how penetrable the enterprise wants its business processes to be and how risk management is integrated into those processes. Management must decide what balance to strike between the benefits of open, collaborative business processes and the risks that greater exposure entails.

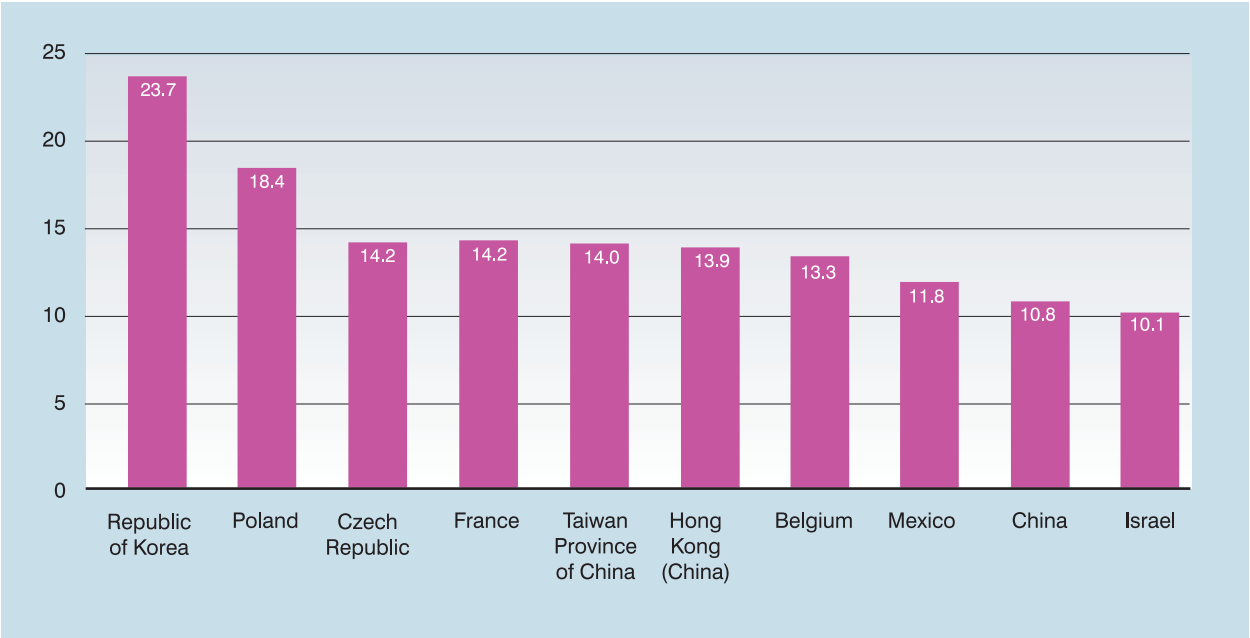
When plans and technology fail and digital intrusion reaches a critical level, companies tend to take strong legal action.[45] In addition, the private sector has an array of preventive and response strategies, including market-based incentives such as trustmarks and privacy seal programmes and the use of alternative regulation methods such as alternative dispute resolution (discussed in chapter 7).

While technology can help reduce those risks and costs, the key to a secure and private online environment is the combination of market efficiency and industry initiatives, political will and an appropriate legal environment. Box 1.2 includes information about recent developments in the area of legal and regulatory aspects of e-commerce, including security and other issues.

In the end, just as in the physical world an essential function of governments is to maintain peace and security so that citizens can go about their business, so in the digital economy law enforcement agencies will have to adapt to the new commercial environment and ensure the rule of law on the Internet. For example, the US Department of Justice has instituted "Operation E-Con", involving several government agencies. Investigations under this initiative concern 89,000 victims, and estimated losses of $176 million were associated with 263,000 Internet-related fraud complaints in 2002 (CyberAtlas 2003a). The Department of Homeland Security has launched a new

Chart 1.12

Attacks per 10,000 Internet users, 1 July – 31 December 2002



BOX 1.2

Legal and regulatory developments

Although several important legal issues such as applicable law, jurisdiction, consumer privacy, and data protection remain unresolved at the international level, a certain degree of predictability and legal certainty has been achieved by a number of developing countries that have enacted legislation recognizing the legal value of electronic means of communication and the validity of electronic signatures. Thus, legislation based on the 1996 UN Commission on International Trade Law (UNCITRAL) Model Law on Electronic Commerce, whose main objective is to offer legislators a set of internationally acceptable rules allowing some legal obstacles to be removed and a more secure legal environment to be created for e-commerce, has already been adopted by a number of developing countries.[46] Furthermore, other developing nations, mainly in Latin America and Asia, have adopted legislation on electronic transactions and electronic signatures[47] that provides the predictability required by business to engage in e-commerce. Unfortunately, many African countries continue to lag far behind, and several of them do not have any legislation accommodating e-commerce.

Another area requiring special attention to ensure that developing countries do not become havens for intellectual property piracy is intellectual property. Some important issues, such as the definition and scope of rights in the digital environment, and some of the challenges of online enforcement and licensing are addressed in two treaties concluded at the World Intellectual Property Organization (WIPO) in 1996: the WIPO Copyright Treaty (WCT) and the WIPO Performances and Phonograms Treaty (WPPT) (commonly referred to as the "Internet treaties"). Both treaties have been ratified by a relatively large number of developing countries.[48] The ratification of these treaties assists in the adaptation of intellectual property laws to the digital age and provides developing-country Governments with tools to protect their national intellectual property assets.

Security is another important area where very little progress has been achieved. Thus, lack of an adequate legal framework with respect to information and infrastructure security and computer crime is currently preventing developing countries from grasping the opportunities offered by e-commerce. The Convention on Cybercrime[49] prepared by the Council of Europe, whose main objective is to pursue a common policy to protect society against cybercrime, especially by adopting appropriate legislation and fostering international cooperation, provides a valid alternative for developing countries wishing to enact legislation.

As regards data protection and information privacy, few Governments in developing countries[50] have enacted legislation regulating the collection, use, dissemination and protection of the personal data to which business actors have access over the Internet. The absence of regulation in this field is clearly detrimental to the national economies of many developing countries, since a large number of developed countries,[51] in order to prevent circumvention of the law through the use of third-party countries and to protect individuals' rights over their personal data, prohibit the transfer of personal data to countries where the data are not provided a comparable or adequate level of protection. To avert the negative consequences of such restrictions, developing countries need to enact data protection legislation or adopt suitable contractual arrangements.[52]

cybersecurity division charged, among other objectives, with detecting and responding to online security incidents in coordination with other agencies, other Governments and the private sector. In addition to action by the law enforcement agencies of its member States, the European Union plans to establish a European Network and Information Security Agency that would play an advisory role on Internet security threats and should be operational sometime in 2004.

Priorities in this area should include identifying risks and critical vulnerabilities, reinforcing international and cross-border cooperation in compliance and enforcement, educating consumers and promoting best practices. Partnership and cooperation between government agencies and private-sector bodies will be key. The OECD's recommendation on privacy protection online is highly relevant and generally applicable to online security threats: "The key for the coming years will be to make traditional means of regulatory enforcement even more efficient, while at the same time encouraging the growth of self-regulatory mechanisms" (OECD 2003).

3. The development of web services

The concept of Web services refers to automated interaction over the Internet between computers managing different business processes, in such a way that they generate a "grid" of computers in which each machine is able to feed other machines the input they require and/or obtain from them the information it needs. This interaction occurs via software that

is designed to use other software, the communication between the two being based on Internet standards and protocols.

Web services have the potential to significantly improve the efficiency of processes such as inventory control and routine purchasing. Web services can also be very useful for the integration of disparate systems such as supply chain systems based on electronic data interchange (EDI) or extensible markup language (XML). In the longer term, their use should extend to other business processes, as they enable seamless, automatic interoperability between the software applications used in running the various aspects of a business (procurement, production, sales and marketing, after-sales service, finance, human resources) as well as with the applications of customers and suppliers. Beyond that, Web services will be an essential part of an economy in which "communication" between Internet-enabled objects (e.g. a sensor in a machine that detects the need to replace a part and places an order with the supplier) will be increasingly important. Although the main impact of Web services will be in enterprise operations, there are also many possibilities for consumer-oriented applications. For example, Web services could be used to create virtual travel agents that give access to the reservation systems of airlines and railways, car rental companies and hotels, travel-related content providers, and so on.

Despite the attention that the competing approaches to Web services by the largest players in the IT industry have attracted to the issue, Web services implementation is only starting to gather momentum. By the end of 2002, about 5 per cent of enterprises in the United States had completed a Web services project, although 80 per cent of them are expected to do so in the next five years (IDC 2003c). Large enterprises, particularly in manufacturing and the service sector, are the earliest adopters, but SMEs should eventually adopt the technology en masse as it matures.

The potential of Web services to become an important factor of change derives from the fact that they lie at the junction of several strong currents. Some of these currents are changing business organization and interaction (e.g. supply and demand chain integration and various forms of outsourcing), and others could influence the future of computing (e.g. the replacement of the "client-server" model by a network-centred approach in which the network itself is the source of computing power).

The first trend in business organization that influences the development of Web services is the integration of supply chains and the move towards demand chain management (in which links between manufactures, distributors and retailers extend down the chain that links suppliers to manufacturers). Tightly integrated, Web-based supply chains allow companies to benefit from low-cost data-intensive exchanges with their suppliers, wherever they may be located, thus overcoming the disadvantages of EDI (cost) and just-in-time purchasing and vendor-managed inventory (which were possible only with suppliers based nearby). In companies applying best practice in this area, information moves back and forth along these chains in real time, adjusting delivery closely to the customer's needs, in location as well as in timing. These integrated chains will deliver all their potential efficiency gains only if synchronized, real-time interaction exists between the networks of all participating actors. Web services technologies fit perfectly into this picture.

Another factor in the development of Web services is the refocusing of enterprises, particularly larger ones, on those activities and processes that constitute the core of their business, and where their competitive advantage rests. They are outsourcing many non-core parts of their business to partners who, because they are specialists, are able to generate more value performing those functions. In addition to this more common formulation, other kinds of outsourcing are developing. For example, some enterprises are co-sourcing – that is, pooling their non-core operations when no large-scale specialist exists. This can also be done internally, as when affiliates of a transnational corporation concentrate their operations for a particular product or service in a single centre. In-sourcing consists of adopting best practice in a certain process and adding to efficiency gains by taking business from other companies (not direct competitors), thus benefiting from economies of scale. In all these modalities, there is an exponentially growing need to exchange information seamlessly between computers running different operating systems and applications in distant locations and serving business processes that are the responsibility of different partners.

The technology current moving Web services forward is the mounting popularity of distributed computing, an approach in which computing resources (processing power or storage capacity) are not concentrated in any particular place but pooled together in the network and used when and as needed, thus allowing more efficient allocation of resources. The Internet has given new momentum to this approach because its standards and protocols are designed precisely to let computers using different operating sys-

tems work together well. Similarly, Web services apply the standards embodied in XML to enable a computer to identify the resources (e.g. a piece of software or a set of data) it needs for a given task, locate and access them through the network, formulate a request and deal with what is sent in response. The network operates as if it were a single powerful computer that, like a desktop computer, needs a sort of "operating system" to manage the flow of requests for resources. This role is played by platforms (or "application development environments") that provide developers with the instruments they need to write their Web service applications. Many Web-based applications are built on a *de facto* open-standard platform called J2EE (Java 2 Platform Enterprise Edition) that is an extension of Java. Microsoft for its part has developed its .NET technology, which it controls but claims to also support open standards.

Competition between these platforms is intense; its results may have strongly influence the evolution of the IT industry in the next few years, and the major players' role in it. In the meantime, for Web services to deliver their potential, services from one application vendor must be able to interoperate with those of another vendor, which may have been built on a different platform. In business terms, this means that there must be a guarantee that the Web service handling a company's inventory management can do business with the Web service that the supplier uses to handle orders.[53]

Web services can put outsiders in contact with systems that are at the core of an enterprise's activity. This is a manifestation of a general trend towards greater openness of enterprises in relation to customers and suppliers. Normally enterprises benefit from this greater openness, because they can be more responsive to their customers and get better service from their partners. But it should not be forgotten that any interface with the outside world represents a risk of intrusion, ranging from the merely indiscreet to the seriously malicious. While the industry is taking significant steps to address security concerns, at this stage of the technology's maturity and users' understanding of it, fully addressing security issues (including their implications for project scalability) should remain a central consideration of any major Web service implementation.

A different kind of danger involved in Web services has to do with the familiar tendency of IT innovations to generate unreasonable performance expectations, particularly in earlier phases of their development. Web services do have significant potential to improve the productivity of enterprises. At this stage, this applies particularly to enterprises in which an above-average amount of resources is employed in the standard, repetitive, not very complex interactions that constitute the routine of business relationships. However, Web services cannot substitute for human intervention in the creation of such business relationships. Simple Web services can be implemented at relatively low cost, but large-scale implementations can be challenging given the current state of the technology. In the medium term, Web services will introduce considerable changes in the way businesses use IT; however, this will not happen as a one-off revolution, but as a cumulative, if fairly rapid, process in which the technology will permeate the structure of enterprises and industries. To be ready to participate in this process, enterprises in developing countries, especially those involved in international supply chains, may benefit from starting to experiment with how Web services may be relevant to their specific circumstances and requirements.

D. Conclusion

Now that the dust raised by the collapsed dot-coms has settled, the trend towards a larger role by the Internet in social life and an extension of the reach of e-business to an ever-larger part of the economy of developed countries remains vigorous. Signs of this are visible in the expansion of the number of computers that make up the Internet, in the growth in the number of people using it, in the larger share of the civic debate that concerns (and takes place on) the Internet, and, naturally, in the constant increase of online economic activity.

Continuity is also noticeable in the uneven patterns of inclusion of developing countries in the global digital economy. It is now clear that the Governments, the civil society and the business community of an encouraging number of developing countries have understood the importance of the issues at stake and are moving decisively to help their people connect to the rest of the world and to eliminate obstacles to the adoption by their productive sector of ICT-enabled methods of creation and exchange of value. While immediate effects are not necessarily dramatic, improvements in the e-business environment should eventually result in productivity gains in these economies, the safest way to ensure sustained improvement of average living standards. At the same time, it must be noted that many other developing countries continue to face difficulties in identifying and realizing

the potential benefits of ICT and the Internet for their economic development. There is a need for a better understanding of the mechanisms through which the strategies, policies and instruments that have delivered results in other parts of the developing world can be adapted to fit the economic realities of those countries that are at greatest risk of e-marginalization.

Notes

1. According to figures from AT Kearny Inc., as quoted in Business Week (2003).

2. See UNCTAD (2003) for a discussion of the measurement of the diffusion of ICT capabilities across countries and relevant statistical indexes.

3. According to World Bank figures, Nigeria had per capita gross national income (GNI) of $290 in 2001. Togo's was $270.

4. Mexico's GNI in 2001 was $5,530, almost three times as much as Colombia's $1,890.

5. See, for example, a regression of gross domestic product (GDP) versus the Network Readiness Index in Dutta, Lanvin and Paua (2003).

6. See chapter 3 of UNCTAD (2002) for an in-depth discussion of gender, e-commerce and development.

7. According to this survey there were 171,638,297 hosts worldwide in January 2003, an increase of 24,293,574 from a year earlier.

8. A host is a computer that is connected to the Internet at a given moment and has an Internet protocol (IP) address. Not all hosts are servers, and a server may host one, several or even hundreds of sites.

9. Netcraft is an Internet service company. Its Web server survey examines software usage on computers that are connected to the Internet. The survey collects and collates as many hostnames providing HTTP (hypertext transfer protocol) service as possible, and systematically sends each one of them an HTTP request for the server name.

10. A simple example of this would be a bank website where a Java applet lets a visitor calculate the monthly payments of the loan he or she may be considering taking.

11. SSL is a protocol for authenticated and encrypted transmission of data via the Internet. Many commercial sites use the SSL protocol to handle confidential information, such as credit card details.

12. This satellite-based technology can be installed at relatively little cost.

13. Technologies such as VSAT could significantly ameliorate this problem.

14. For example, requirements that all Internet service providers (ISPs) use the dominant operator's international gateway, or regulations about the ownership of ISPs.

15. This practice originated when, at the earliest stages of the Internet's development, traffic flowed almost exclusively from developing to developed countries (mostly the United States), where almost all Internet content was located.

16. Regional meetings were held for Central America and the Caribbean (CuraÁao, 25–27 June 2002), Asia and the Pacific (Bangkok, 20–22 November 2002), Africa (Tunis, 19–21 June 2003), the transition economies (Geneva, October 2003) and South America (Rio de Janeiro, 18–20 November 2003). An expert meeting on e-strategies for development was held in Geneva on 10–12 July 2002. The recommendations and policy statements resulting from these events are available at www.unctad.org/ecommerce.

17. Internet traffic growth, however, is not determined exclusively by the number of human users of the Internet. Increasingly, new applications (peer-to-peer services for the exchange of music or video files, grid computing and others) allow computers to generate and receive traffic on a permanent basis. The traffic generated by these applications can impose a heavier load on the backbone than human-generated traffic (for example, by making many simultaneous connections).

18. A petabyte equals 250 bytes or 1024 terabytes (approximately 1015 bytes).

19. The forecast means that by 2007 the volume of information exchanged every day through the Internet will be equivalent to the content of books contained on over 54 million kilometres of shelves, slightly less than the minimum distance from Earth to Mars. See www.sims.berkeley.edu/research/projects/how-much-info/datapowers.html for examples of the size of various forms of accumulated information measured in bytes and its multiples.

20. See OECD (2002) for a presentation of available statistical work in the field of the information economy in developed economies. UNCTAD (2001) discusses the problems involved in measuring e-commerce in general and in developing countries in particular. In September 2003 UNCTAD organized an expert meeting on the measurement of the digital economy. The background paper prepared by the secretariat and the experts' conclusions provide an account of the main

issues at hand together with some practical proposals for addressing them. The documentation of the expert meeting is available at www.unctad.org/ecommerce.

21. See UNCTAD (2002).

22. The higher estimates correspond to a study by Forrester Research, while the source for the more modest one is eMarketer. See UNCTAD (2003) for more detailed estimates and the full references for these sources.

23. The preceding sentences merely summarize a few of the points made in the OECD report, which includes a number of charts and tables presenting official statistical information.

24. Not only do different sources provide widely ranging estimates, but the same sources may drastically change their own estimates in a matter of months or even weeks.

25. Visa International study quoted in eMarketer Inc. (2003c).

26. UNCTAD (2002) published data taken from a survey by the Electronic Commerce Promotion Council of Japan. The amount of online retail sales for 2001 was estimated at 1.484 trillion yen ($12.27 billion). Projections for 2002 and 2003 were that business-to-consumer sales would reach 2.831 trillion yen ($22.54 billion) and 5.034 trillion yen ($42.4 billion). Yen figures have been converted into dollars at each year's average annual exchange rate. The projections for 2003 were calculated at the average exchange rate of the first six months of the year.

27. All the data in this paragraph come from this source.

28. Baquia.com (2003), quoting a report by the Chamber of Commerce of Santiago.

29. Forrester Research (2002a) and IDC as quoted in Business Week (2003).

30. Beijing, Shanghai, Guangzhou and Chengdu. These provinces are generally considered to be the ones with a more dynamic economy.

31. In technical terms, broadband refers to telecommunication technologies in which a wide spectrum of frequencies is available for the transmission of information via a given physical medium. This allows data to be sent using many different frequencies or channels within the band at the same time. More information can thus be transmitted in any given amount of time. In practical terms, this means that, for example, a traditional copper telephone line can be used to carry not just a telephone conversation but also, and simultaneously, a high volume of other data (e.g. video). Broadband technologies allow high-speed connection to the Internet: the term broadband access is often considered to imply data transfer rates of at least 256 kbps, compared to the 56 kbps of a typical dial-up connection. In addition to enabling users to rapidly download software, music and video, broadband technologies also allow permanent connection to the Internet. Broadband access can be provided by using various technologies such as digital subscriber line (which uses existing telephone lines), fibre-optic cable, satellite, and wireless data transfer over radio frequencies.

32. Higher expenditure is also influenced by the generally higher income of broadband subscribers.

33. Spam (unsolicited e-mail) is not intrinsically a security threat, but spamming is frequently malicious and its effects are disruptive enough to be included in this category. It also tends to be associated with illegitimate or criminal activities.

34. Radicati Group, June 2003, as quoted in eMarketer (2003e).

35. Ferris Research, January 2003, as quoted in eMarketer Inc. (2003e).

36. Sending massive amounts of e-mail with the intention of disrupting a website by absorbing available bandwidth that a company's Web server may be sharing with its mail server.

37. These include the blacklisting of any IP address known to have been used by a spammer, the use of software that recognizes the "fingerprint" of any particular spam outbreak (as is done to detect software viruses), whitelisting (accepting e-mail from previously identified correspondents only), collaborative filtering (based on voluntary submission of details of spammers to a central database), Bayesian probability tools (which assess the probability of an e-mail's being spam on the basis of the experience accumulated by the system), heuristics (which use sets of rules defining what constitutes spam) and others.

38. As of end June 2003, the US Senate was considering legislation that would stipulate jail penalties for spamming. The European Union's Privacy and Electronic Communications Directive imposes drastic limitations on unsolicited e-mail.

39. CyberAtlas (2003), quoting a report from The Aberdeen Group.

40. CyberAtlas (2003), quoting a report from mi2g.

41. A digital attack is defined as an incident in which a hacker gains access to an online system and makes modifications to any of its publicly visible components. A digital attack can be either a data attack or a command and control attack.

42. It is worth asking whether the substantial number of attacks in Korea can be explained by the fact that broadband connectivity increases risk.

43. Attacks that because of their origin, target or other features can be considered as terrorist remain extremely rare. According to Symantec (2003), fewer than 1 per cent of all attacks originate in areas where other forms of international terrorism have been detected.

44. Computer Crime and Abuse Report (India) 2001-02, at www.asianlaws.org/report0102; Symantec (2003).

45. Thus, the music industry is routinely filing suits against providers of music streaming whom it accuses of violating its intellectual property rights. Microsoft recently filed lawsuits against 15 alleged spammers from the United States and the United Kingdom who had sent over 2 billion unsolicited messages to users of Microsoft's MSN network and its Hotmail e-mail service. See Detroit News, 2003.

46. As of May 2003 these included Bermuda, Colombia, Ecuador, Hong Kong (China), India, Pakistan, the Philippines, the Republic of Korea, Singapore and Thailand. See www.uncitral.org/en-index.htm.

47. As of May 2003 the following 27 developing countries had enacted legislation on electronic/digital signatures: Argentina, Bermuda, Brazil, Chile, China, Colombia, Costa Rica, the Dominican Republic, Ecuador, India, Indonesia, Malaysia, Mexico, Nicaragua, Panama, Pakistan, Peru, the Philippines, the Republic of South Korea, Singapore, South Africa, Thailand, Trinidad and Tobago, Tunisia, Uruguay, Venezuela and Viet Nam. See rechten.kub.nl/simone/ds-lawsu.htm.

48. As of May 2003 the following 23 developing countries had become parties to both treaties: Argentina, Burkina Faso, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Gabon, Guatemala, Guinea, Honduras, Indonesia, Jamaica, Mali, Mexico, Nicaragua, Panama, Paraguay, Peru, the Philippines, Saint Lucia, Senegal and Togo. See www.wipo.int/treaties/ip/wct/index.html.

49. The Convention was adopted in Budapest on 23 Nov-ember 2001. It is open for signature by the member States and by non-member States that have participated in its elaboration, and for accession by other non-member States. The Convention is not yet in force. Its text is available at conventions.coe.int/Treaty/EN/cadreprincipal.htm.

50. Countries like Argentina (www.privacyinternational.org/countries/argentina/argentine-dpa.html), Brazil, Chile (www.privacyexchange.org/legal/nat/omni/chilesum.html), China (www.pco.org.hk/english/ordinance/ordglance.html) and Thailand have enacted data protection legislation to avoid restrictions on the free flow of personal data to countries that have data protection laws.

51. The European Union data protection Directive (95/46/EC) requires all personal data transferred to countries outside the Union to benefit from "adequate protection".

52. See the safe harbour arrangement between the United States and the European Union at www.export.gov/safeharbor and the European Union Model Contracts for the transfer of personal data to third countries at www.europa.eu.int/comm/internal_market/privacy/modelcontracts_en.htm.

53. This is one of the objectives of the Web Services Interoperability Organization created by several major players in the Web services arena. See www.ws-i.org.

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Chapter 2

ICT, THE INTERNET AND ECONOMIC PERFORMANCE: IMPLICATIONS FOR DEVELOPING COUNTRIES

A. The emergence of the information economy

The recent performance of a number of economies, most notably that of the United States, has been fairly strong. In the late 1990s, these economies were able to grow faster than at any time since before the first energy oil crisis in 1973, while keeping inflation at historically low levels. This combination of strong economic growth and low inflation has been linked to the diffusion of new information and communication technologies (ICT), especially the Internet. The productivity gains that ICT have generated in the production and distribution of goods and services, as well as organizational improvements in the corporate and public sectors, have been identified as the mechanisms through which ICT and the Internet have delivered their macroeconomic benefits.

The emergence of ICT and the Internet as drivers of economic activity has increased the demand for knowledge workers, channelled more venture capital for start-up formation into this sector, and accelerated technological innovation. As a consequence, a growing share of enterprises' assets is embodied in various forms of knowledge. This array of macro- and microeconomic changes, by virtue of which information, knowledge and the networks through which they are communicated and exchanged become a major factor of economic performance, has led many observers to coin terms such as "new economy", "information economy," "knowledge economy" and "network economy."

However, the sharp decline in international stock markets that started in March 2000, and the economic slowdown that followed it, prompted questions about the long-term benefits of ICT and the Internet. The fall in stock prices temporarily reduced the level of venture capital and other investment capital available for ICT infrastructure and may have resulted in levels of investment in ICT and the Internet that are lower than optimal from the point of view of society as a whole.[1]

It is also likely that government intervention in the innovation market has made possible the generation of ICT-related externalities that have contributed to the economic performance of the United States and other developed countries. The need for public support for private-sector innovation is related to possible market imperfections that may result in investment levels in innovation that are suboptimal from a social perspective. An example of such a market failure is the extreme difficulty encountered by small high-technology firms when they attempt to raise financial capital to invest in innovation. That is a primary reason why many governments subsidize research and development (R&D) investment by small and medium-sized enterprises (SMEs) (Siegel, Waldman and Link 2003). Policy intervention to address innovation market failures includes support for the venture capital industry and targeted government investment in SMEs. It also includes the adoption of new standards, financial and regulatory support for cooperative or collaborative R&D, subsidies and tax breaks for R&D (Martin and Scott 2000) and public-private technology partnerships. As is noted in Martin and Scott (2000), another instrument for addressing innovation market failures is the public-private technology partnership, which can assume various forms, such as government subsidies for projects funded by private firms, shared use of expertise and laboratory facilities, university technology incubators, science parks, licensing agreements between universities and firms, and university-based start-ups. Some preliminary evidence (Siegel, Waldman and Link 2003) suggests that the adoption of targeted technology programs has led over time to a reduction in the magnitudes of market failures in developed countries.

Although many policy makers, corporate executives, and producers and users of ICT remain optimistic

about the long-term economic impact of ICT and the Internet, a detailed, sober analysis of this question is essential. A comprehensive review of recent research on this topic is of special interest to developing countries for two reasons. First, these countries have not yet fully reaped the benefits of ICT and are still developing policies and strategies to promote its adoption (an issue discussed at greater length in Chapter 3 of this report). Second, they have fewer resources to devote to these activities and therefore cannot afford as large "margins for error" as developed countries. An objective assessment and resolution of the debate on this subject would have important policy implications, since it could allow developing countries to formulate and implement optimal ICT and e-business strategies, which contribute towards the implementation of the United Nations Millennium Development Goals.

This chapter reviews the literature on the relationship between ICT, the Internet and productivity growth at the firm, industry, and national levels. As much evidence as possible is presented concerning the impact on the industries and firms of developing countries, although the availability of this kind of data is limited. The chapter also examines international evidence of the phenomenon of skill-biased technological change (SBTC) and the organizational dynamics of e-business diffusion in traditional sectors of the economy. It concludes with a summary of the key findings of the literature review and offers recommendations to government policy makers seeking to use ICT and e-business as an instrument to support economic growth.

B. The productivity debate

1. The aggregate impact of ICT

The question of whether the Internet will have an overall impact on the economy comparable to that of the great technological changes of the past has attracted considerable attention in recent years. This is understandable given that between 1987 and 2001 the quality-adjusted price of computing declined by more than 95 per cent, encouraging an extremely fast diffusion of these technologies: in the year 2000, 40 per cent of all US business investment was going to ICT. Such intense investment could be expected to have some effect on business performance. Such effects are not, however, always easy to discern, motivating a desire to assess the validity of the "productivity paradox" (Solow 1987).[2] At the same time a number of studies, such as Liebowitz (2003), have highlighted the limits of the Internet's impact on economic performance, especially in the business-to-consumer (B2C) sector.

The literature analysing the relationship between ICT and economic performance has expanded considerably in recent years. Studies have tended to examine the impact of ICT on productivity growth, but some researchers have also looked into issues such as firm profitability and stock prices. Empirical studies have been conducted at all levels of aggregation (i.e. at the establishment, firm, industry and national levels). Many papers present econometric estimates of a simple Cobb-Douglas production function, with an additional input representing investment in ICT capital, as opposed to conventional physical capital (structures and equipment). Other authors (e.g. Lichtenberg 1995 and Brynjolfsson and Hitt 1996) have derived estimates of ICT labour input (typically the number of employees classified as information systems workers).

Many of those research efforts show a positive correlation between Internet and ICT use and productivity growth. Also, much of the recent firm-level evidence suggests that ICT can generate "excess" returns, and there is also some evidence that these private, or firm-level, returns have increased in recent years. This is important because previously there was a lack of consensus regarding empirical results, at least in some of the early studies (Sichel 1997; Berndt, Morrison and Rosenblum 1992; Parsons, Gottlieb and Denny 1993). Using industry-level data, Morrison (1997) also reported that ICT capital had only a very small impact on technical progress.

The tide appears to have changed in the later studies, as most of the recent papers seem to find a strong relationship between ICT and improvements in economic performance. Stiroh (2001) and Jorgenson and Stiroh (2000) report good news regarding the aggregate impact of ICT investment in the United States. In contrast to their research in the early 1990s, Jorgenson, Ho and Stiroh (2002) conclude that the impact of ICT on aggregate economic performance has increased over time, especially in the late 1990s.

The key figures on sources of economic growth in the United States are presented in table 2.1. Based on a comprehensive analysis of ICT capital, the authors report that computer hardware, software and communications equipment accounted for a much larger fraction of economic growth in the last six years than in earlier periods. This may mean that there are substantial adjustment costs in implementing ICT and that policy makers should not expect dramatic

Table 2.1:
Sources of US economic growth, (1959-2001)

	1959-1973	1973-1995	1995-2001
Output growth of which including	4.18	2.78	4.07
Contribution of capital: including	1.77	1.40	2.03
Computers	0.07	0.20	0.49
Software	0.03	0.10	0.27
Communications capital	0.10	0.12	0.17
Other (non-computer) capital	1.57	0.98	1.10
Contribution of labour	1.24	1.12	1.12
Aggregate total factor productivity	1.16	0.26	0.92

Note: All values are average annual percentage growth rates. Input contributions are real growth rates, weighted by average nominal shares (following the convention in this literature).
Source: Jorgenson, Ho and Stiroh (2002).

improvements in productivity growth in the short run.

Dedrick, Gurbaxani and Kraemer (2003) present interesting findings on what they term the "dualistic" nature of ICT capital. The authors note that ICT capital, like other types of physical capital, can be used to generate more efficient production technology that allows organizations to increase labour productivity. This phenomenon is known as "capital deepening" (i.e. increasing capital input per worker). However, the authors note that ICT also plays a second role, which they consider more important – namely, its role in diminishing the cost of coordination of economic activities within and between organizations, and in improving business processes and organization. The authors present evidence suggesting that this coordination effect has a greater impact on productivity than the capital-deepening effect.

In a similar vein, Morrison and Siegel (1997) consider the possibility that conventional empirical studies of the connection between ICT and productivity actually underestimate the returns from ICT, because they fail to take account of externalities that arise from investment in ICT. The authors extend the simple Cobb-Douglas production framework by estimating a dynamic, flexible cost function (i.e. a generalized Leontief functional form) for US manufacturing industries, which takes account of adjustment costs that might arise from ICT (and other capital) investment. Their paper is a general critique and extension of various new growth studies that use a simple production function approach to assess the impact of what the authors call "external factors" (investment in R&D, computers and human capital) on growth. More importantly, the authors report that increasing investment in ICT (and R&D) in a given industry enhances productivity in other industries (as well as that of their own suppliers and customers). These results fit the notion that ICT and the Internet constitute "general-purpose technologies" (Helpman 1998) that have wide applications and productivity-enhancing effects in numerous downstream sectors.

A recent study by the Organisation for Economic Co-operation and Development (OECD 2003) analysed the contribution of ICT to economic growth, as well as the impact of ICT-using and -producing sectors compared with that of non-ICT sectors on economic growth and labour productivity. The result was fairly conclusive evidence suggesting that investment in ICT made a significant contribution to economic growth in a number of countries (led by the United States, Canada, the Netherlands and Australia) and also had a substantial positive impact on economic performance in other OECD countries. As for productivity, ICT investment has supported labour productivity growth in several countries with strong growth performance (Australia, Canada and the

United States). In some of these countries, sectors in which ICT investment was particularly intense (e.g. distribution and financial services) have experienced faster multi-factor productivity growth. In other countries (Finland, Ireland and Korea), ICT production has made an important contribution to aggregate labour and multi-factor productivity growth. There seems to be evidence that at least part of this productivity improvement is structural, having survived the effects of the latest slowdown, particularly in those countries (e.g. Australia and the United States) where ICT are more widely diffused (OECD 2003).

A critical issue regarding the impact of ICT on the economy concerns whether ICT investments generate "increasing returns" and "network externalities". Complementary to these notions is the concept of path dependence, according to which increasing returns and network externalities result in winner-take-all situations and monopoly outcomes for firms that capitalize on such first-mover advantages. There is some controversy in the scholarly literature regarding the importance of path dependency and, more specifically, the question of whether the "best" technology (from a social standpoint) actually ends up being widely adopted. While some observe that allegedly inferior standards and technologies, such as the QWERTY typewriter standard, VHS and certain operating systems, have emerged victorious in the marketplace (David 2000), others dispute these assertions, noting that there is little empirical evidence in support of path dependency (Liebowitz and Margolis 1990; Liebowitz 2003).

The effects of ICT diffusion seem to differ significantly across developed economies. Thus, it appears that the contribution of ICT to productivity and output growth is smaller in many European countries than in the United States.[3] This has happened despite a convergence in the rate of investment in ICT between the United States and the European Union (see table 2.2).

Table 2.2
Average Annual Percentage of GDP Devoted to ICT Spending (1993–2001)

Country	%	Country	%	Country	%	Country	
New Zealand	10.3	Colombia	7.0	Chile	5.5	Slovenia	3.7
Sweden	8.8	France	6.9	Slovakia	5.5	México	3.5
Australia	8.7	Czech Republic	6.8	Brazil	5.4	Turkey	3.3
Switzerland	8.4	Israel	6.6	Portugal	5.3	Bulgaria	3.1
Singapore	8.3	Belgium	6.5	Viet Nam	4.7	Philippines	3.1
United Kingdom	8.0	Finland	6.4	Italy	4.6	Thailand	3.1
United States	7.8	Germany	6.2	Taiwan Prov. of China	4.6	Russian Federation	2.9
Canada	7.7	Hungary	6.2	Greece	4.4	India	2.7
Netherlands	7.5	Norway	6.1	Spain	4.2	Egypt	2.2
Denmark	7.3	Ireland	5.8	Venezuela	3.9	Indonesia	2.1
Hong Kong (China)	7.2	Republic of Korea	5.8	Argentina	3.7	Gulf States	1.8
Japan	7.1	Malaysia	5.8	China	3.7	Romania	1.5
South Africa	7.1	Austria	5.6	Poland	3.7		

Source: Pohjola (2003).

Part of the apparent difference in productivity growth rates may result from differences in statistical methodologies.[4] Another possible reason for the difference in ICT performance between the two regions is the presence of relative rigidities in markets, particularly the labour market, in many of these countries; according to this view, enterprises in the United States can more easily maximize efficiencies generated by ICT by adapting organizational structures and productive processes and re-deploying labour and other resources.

It is difficult to derive systematic evidence of a correlation between ICT use and economic performance in developing nations. However, anecdotal data and case study evidence are available, particularly in these countries' traditional export-oriented sectors. Some of these studies attempt to assess the impact of business-to-business (B2B) markets on export performance and competitiveness. These studies suggest that, while traditional export sectors use some ICT technologies extensively, they are not yet really connected to emerging e-marketplaces. At the same time, however, there is evidence of improved market access and rapidly increased exports by selected developing and transition economies. This is partly the result of business process outsourcing (BPO), including the relocation of back-office operations by transnational corporations (TNCs), a phenomenon discussed in more detail in Chapter 5. The implication is that there may be promising ICT-related niches in global markets for many developing countries possessing skilled labour and sufficient Internet bandwidth access.

2. Industry- and firm-level evidence

It is often more practicable and convincing to focus productivity analysis across several industries, or on particular sectors or firms. Because firms are smaller entities than national economies, the time needed for ICT policy to generate efficiency and productivity gains can be shorter, and it can be more easily measured by examining firms' accounting and financial data.

Carayannis, Alexander and Geraghty (2001) present some interesting examples of how the Internet has been used for B2B e-commerce in two traditional sectors of the economy, the petroleum and chemical industries. They demonstrate how e-commerce Internet technologies can be used as general-purpose technologies, resulting in dramatic improvements in quality and productivity in services. The first case study describes an integrated system for facilitating B2B procurement transactions, or supplier-oriented e-commerce, used by BOC Gases, a British firm. The company uses e-commerce in warehousing, cargo handling, and distribution to process orders with suppliers and customers. The use of this system has generated substantial inventory-holding cost savings and has resulted in highly efficient processing of orders. BOC also utilized customer-oriented B2B e-commerce for market makers in the chemicals industry. The authors also describe how Boeing uses the Internet and e-commerce to ensure that production lines correlate closely with fluctuations in product demand. Other examples provided in the paper include Wal-Mart's use of electronic data interchange (EDI) with its suppliers and the formation by four chemical firms (Ethyl, Eastman, Chemical and Sunoco) of a "B4B" mechanism for standardized exchange of industry data . The latter is an example of the establishment of technological infrastructure for B2B trading.

Examples of the economic payoff from the Internet abound in a recent Brookings volume edited by Robert Litan and Alice Rivlin (Brookings 2001). The editors commissioned studies of the Internet's impact on productivity growth in eight sectors of the US economy. These industries, which account for more than 70 per cent of gross domestic product (GDP), are manufacturing, automobiles, financial services, trucking, retail services, health care, higher education and the public sector. The productivity improvements come from savings on transactions costs, more efficient management, enhanced efficiency of markets, and other economic benefits, including additional product variety and consumer choice, improvements in health care outcomes, and greater convenience, among others. The general conclusion of this study is that the Internet by itself might add roughly 0.25 to 0.5 per cent a year to US productivity growth during the next five years.

In Brookings (2001), McAfee, looking at the manufacturing sector, presents an interesting case study of Cisco Systems, which is not only the world's leading producer of routers and other Internet networking equipment but a leading user of the Internet in organizing its manufacturing through outsourcing. Cisco estimates that intensive use of the Internet as a management tool over a 4,5-year period enabled it to save $650 million in 1995–99, which represents 5 per cent of its revenue in 1999. According to McAfee, many manufacturing firms have tried to emulate Cisco's success by forming "virtual supply chains", B2B exchanges that can generate substantial cost savings. This is especially true in manufacturing, where inter-

mediate goods and materials typically constitute more than half of total cost.

According to Fine and Raff (Brookings 2001), the largest Internet-related productivity gains in the automotive sector resulted from significant improvements in supply chain management. They conclude that the clear winner in using ICT and the Internet was Daimler-Benz, which developed an Extended Enterprise approach and even trademarked it. This model constitutes a dramatic change in the way the firm manages its relationships with suppliers. Daimler-Benz committed to long-term relationships with suppliers to develop complete subsystems and to share any ICT-related cost savings with them. Thus, the Internet was facilitating the implementation of a corporate strategy of "quasi-vertical integration", a tactic commonly used by Japanese firms. The company made heavy use of ICT and the Internet to implement this strategy, which turned out to be highly profitable. The Dell model (where consumers specify the parameters of ordered PCs) would not work with automobiles owing to the higher complexity of automobile production lines and relations with subcontractors.

In financial services, Clemons and Hitt (Brookings 2001) assert that productivity gains stem from transparency, pricing and disintermediation. They define transparency as the ability of consumers and corporate customers to assess the full range of prices and qualities of the various financial instruments and services offered. The authors discuss three insurance companies that provide price comparison services: Insuremarket, Quotesmith and eHealthInsurance.com. Differential pricing allows firms to treat customers differently based on the revenue they yield, or (in the case of insurance) on the amount of risk to the firm, while disintermediation refers to the ability to reduce the need for brokers or agents. Similar tactics have been widely adopted in the airline industry (e.g. in "yield management" pricing strategies) and, increasingly, in financial services. The authors estimate the annual cost savings from productivity improvements at approximately $18 billion in the financial services sector alone.

Nagarajan et al. (Brookings 2001) present some useful case studies from the trucking industry. ABF Freight Systems has set up "transparent direct links," which allow customers to use data from ABF's Web site on their own sites. Other Internet-related innovations include programs to streamline efficiency in routing and shipments. These projects have been extremely useful for customers, especially those using just-in-time (JIT) inventory management systems. In another example, Transplace.com is a start-up formed as an alliance among six of the largest publicly traded firms in the industry. Its corporate strategy is to exploit Web-based opportunities to enhance economic performance, including improvements in the efficiency of logistics and purchasing and load matching, in order to reach optimal levels of capacity utilization.[5]

Fountain and Osorio-Urzua (Brookings 2001) find substantial cost savings arising from e-government initiatives, which appear to depend strongly on the extent to which Internet use is pervasive in the relevant community. This has important implications for developing countries, where the rate of Internet use among the populace and firms is quite low. Positive productivity effects stem from reductions in paperwork, fewer errors on the part of public employees, the elimination of redundancies (which can be considerable in the public sector) and improved customer service. Goolsbee (Brookings 2001) examines online higher education and other Internet-related initiatives in the educational sector and concludes that there is substantial potential cost savings to be derived from an industry that he characterizes as "massive, regulated, and bureaucratic".

3. Considerations for developing countries

A number of sector- and firm-level discussions on ICT application in developing countries have appeared in response to the heated debate over whether Internet technologies can help communities, firms or even whole developing countries leapfrog into the digital age. While evidence is scarce, what does exist is somewhat encouraging.

Moodley (2002) conducted an in-depth quantitative and qualitative analysis of the use of B2B e-commerce by manufacturing firms in South Africa. The study is based on 120 firm-level interviews and 31 interviews with industry experts. The evidence indicates that the incidence of use is fairly low. Although 87 per cent of the firms had access to the Internet, only 49 per cent had a corporate site and only 22 per cent were using the Internet for order taking. The author concludes that e-commerce is not yet an important strategic objective for most South African firms. Moodley also hypothesizes that e-commerce is an evolutionary technology, not a revolutionary one, as some of its strongest advocates have asserted. He states that, according to his evidence, B2B e-commerce is in the

early stages of its evolution and is likely to follow path-dependent patterns.

Masten and Kandoole (2000) examine patterns of ICT investment in Malawi. They find that the Government has focused a great deal of attention on helping SMEs use ICT to increase employment and income. This may be because the country does not receive much foreign direct investment (FDI) by large, multinational firms. Malawi is an interesting country to study because the institutions involved in promoting ICT investment among small businesses have received at least some support either from developed countries (e.g. Germany, the United Kingdom and the United States) or from international organizations (e.g. the United Nations and the World Bank) or non-governmental organizations (e.g. World Learning and Women's Village Banking). The authors conclude that there is an extensive support system for companies implementing ICT in this country. Not surprisingly, they find an unusually high level of satisfaction with these services, and they suggest that resources have been used quite effectively. The result appears to be a small-business sector that is growing dynamically, especially given that Malawi is a very poor country, ranked 162 out of 175 nations in terms of economic well-being by the United Nations Development Programme (UNDP (2003).

Humphrey et al. (2003) examined the B2B e-commerce of firms in the horticultural and garment sectors of Bangladesh, Kenya and South Africa. The study was based on field interviews with 74 enterprises. An additional 37 interviews with industry experts, business associations, e-commerce solution providers and government officials were conducted across the three countries. The enterprise interviews were conducted with individuals in senior management positions who were well positioned to provide information on the scale and impact of ICT use to support B2B e-commerce. The authors' findings challenge the view that the mere low cost of information transfer makes B2B e-commerce a particularly advantageous proposition for firms from developing and transitional economies. They attribute this to a lack of awareness regarding the benefits of e-commerce, institutional and regulatory problems, and the current technological divide between the have and have-not nations. On a more positive note, the authors find that in some cases, B2B e-commerce can reduce the costs of making firms known to each another. However, many implementations of Internet applications do not offer packages of services such as payment and settlement mechanisms, insurance, logistic systems, inspection, certification of quality, and customs clearance. According to the authors, without low-cost access to such services, developing-country firms may find it prohibitively expensive to exploit new external markets.

C. The effects of ICT on wages and work environment

1. The impact of ICT on labour force composition

The ICT revolution has heightened a phenomenon known as "skill-biased technological change" (SBTC), where technological change results in a greater demand for highly skilled, highly educated labour, which leads to an increase in the relative wages of these workers and shifts in the composition of the workforce in favour of such workers.

Studies of SBTC are usually based on estimates of wage equations or cost functions, typically including dummy variables that serve as proxies for technological change. The cost function approach is desirable because it allows one to formally test for whether technical change is non-neutral (i.e. favours one factor of production over another). Under SBTC, the assumption is that technological change favours one class of workers (e.g. highly educated workers) at the expense of another class of workers.

A summary of some recent studies of the impact of ICT on wages and labour composition is presented in Annex II. Despite the fact that researchers have employed alternative methodologies and have analysed data from different countries at different levels of aggregation (individual, plant, firm, and industry levels), each study reports evidence that is consistent with the existence of SBTC. In other words, some proxy for technological change (R&D, computers, adoption of advanced manufacturing technologies) is positively correlated with wages and shifts in labour composition in favour of highly skilled or highly educated workers.

Two wage-based studies from the United States and the United Kingdom provide additional support for the existence of SBTC. Bartel and Sicherman (1999) analyse worker-level data from the National Longitudinal Survey matched to industry-level data. They find that there is a positive correlation between wages and proxies for technological change and that this

relationship is stronger for non-production (i.e. services-related and hence more ICT-intensive) workers than for production workers. Finally, their findings imply that the SBTC wage premium can be directly related to enhanced demand for workers with higher levels of education and skill in industries experiencing technological change. Haskel (1999) analyses industry-level data from the United Kingdom and reports a strong positive correlation between relative wages and investment in computers. He estimates that the wage premium for skill grew by 13 per cent in the United Kingdom in the 1980s and that computers account for about half of this increase. Moreover, computerization reduced the demand for manual workers (both skilled and unskilled ones).

An analysis of industry-level data from other countries yields similar patterns. Berman, Bound and Machin (1998) find that shifts in the employment structure in favour of highly educated workers are evident across many developed countries. The authors conclude that these wage and employment shifts can be linked to technological change. Also, the magnitudes of these linkages are quite similar across countries. Additional international evidence is provided by Park (1996), who reports a positive correlation between labour productivity growth and the proportion of multi-skilled workers in Korean manufacturing industries.

Siegel (1999) reports that implementation of a new technology leads to downsizing and a shift in labour force composition and compensation in favour of white-collar workers. More importantly, the empirical findings reveal that there is considerable heterogeneity in downsizing and skill upgrading across different types of technologies. Thus, the magnitude of the skill bias may depend on the type of technology that is implemented.

The existing evidence on SBTC bodes well for developing countries. Berman and Machin (2002) have recently assessed what they refer to as "skill-biased technology transfer" in 37 countries, including several developing nations. Their empirical results suggest that there is no SBTC in low-income countries. More importantly, they find evidence of "transfer" of skill-biased technologies from high-income to middle-income countries and regions, but not from high-income to low-income countries and regions.

The rising demand for skilled, educated labour in developed countries has also led to large wage increases in many high-technology sectors in middle-income countries and lower-income countries with relatively developed ICT-related clusters or regions. This has resulted in an increase in the propensity of high-tech firms to engage in domestic and global outsourcing. Many major US companies have made significant investments in India in software and R&D to take advantage of considerably lower labour costs for engineers, computer scientists and software developers. Similar firms have also undertaken projects in China.

An interesting study was conducted by Lal (2002), who examined comprehensive data from 51 Indian firms on numerous aspects of performance and other firm characteristics, including data on ICT investment, wages, exports, imports, profits, and the extent to which firms adopt e-business methods. These companies were located in a newly developed industrial town near New Delhi called the New Okhla Industrial Development Area. The firms had access to two private-sector Internet service providers (ISPs) and two public-sector ISPs. The author estimated firm-level Tobin regressions of the determinants of export performance. The regressions included many control variables and a measure of the nature of the firm's use of e-business methods. The three types of e-business technologies were email, URL, and portal. Lal concluded that firms that adopted more advanced e-business tools generated higher levels of exports. This finding on a key dimension of performance for companies for a cluster in India might be valuable for smaller developing countries, where domestic markets are often quite small. Thus, it appears that the adoption of sophisticated e-business technologies may improve economic performance. Another critical factor is that ICT labour costs are substantially lower in India than in developed countries. For instance, systems analysts were earning an average of $48,000 a year in the United States and $34,000 in the United Kingdom in 1995, while their counterparts in India were earning $14,000.

ICT-induced changes in the labour market have also affected women's employment, in particular in developing countries (UNCTAD 2002). For example, in services related to information technology (IT), employment for women has grown enormously. Today, women form a significant share of the workforce in the IT-enabled industry in developing countries, notably in Asia, but increasingly also in Africa and Latin America, where IT-related services are being created. Women usually predominate in services requiring rather routine, low-level skills or limited technical training. These include activities such as customer call centres, data entry and processing, transcription services, claims processing and remote sec-

retarial services. It is more difficult for women to move into the higher-skilled, better-paid jobs of the IT-related service sector, such as software development and programming or geographical information systems (GIS) analysis.

2. ICT and changes in work environment

Many economists who have studied SBTC ignore the role of organizational change in the implementation of new technologies. In recent decades, many manufacturing firms have adopted new ICT-based technologies, such as computer-aided design (CAD), computer-aided manufacturing (CAM), computer numerical control (CNC), and just-in-time (JIT) production systems. Implementation of these technologies can dramatic affect the work environment, since they may simultaneously result in downsizing (labour-saving innovations), retraining of the remaining workforce (skill upgrading), and changes in job responsibilities resulting from integration across the functional areas of business (marketing, manufacturing, R&D, accounting/finance, logistics, purchasing and product design).

Some recent studies have examined the relationship between technical and organizational change. They have found that ICT investment is often accompanied by substantial changes in the work environment. For example, Siegel, Waldman and Youngdahl (1997) analysed the effects of the adoption of advanced manufacturing technologies on human resource management practices, including proxies for employee empowerment, such as training, changes in job responsibilities, new career opportunities and enhanced employee control. They report a strong positive correlation between the implementation of certain types of technologies and greater employee empowerment.

In a similar vein, Bresnahan, Brynjolfsson and Hitt (2002) present evidence of the connection among technological change, organizational change and organizational performance. The authors study the effects of declining ICT prices, increased use of ICT and a rise in the relative demand for highly educated workers. They conjecture that, in order to implement new technologies successfully, companies need to decentralize decision making and adopt other "high-performance" workplace practices. Such practices include increased reliance on worker teams and quality circles, where employees can decide on the pace and method of work that will achieve the best results.

To test these theories, the authors estimate three variants of a regression model with ICT demand, human capital investment, and value added as dependent variables. They report that proxies for workplace organization and human capital are strong determinants of the demand for ICT capital, but not other types of capital. This finding is consistent with the argument that there is complementarity among ICT, organizational change and human capital. Similarly, firms with higher levels of investment in human capital, as measured by a greater emphasis on selection, appraisal, and training of employees, tend to have higher levels of ICT investment and more decentralized work organization.

To examine complementarities in a production or cost function framework, it has been assumed that there are adjustment costs associated with implementing complementary strategies (Caroli and Van Reenen 2002). Adjustment costs are relevant because, while firms may find it easy to acquire and install ICT equipment, they may have great difficulty implementing the required complementary organizational changes to achieve a fit among all their organizational architecture components. Thus, adjustment costs lead to variation across firms in the use of ICT, its organizational complements, and the resulting product mix. Bresnahan, Brynjolfsson and Hitt (2002) provide evidence of the effects of ICT on the work environment, based on a survey of managers. They report that ICT use is positively correlated with enhanced worker autonomy, management's need and ability to monitor workers, and the firm's desire to increase investment in human capital.

Finally, Danzon and Furukawa (Brookings 2001) examine Internet initiatives in health care and pharmaceuticals. They disaggregate these efforts into those relating to connectivity, content, commerce and care. The authors assert that optimal connectivity would enable providers, payers and patients to have seamless access to information, which would greatly reduce the demand for clerical labour, improve customer service and, most importantly, enable physicians to spend additional time with patients. They also focus a great deal of attention on the use of Internet to allow physicians to manage their practices more effectively. With respect to information content, the authors identify physician and consumer information portals. These portals allow doctors to easily follow the latest developments in their fields, and they enable patients to access better information. The authors' discussion of commerce highlights the significant savings that B2B e-commerce can produce in supply chain management.

Several key stylised facts have emerged from the literature on the relationship between technological change and organizational change in developed countries. Brynjolfsson and Hitt (2000) report that ICT use is associated with a cluster of complementary organizational practices. These include a transition from mass production to flexible manufacturing technologies, changing interaction with suppliers and customers (mostly resulting in closer relationships with customers and suppliers), decentralized decision making and other organizational transformations, greater ease of coordination, and enhanced communication. These complementary technological and organizational changes enhance the market value of firms.

Thus, it seems that the way ICT is being used is changing organizational structure, design and control systems. For instance, researchers have reported that back-office jobs are being replaced, while the importance of front-office skills and managerial leadership has increased. Networks of PCs are changing the way people work and the way they are compensated, in the sense that rewards for multi-tasking are increasing and employers seem to prefer employees with broad-based education and conceptual and problem-solving skills, which are valued more and more by companies in developed countries. The OECD (2003) stresses that investment in and use of ICT have a great impact on firms provided that they are accompanied by other changes and investments, including expenditures on employee training and organizational changes. Those complementary investments might considerably increase the positive correlation between ICT and productivity.

One result of this is that more and more people are returning to school, largely owing to technological change and concomitant organizational changes that raise the value of knowledge workers to firms and other organizations. Despite the fairly substantial increase in the number of returning students, the demand for ICT-literate workers continues to outstrip supply, which explains part of the wage premium economists have observed for these workers. This also explains why numerous multinational companies have begun outsourcing jobs requiring high-skilled labour in developing countries, as in the case of software programming in India. Morrison and Siegel (2001) report evidence consistent with this assertion, finding a positive correlation between ICT investment and the propensity of US manufacturing firms to engage in foreign and domestic outsourcing of mostly business services. (For a more detailed discussion of outsourcing, see Chapter 5 of this report.)

D. Conclusion

The findings of the research on ICT and economic performance reviewed in this chapter are remarkably robust in the sense that the majority of researchers have found a positive correlation between some proxy for ICT investment and some proxy for economic performance at each level of aggregation (plant, firm, industry and national economy). Furthermore, there is evidence suggesting that complementary investments in ICT-related labour and organizational factors that provide a supportive work environment for maximizing the returns on ICT investment also contribute to improvements in productivity growth. The evidence seems to indicate fairly clearly that the dissemination of this general-purpose technology will have a sustained, long-lasting impact on productivity and economic growth, provided that policy makers implement policies that facilitate a faster rate of diffusion and better allocation of resources.

Although several sections of this chapter are based on ICT- and Internet-related data and analysis derived from developed economies, the evidence provides important lessons for developing countries. First, developing countries should not lose sight of the big picture regarding the payoff from investment in technology. These nations should focus on implementing technology policies that foster long-term economic growth. Furthermore, policy makers should not misinterpret the recent financial boom and bust in financial markets (which is reversing itself as this chapter is being written) as indicating a decline in the social rate of return on investment in ICT and the Internet. Even in the developed world, where organizations encounter substantially more favourable institutional conditions and better technological and physical infrastructure, it has taken several decades for the benefits associated with ICT investment to result in substantial improvements in economic growth.

The policy areas that e-strategies for development must contemplate in order to generate an environment in which ICT can realize their full potential include problems of awareness, infrastructure and access, regulation, skill building and local content creation, among others. They are the subject of Chapter 3 of this report. However, some elements related to the impact of ICT on productivity can be highlighted here. These refer to key deficiencies that policy makers in developing countries must address in order to stimulate higher social returns on investment in ICT.

The first deficiency concerns a lack of knowledge of best practice in the use of ICT. Thus, governments should foster improved understanding by local firms of the best methods of using ICT in their respective sectors, so that optimal choices can be made regarding the most efficient uses of these technologies. Governments should also support the adoption of best e-commerce and e-business practices by themselves adopting these technologies, particularly in areas such as procurement. In so doing they will not only be generating economy-wide effects on productivity but will also obtain direct benefits in terms of fiscal savings and improved government transparency and accountability.

Another problem governments should address is the danger of under-investment in ICT-related technology. Policies promoting and supporting infrastructure development can help provide greater access to low-cost, high-bandwidth Internet connections. Governments can institute policies supporting the development and use of appropriate software, including open-source software (see Chapter 4). Also needed are policies and legislative action to improve the security of electronic transactions and enhance consumers' confidence in these transactions. Currently, players from many developing countries are sometimes reluctant to share information online, which is a major barrier to the successful adoption of B2B and B2C e-commerce.

The public sector should also play a leading role in addressing another major obstacle: ICT-related skill deficiencies in the workforce. This can be achieved in several ways. One approach is to provide training and skills development, or at least encourage state-run educational institutions to shift their priorities accordingly. Another avenue is to provide firms with incentives (through tax policy or subsidies) to engage in such training themselves.

If, as seems possible, the magnitude of the market failures leading to sub-optimal levels of investment in ICT is sufficiently large, then the public sector in an individual country may be unable to effectively overcome them. This is especially true for the smaller developing nations. A wide range of collaborative arrangements can be used to address these market failures, including public-private partnerships, alliances and consortia. These partnerships would be useful for:

- providing better access to financial capital to stimulate investment in ICT;
- enhancing the development of human capital to facilitate implementation of the new technologies;
- stimulating the development and extension of networks that increase the private (firm-level) and social returns on ICT and e-business; and
- allaying concerns regarding sharing proprietary information.

National governments, the private sector, society at large, and especially the R&D community in developing countries must realize that ICT cannot be treated as a homogenous phenomenon. There is considerable heterogeneity in the challenges and policy issues associated with each type of ICT investment. Still, the empirical evidence suggests that the potential for investment in ICT to generate substantial productivity gains may actually be greater for firms in developing countries than those in developed ones. Still, the vast potential of ICT cannot be exploited without considerable attention being devoted to understanding sector-specific characteristics relating to market structure (e.g. the extent of consolidation in the industry), the state of the supply chain, and resources available to firms to support their businesses. UNCTAD's E-Commerce and Development Report has on several occasions addressed sector and industry specificities and possible ICT policies and strategies (2001, 2002).[6]

In developing countries, these characteristics are likely to be different than in developed countries, even within the same industry. Developing countries, having relatively weak risk management systems in place and fewer resources to invest, cannot afford to waste their limited technical, financial and human resources on yet more dot-com hype. They must make prudent decisions regarding ICT-related investment while targeting their niches in the information economy.

In the long run, ICT and the Internet will generate high social returns to countries that invest in these technologies and use them wisely. The pace of technological progress in ICT goods and services shows no signs of slowing. As a result, these products are becoming more affordable to businesses and households in countries with lower per-capita income. Hence, existing cost barriers to acquisition of the new technology in these nations are diminishing. The bottom line is that there exists a critical opportunity for developing countries striving to improve their global competitiveness and enhance economic growth through ICT-related investment. Thus, it is incumbent on policy makers in these countries to ensure that domestic firms encounter a conducive environment and sufficient incentives to join the information economy at all levels, and hence improve their export competitiveness.

Given the strong connection between technological investment and economic growth, it is conceivable that developing countries could achieve higher growth rates through optimal investment in ICT and Internet-related technologies. In this regard, the evidence from the surveyed research, the majority of which was conducted in a developed-country context, could also be used by policy makers in developing nations as they implement more active ICT and e-business-related strategies. Policy makers should, however, keep in mind that the experience of developed countries in North America, Europe and Asia, as well as of some leading adopters among developing countries, illustrates the trade-offs that governments face in the area of ICT, as a consequence of differences in the environment (physical, political and legal), the sources of comparative advantage of their respective economies and the predominant conceptions about the role of the state in the economy and in society as a whole. In other words, they should be aware that there is no model path that all countries should follow in their progress towards an information society. As they mainstream ICT into their national development strategies, developing countries should endeavour to reflect their society's own economic, social, cultural and political preferences and priorities.

Notes

1. At the height of the dot-com revolution, the perceived optimal level of investment in R&D was considered by some researchers to be at least four times larger than the actual R&D investment. See Jones and Williams (1998).

2. The controversy surrounding the role of ICT in productivity enhancement stems largely from Nobel Prize winner Robert Solow's famous quip in 1987 that one "can see the computer everywhere except in the productivity statistics" (Solow 1987).

3. See, for example, Daveri (2002).

4. See Lequiller (2001).

5. Load matching refers to a firm's ability to match shipments with trucks having excess capacity, a major problem in this highly fragmented industry.

6. UNCTAD has analysed the development of e-commerce in the tourism, logistics, banking, insurance and publishing industries, as well as agriculture and e-government.

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Annex I

Recent Empirical Studies of the Impact of ICT on Economic Performance

Author(s)	Methodology	Country/Sector	Level of aggregation	Results
Dunne, Foster, Haltiwanger and Troske (2000)	Regressions of labour productivity on computers	United States/ Manufacturing	Plant level	Positive association btw. computers and labour productivity, which appears to be growing over time
McGuckin and Stiroh (1999)	Cobb-Douglas production function with computer capital	United States/ Manufacturing and service	Aggregate, major sector and 2-digit SICa industry levels	Evidence of excess returns on computer capital at each level of aggregation
Lehr and Lichtenberg (1999)	Cobb-Douglas production function with computer capital and labour	United States/ Manufacturing and service	Firm level	Excess returns on computer capital, especially PCs; returns on computers appear to have peaked in 1986 or 1987
Wolff (1999)	Regressions of non-parametric measures of total factor productivity growth	United States/ Manufacturing and service	Industry level (85 sectors)	No evidence of positive relationship btw. computers and productivity growth; weak evidence of positive association in goods industries during 1977–87
Licht and Moch (1999)	Cobb-Douglas production function including 3 types of computers (terminals, UNIX workstations and PCs)	Germany/ Manufacturing and service	Firm level	Strong positive relationship btw. PCs and productivity in manufacturing and services
Gera, Wu and Lee (1999)	Cobb-Douglas production function with computer capital	United States and Canada/ Manufacturing	Industry level	Positive correlation btw. investment in computers and labour productivity growth
Bharadwaj, Bharadwaj and Kronsynski (1999)	Regressions of Tobin's q on measures of investment in IT	United States/ Manufacturing and service	Firm level	Positive association btw. investments in IT and Tobin's q
McGuckin, Streitwieser and Doms (1998)	Regressions of labour productivity on dummies denoting whether plant uses computer-based manufacturing technology	United States/ Manufacturing and service	Plant level	Plants using advanced computer-based technologies have higher productivity levels; weaker evidence on relationship btw. technology use and productivity growth
Lehr and Lichtenberg (1998)	Cobb-Douglas production function with computer capital and labour	United States/ Public sector	Organizational level (government agencies)	Excess returns on computer capital
Stiroh (1998)	Sectoral growth accounting methods and regression analysis based on Cobb-Douglas production function	United States/ Manufacturing and service	2-digit SIC industry level	Computer-producing sector (SIC 35) has made a strong contribution to economic growth; computer-using sectors have not made a similar contribution. No evidence of positive relationship btw. computers and total factor productivity growth at the sectoral level.
Siegel (1997)	Latent variables model: regressions of parametric and non-parametric measures of total factor productivity growth on rate of investment in computers	United States/ Manufacturing 4-digit SIC	Industry level	When controls are included in the model for measurement errors, computers have statistically significant positive impact on productivity
Morrison and Siegel (1997)	Dynamic cost function estimation with ìhigh-techî capital	United States/ Manufacturing	4-digit SIC industry level	"External" investments in computers by related industries (4-digit industries within a 2-digit sector) enhance productivity

Annex I (*continued*)

Author(s)	Methodology	Country/Sector	Level of aggregation	Results
Greenan and Mairesse (1996)	Cobb-Douglas production function with computer capital	France/ Manufacturing and service	Firm level	Impact of computers is positive and at least as large as for other types of capital. Returns appear to be higher in services than in manufacturing
Brynjolfsson and Hitt (1996)	Cobb-Douglas production function with computer capital and labour	United States/ Manufacturing and service	Firm level	Excess returns on computer capital and labour
Lichtenberg (1995)	Cobb-Douglas production function with computer capital and labour	United States/ Manufacturing and service	Firm level	Excess returns on computer capital and labour
Oliner and Sichel (1994)	Growth accounting methods to estimate the contribution of computers to economic growth	United States	Aggregate level	Under standard neoclassical assumptions, computers account for only a small percentage (0.15%) of average annual economic growth
Jorgenson and Stiroh (2000)	Sectoral growth accounting methods	United States	Aggregate level	Growth contribution of computers increased substantially in mid- to late 1990s
Parsons, Gottlieb and Denny (1993)	Estimation of a translog cost function with computer capital	Canada/ Service	Industry level	Very low returns on investments in computers for banks
Loveman (1994)	Estimation of a Cobb-Douglas production function	United States/ Manufacturing and service	Business unit level	Output elasticity estimates for computers insignificantly different from zero (ìmarginal productî of computers is 0)
Siegel and Griliches (1992)	Correlation btw. non-parametric measures of total factor productivity and rate of investment in computers	United States/ Manufacturing	4-digit SIC industry level	Positive correlation btw. rate of investment in computers and total factor productivity growth

Positive correlation btw. rate of investment in computers and total factor productivity growth
[a] Standard international classification.
Source: Link and Siegel (2003), pp. 93–95.

Annex II

Recent Empirical Studies of the Impact of ICT on Wages and Labour Composition

Author(s)	Methodology	Country	Level of aggregation	Indicators of technical change	Measures of labour input	Results
Bartel and Sicherman (1999)	Estimation of wage equations	United States	Worker data (NLSY)b matched to industry-level data	Expenditures on computers, R&D	Non-production and production workers	Positive correlation btw. wages and proxies for technical change, which is stronger for non-production workers than for production workers; wage premium attributed to greater demand for ability in industries experiencing technological change
Haskel (1999)	Regressions of changes in relative wages of workers on computers	United Kingdom	3-digit SICa industry level	Dummy variable denoting whether a plant introduced new equipment using microchip technology	Skilled and unskilled workers	Positive correlation between relative wages and computers; wage premium for skill rose 13% in 1980s in UK; computers account for about half of this increase
Morrison and Siegel (2001)	Dynamic cost function estimation with ìhigh-techî capital	United States	4-digit SIC industry level	Computer capital and R&D	Four types of workers, classified by level of education	Computers and R&D reduce demand for workers without college degree and increase demand for workers with at least some college. Trade has a strong indirect impact on demand for less educated workers, because it stimulates additional investment in computers
Berman, Bound and Machin (1998)	Cross-country correlations of within-industry changes in proportion of non-production workers	9 OECD countries	2 and 3-digit SIC industries	Expenditures on computers, R&D	Employment and wage shares for production and non-production workers	Positive correlation across 9 OECD countries in within-industry changes in shares of non-production workers
DiNardo and Pischke (1997)	Estimation of wage equations	Germany	Worker data (NLSY) b matched to industry-level data	Dummies for whether a worker sits down, uses a telephone, calculator, pen and pencil	Detailed data on workers: age, sex, race, union status, region	Workers who use a computer earn a wage premium, but so do those who sit down while they work or use a calculator, telephone, pen and pencil
Park (1996)	Regressions of changes in relative wages of skilled and unskilled workers on computers	Korea	2-digit SIC industry level	Growth in labour productivity	All workers, excluding unskilled	Positive correlation btw. labour productivity growth and proportion of multiskilled workers in Korean manufacturing
Entorf and Kramarz (1998)	Estimation of wage equations	France	Data on workers and firms that employ them	Firm-level data on use of 3 computer-based technologies	Occupational mix: unskilled and skilled blue-collar, clerks, managers, engineers, professionals	Positive correlation btw. technology use and wages; highest wage premiums earned by those with lowest skill level

Annex II (*continued*)

Author(s)	Methodology	Country	Level of aggregation	Indicators of technical change	Measures of labour input	Results
Regev (1998)	Estimation of production function	Israel	Firm level	Technology Index based on quality of labour and capital and R&D investment	No decomposition of labour	Technology intensive firms pay higher average wages, generated new jobs during a period of downsizing

[a] *Standard international classification.*
[b] *National Longitudinal Survey of Youth*
Source: Link and Siegel (2003), pp. 82–87.

Annex III

Examples of Innovative ICT Initiatives in Developing Countries

Country	Description of initiative
Chile	Developed a successful software industry through a public-private partnership involving firms, universities and government
Egypt	Initiated several useful IT applications in employment and e-government and established a regional information technology development centre
Gambia	Developed an effective telecommunications infrastructure with several applications
India	Developed its own satellites to establish information and communication systems that reach rural areas
Singapore	Use of EDI at harbour, which is now ranked among world's best in IT use
Tunisia	Established a regional information technology development centre

Source: Udo and Edoho (2000).

Chapter 3

ICT STRATEGIES FOR DEVELOPMENT

A. Introduction

As information and communications technologies (ICT) continue to spread into all sectors of social and economic life, they appear to be transforming our world into an information society.[1] While the rapid growth in the Internet's reach and use have occurred largely in the absence of government intervention, there is little doubt that policy action is required in such areas as regulating the telecommunications sector, establishing legal frameworks for e-business and building ICT-educated workers and citizens. Above all, however, the growing digital divide between developed and developing countries, rural and urban areas, men and women, skilled and unskilled citizens, and large and small enterprises has prompted an ongoing debate about the need for policy action, and calls for building an all-inclusive information society are becoming more and more prevalent. These developments highlight the need for a critical examination of ICT policies and strategies and their effectiveness for advancing the information society and economy in developing countries and thus bridging the digital divide. Such an examination will be the focus of this chapter.

1. ICT as an enabler for growth and development

It appears to be widely accepted that ICT have the potential to bring about many positive developments in the economies and societies of all countries. This is reflected in the current international debates on the information society – for example, within the framework of the UN ICT Task Force and the World Summit on the Information Society (WSIS).[2] Many developing countries, following the lead of their developed counterparts, are making serious efforts to develop policies designed to enhance the spread and use of ICT at the domestic level.

While there is general agreement that ICT will directly or indirectly affect all sectors of society and the economy, and that policies should therefore be as comprehensive as possible, this chapter argues that particular attention should be given to policies fostering the adoption of ICT by businesses. This is based on the assumption that, through the application of ICT, enterprises will become more competitive, new markets will be accessed and new employment opportunities created.[3] All of this will result in the generation of wealth, thus ensuring future sustainable economic growth.

This, in turn, will directly and indirectly affect other aspects of society and will foster the development of an information society. It is well known that, while the Internet and its predecessors have existed since the 1960s, only when businesses started to use the Internet in the mid-1990s did it really begin to take off.[4] In other words, the business community has played a central role in the advancement of the information society and will continue to do so.

Discussions on the advancement of the information society often call for policies designed to achieve the United Nations Millennium Development Goals (MDG), in particular the eradication of poverty. While achievement of the MDG must certainly be the ultimate objective of all development policies, one should keep in mind that, for example, the eradication of poverty will not happen through access to information by itself. It will be through the use of information and the creation of knowledge that economic livelihood can be improved and income generated; it will be through the creation of economic opportunities and the translation of ICT into economic benefits that people can be lifted out of poverty. Therefore, policies that encourage and enhance the use of ICT by the enterprise sector and private consumers will contribute directly to achieving the MDG.

Many developing countries are only beginning to tap the potential benefits of ICT. As a result, the gap

between developed and developing countries' use of ICT remains wide (see chapter 1). The underlying causes of this situation have been amply articulated. They include lack of awareness of what ICT can offer; insufficient telecommunications infrastructure and Internet connectivity; expensive Internet access; lack of adequate legal and regulatory frameworks; shortage of requisite human capacity; inadequate use of local language and content on the Internet; and lack of skills and entrepreneurship.

2. The role of national strategies

To tackle these difficulties, Governments – often supported by the international community – have launched a number of initiatives aimed at promoting various aspects of the information society and economy.[5] This process has accelerated during the past year, driven by the momentum created by the WSIS and other forums. Initiatives are underway in the area of awareness raising, infrastructure building, telecommunications deregulation, education and labour force training, changes in legislation, and e-government.

The responsibility for taking action is usually distributed among various government offices and departments, as well as other actors in the society, with little coordination among them. However, as ICT are tools that can be applied across all sectors of an economy and society, deployment of ICT at the national level requires close coordination and coherence among various ICT-related activities and initiatives. As a result, much emphasis is being placed on the development and implementation of national strategies.

Since national strategies imply significant involvement by the public sector, one may ask whether a government-led strategy is the best choice or whether, to take the example of e-commerce, its growth should be left to market forces and self-regulation by business, especially given the rapid changes in the technologies on which it is based. How can public and business interests be addressed by the same policies?

The countries that are considered as having advanced the most in their ICT developments are those that implemented national strategies or ICT plans early on. For example, Singapore started as early as 1991 to develop a national ICT strategy, followed in 1993 by the United States and within five years by Canada, Japan and many European countries (Dutta, Lanvin and Paua 2003). Experience from these and other countries has shown that what matters is not so much the question of whether to implement a formal strategy or not, but the type of approach and the degree to which the government will be involved in certain policies.[6]

Since the late 1990s, many developing countries have followed the example of developed countries and launched their own national ICT programmes and strategies. Particularly for developing countries, this undertaking first calls for a stocktaking exercise and reflection on best practice and past experiences. UNCTAD has organized a number of workshops and conferences to address the subject of national policies and strategies for the development of ICT and e-commerce in the developing countries. This chapter, drawing from the various inputs to these meetings, will address the questions posed above and will identify areas where policy action is needed; describe main areas and sectors of policy action; look at best practice based on experiences from developed and developing countries; and make suggestions regarding the implementation of these strategies.

Section B gives an overview of the main policy areas that should be covered by national strategies and provides suggestions based on lessons learned from previous efforts to implement strategies. Central to this discussion is the introduction of a model framework for the development of a national strategy, and particularly e-business policies. Section C looks at the stakeholders involved and the implementation of strategies. Section D presents Thailand's ICT strategy as an example of a developing country's effort to develop its information society. The final section draws conclusions and makes final recommendations on the development of national ICT strategies.

B. Key policy elements of ICT strategies

1. A model framework for a national ICT strategy

Given the cross-cutting nature of ICT, which can be applied in areas as diverse as health, education and manufacturing, national ICT plans and strategies need to address a wide spectrum of policy sectors. But exactly which sectors should be included, and what policies will best promote the deployment and use of ICT in the productive sphere, or foster the development of a national information economy?

Chart 3.1 provides a model framework for the development of a national ICT strategy.[7] This framework

serves as a useful basis for explaining the policy areas that should be covered under such a strategy and showing how policies related to an information economy (including e-business and e-commerce),[8] the main focus of this chapter, fit into such a framework.

Accordingly, a framework for ICT strategies will cover a number of *sectors* that need to be targeted by specific *policies* (chart 3.1). Sectors are here divided into two groups, those primarily related to the information society (including education and health) and those primarily related to the information economy (including all industry sectors, trade, investment and finance). Along such a continuum of sectors, the government is placed somewhere in the middle, providing services to both the private and public sectors.

As chart 3.1 illustrates, there are different types of policies addressing these sectors:

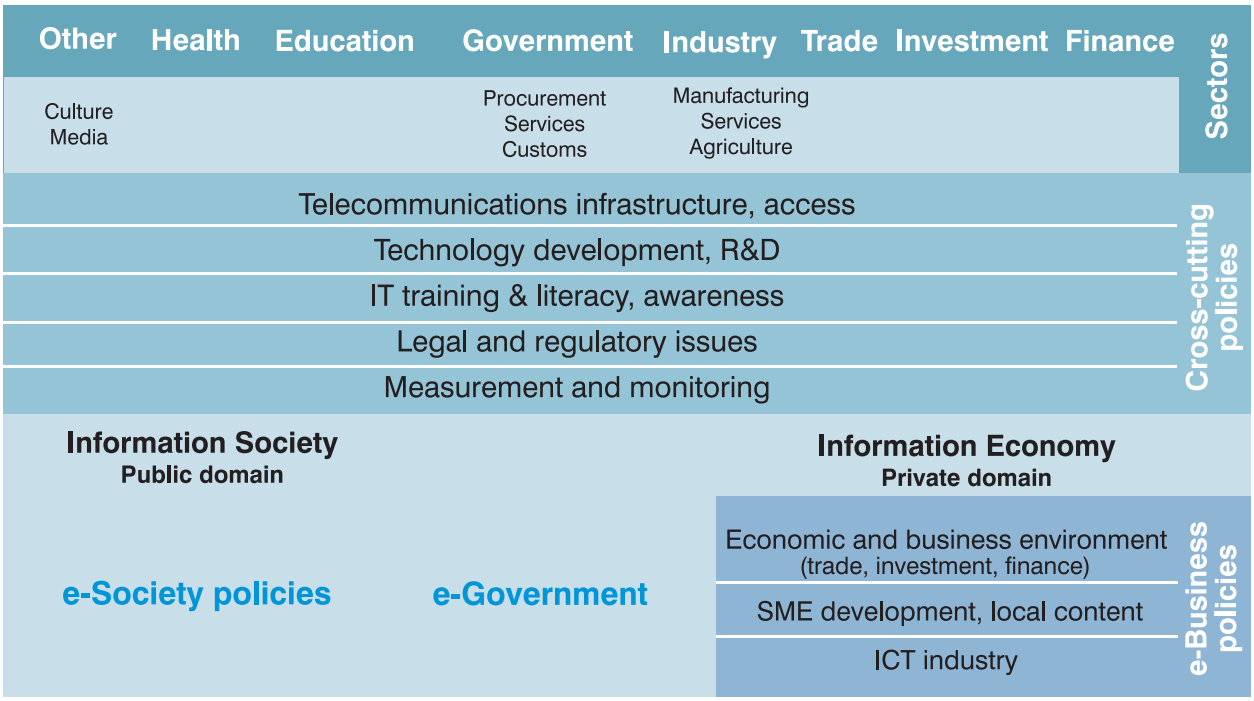
- *Cross-cutting policies* will affect all of the described sectors. They include policies related to telecommunications infrastructure, research and technology development, awareness creation, information technology (IT) training and literacy, legal and regulatory issues and measurement and monitoring.
- *E-business policies* (including e-commerce policies) will particularly affect the economic sectors. They include policies related to the business and economic environment, enterprise development (especially promotion of small and medium-size enterprises, or SMEs) and development of the ICT industry.
- *E-society and e-government policies* include areas such as health, education, culture and the media, as well as government services and customs.

Within this general framework, this chapter is primarily concerned with e-business policies and cross-cutting policies, as they have an impact on the information economy and the adoption of ICT by the business sector. It is recognized that some of the cross-cutting policies discussed below – for example, those related to developing the telecommunications infrastructure or IT literacy and skills – overlap with policies designed to develop other elements of the continuum.

A preliminary survey by UNCTAD in 2002 revealed that many ICT strategies did not distinguish between e-business and other ICT policies.[9] The model framework provided in chart 3.1 explains how e-business

Chart 3.1

ICT policy model framework



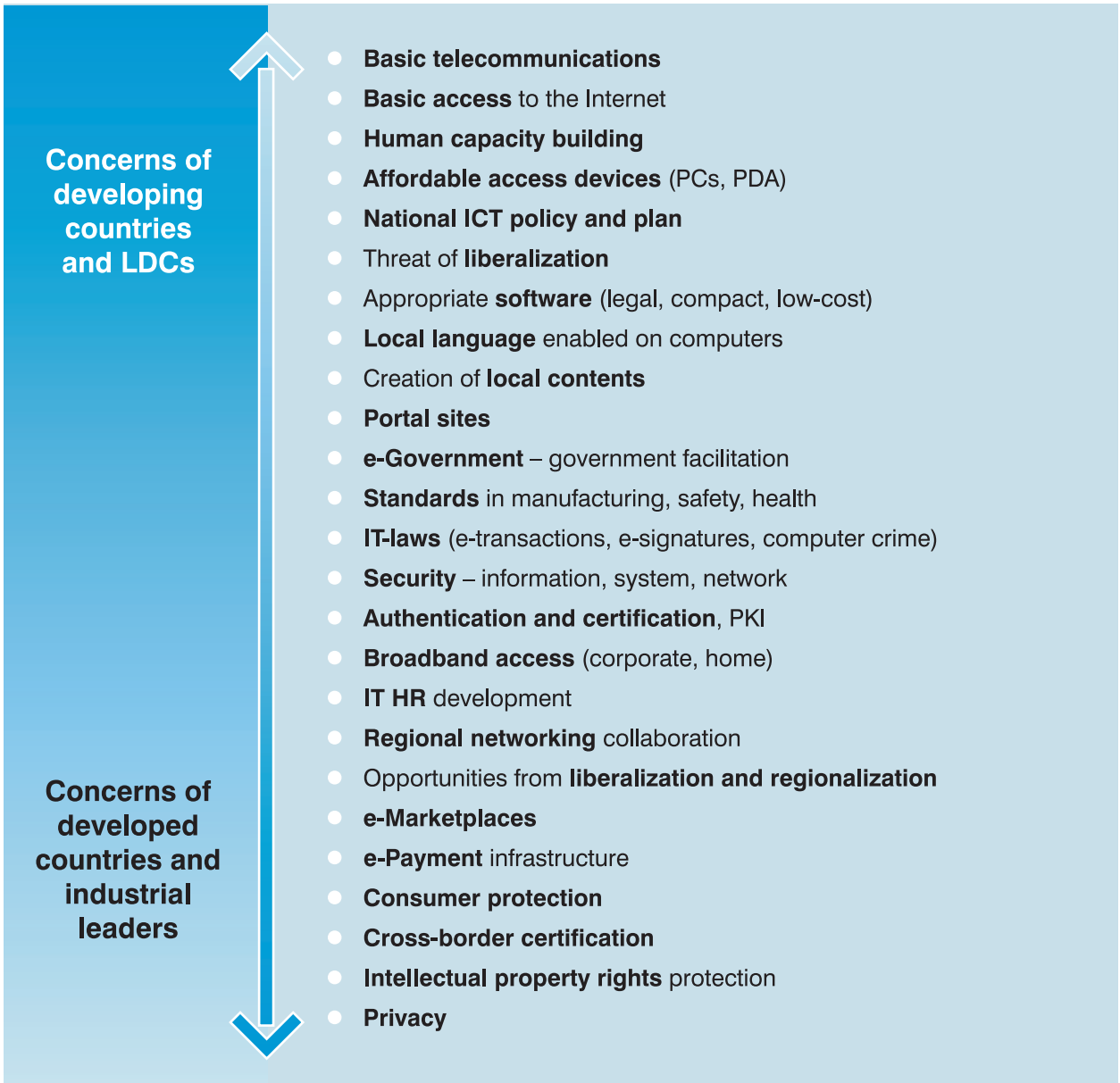
fits into the overall national ICT strategy. It also shows that e-business policies are at the heart of policies to promote the information economy.

Elements and priorities of national ICT strategies might differ between developed and developing countries (chart 3.2). In many less advanced countries, there is still widespread lack of knowledge about using the Internet in business. For these countries, enhancing awareness and public understanding of the benefits of ICT is often an important starting point in policy planning. Other priority areas for developing countries are basic access to ICT, low-cost hard- and software and the use of local-language Internet portals. Furthermore, in many developing countries a lack of local Internet content leads most people to buy online from foreign (mainly US and European) rather than local or even regional sites. Although business-to-consumer (B2C) e-commerce has only a minor share in global e-commerce, it may help SMEs in developing countries to export indigenous goods and services.

In developed countries, business interests appear higher on the policy agenda (WITSA 2002). Busi-

Chart 3.2

Strategy divide between developed and developing countries



Source: Adapted from Dr. Thaweesak Koanantakol, Director, NECTEC, Thailand, Presentation given at UNCTAD-ESCAP Regional Conference on Electronic Commerce Strategies for Development, Bangkok, 20-22 November 2002

nesses worry about issues such as competition, trust and security, interoperability, intellectual property and an open market environment. Since the telecommunications sector is largely in private hands,[10] infrastructure and access are less of an issue for policy debate. Other priority areas for developed countries may include issues such as broadband access, the building of regional networks, market exchange, and cross-border certification. Recognition of a strategy divide between developed and developing countries is important, as it helps to better target the specific needs of developing countries.

One cross-cutting issue relevant for countries at all levels of development is that of gender imbalances related to the digital economy. While in some countries Internet access figures for women are catching up quickly with those for men, women are less present when it comes to actual use of the new technologies (see chapter 1). In many countries, women make up the majority of the rural population, which is often marginalized in terms of telecommunications infrastructure, education and training. Therefore, it is important to mainstream gender in all areas of national ICT strategies, and a number of international initiatives have been launched to that effect (see box 3.1).

The following sections provide an overview of policy areas relevant to the deployment and adoption of ICT across the economy, including cross-cutting policies. The main objective is to outline key issues and make suggestions for best practice, drawing extensively on country experiences presented at UNCTAD meetings.[11]

BOX 3.1

Gender mainstreaming in ICT

The questions of whether women have equal access to ICT; whether the new technologies enhance business opportunities for women, especially in developing countries; and what barriers women must overcome to participate actively in the information society, have been on the agenda of many national and international meetings and forums, governmental as well as non-governmental, and they are driven by the WSIS preparatory process. Much of the work at the international level focuses on how ICT can become a tool for the advancement and empowerment of women, including in areas such as education and training, health, and participation in public life and the productive sphere.

Within the United Nations, the Division for the Advancement of Women (DAW) has taken the lead in promoting the gender dimension in the ICT policy-making process. In collaboration with the International Telecommunication Union (ITU), which is manager of the Inter-Agency Task Force on Gender and ICT, and the UN ICT Task Force, DAW organized an Expert Group Meeting on the role of ICT for the advancement and empowerment of women in the Republic of Korea in November 2002. The result of the meeting contributed to the forty-seventh session of the UN Commission on the Status of Women (CSW), held in March 2003, which considered the subject of gender and ICT. In its agreed conclusions, the Commission urges Governments and other stakeholders to take action on 24 recommendations and to integrate gender into every facet of the WSIS. Most importantly, it calls on governments to "prioritize the integration of gender perspectives and ensure women's early and full participation when developing and implementing national policies, legislation, programmes, projects, strategies and regulatory and technical instruments in the area of information and communications technologies and media and communications, and create monitoring and accountability mechanisms to ensure implementation of gender-sensitive policies and regulations as well as to analyse the gender impact of such policies in consultation and collaboration with women information technology specialists, women's organizations and gender equality advocates" (UNCSW 2003). UNCTAD, as manager of the UN Task Force on Gender and Trade, is working to mainstream gender into its work on ICT and development.

There are many good examples of country-level initiatives to advance women's use of ICT. In the Republic of Korea, the Government has launched a gender-awareness IT project to bridge the gender digital divide in the country. It focuses on activities such as giving 8.5 million households high-speed Internet access, providing Internet training for 2 million housewives, and a range of other training measures pertaining to ICT use and e-business for women, including IT professionals.[a]

[a] *Presentation by Prof. Kio Chung Kim, Asia Pacific Women's Information Center, Korea, at UNCTAD-ESCAP Regional Conference on E-Commerce Strategies for Development, Bangkok, 20-22 November 2002*

2. Awareness creation

In many developing countries, there is little awareness of various aspects of e-business and ICT, such as their benefits, legal and regulatory issues, best practices or technological solutions. This lack of awareness prevails at all levels, including government officials, entrepreneurs and consumers. Promoting the use of ICT and the Internet therefore ranks high on the e-business agendas of developing countries (UNCTAD 2002a).

Awareness can be heightened in a variety of ways, including through appropriate curricula in the education system, sharing of best practice, media campaigns, public demonstrations to familiarize stakeholders with the relevant technologies, government- and company-sponsored training, and workshops and conferences. The aim of these efforts should be to create an e-business culture in the country, recognizing the role culture plays in the business environment; the change of mindset among entrepreneurs, managers and executives is as important as the technological change itself.

Governments can set a valuable example by providing information and services online and using the Internet as an additional channel for communication with citizens (see section C.11). By stimulating demand for information networks, governments and other public agencies can play an important role in raising awareness of the usefulness of, for example, e-commerce, and in contributing to increased use of the new technologies. Governments also need to provide leadership in the area of e-business (e.g. by using e-procurement) and the use of online government services. Therefore, intensive awareness programmes should also be implemented in public offices at the executive level.

3. Telecommunications infrastructure

Without an appropriate network infrastructure, there will be little use of ICT by the business community. The network infrastructure needs to be accessible, affordable and of good quality. For many Governments, particularly in the developing world, the scope and modalities of telecommunications sector privatization, liberalization and regulation pose difficult problems, as private-sector-led approaches must be balanced with the demands of national public operators. Countries that have carried out telecommunications sector reforms have experienced significant improvements in access to telecommunications facilities (OECD 2002a). In most countries, opening up the sector to several providers has resulted in a higher number of users, lower prices and higher-quality services (see chart 3.3).

For example, Estonia was one of the first Central and Eastern European countries to open up its telecommunications market in the early 1990s. This move led to a rapid increase in the number of telephone lines and mobile telephone subscriptions; reduced prices; and constant growth in the telecommunications sector. Since approving its national ICT plan in 1999, Egypt has successfully increased nationwide telephone capacity and teledensity, the numbers of mobile phone subscribers and international circuits, and the capacity of international links to the Internet, meanwhile reducing access costs. Similar positive developments in telecommunications infrastructure and services have occurred in Bermuda, Chile, El Salvador and the Philippines since the introduction of competition into their telecommunications markets (OECD 2002a).

According to a recent study by the Organisation for Economic Co-operation and Development (OECD 2000), in the 1990s mobile phone density grew much faster, and prices fell more rapidly, in liberalized telecommunications markets. The study concludes that, for average prices to decline, pro-competitive legal frameworks have to be in place. Other studies (e.g. GTZ 2002) suggest that the success of reforms does not necessarily relate to a country's level of development but rather to the quality of its governance and institutional conditions.

China is a special case: in the 1990s it faced the world's fastest infrastructure deployment without privatization. It only started opening up its telecommunications market to competition in the late 1990s, and then allowed competition only among public operators. A strong commitment by the Government to invest heavily in the country's telecommunications infrastructure resulted in steep growth in the number of Internet subscribers (UNCTAD 2001).

While the introduction of competition and reform in all areas of telecommunications and data services are to be recommended, at the same time it is important to protect the interests of consumers with respect to price, quality and variety of services, as well as universal access. Other important measures include enhancing the capacity of the existing infrastructure by increasing bandwidth access and availability, and reducing Internet access costs for businesses and

CHART 3.3

Internet access and market structures (2001)

Countries	ISPs C= Competition M= Monopoly (Number of ISPs)	Tariffs (off peak; 30 hrs/month)
South Korea	C (270)	10.15
Sri Lanka	C(12)	11.97
Singapore	C (47)	12.17
China	C (59)	18.24
Australia	C (235)	23.32
Japan	C (234)	58.36
Cambodia	C (2)	129.56
Marshall Islands	C (2)	159.00
Maldives	M (1)	168.22
Papua New Guinea	M (1)	185.97
Tuvalu	M (1)	212.73
Kiribati	—	222.09

Source: ITU various publications; presentation by Dr. Eun-Ju Kim, ITU, at UNCTAD-ESCAP Regional Conference on Electronic Commerce Strategies for Development, Bangkok, 20-22 November 2002

households. Service providers could be encouraged to introduce alternative (and cheaper) devices and consider the possibilities of wireless technology.

Developing countries need to take into consideration that building telecommunications infrastructure is costly. In many cases, countries will need inflows of foreign direct investment (FDI) to improve domestic infrastructure. This means that, in addition to establishing a well-regulated telecommunications market, they also need to put in place policies to ensure an appropriate investment climate for foreign service providers. Effective implementation of the WTO Agreement on Basic Telecommunications could be useful in this respect.

4. Creating universal access to ICT

While telecommunications sector reforms usually result in improved quality and access to telecommunications services, market-driven infrastructure development often leaves out areas that are sparsely populated or are inhabited by underprivileged communities where investment in telecommunications development would not be profitable. Therefore, strategies relating to telecommunications, infrastructure and access need to take into account all segments of the society so as to minimize digital exclusion.

From a development point of view, the issue of universal access or universal service[12] is critical, given that many of the world's poor live in remote and

underserved areas. Providing access to ICT for all citizens often requires some kind of government intervention. There are several models and policy options for bringing the Internet and other technologies to the poor. The developed-country model of home-based and work-based access cannot easily be applied in developing countries.

In developing countries, it may be better to focus on shared-access models than on connecting all households, which would require large amounts of funding. For example, the use of ICT and the Internet can be broadened by setting up public access points or facilitating the provision of free Internet access in all public schools, universities and other public locations such as libraries, and by establishing telecentres throughout the country. At the same time, publicly subsidized community access centres should be business-oriented and work towards achieving self-sustainability. They should not compete with or distort the operation of Internet cafes that may have already been set up by local entrepreneurs. Good business models for such centres have been developed in Peru, where the establishment of private-sector-initiated Internet booths resulted in a high number of Internet users per Internet host (Hilbert and Katz 2003; DOI 2001). The RCP (Red Cientìfica Peruana) model has been adopted by El Salvador, which is planning to open 100 new telecentres by the end of 2003.[13] Costa Rica has set up 187 telecentres, including in all local government headquarters, public libraries and 30 post offices. Egypt has established 305 IT clubs and telecentres, mainly in deprived and low-income communities. India's Community Information Centres (CIC) project covers eight states in the north-astern part of the country, where the rural population uses the centres primarily for Internet and email, word processing and computer training. Community Information Centres are being established with the help of The Asia Foundation in 22 provinces and municipalities across Cambodia. Located in the offices of local non-governmental organizations (NGOs), these centres feature Khmer-language World Wide Web portals and email services.

In a number of countries (e.g. the Bahamas, Brazil and Malaysia), Governments have successfully raised funds for universal access by channelling a percentage of telecommunications operators' gross income into special funds to finance public access points. These universal service obligations (USO) generate income from the incumbents and various public telecommunications services operators that can be used to provide access to rural and underprivileged groups. For example, Chile has used the funds to provide subsidies for the installation of public telephones (Dutta, Lanvin and Paua 2002). The goal of universal service should extend beyond simple telephony to embrace Internet access (as in Brazil) and broadband access to facilitate the use of e-commerce and e-business technologies.

Other possible government policies to promote universal access include the following:

- Allowing competition in order to foster a choice of services and suppliers as well as competitive prices
- Establishing special public-private partnerships to provide universal access (ICT access as a public good)
- Introducing concession agreements with telecommunications carriers and obliging them to ensure connectivity in rural and remote areas (as was done in Estonia; such a scheme failed in the Philippines, though) (Dutta, Lanvin and Paua 2002)

Countries will face a number of challenges in implementing policies for universal access to ICT. For example, they have to set up mechanisms to raise USO funds. Large developing countries, such as India, will face greater challenges to providing universal access than smaller ones, such as Costa Rica. Finally, without proper education and training, local content, sociocultural awareness and a stable social, economic and political environment, it will be difficult to make ICT available to all communities.

In conjunction with access to telecommunications networks and service, the development of appropriate technologies to address the needs of disadvantaged communities can be an effective way to bring ICT to remote areas. Examples include the Jhai Foundation's project in the Lao People's Democratic Republic and the Indian Simputer (see boxes 3.2 and 3.3). The use of open-source software is another recent development that is gaining increasing attention and that provides developing countries with cheap access to technologies (see chapter 4). The use of software, whether open-source or commercial, is contingent on access to affordable hardware. Possible policy models include subsidizing household ownership of personal computers (PCs) and establishing and subsidizing community access centres.

Box 3.2

The Jhai PC

Computers and Internet access is being brought to remote villages in the Lao People's Democratic Republic using solar- and muscle-powered systems and low-cost wireless technology. The Jhai Foundation,[a] a non-profit organization based in the United States, has developed a wireless voice and text communication system based on the Internet protocol (IP) and specially designed for use by villages in developing countries. Initial installation has been done in a group of five villages north of the capital, an area where 8,000 people were displaced during the military conflict in the late 1960s and early 1970s.

The system will have one public station in each village and is based on low-cost wireless PC technology (based on Wi-Fi, or wireless fidelity, technology) and the open-source Linux operating system, customized to allow access via the local Lao script. Electric power will be generated by solar- and muscle-powered systems. The computers connect to the Internet via a radio network and are powered by hulking batteries attached to stationary bicycles imported from India, with one minute of pedalling yielding five minutes of power. The organization hopes that the 6-watt Jhai computer will withstand the heat and rain to provide email and Web access as well as allow phone calls over the Internet. The system is being installed in full cooperation with village inhabitants; it was actually they who asked the Jhai Foundation for help accessing the Internet so that they could monitor prices for the rice, chickens and silk they sell in the nearest market. They also want to sell local textiles and handicrafts in Europe or the United States, and email and talk to relatives.

The network was designed and built for about $19,000 plus donated labour, and it is expected to cost the villages about $21 a month to operate. The project is expected to be sustainable and may be replicated in other locations. The Jhai Foundation reports it has received inquiries from 40 countries thus far.

One problem the project faces is stopping people from stealing the equipment, as solar panels are routinely stolen. Therefore, the Jhai Foundation is devoting great effort to an alarm system that still sounds minutes after being tripped, and even after all the wires connecting to it have been cut. Another question that has been raised is whether the project has set up a training programme and has made enough content available in Lao as well as some of the tribal languages of the indigenous population. Project staff members say that, although English-language Web sites will remain in English, villagers will be able to send and receive messages in their native language. Software will also feature menus translated into Lao. Village children will be trained to use the computers and the Web and will then teach older villagers to do the same.

The project was to be launched in May 2003 in Phon Kham village, 100 kilometres north of the capital, Vientiane, but it has been delayed by unresolved disputes between the Foundation and the Government of Cambodia.

The Jhai Foundation has also set up Internet learning centres in the Lao People's Democratic Republic, some of which have been handed over to the Government after the initial start-up phase. The centres, which are located in high schools in rural areas, aim to bring technology to students and teach them how to use Internet for educational purposes and communication with students from other countries, particularly India. The centres provide Internet access and offer practice in computer use and basic English to students age 10 and up.

[a] *See www.jhai.org.*

BOX 3.3

The Indian Simputer

Developed by a team of Indian scientists and engineers, the Simputer is a hand-held device designed as a low-cost portable alternative to PCs. Its name stands for Simple Inexpensive Mobile People's Computer, and it is a shared device for a local community of users. Equipped with a smart card reader and writer, the Simputer can be personalized using a smart card for individual use on a changing basis. It can be linked to a PC for transfer and storage of information (it has only limited internal storage capacity). An interface based on Information Markup Language (IML) permits use based on sight, touch and audio, thus enabling use by illiterate people. The technology is based on GNU/Linux software technology that is open and modular and uses a chip low in power consumption. Thus, the Simputer runs on three rechargeable AAA batteries.

In November 2002, two Indian companies began commercial production of the Simputer. One of them, Encore Software Ltd., has already shipped about 1,000 Simputers from India and Singapore, where it has a second sales office. The company expects to exit the trial phase during 2003 and sell 25,000 to 50,000 Simputers in 2004 (Hindu Business Line 2003).

The second manufacturer, PicoPeta Simputers Ltd., sells its Simputer for Rs. 13,000 and is hoping to lower the price to Rs. 10,000 (approximately US$200) during 2003 as volumes increase. Large orders are expected from the Government of India in particular.

In India, the Simputer has already been successfully used in projects involving bringing technology to schools, providing microfinance for farmers in rural areas, and using e-governance to automate the process of land records procurement.[a]

[a] *See www.picopeta.com/showcase for examples of Simputer projects.*

5. Human resources development

Most policy makers agree that unless businesses and consumers are educated about the opportunities and benefits offered by ICT, and unless they are trained to use the Internet, e-business will not take off. While access to computers and the Internet is essential, it is not enough; it is equally essential to create a demand for the new technologies and for e-commerce. Some have even argued that education, and not connectivity, is the main challenge for most developing countries seeking to participate in the digital economy (ILO 2001).

Education and training are fundamental to the widespread and effective use of new technologies. Since a networked society is essentially a knowledge society, many of the potential benefits of ICT relate directly to the capability to use data and information to create new knowledge. Therefore, human resources development (HRD) is considered to be a core component of an ICT strategy and one of the most challenging bottlenecks for developing countries seeking to engage successfully in e-business. In many developing countries, the literacy rate is low, especially among women and girls, and the level of education is insufficient for full implementation of the changes in work organization that are required for the efficient adoption of ICT. Given the relatively fast technological change related to ICT, continuous learning is required. This means that even adults need to improve skills or acquire new ones on a regular basis.

Developing the human resources of the country and meeting the challenges of the e-business environment requires a commitment by the highest levels of government. Governments need to define their respective national value propositions based on their comparative advantages – including, for example, multilingual capacities – and focus their HRD on those areas. HRD plans should include a shift from transmitting information and knowledge to learning critical and creative thinking. Also, HRD policies should be designed to give men and women equal access to opportunities in the labour market.

One common dilemma for Governments is how to allocate the education budget. In many countries, public education services and universities operate in poor conditions, and improvements have implications for the education budget.[14] One way to increase resources is through partnering with the private sector or NGOs. Indeed, the implementation of national HRD policies for ICT could involve many different players, including Governments, private training institutes, international and regional organizations and NGOs.

Enhancing basic IT education

Governments can play an important role in enhancing digital literacy through the country's basic education system. Improving Internet access and the number of computers in schools and training teachers in the use of ICT in the classroom will contribute to a new generation of IT-literate children. At the same time, Governments need to be aware that an increase in the number of computers in schools will require training teachers to use the new technologies, as well as an increase in the number of technicians and other IT-literate people to operate and repair computers and teach software programmes.

Chile has been working to enhance national IT literacy through its Enlaces programme (see box 3.4). Since putting in place its national ICT plan in 1999, Egypt has provided over 6,000 high-school and university students with basic IT training, and over 8,500 professionals with certified high-level training. The Republic of Korea has implemented a comprehensive plan for IT education in elementary and secondary schools. According to a survey carried out in 2000 by KRNIC (Korea Network Information Center),[15] most Koreans were first exposed to the Internet through school assignments (23%) or out of curiosity (24%), followed by business use (19%), everyday information (15%) and other means.

In low-income countries and remote communities, where education systems may have major deficiencies, community-based centres (such as telecentres) have proven successful in providing basic training in ICT literacy and raising awareness of the benefits of using the Internet. Media Lab Asia, an academic research programme with regional laboratories in five Indian states, strives to bring ICT capacity to people in rural India.[16] Stakeholders involved include MIT Media Lab,[17] academia, NGOs, the Government and industry. The programme brings digital connectivity to villages and trains rural young people in entrepreneurial skills.

It is important to remember that access to quality basic education should be the priority concern of all

Box 3.4

Red Enlaces: 10 years of IT education in Chile

Launched by Chile's Ministry of Education in 1992, the Enlaces[a] programme is one of the early efforts by Governments to prepare students for the information society and to introduce ICT into a country's basic education system. The programme provides infrastructure (computers and Internet access), capacity building (for teachers) and content (educational software and Web sites). Enlaces is the main provider of ICT equipment in the country's schools; in 2001 it provided 80 per cent of equipment in primary schools and 59 per cent in secondary schools.

After 10 years in operation, in 2002 the programme was operating in 74 per cent of primary schools and 93 per cent of secondary schools, or a total of 77 per cent of all schools in Chile. It has managed to distribute computers to 72 per cent of schools (a total of 50,000 computers) and provide Internet connections to 56 per cent of schools. 60 per cent of teachers have been trained. The Government hopes to reach 100 per cent coverage by 2005.

The programme aims not only to provide access to the Internet and new technologies, but also to introduce the use of ICT into school curricula as a support medium for teaching. Results in this area have been limited thus far, since the programme has mainly focused on training staff members to use the system, rather than encouraging teachers to use ICT as a pedagogical tool. This remains one of the most important challenges for the future development of the programme (Hilbert and Katz 2003).

[a] *www.redenlaces.cl*

Governments. Introducing computers into badly equipped schools with poor curricula will not produce better-educated citizens equipped for the challenges of the information society.

Labour force training and skills development

In addition to introducing basic computer education in schools, countries will also need IT professionals such as software engineers, programmers and other technical specialists, as well as businesspeople with IT skills. The demand for ICT-related skills is not limited to the ICT sector but arises in all areas of economic activity as ICT becomes an essential part of every enterprise. Skilled professionals must be attracted, developed and retained as an essential part of national ICT strategies.

High-skill professional ICT training is usually provided by universities and technical colleges, while lower-skill IT-related training can be offered by community colleges or similar training institutes, private-sector training centres, and in-house company training as well as over the Internet. A number of universities worldwide have started to offer programmes combining business and technical skills. Since women are particularly underrepresented in ICT-related professions, programmes supporting female enrolment are important elements of national strategies in the area of education and training.

Because ICT develop rapidly, the public sector has difficulty adapting its IT training curriculum accordingly. Therefore, the private sector, especially the IT industry, can play an important role in training the workforce. Yet Governments need to keep in mind that private training is often affordable only to the urban upper class and may leave out many members of the marginalized or rural labour force. Building public-private partnerships could be a good alternative: for example, Egypt has started a programme to train 5,000 young professionals a year in collaboration with numerous renowned multinationals established in Egypt, such as Microsoft, Oracle, IBM and Siemens. Other examples of countries that have initiated a number of IT training programmes are the Philippines (see box 3.5) and the Republic of Korea.

Increasing the number of HRD programmes and activities will be effective only if the education and training match the changing needs of the industries concerned. Upgrading teaching standards, encouraging faculty to acquire new knowledge, developing aca-

BOX 3.5

IT training projects in the Philippines

At the country level, human capacity building for ICT may take various forms. For example, the Government of the Philippines has implemented the following projects:

- ***Virtual Center for Technology Innovation in Information Technology.*** Funded by the Department of Science and Technology, the centre provides training and certification programmes as well as e-learning facilities. Certification programmes are in computer networking, database systems, and Internet software development.
- ***PCs for High School project.*** Funded by the Department of Trade and Industry, it aims to provide computers with printers and modems to 1,000 of the 4,336 public schools in the country.
- ***School Cyberfair project.*** It recognizes high schools that produce the best websites telling a story about a programme or people in their local communities.
- ***APEC Tel E-Commerce Skills Standards Project.*** This project is an initiative of the Asia-Pacific Economic Cooperation (APEC) forums to develop e-commerce skills standards to improve the quality and consistency of human capital for e-commerce in the region. It covers subjects such as knowledge management, software development, website development and maintenance, order fulfilment, marketing, network technologies, outsourcing and project management.

Other projects include an online open university; an e-government awards mechanism to encourage the use of e-government services and facilities; a free online marketplace project sponsored by the World Bank, which includes training activities; and an Internet Day celebrated each year to build awareness of e-commerce and the Internet.

demic exchange programmes, and fostering regular discussions between educational institutions and the private sector can contribute to the development of better human resources for e-business.

At the global level, the demand for IT skills has grown considerably over the past few years and has not been met by the supply of IT labour. As a result, there is a considerable shortage of IT skills, especially (but not only) in the developed countries (ILO 2001). To fill this labour shortage, some developed countries have hired high-skilled migrant labour, often from developing countries. This practice can be costly for developing countries such as India that have invested heavily in creating a domestic IT human resources pool and are facing increasing domestic demand for IT professionals. Hence, companies in developing countries need to consider providing attractive working conditions to prevent their IT professionals from looking for alternatives abroad. The availability of specialized IT skills in developing countries could help attract IT companies from developed countries to set up enterprises or subsidiaries in developing countries.

The following recommendations have resulted from UNCTAD meetings[18] discussing HRD policies for the development of ICT and e-commerce:

- Activities should preferably be conducted in provincial cities, as many programmes are often already available in capital cities.
- Activities should cater to the needs of SMEs, be tailored to local requirements, and involve both local and international resource persons.
- Activities need not only to encourage people to get online but also to prepare them for the difficulties they are likely to face in the process. Such an approach will increase user trust and confidence and reduce security problems.
- Copious information on best practice and barriers to e-commerce development is already available online free of charge and can be used to enhance the quality and relevance of HRD activities.
- E-commerce training courses should be constantly updated, as new innovations and practices emerge very rapidly in this field. Institutions in charge of HRD for e-commerce should provide appropriate incentives for keeping e-commerce courses up-to-date.
- Activities organized by regional or international organizations should preferably be conducted in partnership with local organizations responsible for HRD, such as universities.

6. Legal infrastructure[19]

The need for a legal infrastructure supportive of and conducive to e-business activities constitutes one of the main issues that policy makers should address when defining an ICT strategy. Lack of trust, security and harmonized national legislation, coupled with an increasing number of reported cybercrimes, viruses, spams and fraud, has become a major impediment to the expansion of the information economy. Providing an enabling legal framework is a key specific e-commerce element of a national ICT strategy, as it particularly affects the ability to conduct transactions online. Policy makers need to remember, however, that adjusting the legislative framework to e-commerce will not solve other, more fundamental problems inherent in the existing legal system of a country.

The main legal challenge of e-commerce is that tangible information is unavailable (i.e. there are no original paper documents, only electronic messages). This is often referred to as the dematerialization problem. Because of this and other unique characteristics of e-commerce, national legal frameworks need to be adapted to enable the development of e-commerce and give legal value to electronic documents and signatures. It may be useful for Governments to examine their legal infrastructure to see if paper-based form requirements prevent laws from being applied in an electronic environment.

Although it is well known that commerce and technology often advance ahead of the law and that historically the law has adapted to serve commercial and financial demands and facilitate trade, it is equally true that technology needs to take into account relevant legal requirements. This is very much the case with e-commerce, since the laws of many countries include strict requirements concerning issues such as negotiability and documents of title. Furthermore, efficient regulation of e-commerce issues such as spam and digital rights management requires that legislative solutions be accompanied by technical solutions.

National policy priorities need to be reflected in the legal framework in order to maximize certainty and encourage confidence in and use of e-commerce. The legal framework, a key element in the enabling environment, affects market participation. It is important

to hold a broad public dialogue and debate with all stakeholders before preparing e-commerce legislation so as to ensure fairness and an equitable balance between different interests at stake.

Legislation should aim at providing legal security and predictability and technological and commercial neutrality as well as removing barriers to accessing and using e-commerce. Thus, it is essential to ensure that online transactions are legally valid, binding and enforceable. In preparing legislation, Governments should not overregulate; party autonomy should be preserved; and the legislation adopted should be technology-neutral.

Important legal issues include electronic contracting, consumer protection, privacy and data protection, cybercrime, jurisdiction and applicable law, intellectual property rights (including digital rights management), alternative and online dispute resolution[20] and taxation.

Electronic signatures are a vital tool to ensure authentication of electronic communications. It is important that countries wishing to use various e-signature techniques enact appropriate legislation to ensure that electronic signatures can be used with legal effect. The United Nations Commission on International Trade Law (UNCITRAL) has developed Model Laws on E-Commerce and Electronic Signatures, primarily designed to enable e-commerce development as opposed to regulating e-commerce. While there are many electronic signature and authentication technologies, it is important to determine the extent to which a law on electronic signatures should prescribe a given type of signature or technology. A review of legislative and regulatory activity so far reveals three basic approaches:

- Minimalist approach (e.g. in Australia, the United Kingdom, the United States) – No specific protocol or technology is advocated. Legislation is limited to defining the circumstances under which an e-signature will fulfil existing legal requirements for tangible signatures.

- Prescriptive approach (e.g. in Argentina, India, Italy) – Asymmetric cryptography[21] is generally the approved means of creating a digital signature; operational and financial requirements are imposed on certification authorities and key holders. Prescriptive laws may create problems for cross-border transactions.

- "Two-tiered" approach (e.g. in the European Union, Pakistan, Singapore) – The first two approaches not being mutually exclusive, this approach combines them by prescribing standards for asymmetric cryptography operations while at the same time taking a broad view of what constitutes a valid e-signature.

A flexible approach to the legal issues raised by electronic signatures and authentication might be considered, not only to ensure the continuing usefulness and applicability of the law but also to take into account the business community's concerns that rule making may unnecessarily hinder the development of new techniques. The law should cover a diversity of existing techniques offering varying levels of reliability and security, while at the same time leaving room for techniques that may be developed in the future.

Privacy and data protection. Appropriate data protection legislation or appropriate guidelines regulating the collection, use, dissemination and protection of personal data to which business actors have access over the Internet are necessary. It is important to avoid undue restrictions on transborder data flows from countries where data are protected. To boost consumer confidence and as a complement to consumer protection legislation, policy makers might wish to consider the promotion of self-regulatory instruments such as trustmarks or "seals of approval", guidelines and codes of conduct.

Intellectual property protection. Authors, publishers, producers and content providers are increasingly demanding legal and technological answers to their concerns about copying and dissemination of digital material. Thus, in addition to appropriate copyright legislation and enforcement mechanisms, cooperation between Internet service providers (ISPs) and rights owners is very important. Technological protection measures such as digital rights management (DRM) systems are effective mechanisms that have been developed to protect digital content and prevent unauthorized use of copyrighted content. Their aim is to secure rights clearance and revenue collection. It is therefore important that, in addition to appropriate copyright legislation, intellectual property rights holders in developing countries have easy access to DRM systems in order to protect content. When implementing intellectual property legislation, Governments might consider ratifying the WIPO Internet Treaties.

Cybercrime. It is important for Governments to examine their legal frameworks and, where appropriate, enact legislation to criminalize activities that involve interference with infrastructure security and computer crime. In reviewing their criminal laws, Governments might consider taking into account the Council of Europe Convention on Cybercrime.

Taxation.[22] Fears of revenue losses from uncollected taxes and duties on Internet transactions have prompted many Governments to work towards internationally acceptable solutions for changing existing tax legislation to take account of e-business. The OECD, within the framework of its Model Tax Convention, has taken a lead in adapting existing frameworks to reflect the existence of e-commerce. Developing countries, even if they are not part of an OECD agreement on Internet taxation, should use the agreed-on rules as a basis for adjusting their own legislation and should start to develop efficient tax collection systems for e-commerce.

7. Economic and business environment

In addition to the telecommunications sector, which is clearly in greatest need of regulation, there are other policy areas that Governments need to address in order to create a business and economic environment that will facilitate the adoption of ICT by the business community. These areas relate to trade and investment, standard setting, and banking and finance.

Trade and investment

A policy framework that promotes open markets, competition and private-sector investment will attract companies not only in telecommunications but in other sectors that support and benefit from the information economy. Trade-related policy objectives should enable innovation, a key element in an economy and society that is increasingly becoming knowledge-based. Regulations should be internationally coordinated; otherwise they create uncertainties as to which rules apply. From a business point of view, non-discriminatory treatment of e-commerce is essential (WITSA 2002).

Active participation by Governments and commitments made in WTO multilateral trade negotiations could result in an environment that stimulates trade and investment. Policies could include a reduction of import tariffs and taxes on software and hardware, the temporary movement of skilled labour (as provided for in the GATS), participation in the Information Technology Agreement (ITA) or the customs moratorium on electronic transmissions. Further liberalization of the services sectors, especially services that can be provided digitally (e.g. computer-related services, business services, financial and insurance services), as well as communication services, could stimulate export growth in these sectors.

Common changes in trade policies include the lowering of import tariffs on computers and other hard- and software, which are important inputs into the domestic IT industry. As this measure typically results in lower prices, it has proved helpful for increasing the use of computers and ICT in general, and especially among SMEs. Examples of developing countries that have adopted this approach include the Government of Uganda, which removed all major taxes on computers and related equipment as of 1 July 2002. Ecuador eliminated import duties on computer hardware in January 2002 in an effort to increase the number of computers and Internet users in the country (US Commercial Service 2002).

In addition to recognition of the convergent nature of e-commerce, there is also increasing recognition of and reliance on general competition law principles to guard against anti-competitive activity in the e-commerce space.

Trade support services such as customs and logistics need to be made more efficient and to incorporate ICT into the management of cross-border transactions. Government measures to streamline regulations affecting customs and exports of intangibles, and to modernize customs systems, could be efficient ways of supporting the information economy.

Technical standards

In choosing technological standards, it is crucial to consider their compatibility at the international level. Countries need to be aware of the fast pace of ICT convergence and the danger of "lock-in" effects for consumers in connection with use of certain technologies that do not meet internationally agreed standards or are not based on interoperability. These range from pay television to mobile phone standards to software (see chapter 4). As a general principle, open

standards should be chosen over proprietary ones (Hilbert and Katz 2003).

The availability of international technical standards could also facilitate resolution of the legal issues likely to arise in international transactions. Recent efforts by the United Nations Centre for Trade Facilitation and Electronic Business to develop XML standards for e-commerce could be useful.

Finance and payments[23]

The low level of credit card ownership in many developing countries is a major impediment to the spread of business-to-consumer (B2C) e-commerce. Governments are therefore encouraged to adopt flexible regulations and create a supportive institutional environment to encourage the introduction of e-payments, Internet banking, online trade finance and credit information, and other e-finance facilities relevant to SMEs, and to ensure public-private cooperation in these areas.

Estonia is a country that has become a leader in Internet banking (which now reaches 18 per cent of the population), not only among Eastern European countries but in world rankings, through a combination of easy-to-use software, free-of-charge transactions and behaviour changes resulting from the influence of the Nordic countries' IT culture on Estonia.[24] Thailand's e-payment strategy 2002–2004, under the leadership of the Bank of Thailand, has created an industry payment body to involve other stakeholders, in particular from commercial banks, which take leading responsibility for the development of e-payment systems and technologies.

Online security is a major factor limiting the development of e-business in many countries. Consumers consider credit card security their number one concern about online shopping. In some countries, like China, holders of credit or debit cards are liable for the amount of charges on their cards, even in cases where the card number is stolen.[25] In some developing countries there are very few secure servers, which increases the risk of credit or debit card misuse. Governments, in cooperation with the private sector, should foster the creation of an e-payment- and e-finance-friendly regulatory environment and the development of secure methods of electronic storage and transmission of commercial messages, electronic signatures and e-contracts.

8. Promoting e-business among SMEs and creating local content

Small and medium-size enterprises are the backbone of the economy – not only in developing countries – and employ the large majority of the workforce. Any strategy to promote the information economy and the adoption of ICT by the business sector therefore needs to consider the critical role of SMEs in creating employment and enhancing the gross domestic product (GDP). Through the use of ICT, SMEs can access important information related to products, markets, legal and regulatory requirements and finance; establish and maintain contacts with clients and business partners; make business processes more efficient; and improve firm organization and management, all of which contribute to increased competitiveness.

SMEs have many advantages that could allow them to spearhead e-business in some developing countries. These include their great adaptability and ability to keep up with change, a flexible structure to meet changing requirements, and a simple decision-making process, all of which fit well into the current rapidly changing e-business environment.

Yet bringing the benefits of ICT to SMEs, especially microbusinesses, in developing countries is also the most challenging task for policy makers and international aid agencies. Existing policies and programmes to promote SMEs need to integrate ICT-related components, taking into consideration the special situation of SMEs, which face the following problems, among others:

- limited access to finance that would enable them to introduce ICT into their organizational structures or venture into e-commerce
- limited human resources, including IT and foreign-language skills
- limited resources to buy expensive hardware and software

Therefore, some of the policies described above need to target SMEs through, for example, low-cost distribution of software (including possible use of open-source software), subsidized IT training programmes for SMEs, incubators, the availability of venture capital, and/or trade-related e-finance mechanisms for SMEs. Also, because SMEs have less credibility on the international market than large multinational

enterprises, they need help to improve the quality of their products and services in order to be able to sell them on the now much more accessible international market.[26]

In addition, policies that target the development of certain sectors of economic importance should focus on SMEs. These include sectors such as tourism and software and IT-related services. In order to promote SMEs' participation in the digital economy, the Government of Costa Rica has established an Internet portal (www.marketplacecostarica.com) that markets Costa Rican products and allows SMEs to establish business contacts and advertise their products at minimal cost. Jamaica has developed a set of sectoral plans that include support for e-business in dynamic sectors of the economy. SMEs need more and better information about potential market niches or diaspora markets (Africa) – for example, on business clients, types and volumes of product needs, and quality and other requirements. Mechanisms to help SMEs connect with prospective business clients in developed countries are very helpful and have been established in Uganda at no cost to entrepreneurs. Uganda has also adopted a partnership model for mentoring and twinning to start up e-businesses and is setting up the first e-business incubator, following models in Asia and North America.

In order for SMEs to realize the benefits of ICT, the generation of local content is vital. This issue is especially addressed in discussions of models and policies to enhance the adoption of ICT in rural areas, which requires the availability, in local languages, of information relevant to local communities. SMEs have shown more interest in e-commerce when efforts were made to facilitate the use of local languages (Hilbert and Katz 2003). A study on ICT usage in Costa Rica has shown that the lack of Spanish-language content is a major reason for the limited use of the Internet by businesses (Monge and Chacón 2002). Many developing countries have a rich cultural and historical heritage that is reflected in their music, handicrafts, local customs and traditions and in their popularity as tourist destinations. SME support programmes should help SMEs provide local content to both domestic and foreign consumers. The UNCTAD-initiated Global Trade Point Network (GTPNet)[27] is a good example of how SMEs from developing countries can use the Internet to expand their domestic and international markets.

9. Promoting the ICT industry

By targeting certain industries and business sectors, Governments can play an important role in enhancing the development of e-business in the country. In a number of countries, development of the domestic ICT-producing sector[28] has been a priority in the national development strategy (e.g. in Malaysia and India, as described in box 3.6). Development of ICT hardware and software production is often pursued by establishing joint ventures or creating high-technology parks offering investment and export incentives. This requires the availability of capital, either public or private. Government funding can be particularly useful as seed capital to start-up companies and has been provided in countries such as Australia, Greece, Israel, Singapore and the Republic of Korea (Dutta, Lanvin and Paua 2003).

Governments wishing to develop the national ICT sector need to ensure that the industry is subject to competitive pressure; that it creates diversified producer capabilities; that it is adapted to local needs; and that it creates jobs directly and indirectly (in the long term) – that is, has spillover effects. For these policies to succeed, the government needs to work very closely with the business sector and respond to its very specific needs. At the same time, academia needs to be present in the policy making so that colleges' and universities' teaching programmes correspond to the needs of the emerging sector.

Experiences from countries that have chosen an ICT-led export focus show a positive impact on balance of payments and GDP (e.g. in Costa Rica and India). An ICT export focus may also help countries reduce their dependence on traditional commodity exports. On the other hand, this strategy may have only limited impact on the development of the national infrastructure and on other national development objectives. In India, where there was a strong focus on the ICT export sector, few benefits trickled down to the poor, and ICT infrastructure and access are still in bad shape in many rural areas.

Some studies have found that while a policy to globally position the domestic economy makes sectors more competitive and attracts FDI, it does not necessarily translate into social development, especially for vulnerable groups (DOI 2001). Similarly, if ICT developments are limited to closed technology parks or zones and are not combined with other policies in the area of education and training, the gains will not diffuse throughout the economy. Hence, more atten-

Box 3.6

Promoting the ICT sector as a development strategy?

Malaysia and India are well-known examples of countries that have chosen an ICT sector strategy. In the case of Malaysia, a key policy strategy for the development of the ICT industry has been to facilitate a rapid transition of the telecommunications industry towards full competition. This strategy is being implemented through, among other means, the establishment of a universal service provision policy framework, with funding from both industry and the Government; moves towards cost-based tariffs, starting with tariff re-balancing for fixed-line services; opening up the last mile by issuing new licenses; legalizing the voice-over Internet protocol; and lifting controls over mobile telephony charges. These policies are complemented by the Multimedia Super Corridor (MSC) initiative, which includes the implementation of a number of flagship applications to develop the country's ICT industry.

The Indian example is based on a successful technology park strategy. Government policies to promote the IT services export industry included permitting duty-free imports of a number of key IT products; allowing 100 per cent foreign equity; deferring corporate income tax until 2010; dedicated data communication links; single-window Government clearance; and providing single-point custom bonding and export certification. This was complemented by support for incubators, human resources training, numerous e-governance initiatives and the unding for venture capital. The success of this strategy was greatly aided by the existence of a large pool of IT-skilled labour, to which new technology parks were set up in close proximity (e.g. in Bangalore).

tion needs to be paid to linking these strategies to the domestic industry and other related policies (see Thailand's linking of incubators with other ICT-related policies). To yield their full potential, ICT need to be mainstreamed into all sectors, as was outlined in previous sections of this chapter.

10. Monitoring and measuring ICT usage[29]

The lack of reliable statistics and indicators for assessing e-business developments at the national and international levels has been a source of major concern and has received attention from policy makers in many countries. Data on the use of ICT are fundamental for facilitating well-informed decisions on how to formulate and implement ICT strategies and to benchmark a country's digital economy vis-à-vis those of other countries.

Countries that have started to collect statistics about the digital economy are already benefiting from the results. They are now in a position to benchmark their economies with those of competitors internationally, and they are able to identify the number of qualified people needed to advance their country's digital economy and to calculate the amount of investment funding needed to provide businesses with access to the Internet. The United States is planning to include the measurement of e-commerce transactions in its entire statistical programme, which will enable it to measure the impact of e-commerce on the overall performance of the economy.[30] Both policy makers and businesspeople are able to take better-informed decisions about public policy measures and private investments in e-business-related sectors.

Recognizing the value of ICT data, policy makers designing national ICT strategies increasingly include in their programmes the need to measure the digital economy. For example, the European Union eEurope 2002 Action Plan includes a set of benchmark indicators to monitor progress towards its targets (Deiss 2002). In Japan, the Basic Law on Formation of an Advanced Information and Telecommunications Network Society ("Basic Law on IT") that came into force in January 2001 obliges the Government to work out a basic strategy to promote the formation of an advanced IT network society (the "E-Japan Strategy"), and also obliges the Government to prepare official statistics related to ICT.[31] In short, measuring the digital economy has been recognized as an important element in the development and planning of national ICT strategies.

Digital economy indicators and statistics are important for the design of ICT strategies in two ways.

- They help policy makers to better plan their strategies by identifying gaps and areas that need improvement.

- Basic information on the use of ICT by businesses and consumers is needed in order to assess the current and potential impact of the digital economy and thus to evaluate the impact of ICT strategies. This, in turn, leads to revised policies on how to best exploit the economic potential of the new technologies.

Even though the volume of e-commerce or the use of ICT by businesses may still be marginal in many developing countries, it is essential to start preparing ICT indicators now, for two reasons.

- The development and growth of the digital economy are irreversible. Businesses all over the world are increasingly using ICT in their business processes and are gradually moving towards e-business.

- The experiences of countries that have started to develop their e-statistics show that it takes several years to design and implement an optimal national strategy for measuring the digital economy. Hence, the earlier countries begin to work on their e-measurement strategy, the more likely they are to achieve good results at the time when e-business spreads to most parts of the developing world.

11. E-government

When developing ICT at the national level, Governments can assume three different roles (Dutta, Lanvin and Paua 2002). They can be

1. Producers of ICT – through the development and deployment of ICT goods and services and ICT infrastructure

2. Facilitators – through the creation of an enabling environment, including a conducive macroeconomic environment; a fiscal, legal and regulatory framework; and education policies

3. Leaders – by implementing e-government (i.e. becoming users of ICT), addressing digital divides in the country, and making ICT a national priority (e.g. through projects)

Based on this classification, *leaders* include countries and economies such as Singapore, the United States, Finland, Canada, Sweden, the United Kingdom and Hong Kong (China) – all of them economically more advanced while also rating high on the network readiness scale. Leaders usually also have a strong *facilitator* role, encouraging competition and supporting market efficiency.

Governments play an important role as users of ICT. They use ICT for reforming government; promoting e-government projects at all levels of government; enabling online tax payments (for citizens) and online procurement (for businesses); mainstreaming ICT in areas such as health, education and the legal system; and customs automation. Governments should give high priority to security, privacy and consumer protection and should involve civil society as much as possible in decision making.

According to a United Nations report (2002), the world's 10 most advanced e-governments in 2001 were those of the United States, Australia, New Zealand, Singapore, Norway, Canada, the United Kingdom, the Netherlands, Denmark and Germany. Examples of developing countries with high e-government capacity include the Republic of Korea, Brazil, the United Arab Emirates, Mexico, Kuwait, Argentina, Bahrain, Uruguay, Chile and Lebanon.

Good examples of developing-country Governments taking an active role as users of ICT include the Government of the Republic of Korea, which is using the Internet heavily to purchase materials for state-run companies (up to 50 per cent of purchases were online in 2002). Supplies, contracts, deliveries and the like are handled electronically, based on electronic data interchange (EDI) systems, and e-business applications are used in the evaluation of management of public companies.

The Government of Brazil has used incentives to promote online income tax payments, discouraging paper-based filing and providing faster processing of online filing of tax returns. As a result, in 2000 – only four years after the introduction of the online system – 90 per cent of income tax declarations were submitted via the Internet (Hilbert and Katz 2003). Through its Post Office programmes, the Government provides a number of services to citizens, ranging from free email to export process simplification for SMEs. This has resulted in the growth of SME exports from less than $1 million (1999) to $43 million (2001).

Chart 3.4

Stakeholders in ICT policy making

• IT Industry	• Industry representatives
• Business associations	• Donors
• Banks	• Ministries (trade, science and technology, customs, education, telecommunications, industry, finance, etc)
• Freight forwarders	
• Lawyers	• NGOs
• Development organizations	• Universities
• Women's groups	• Consumers
• Other public institutions	• Telecom regulators

C. Stakeholders and implementation of strategies

The development and implementation of national ICT strategies is perhaps the biggest challenge policy makers face. At the start of such a process, the following questions need to be addressed:

- How will the implementation of the strategy be organized and coordinated?
- Who are the main partners and stakeholders involved in the implementation process?
- Which policy areas should be given priority over others as far as resources are concerned?
- What institutional aspects need to be taken into consideration?

Given the complexity and cross-cutting nature of ICT, a holistic approach is essential to a national ICT strategy, as far as both sectors and stakeholders are concerned. It will be difficult to create awareness at the political level or to adopt a state-of-the-art regulatory framework unless the elements of an ICT strategy are rooted in the reality of the national economy. Therefore, stakeholders from all areas of the society and economy should be involved: public institutions (telecommunications, education, health, trade and industry, economic development, juridical, customs), the business sector (service providers as well as representatives from all industry sectors, especially the ICT sector), academia, NGOs, standardization bodies, and Internet governance (see chart 3.4).

Given the array of involved stakeholders, which can have very diverse agendas and priorities, it is obvious that conflicting concerns will have to be addressed. The government may be more concerned with social and political issues (e.g. SME promotion, marginalized communities, schools), whereas the private sector, being more profit-driven, will focus on urban and other areas having a high population density. In such a situation, all stakeholders need to make an effort to compromise and find a balance between the different needs.

For the public sector, it will be important to take into account the concerns of the private sector and civil society. While it may be more feasible to work with the private sector through representative organizations (as business executives are usually too busy), it should be kept in mind that such organizations can only advise, not be implementing partners.

According to the Alliance for Global Business, an international private-sector group, "business self-regulation and the voluntary use of empowering technologies should be the main drivers behind the creation of trust across the whole spectrum of users and providers of e-commerce goods and services" (AGB 2002). Governments, on the other hand, should provide a stable and predictable environment enabling enforcement of e-contracts, protection of intellectual property and safeguarding of competition. While a "hands-off" approach by the government may be appropriate in certain areas, government intervention is required in others such as intellectual property protection, taxation, and the removal of barriers to competition in providing ICT infrastructure. In addition, given that e-business largely transcends borders,

issues such as interoperability and global standards become important. Therefore, government policies should be internationally coordinated and compatible, and should facilitate interoperability.

The coordination of national ICT strategies at the governmental level needs to be well prepared. This involves the identification of a national authority responsible for the coordination. Experience from countries (e.g. Costa Rica, Estonia, Jamaica, Malaysia, Thailand) has shown that, rather than giving the responsibility to an existing government office, such as the telecommunications authority, the ministry of science and technology or the ministry of communications, it may be more effective to create an inter-ministerial authority or committee that is directly under the presidency or the office of the head of state. Such a horizontal body is better placed to address the cross-cutting nature of the subject and the far-reaching impact of ICT in the country. Furthermore, the characteristics of the implementing authority can heavily influence the design and implementation of the strategy, and a newly created body is likely to be more open to structural innovations (Coppock and Maclay 2002). Decisions related to the national ICT strategy should be taken at the highest policy-making level and require strong leadership from the top for the deployment of ICT in the country. Furthermore, the role and responsibilities of the national ICT authority need to be clearly defined.

A number of possible problems may arise in the implementation process, such as power struggles among officials responsible for different policy areas, fear of loss of responsibilities, or unwillingness to cooperate among the different public offices. Competition among different authorities is often a major impediment to implementing a national strategy. Therefore, funds for ICT projects (e.g. by the international donor community) should be channelled through one coordinating office. Finally, creating a good working relationship between the public and private sectors and civil society is still a relatively new task for many government officials and thus will take time.

Effective implementation of national ICT strategies also calls for a change of thinking among political leaders. Given that ICT are a fairly new phenomenon, awareness raising is needed not only among businesses and individuals but also among policy makers within the government, in order to preclude hostility among middle-level officials towards ICT-related developments.

As far as the design of ICT-related policies is concerned, a reasonable approach is to mainstream ICT components in respective policies, rather than "adding" another policy layer or reform. In other words, ICT need to become integrated parts of any restructuring, reforms or new programmes envisaged by the government. To do otherwise may lead to a waste of resources and the overlapping of work among different public programmes.

Many of the policies identified under such a national strategy will have to be implemented simultaneously, as they will complement one another. Others may have to follow a certain sequence, as they will build on one another. The timing of the implementation of ICT policies has to be carefully planned by the coordinating authority, in close cooperation with the stakeholders responsible for the implementation.

Finally, policies need to define precise goals and objectives, which need to correspond to previously identified needs and priorities. These need to be checked regularly through a periodic review of the national ICT strategy.[32] For this purpose, it is necessary to define measurable criteria, indicators and benchmarks that will be used for the evaluation and assessment of strategies, addressing questions such as whether the strategy has worked, or what has been the impact of a certain policy. This involves the need to develop a thorough e-measurement strategy at the national level.

D. Case study: Thailand's National ICT Strategy[33]

1. History

In the early 1990s, the Government of Thailand recognized ICT as a potential enabler for national economic and social development and for strengthening the country's competitiveness. In 1992, it set up the National IT Committee (NITC), a high-level body chaired by the Prime Minister and with members from both the public and private sectors. The NITC was given the responsibility for overseeing and developing ICT policies in the country.

In 1996, the first national IT policy plan (IT 2000) was endorsed. It focused on three core development agendas: a national information infrastructure; ICT capacity building; and good governance through the

use of ICT. IT 2000 provided a roadmap for the country's ICT policies for 1995–2000 and a solid framework and directions for subsequent plans and policies.

In response to rapid global developments in ICT, involving technological advances as well as the diffusion of ICT to all sectors of the economy, the NICT revised the IT 2000 and developed, in cooperation with other partners, a 10-year national ICT policy framework – IT 2010 – that went through public consultation in 2001 and was approved and endorsed by the Government in March 2002. IT 2010 covers the period 2001–10. The new plan incorporates experience gained from the implementation of IT 2000, as well as national and global developments in sectors related to the production and use of ICT. It also establishes a clear link to the national economic and social development plan, taking into account Thailand's overall development goals.

2. Framework and key elements

IT 2010 was designed as a blueprint for the country's development towards a "knowledge-based and sustainable economy" (NECTEC 2002). Its emphasis is thus not merely on the technology aspect but also on the use of ICT for economic and social development. The plan is built on three key principles: (i) building human capital; (ii) strengthening information infrastructure and industry; and (iii) promoting innovation. It identifies five "flagship" sectors: (a) e-government; (b) e-commerce (see box 3.7); (c) e-industry; (d) e-education; and (e) e-society. The development of each sector must be harmonized with that of all the others and must comply with the three guiding principles. Another new feature of IT 2010 is its explicit integration into the country's Ninth (2002–06) and Tenth (2007–11) National Social and Economic Development Plans.

While IT 2010 identifies rather long-term policies, the National ICT Master Plan 2002–06, approved by the Cabinet in September 2002, identifies more specific strategies and work programmes and sets clear targets for the five-year period. It includes seven strategies or policy targets:

1. Promote the ICT industry in the country, especially the software industry[34]
2. Use ICT to develop quality of life
3. Reform and build capacity in ICT research and development

Box 3.7

Thailand's e-commerce policy framework

As one of the flagships of IT 2010, Thailand's national e-commerce vision is to strengthen the competitive advantage of Thai entrepreneurs, especially SMEs, by using e-commerce as a vehicle for exporting goods and services and also for domestic trade. This policy framework was initially developed by both public and private stakeholders starting in October 2000, and later refined and incorporated into IT 2010 and the National ICT Master Plan.

To accomplish the e-commerce objectives, the Government must implement eight strategies:

- declare e-commerce as the national trade strategy and proactively engage in international trade
- raise public awareness and understanding
- create trust and confidence by developing a legal framework
- promote interoperable payment systems and security
- promote and facilitate SMEs' e-commerce development
- develop human resources

Box 3.7 (*continued*)

- collect indicators and create databases necessary for measuring and monitoring e-commerce development
- provide adequate and affordable IT infrastructure

These strategies are in line with the following policies:

1. The Government should recognize e-commerce as the national trade strategy that should be included in the Ninth and Tenth National Plans for Social and Economic Development.
2. The Government should support and provide measures facilitating the private sector's and consumers' e-commerce activities, aiming at building trust and confidence among entrepreneurs and consumers.
3. The Government should enhance the competitiveness of SMEs in the global economy.
4. The Government should minimize any restrictions that would obstruct such development.
5. The Government should give priority to streamlining public administration by putting in place electronic media and information technology and setting up e-government services.
6. The Government, together with the private sector, should monitor and set up e-commerce-related indicators and databases, and should study policies and guidelines for their development at both international and regional forums.

Source: National Electronic and Computer Technology Center (NECTEC), Thailand; see www.ecommerce.or.th.

4. Enhance potential social infrastructure for future competitiveness
5. Promote entrepreneurship with a view to expanding exports
6. Facilitate SMEs' efforts to utilize ICT
7. Deploy ICT for government administration and services and develop e-government procurement

3. Design and implementation: institutional aspects

Under the chairmanship of the Prime Minister, the NITC has the mandate to promote ICT deployment and use in the country. All policy-related work in ICT, including implementation of the ICT master plan and coordination among government agencies to develop e-services and e-government, has been transferred to a new Ministry of ICT created in October 2002.

IT 2010 is built on a number of lessons learned from, and improvements on, IT 2000, including the following:

- Leadership must come from the top (the Prime Minister).
- Integration with other development policies is fundamental.
- Stakeholders from the private and public sectors must participate from the beginning.
- Implementation plans must be explicit.
- Measuring and monitoring mechanisms are needed.

Therefore, for successful implementation of IT 2010, the national ICT development strategy imposes five conditions (Thuvasethakul and Koanantakool 2002):

1. Information, contents and knowledge must receive priority over investment in infrastructure and equipment (i.e. the ability to translate data into information and knowledge and apply it for the benefit of social and economic development).
2. Development of human resources must be carried out on a consistent and continual basis so as to increase the supply of knowledge workers.

3. The national digital divide (including infrastructure, literacy, cultural and management divides) must be reduced.

4. A permanent and clear-cut leadership mechanism must be established.

5. A link between the policies and operations of the NITC and those of the national telecommunications and broadcasting committees must be established.

The leadership mechanism established under the Thai national ICT strategy deserves particular attention. The national ICT development policy identifies this as one of the key criteria for the successful implementation of a national strategy. The ICT plan specifies that the Prime Minister must chair the NITC and cannot delegate this role to anyone else. The NITC is supported by an ICT Policy Office that is responsible for facilitating the policy's implementation, monitoring, appraisal and evaluation. The office is an independent entity and does not need to comply with cumbersome official regulations that might slow down its work. An ICT Operations Support Office facilitates the implementation of policies, providing technology and project supervision and management. It also supports public agencies in their restructuring efforts under the e-government programme. Stakeholders from the private sector are expected to participate in most of the operations. Both offices must closely coordinate their activities in implementing policies set by the NITC.

The Government works closely with other stakeholders in implementation – for example, with the Communications Authority of Thailand in providing various telecommunications services as well as new services such as e-payments (in cooperation with banks) and online shopping; with the Telephone Organization of Thailand to build a network to support EDI and e-commerce; and with several commercial banks to provide Internet banking and e-payment services.

A number of Government agencies are responsible for implementing the national ICT strategy:

- The Department of Revenue is working on e-government, especially introducing e-filing services for personal income tax and e-filing and payment services for value-added tax.
- The Department of Export Promotion has launched an e-commerce project to help Thai manufacturers and exporters trade online with the international business community.
- The Office of the Prime Minister is coordinating the development of e-government procurement, aiming to reduce cost, improve the productivity of public procurement, increase transparency, and provide businesses with better access to more efficient government markets.
- E-commerce facilitation for SMEs and community development is carried out by the Department of Community Development, Ministry of Interior, through its "Thai Tambon project" (see section D.4), and by the Thai National Electronics and Computer Technology Center (NECTEC) through the establishment of telecentres and community access centres, in cooperation with other local organizations. The aim here is not simply to provide access to the Internet, but to develop appropriate e-commerce business models for the local community (and in close collaboration with it).
- The Department of Foreign Trade, Ministry of Commerce, is working on issuing import and export certificates using EDI systems via the Internet. The Customs Department has launched projects to develop EDI for import/export processing systems and cargo control systems.
- The Ministry of Education is coordinating the SchoolNet project (see section D.4).

ICT-related laws have been enacted (e.g. the Electronic Transactions Act, 2001), and further laws are being reviewed (data protection, computer crime, national information infrastructure) or drafted (electronic funds transfer), under the responsibility of the NITC.

By the end of 2002, each government agency had submitted to the NITC its ICT operation plans, following the seven major strategies outlined in the National ICT Master Plan.[35] These were then combined into an integrated ICT plan, which is the blueprint for transforming the ICT Master Plan into an operational plan and enables ICT development to be harmonized at the national level.

4. Achievements

Under the implementation of IT 2000, some programmes achieved their goals while others fell far short, especially those relating to capacity building and e-government (partly because of the recession in the late 1990s). Nevertheless, to date a number of projects and programmes have been launched, with the following results:

- Two national Internet exchange points have been set up, which have considerably improved the speed and reliability of domestic interconnection.[36]

- 1,100 public Internet booths have been established in all provinces and most districts (July 2002) by the Communications Authority of Thailand and the Telephone Organization of Thailand; users have to purchase smart cards to use the booths. The number of Internet users in Thailand more than doubled from 2000 (2.3 million) to 2002 (4.8 million).[37]

- A Thai-language Linux operating system was developed by NECTEC and a local-brand quality PC programme was promoted. In 2002 the Linux Thai Language Extension (Linux TLE) received broad acceptance from computer users who could not afford expensive licensed commercial software. Later in 2002, an office suite called Office TLE, based on OpenOffice, was released. In March 2003, following the success of the low-cost local-brand PC programme, the Ministry of ICT successfully released low-cost PCs and notebook computers (costing about $250 and $500 respectively) for the mass market. As of May 2003, over 160,000 machines had been delivered. They use Linux TLE and Office TLE and come with a one-year maintenance warranty.

- SchoolNet Thailand has been launched, targeting five areas: Internet connection; technical support; content development; teacher training; and promotion of Internet use for classroom activities. As of June 2003, SchoolNet had connected 4,787 schools to the Internet. In the area of technical support, a Linux-based school Internet server has been developed by NECTEC and distributed to schools as freeware. In the area of content development, a digital library of educational sites in the Thai language has been created, with content inputs from teachers and students. More than 250,000 teachers have been trained (as of May 2003), or about 50 per cent of the total number of teachers. SchoolNet is expected to merge with the Ministry of Education's educational network (EdNet) to cover schools nationwide.

- The Government Information Network (GINet) has set up a high-speed virtual private network service for accessing government agencies throughout the country and provides a range of online services to its clients. For example, the number of personal income tax returns filed online is steadily rising. It totalled 63,000 in 2002 and 70,000 for the first two months of 2003 (Bangkok Post, 11 March 2003).

- The Electronic Transactions Bill came into effect in April 2002. It includes provisions for electronic signatures.

- Tambon Net (also known as Internet Tambon), an initiative by the Department of Local Administration, under the Ministry of Interior and supported by Prime Minister Thaksin Shinawatra, is aimed at establishing Internet access points in all *tambons* (subdistricts) in Thailand. In May 2003, 4,000 tambons (out of 7,200 targeted for 2004) were connected to the Internet, selling 15,000 different items on 43,000 webpages and advertising 6,300 tourism spots. The Internet is used by local administrations and for e-commerce projects related to another government programme, One District, One Product, aimed at promoting local community-based products in the country. The programme helps local communities market and sell over the Internet products ranging from cultural products and agricultural and food products to office supplies and tourist services. Information provided on the sites includes general information about the tambon, its administration and transportation, as well as information on products, tourist locations, hotels and restaurants. The goal is to facilitate the buying and selling of rural products and promote tourism at the tambon level. Tambon Net is regarded as a good example of rural development using the Internet. It has increased the average monthly community income by $240, to $730.[38] It has expanded the sellers' market to Bangkok and other big cities (both retailers and wholesalers), as well as foreign markets.

- E-marketplaces have emerged in sectors such as food, oil, textiles and automobiles. Specific sectors that have been successful in e-business (and were targeted by e-commerce policies) include fashion (gems, jewellery, clothes), tourism and distribution.

5. Monitoring and evaluation

The National ICT Master Plan includes as an important element the measurement and monitoring of ICT developments and usage in the country, as a basis for policy evaluation and revision. Therefore, considerable efforts have been made during the past few years to initiate e-measurement programmes in the country.

Thailand has participated actively in the e-ASEAN Readiness Assessment since its launch in 2001. It is designed to evaluate the readiness of ASEAN member countries with respect to ICT investment, spending, Internet hosts, Internet access costs and related areas. In a second stage, the e-ASEAN measurement framework focuses on measuring ICT usage, including Internet use by households, enterprises and government. Thailand has carried out a number of surveys in this regard:

- Two e-commerce website surveys were carried out in 2000 and 2001. The results showed that the proportion of sites offering e-commerce had increased from 6 per cent to 12 per cent over the period. Tourism was found to be the sector most frequently featuring e-commerce applications, including online transactions. This partly reflects the Government's selection of tourism as a pilot sector for the promotion of business-to-business (B2B) e-commerce in the country. Other sectors employing Web-based e-commerce applications are the computer, apparels/cosmetics, florist and handicrafts industries. The 2002 survey will build on the experiences of the first two surveys and collect more specific data and indicators.

- Internet user profile surveys were carried out in 2000, 2001 and 2002. The 2002 survey revealed, for example, that about 50 per cent of users were located in Bangkok (62.5 per cent if Bangkok's suburbs are included, and 88 per cent if all other urban areas are considered). Although this figure is decreasing (i.e. it was even higher in the previous years), it still points to the huge urban-rural gap that needs to be bridged as far as Internet penetration and usage is concerned. The survey results also showed that almost all Internet users had some English language skills, which points to the need for Thai-language local content. As far as online (B2C) purchases are concerned, 76 per cent of users have never made a purchase online, mainly because they cannot see/feel the product (40.5 per cent), do not trust merchandisers (32.7 per cent) or do not want to reveal credit card numbers (27.3 per cent).

- The first household survey including questions on ICT usage was implemented in 2001, and the first business survey including questions on ICT and e-commerce usage was carried out in 2002. The results show that, for example, 10.5 per cent of business establishments countrywide have Internet access, and 50 per cent of those are located in Bangkok. Only 7.6 per cent of the businesses that have Internet access have their own sites.

6. The way forward

The Government of Thailand has made a considerable effort to give ICT developments high priority on its development agenda. The Prime Minister is fully committed to supporting the country's transformation into an information society. This high-level support and commitment will continue to play a considerable role in the country's advancement in ICT.

Nevertheless, the challenges are also considerable, given that the country has only recently started to implement ICT, that it has undergone a serious economic recession and that it started with low levels of ICT penetration. Widespread ICT deployment and use thus remain long-term policy goals.

The following areas seem particularly in need of future attention and policy action:

- Reform of the telecommunications sector. While competition in mobile services produced rapid growth in the number of mobile phone users in 2001–2002, which resulted in mobile density being well above fixed-line density (26 per cent penetration compared to 10 per cent for fixed-line, or 72.7 percent of total telephone subscribers in 2002[39]), two state-run telecommunications providers and the lack of an independent regulator keep costs high.

- Introduction of competition into the international Internet bandwidth market in particular. Currently the lack of competition results in low and expensive bandwidth, in particular vis-à-vis some of Thailand's neighbours (e.g. Malaysia and Singapore).

- Connecting rural Thailand. The overwhelming majority of Internet users are located in Bangkok and other urban areas, while rural communities remain largely excluded from the information society. In addition to the establishment of physical infrastructure (already well under way through various projects mentioned above), more Thai-language content is needed if farmers and others in remote communities who lack foreign-language skills are to develop an interest in using the information provided through the Internet.

- Increasing the number of "knowledge workers" and creating an ICT-educated society, as stipulated in the IT 2010 development goals. In order to achieve the target of 30 per cent of the total workforce (compared to the current share of 12 per cent), comprehensive HRD plans and educational reforms will have to be implemented.

- Better data on the information society. While several initiatives have been launched to measure ICT deployment and use in the country, large gaps remain in the data necessary to identify specific areas in need of policy action.

E. Conclusions

Developing the right policy framework for the deployment of ICT is a challenging task. As we have seen, establishing a network infrastructure is not enough. People must be trained to use it and to exploit commercially the information and knowledge that it makes available. Regulatory frameworks need to be put in place to provide companies and consumers with the confidence and security they require to use the Internet. Financing needs to be available for infrastructure development (including FDI) and SME development. Finally, local content needs to be created to enable small businesses and underprivileged people to go online. While awareness raising is important, e-business will still grow slowly in some countries, and people will start using the technologies only when they have experienced their immediate benefits. In places with a management or business culture that is open to and ready for change, the use of new tools and the digitization of business processes will advance more quickly.

How much of this activity should be left to market developments, and to what extent should government be involved? Obviously, without the initiative of the business community, the information economy will not take off. But, as this chapter has demonstrated, there is no doubt that Governments will have to play an important role, both in developed and developing countries, in promoting and facilitating the development of the information society and economy.

First and foremost, Governments should lead by example by adopting e-government practices. Among the developed countries, the Governments of the United States and Iceland have the highest degree of involvement in ICT developments at the national level. It is also interesting to note that the Governments of high-income countries are playing a bigger role in ICT in many economic sectors than the Governments of lower-income countries (Dutta, Lanvin and Paua 2003). Especially in the early stages of ICT deployment, Governments play an important role as leaders, providing vision, raising awareness and enhancing the profile of ICT development by making it a national priority.

Governments should play an active role without interfering with local competitive market forces. They should be active players but not become substitutes for private-sector action; they should focus especially on facilitating the entry of smaller, underprivileged players into the marketplace. Government intervention is particularly needed when the market fails. There is a real danger that rural and remote areas will be left out, as the private sector has few incentives to provide universal access to telecommunications services. Other key areas are those related to educational, legal and regulatory issues. Governments also have a role to play in integrating SMEs into the information economy, in particular in developing countries.

The following recommendations summarize some of the key issues related to the development of national ICT strategies:

- *The need for leadership from the top.* In the countries that have shown most success in the deployment of ICT, a strong commitment from the head of state to introducing the necessary changes was crucial. This included having the strategies or national ICT committees be directed by the office of the head of state.

- *The need to involve all stakeholders.* E-business and ICT development is a multidimensional issue, and the design and implementation of effective ICT strategies require the involvement of all stakeholders, including high-level government representatives, business organizations, civil society and consumers. Successful experiences have shown that the establishment of an entity at the highest level of government that includes all stakeholders is a key element of an ICT strategy. By providing a framework, Governments can play an important role in ensuring that stakeholders are fully involved.

- *The need for a holistic approach.* A national ICT strategy is comprised of a package of measures complementing one another. Implementing only a few policies would be insufficient, since areas where no action was taken might undermine the effectiveness of those policies that were put in place. Thus areas such as legal issues, awareness, human resources development, infrastructure and access, market regulation and e-government have to be considered together and developed in parallel. All of this requires a coherent approach and strong coordination at the national level.

- *The need for a liberalized economic environment.* The success of e-business is enhanced through reforms, including liberalization of areas such as telecommunications, trade and finance systems. However, such a strategy can affect social cohesion if it is not accompanied by remedial measures taking into account the needs of people and regions that might be negatively affected. Far-reaching liberalization measures of this nature need to be instituted in the context of broader national economic structural reforms. Further, liberalization should ideally be introduced consistently in all sectors or services. Liberalizing some sectors while leaving others untouched could prevent the full implementation of strategies.

- *The need to monitor e-developments.* The lack of readily available data on the use of ICT and e-commerce by the business sector and households is a major obstacle to identifying priority areas of policy action; monitoring, assessing and revising ICT strategies; and benchmarking national economies vis-à-vis those of other countries. Governments should therefore start to develop and collect data and indicators regarding the use of ICT by businesses. In parallel, they should participate in international debates on ICT indicators aimed at harmonizing data and statistics at the international level.

- *The need to tailor e-strategies to individual countries' requirements.* While a range of ICT strategies could be applied to developing countries in general, no single set of strategies can fit the conditions and requirements of all developing countries. In practice, alternative strategies exist for the viable development of e-business in different countries. In order to succeed, an ICT strategy has to be tailored to the economic, social and political environment of a particular country, leveraging the emerging body of international good practice and bearing in mind issues such as harmonization and interoperability.

Notwithstanding the important role of government in initiating and implementing national ICT strategies, in the final analysis much of the required investment needs to come from the private sector. Experience shows that the private sector has been the most innovative player and the major driving force behind e-business and ICT deployment. In general, the modalities of application of technology to business activities are more efficiently decided by the market than by government. An ICT strategy that combines public intervention with private-sector initiative in a mutually supportive manner is the only viable option.

Perhaps most important aspect of all, in preparing ICT strategies and programmes, is a comprehensive approach that integrates ICT into the country's broader economic and social development strategies and policies. Linking ICT policies to other development policies, in areas such as education, trade and investment, produces benefits from synergies between different elements and ensures a more broad-based diffusion of ICT. In other words, ICT strategies should never be decoupled from broader development policy frameworks but rather mainstreamed into these policies.

The international community will have to play an important role in supporting developing countries' efforts to develop their national ICT strategies. This fact has been fully recognized by the WSIS preparatory process, including in the statement that "ICT should be part of any strategy aimed at achieving the Millennium Development Goals (MDG) of combating poverty, hunger, disease, illiteracy, environmental degradation and gender inequality. Without the widespread and innovative use of ICT, the MDG may prove impossible to attain" (WSIS 2003).

Notes

1. The World Summit on the Information Society (WSIS) Regional Conference of Latin America and the Caribbean, held in Bávaro (Dominican Republic) on 29–31 January 2003, defines the information society as follows: "The information society is an economic and social system where knowledge and information constitute the fundamental sources of well-being and progress... [I]t represents an opportunity for our countries and societies, so long as it is understood that the development of that society within a global and local context requires a deeper appreciation of fundamental principles such as those of respect for human rights within the broader context of fundamental rights, democracy, environmental protection, the advancement of peace, the right to development, fundamental freedoms, economic progress and social equity." See *www.indotel.org.do/WSIS/Docs/f_declaration/final_declaration_Bavaro.pdf.*

2. The first meeting of the WSIS will take place in Geneva on 10–12 December 2003 and the second meeting in Tunis on 16–17 November 2005.

3. For more details on the economic impact of ICT, see chapter 2.

4. This was made possible by the development of HTML (hypertext markup language), which allowed the creation of hypertext documents and their publication on the World Wide Web. Hypertext links make it possible to direct users to other webpages with just a click of the mouse.

5. Non-governmental organizations, too, have incorporated ICT into their development programmes, both at the national and international levels.

6. For example, the EU approach is more government-led and highly structured, while the US approach is more bottom-up, self-regulating and led by the private sector.

7. A number of WSIS documents have referred to "e-strategies" for development of the information society. Given that the prefix *e-* often implies "electronic", this discussion will avoid the term and instead refer to *ICT strategies,* a more accurate term for describing the process of promoting and supporting the spread of ICT in society, which in turn leads to the development of the information society.

8. The chapter will mainly use the term *e-business* rather than *e-commerce.* E-commerce is normally understood as trade conducted electronically and does not include other uses of ICT, such as the digitization of production systems. The concept of e-business, on the other hand, is broader and includes the integration of electronic means (mainly network technologies) into business processes (Hilbert and Katz 2003). Since this chapter is concerned with the use of ICT in commerce and business, the term *e-business* is more appropriate.

9. This has been confirmed by a study carried out by Coppock and Maclay (2002).

10. According to the ITU (2002), in 2001 there were 113 countries with fully or partly privatized telecommunications operators (a figure that included all developed countries), and 86 countries with no private operators (all of which were developing countries).

11. Many of the examples cited in this section are based on country presentations given at various UNCTAD meetings. In these cases, no references to published documents are provided.

12. The ITU's definition of universal service refers to availability, non-discriminatory access and widespread affordability of telephone services (measured by the percentage of households with a telephone). Generally the term *universal service* is taken to mean the availability of a telephone in every home or office, while *universal access* means each person is within a reasonable distance of a public-access telephone. Recently, the concept has been broadened to cover ICT services more generally and Internet access services in particular (ITU 1998).

13. 40 telecentres were in operation by March 2003; see *www.infocentros.org.sv.*

14. Costa Rica solved this problem by redirecting its defence funding to education; this was further enhanced by a 1998 constitutional reform mandating that 6 per cent of GNP be invested in education (Dutta, Lanvin and Paua 2002).

15. See *www.nic.or.kr/www/English.*

16. See *www.medialabasia.org.*

17. Massachusetts Institute of Technology; see *www.media.mit.edu.*

18. These include a regional conference on e-strategies held in Curaçao (June 2002), an Expert Meeting on "E-Commerce Strategies for Development" held in Geneva (July 2002) and a regional conference on e-strategies held in Bangkok (November 2002).

19. A comprehensive overview of policies that should be implemented to adjust the legal framework to ICT and e-business is provided in UNCTAD (2001).

20. See chapter 7 of this report.

21. In asymmetric cryptography, a pair of keys are used to encrypt and decrypt a message so that it arrives securely (see *searchsecurity.techtarget.com/sDefinition/0,,sid14_gci836964,00.html*).

22. See UNCTAD (2001) for a discussion of recent developments in the area of taxation and electronic commerce.

23. The subjects of e-finance and e-payments are dealt with at length in UNCTAD (2001, 2002b).

24. "Estonian Transition into Information Society", presentation by Linnar Viik at the UNCTAD Expert Meeting on Electronic Commerce Strategies for Development: The Basic Elements of an Enabling Environment for E-Commerce, Geneva, 10–12 July 2002.

25. Mann C (2003). Achieving the benefits of connectivity and global e-commerce. Paper presented at the UNCTAD Expert Meeting on Electronic Commerce Strategies for Development: The Basic Elements of an Enabling Environment for E-Commerce, Geneva, 10–12 July.

26. One suggestion made at an UNCTAD meeting, and which may apply more to the private than the public sector, was to establish a credibility certification label for SMEs. This would help particularly African companies, which are considered risky in the international market.

27. For more information, see *www.wtpfed.org*.

28. For a definition of the ICT sector, see OECD (2002b).

29. For a discussion of information society measurements and their relevance for developing countries, see UNCTAD (2003b).

30. For progress made in collecting e-statistics in the United States, see Mesenbourg (2001).

31. Kitada H (2002). Japanese ICT statistics and new JSIC with the Information and Communications Division. Paper presented at the seventeenth meeting of the Voorburg Group on Service Statistics, Nantes, 23–27 September.

32. For example, the EU approach included the adoption of a series of two-year action plans, each building on the last and shaped by input from benchmarking studies (Coppock and Maclay 2002). A number of countries from the ASEAN region have applied a similar tactic.

33. This section is largely based on information provided by the Thai National Electronics and Computer Technology Center (NECTEC); see *www.nectec.or.th, www.nitc.go.th* and *www.ecommerce.or.th*.

34. A cluster of IT development centres are to be set up to promote the development of the ICT sector, especially in the area of software development, as the software industry is believed to bring in large amounts of foreign currency. At the end of 2002, the Government committed 1 billion baht to the development of an IT knowledge park project in Chiang Mai. Other software parks are envisaged for Phitsanulok, Phuket, Khon Kaen, Koh Samui and Koh Chang, all located outside Bangkok (*Bangkok Post* 2002).

35. The national ICT master plan includes a total of 1,085 proposed projects worth 23,510 million baht.

36. For updated information on bandwidth, data volume and interconnection maps, see *www.nectec.or.th/internet*.

37. Available at www.itu.int.

38. Kittipong Tameyapradit (2002). Telephone Organization of Thailand, Presentation at the APT Seminar on Digital Opportunity for All, Chiang Rai, Thailand, 29 July – 1 August.

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Chapter 4

FREE AND OPEN-SOURCE SOFTWARE: IMPLICATIONS FOR ICT POLICY AND DEVELOPMENT

Free and open-source software (FOSS) challenges our preconceptions about how software is produced and distributed. The software industry today generates yearly revenues in excess of $300 billion. FOSS is software that has made its source code public and allows – perhaps even motivates – users to change the source code and redistribute the derivative software. Liberating the source code supports broad collaborative development in software production, better porting[1] with other programmes produced by independent programmers, and the customization of software to meet different commercial, regulatory, cultural and linguistic requirements. Most importantly, in particular for developing countries, FOSS allows today's and tomorrow's experts and information technology (IT) leaders to acquire skills and advance their knowledge rapidly.

Its technological opposite, closed-source or proprietary software, may not support the information and communication technology (ICT) development process as well because it requires a significant upfront investment in license fees for installation and upgrades; it is not always adaptable to local concerns; and its exclusive or even dominant use may not adequately support the local development of the expert knowledge and skills needed to fully embrace the information economy. While proprietary software has its place and role, Governments should consider their policy position on FOSS in the context of their overall agenda and their ambitions of bridging the digital divide and using ICT for increased, improved trade and development.

A. Introduction

The hardware that makes modern computing and communications possible has advanced at an extraordinary rate in the last few decades, and that process is likely to continue. "Moore's law", which is really an observation of a pattern, states that the capability of microprocessors doubles, while their price falls by nearly one-half, every 18 months.[2] This has created an information-processing ecology where computer hardware is much more sophisticated and reliable than software – the instructions that human beings create for it.

However, there is no Moore's law for software. While computing power falls rapidly in price, software that can make use of that computing power becomes more complicated, sometimes more expensive and less reliable, and almost always more difficult to configure and maintain. Yet it is software that constitutes the fundamental rules for information processing, and thus for an information economy and an information society. Massive processing power connected by ever-increasing bandwidth is a skeletal infrastructure. Software determines how information is manipulated, where it flows, to whom and for what reasons.

Developing countries need to define their ICT strategies and make them relevant to the development process. Policy regarding software use has suddenly become an important issue because a new choice has recently become viable: that of FOSS, and with it the promise of information-enabled development. However, Einstein once commented that "sometimes one pays most for the things one gets for nothing", and this thought is relevant to the FOSS debate. The countries and individuals that will profit from FOSS are those that will strive to formulate their policies in an informed manner and that will contribute back to the FOSS knowledge base.

This chapter explains how FOSS and, for comparison, proprietary software are created – not in a technical sense, but in an organizational sense – and why that matters, for developed and particularly for developing economies. It suggests that the FOSS process produces better software that could match the unending improvements in computer hardware. Like any product, software is simply the outcome of a produc-

tion process that combines human effort, inputs, and capital of some sort in a distinctive way.

The "standard" way of organizing software production has been much like the standard way of building a complex industrial good: a formal division of labour that uses proprietary knowledge, guarded by restrictive intellectual property rights (IPR) and enclosed within a corporate hierarchy, that guides and governs the process. Following this approach, today's software industry has grown into a colossus estimated to generate more than $300 billion in annual earnings.

Table 4.1

Top 10 software companies, ranked by revenue and market capitalization

		Annual revenue	Market capitalization
		(millions of $)	*(millions of $)*
1	Microsoft	31,375	260,000
2	Oracle	9,487	63,400
3	SAP	7,700	32,300
4	Computer Associates	3,083	12,400
5	VERITAS	1,531	10,100
6	Electronic Arts	2,489	9,300
7	Intuit	1,373	9,000
8	Adobe Systems	1,194	8,000
9	Symantec	1,328	6,600
10	PeopleSoft	1,949	4,700
11	Competition to Top 10[3]	8,445	28,582
Total		**69,954**	**444,400**

Source: UNCTAD estimates based on data from Yahoo Finance (http://finance.yahoo.com) and Financial Times Market Data and Tools (http://www.ft.com).

According to industry analyst IDC, the packaged software industry[4] alone is worth almost $200 billion, while the Gartner Group puts the market for corporate software at nearly $80 billion.[5] Table 4.1 gives some data on the largest proprietary software producers. These figures should be taken with caution, as not all revenues earned come from selling proprietary software licenses. Indeed, consulting and customizing software for clients is an important activity as well. In addition to the listed firms, IT heavyweights such as IBM, Sun Microsystems and EMC, as well as the major personal computer (PC) hardware producers, also generate significant revenues from corporate software services.[6]

But this is not the only way to organize software production. In the last few years, another way of building software, the open-source process, has gained publicity just as the products of this process, such as GNU/Linux, are gaining market share. In fact, open source is not a new process. However, it is fundamentally different from the leading alternative, and the success of FOSS projects demonstrates that complex software can be built, maintained, developed and extended in a non-proprietary setting where many developers work in a highly parallel, relatively unstructured way, often without direct or immediate monetary compensation.

This chapter establishes and builds on the premise that the open-source process is a viable mode of software production that presents a real choice for firms and Governments making ICT decisions, in particular in developing countries. It aims to elucidate the FOSS phenomenon itself and to clarify some of the issues involved in choosing between open-source and proprietary software. It presents some of the parameters and variables that may influence these choices, along with practical examples of the possibilities and consequences of open-source adoption, using examples from industrialized countries and highlighting initiatives in developing countries. Finally, the chapter provides a framework for understanding the policy implications surrounding FOSS, focusing on choices that the public sector should consider, and on reasons that might influence its decisions.

B. The process and the challenge

What is FOSS, and how is it different from proprietary software products sold under conventional intellectual property (IP) regimes? A simple analogy to any popular cola drink can be helpful.[7] A manufacturer sells bottles of cola soda to consumers. Some consumers may choose to read the list of ingredients on the bottle, but that list of ingredients is surprisingly generic. The manufacturer typically has a proprietary "formula" that it does not reveal. The formula is the knowledge that gives guidelines on how to combine the ingredients in particular proportions, and perhaps with some "secret" flavouring mix, to pro-

duce something of commercial value. However, the bubbly liquid cannot be reverse-engineered into its constituent parts. You can buy cola soda and you can drink it, but you cannot *understand* it in a way that would empower you to reproduce the drink or improve on it, and to distribute your copied or improved cola drink to the rest of the world. In order to guarantee that no entity rediscovers, reverse-engineers or (by more devious means) acquires the cola formula, the formula is also subject to IP protection.

The basic economics of IPR provides the rationale for organizing cola soda production this way. The core problem of IP is supposed to be about creating incentives for innovators. Patents, copyrights, licensing schemes and other means of restricting knowledge give legal backing to the notion that economic rents are created and that innovators can and should appropriate some proportion of those rents as incentives to innovate. Without IP protection, should a "new and improved" formula be discovered, the person who invents the new formula would have no defensible economic claim to a share of the profits that might be made by selling drinks engineered from the innovation. That person no longer has a financial incentive to innovate in the first place, so the system unravels and improved cola soda is never produced. While the original producer certainly supports and takes advantage of all available IP protection, it is aware that the security of its formula, and consequently its business, lies in its physical protection, and in the entry costs, as well as the manufacturing and distribution costs, for potential competitors. Thus, the manufacturer complicates the recipe, divides up the formula so that certain individuals know only parts of it while no one knows it in entirety, uses a good safe, and strives to establish a monopoly market position.

The production of proprietary computer software is typically organized under a similar regime, with a parallel argument behind it. When purchasing software, for example, people or companies actually buy a right-to-use license. They do not own the software in the sense that they can do with it what they wish. The right-to-use license permits them to use proprietary software on a computer, but only under very specific terms: they cannot reproduce it, modify it, improve it, or redistribute their own version of the software to others. Copyright, licenses, patents and other legal structures provide a layer of legal protection to this regime, but there is an even more fundamental mechanism that stops license holders from doing any of these things. Just as the cola soda producer will not release its formula, a proprietary software producer will not publicize the software's source code.

Programmers *write* software *source code* using a programming language. Computers *run* software in *binary code* format.

The source code is a list of instructions that make up the "recipe" for a particular software application, such as a word processor or a spreadsheet. Software engineers write source code using a particular programming language (like C++ or Fortran) that experts can read and understand, as well as fix and modify. To non-experts, source code looks like a combination of unintelligible language and mathematical and logical expressions.

Before the software can be used on a computer, it needs to be "compiled". *Compiling* is the process of translating the source code into binary code, consisting basically of series of ones and zeros, after which it is saved as a separate file. Only then can the compiled file run on a computer, at which point it is called the *executable binary file* or the *binary*. Most proprietary commercial software is distributed only as executable binary files, which a human cannot "read" and make sense of. Not having access to the source code restricts users' ability to modify the software. Reverse engineering the binary code back into source code is generally not possible either. Thus, selling only the executable binary files is a very effective way for proprietary software producers to control what users can and cannot do with the software they buy.

Proprietary source code is the touchstone of the conventional IP regime for computer software. Proprietary source code is an important reason why the software industry can generate sizable revenues and earnings (see table 4.1). In turn, these companies distribute part of their profits to the programmers who write their code and, in this way, provide incentives for them to innovate.

The open-source process inverts this logic. The essence of FOSS is that the source code is "free". That is, along with the executable binary files that actually run on the computer, the source code is released[8] for anyone and everyone to examine, use or modify it. "Free" in this context means the freedom to run the programme for any purpose, to study how it works and adapt it to one's own needs, to redistribute copies to others, and to improve the programme and share improvements with the community so that all benefit (FSF 1996). It does not necessarily mean that the price is zero, since FOSS can be traded in

markets just like any other artifact. Programmers often explain this seeming incongruity in shorthand such as the following: when you hear about "free" software, think "free speech", not "free lunch"; or "software *libre*", not "software *gratis*".[9]

For example, the popular FOSS GNU/Linux distributions are sold on CD-ROM for prices ranging from several dollars (for discs only) to more than $100 (for packages that include manuals and help-line access for a certain period). Often, the executable binary files can be obtained without paying, but this would require users to download the files from the Internet and burn their own installation CD-ROMs. This approach, too, has a definite cost, involving Internet access (preferably broadband), as well as a printer, a CD burner and blank CDs. Whether or not an ICT business can make money with FOSS is a relevant issue and is discussed in section E of this chapter.

Building complex software is a difficult and exacting task because it involves technical and human complexity in both abstract conception and implementation. People use software in an extraordinarily diverse technological and cultural matrix that changes almost continuously. For example, if an auto engineer has to try to envision the range of conditions under which people will try to drive a car, the software engineer is faced with a harder task because much of the technological environment in which a piece of software will be used has not even been produced or distributed at the moment that the software is being written. Aside from hardware advances, changes in operating system and networking environments will influence how we use software designed today. Highways and bridges simply do not change that fast, and they are not configurable by users in the way that software is.

The software production problem leads unavoidably to a division of labour. The primary questions are: What kind of division of labour? How should this be organized? Putting the right numbers of people in the correct positions is also important but is really a secondary problem.

The standard answer to that question is hierarchical organization in the Fordist[10] style. A clear division between design/architecture and implementation, segmentation of tasks into subsystems that are then supposed to "snap" together, and reporting hierarchies with command and control from above – these are all familiar features of industrial organization. An authority assigns tasks, monitors performance, and compensates according to measurable indicators of execution. Controlling the source code becomes a means of controlling the division of labour.

The open-source process approaches this challenge from a different direction. Once the source code is released, the configuration and management of labour becomes a project of the labourers themselves. *The key elements of the open-source process, as an ideal type, are voluntary participation and voluntary selection of tasks.* Anyone can join an open-source project, and anyone can leave at any time. There is no consciously organized or enforced division of labour. It may be that the underlying notion of a division of labour does not fit the open-source process very well. Labour is *distributed*, and it could hardly be otherwise in projects that at any given time may involve a hundred or even thousands of programmers. But it is not really *divided* in the industrial sense of the term. The discussion of the Apache and GNU/Linux structures in section F of this chapter reflects on how individual motivations translate into collective actions.[11]

C. A history of software production

The concept of "free" software is not new. In the 1960s and 1970s, mainframe computers in university computer science departments and in corporate facilities were principally tools for research. The idea of free access to the source code for the installed software was seen as natural and was often taken for granted. The FOSS environment was needed to advance compatibility among different computer systems for which software had to be reengineered to account for different hardware – an often time-consuming and expensive process. Incompatibility clashed with the scientific ethic of sharing and accumulation of knowledge, as well as the practical problem of having to rewrite extensive amounts of code for different types of computers.

In the United States, AT&T's Bell Labs led the way by focusing effort on development of the UNIX operating system and an associated language for developing applications, called simply C, that could run on different and varied hardware.[12] Under the terms of its regulated monopoly deal with the US Department of Justice, AT&T could not engage in commercial computing activities and thus could not sell UNIX for profit. It seemed almost natural to give away the source code to universities and others who the Bell Labs engineers believed could help them improve the software by finding bugs and fixing the source code.[13]

Thus, UNIX software, typically under copyright, nonetheless was in most cases distributed for free along with the source code.

Concrete incentives supported this very casual and informal treatment of copyright. The behaviour made sense to the owner of the copyright, since software was seen at this time not as a profit center itself but principally as a hook to encourage people to buy hardware. Give away better software, and you can sell more computers – so the thinking went. It also made sense for an innovative programmer to freely give ideas to the software's owner. If all or many of these innovations were incorporated into future software releases, computer departments would not have to bother reintegrating improvements piecemeal, but could simply await the next official release.

The logic of free software began to break down in the late 1960s. In 1969 the US Department of Justice filed a massive antitrust suit against IBM, pushing it to unbundle its "solutions" and begin charging separately for software.[14] IBM subsequently began to ship its new mainframes with operating systems that did not distribute source code. In fact, administrators had to sign non-disclosure agreements simply to get an executable copy. This decision represents the birth of the modern commercial software industry. Microsoft was founded in July 1975 as a company that for all intents and purposes simply wrote and sold software. The arrival of the PC in the early 1980s and its rapid widespread distribution onto desktops in the business world reinforced this trend. Software that at one time had been traded freely among programmers was now an extraordinarily valuable and lucrative product in its own right. The development of a separate software industry and business model had a major impact on the programming profession. Many of the best programmers in the United States and elsewhere were hired away into lucrative positions at spin-off software firms.

In reaction to these developments, in 1984 Massachusetts Institute of Technology researcher Richard Stallman founded a project to revive FOSS activities by creating a complete set of FOSS utilities and programming tools.[15] This initiative led to the establishment of the Free Software Foundation (FSF). The FSF exclusively uses the term "free software" to denote software that allows the user to run, copy, distribute, study, change and improve it through access to the source code. The FSF sees copyright as a means of imprisoning information and creating unequal access, usually along the lines of wealth and poverty. To replace traditional copyright, the FSF has developed a standard copyright agreement, the GNU General Public License (GPL), that is often called "copyleft".[16] GPL is designed to deter programmers from "closing" the source code of an FOSS computer programme and stop anyone from bringing it into a proprietary commercial development environment.[17] Box 4.1 discusses the principal position of the FSF in more detail. Section 3 of this chapter discusses the legal details of the GPL (under the heading "Intellectual Property Rights").

Box 4.1

The Free Software Foundation and the General Public License

The central idea of the General Public License (GPL) is to prevent cooperatively developed open/free software source code from being "enclosed" or turned into proprietary, restrictively copyrighted software. The GPL states that users are permitted to run the programme, copy the programme, modify the programme through its source code, and distribute modified versions to others. What they may not do is add restrictions of their own. This is the "viral clause" of GPL. It compels anyone releasing derivative software that incorporates code "copylefted" under GPL to use the GPL in the new release as well. The Free Software Foundation states: "You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program [any programme covered by this license] or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this license" (FSF 1991).[18]

Stallman and the FSF created some of the most widely used pieces of UNIX software, including the Emacs text editor,[19] the GCC compiler,[20] and the GDB debugger.[21] As these popular programmes were adapted to run on almost every version of UNIX, their availability and efficiency helped to cement UNIX as the operating system of choice for "free software" advocates and leading academic and research institutions. But the success of the FSF was in some sense self-limiting because of the viral nature of the GPL. Its principal position against proprietary software clashed with the utilitarian view of many programmers, who wanted to use pieces of proprietary code together with free code when it made sense to do that, simply because the proprietary code was technically good. The GPL does not permit this kind of flexibility and sometimes poses difficult constraints to developers looking for pragmatic solutions to problems.

The FOSS process depends heavily on communications tools to enable modification, innovation and evolution with regard to the code, with collaboration between diverse and remote localities. While the ARPANET was barely sufficient, the rapid spread of the Internet in the early 1990s accelerated FOSS activity. The development of the GNU/Linux PC operating system software began during this period from honourably modest roots.

In late 1990, Linus Torvalds, a 21-year-old computer science student at the University of Helsinki, started building the kernel of a UNIX-like operating system on his home PC. In autumn 1991, Torvalds released the source code for the kernel of his new operating system named GNU/Linux to an Internet newsgroup, along with a note asking for comments and collaborators. The response was unexpectedly good. By the end of the year, nearly 100 people worldwide had joined the GNU/Linux newsgroup; many of these people were active developers who contributed bug fixes, code improvements and new features. Through 1992 and 1993 the community of developers grew at a gradual pace. This was happening at a time when it was becoming generally accepted within the broader software community that the era of UNIX-based operating systems was coming to an end in the wake of Microsoft's increasingly dominant position (Raymond 2000). In 1994 Torvalds released the official GNU/Linux version 1.0.

While various proprietary versions of UNIX lost market share during the mid-1990s, GNU/Linux steadily acquired market share in the late 1990s and has now become the only credible competitor to Microsoft in the PC operating system market. The growth of GNU/Linux had several causes. Many in the ICT community found the manner in which proprietary software companies leveraged their IP (source code) galling. Others asserted that that the technical quality of proprietary software was suffering from the corporate-style development process. It was claimed that, regardless of how powerful the proprietary software companies grew, they simply could not employ enough testers, designers and developers to thoroughly debug their own software. At the same time, proprietary software firms invited only limited interaction between advanced users and programmers to repair and improve a piece of software.

While GNU/Linux grew, the viral nature of the GPL, as well as the rigour of the FSF's position, gave rise in the mid-1990s to an alternative institution for "free" software, the Open Source Initiative (OSI). The OSI came into being in February 1998 during a meeting of several influential IT experts convened in response to the decision by Netscape to publicize the source code of its browser. Netscape's decision was seen as a lead to follow in promoting the development of FOSS, in particular vis-à-vis the business and corporate community. Instead of including a prescribed copyright or "copyleft" message, the OSI requires entities distributing FOSS to satisfy the Open Source Definition (OSD) in its copyright statement.[22] While the GPL *requires* any redistribution of GPL software to be released only under GPL (to prevent the "closing" of the code), the OSD *allows* redistribution under the same terms, but does not require it. Certain licenses that fall under the OSD entitle a programmer to modify the software and release the modified version under new terms that include making it proprietary. Box 4.2 gives an overview of the OSD.

The OSI emphasized economic competitiveness and aimed its message directly at the mainstream corporate world.[23] The argument was that the open-source process emphasized high reliability, low cost, and better features. Most importantly, a business or Government using FOSS could avoid becoming locked into using software produced by a controlling monopolist. Open-source users would gain autonomy through control of their information systems, which were increasingly the core asset of almost any business. The OSI initially aimed its message at the CEOs of the largest multinational companies and emphasized the various ways in which IT companies themselves could generate economic profits while freeing source code. For example, better software would allow hardware manufacturers to sell more computers and other devices. Customization services that built packages of open-source solutions, then optimized, maintained and serviced them for particular business and government settings, would be extremely valuable.

The corporate world's response was immediate. In January 1998 Netscape announced that it would release the source code for its World Wide Web browser as open-source code. By the summer Oracle and Informix, two of the largest independent software vendors for corporate applications and databases, announced that they would port their applications to GNU/Linux. Over the next several months, other first-tier independent software vendors, including Sybase and the German SAP, made similar announcements. In the first half of 1999 IBM began focusing on GNU/Linux as an operating system for its servers (Berinato 1999, 2000). IBM also became a major supporter of Beowulf supercomputing (CNET 2000). Major US hardware vendors (Compaq, Dell, Hewlett Packard, Silicon Graphics) as well as chip

BOX 4.2

Open source defined

The Open Source Definition (OSD) maintains the following position:

- Source code must be distributed with the software or otherwise made available for no more than the cost of distribution.
- Anyone may redistribute the software for free, without owing royalties or licensing fees to the author.
- Anyone may modify the software or derive other software from it and then distribute the modified software under the same terms.

OSI removes the viral impact of the GPL. Open source does not just mean access to the source code. The OSI "approves" existing licenses as compliant with the OSD. (A recent count found 21 of these, including the GPL license but also licenses from IT corporate heavyweights such as IBM, Nokia and Intel.) The OSI aims to bring pragmatism into the development of technically sophisticated software and discards the FSF ideology. Not everyone shares this goal or sees it as a progressive change. However, it is worth remembering that the philosophical core of the OSI was in a very different place. One of its founders, Eric Raymond, explained:

"It seemed clear to us in retrospect that the term 'free software' had done our movement tremendous damage over the years. Part of this stemmed from the well-known 'free-speech/free-beer' ambiguity. Most of it came from something worse – the strong association of the term 'free software' with hostility to intellectual property rights, [with] communism, and [with] other ideas hardly likely to endear themselves to an MIS manager" (1999a).

manufacturers Intel and AMD have all made major commitments to GNU/Linux. For-profit companies that provide auxiliary services and support for GNU/Linux, such as Red Hat Software in the United States, SuSe in Germany and MandrakeSoft in France, started commercial operations in the late 1990s. Apache continued to increase its lead in the Web server market just as the Web itself was exploding in popularity. In October 2000, Sun Microsystems released the source code for StarOffice, a software suite for everyday office use, in order to establish OpenOffice.org. These and other important or popular FOSS applications are described in box 4.3.

Microsoft began to see the open-source process in general, and GNU/Linux in particular, as a major credible threat to the market presence of its Windows operating systems, on servers and perhaps even on desktop PCs.[24] A high-level internal Microsoft memorandum issued in 1998 was leaked on 31 October and became known as "the Halloween Memo". It reportedly portrayed FOSS as a direct short-term threat to revenues and dominant position in some markets. It was also a long-term strategic issue because, according to the memo, "the intrinsic parallelism and free idea exchange in OSS [FOSS] has benefits that are not replicable with our current [proprietary] licensing model."[25]

The brief history of software, from its open-source roots to proprietary models and, now, the journey back to open source, has appeared to take place mainly in the United States. Indeed, Lancashire (2001) supports this notion and gives some geographic data for participating developers. In a sense, this phenomenon is self-explanatory, as the majority of FOSS developers will be based in the countries with the most developed software industries. A look back at table 4.1 reveals that, of the top 10 global software firms and their 10 main competitors, only three are not based in the United States and only one is in a developing country.[26] However, the situation seems to be rapidly changing, and, judging from the results of the survey reported in section H of this chapter, FOSS activities in developing countries may become increasingly visible in the near future.

By the end of the 1990s the FOSS process had proved its viability as a means for building complex software packages that could compete successfully with proprietary products, and in an increasing number of IT market segments, from low-end embedded processing applications to grid-based supercomputing. Companies as diverse as GNU/Linux distributor Red Hat and traditional IT giant IBM have learned how to generate sustained profits by providing services using various kinds of FOSS. It is now clear that there are at least two discrete models for organizing the production of software. Both appear to be sustainable. Today Governments, businesses and almost anyone who uses software can make choices, and will need to make choices,

between and among products generated through both processes of building software.

D. Is FOSS better?

The ultimate issue that the open-source process has to contend with is achieving quality equal to or superior to that achieved in proprietary corporate organizations. It can do so in four ways.

1. While affirming that while all software has programming errors (bugs) and stability problems, FOSS can have more developers looking critically at problems and proposing fixes than any proprietary software corporation. In other words, "given enough eyeballs, all bugs are shallow" (Raymond 2000).

2. Because FOSS is not hampered by the marketing and business dynamics of maximizing revenue from license sales, developers can and do release bug fixes, patches and new versions more frequently.

3. The installation of proprietary software following the purchase of a right-to-use license is often tied to accepting terms and conditions that decline any liability for damages resulting from its use, beyond the replacement of the hard disk drive where the software was installed – clearly not a hard guarantee of quality with which to compete.

4. Source code availability is in itself an important product quality. Imagine a transportation company purchasing a fleet of vehicles that arrive without the keys to the engine hoods; the keys would be useless because the company has agreed in a contract with the manufacturer that it will in no way attempt to fix or inspect the vehicles' engines. Such vehicles, like analogous software, are obviously inferior.

The FOSS process is, however, neither fool- nor failure-proof. One possible problem is the fragmentation and forking of projects: a collaborative team may come to loggerheads over technical issues, or even personality problems. Fragmentation, or forking, means that existing development resources are split between the main and dissenting teams and users may be faced with unwanted choices and compatibility issues. Another cited problem is that it is difficult for users to clearly predict where the development may be going in terms of future versions, functionalities or hardware support. Finally, developers and project team leaders may simply lose interest or reestablish themselves in a way no longer relevant to the software project. However, these problems are not the exclusive territory of FOSS. Proprietary software carries its heavy share of differing standards and compatibility. Often, good software has been produced by companies that did not achieve comparable financial results, thus forcing consumers to switch to products from better-managed companies. Software support for new hardware in the proprietary software world is often conditional on a forced "choice" to upgrade and pay anew for licenses.

No single software can be unambiguously "better" than all others. Like any tool, software has certain characteristics of usability, reliability, flexibility, robustness and cost. There is no single optimal balance between these characteristics, and much depends on the distinctive needs of a particular user. All things being equal, however, software with fewer serious bugs and a lower total cost of ownership is generally preferable on simple economic grounds. Yet even these criteria are hard to measure. An often-used test of robustness is the average uptime. Table 4.2 gives an overview of Web servers with the longest uptime measured during the week of August 18, 2003, and the operating system and server software that they use. It is notable that only one of the 20 most robust Internet servers runs on proprietary software.

Because bugs appear while software is used in diverse environments, there may not be precise or reliable means of estimating the scope or seriousness of a particular programme's bugginess. More important is how quickly a bug, once identified, can be fixed. A recent study compared bug resolution for three matched pairs of FOSS and closed-source proprietary programmes: two Web servers, two operating systems, and two graphical user interface (GUI) packages. It found some support for the hypothesis that open-source bug reports are resolved faster than closed-source service requests, after controlling in some ways for the priority and severity of each request.[27] This is a very cautious finding, since it may be that bugs are uncovered at different rates as well, and have different characteristics of complexity across types of software. The result is consistent with the expectation that users are most highly motivated to fix what gets in the way of their intended use if they are empowered to do so by having access to source code.

Calculations of total costs of ownership (TCO) try to capture fully the costs of deploying, maintaining and using a system over the course of its lifespan. Studies

Table 4.2

Web servers with longest average uptime

Rank	Site	Average uptime (days)*	Operating system	Server software
1	www.daiko-lab.co.jp	1569	FreeBSD	Apache/1.2.4
2	www.rfj.ac.se	1389	BSD/OS	Apache/1.3.26 (Unix)
3	amedas.wni.co.jp	1360	FreeBSD	Apache/1.3.26 (Unix)
4	www.alfaoffset.se	1347	BSD/OS	Apache/1.3.26 (Unix)
5	www.sisu.ac.se	1320	BSD/OS	Apache/1.3.26 (Unix)
6	www.lobomar.se	1319	BSD/OS	Apache/1.3.26 (Unix)
7	d1o20.telia.com	1309	BSD/OS	Apache/1.3.26 Ben-SSL/1.48 (Unix) PHP/3.0.18
8	treefort.org	1298	FreeBSD	Apache/1.2.6
9	www.treefort.org	1298	FreeBSD	Apache/1.2.6
10	www.21stcenturycomputers.com	1283	BSD/OS	Apache/1.3.26 (Unix) mod_ssl/ 2.8.10 OpenSSL/0.9.6g
11	www.wycomp.com	1282	BSD/OS	Apache/1.3.26 (Unix) mod_ssl/ 2.8.10 OpenSSL/0.9.6g
12	wwwdir.telia.com	1272	BSD/OS	Apache/1.3.26 (Unix)
13	www.21net.ne.jp	1155	FreeBSD	Apache/1.3.9 (Unix)
14	www.helmarparts.com	1149	BSD/OS	Apache/1.3.23 (Unix)
15	www.lan.ne.jp	1113	FreeBSD	Apache/1.2.6
16	dbtech.net	1028	BSD/OS	Apache/1.3.27 (Unix)
17	www.icard.com.hk	1023	BSD/OS	Apache/1.3.26 (Unix)
18	www.alasearch.com	1015	BSD/OS	Apache/1.3.27 (Unix)
19	www.murrayfin.com	1000	BSD/OS	Apache
20	www.ehokenstore.com	999	BSD/OS	Oracle_Web_Listener/ 4.0.8.1.0EnterpriseEdition

* Uptime is the time since the last reboot of the front-end computer or computers hosting a site.
Source: Netcraft http://uptime.netcraft.com/up/today/top.avg.html. Accessed on 28 August 2003.

of TCO for FOSS packages have been controversial, in part because the cost structure of upgrades and maintenance is somewhat opaque relative to proprietary pricing. At acquisition, open-source solutions often cost less, depending on the type of customization and additional services that an organization chooses to buy. Deployment often requires training, which is sometimes as expensive with FOSS as with proprietary solutions, or more so. During the period of use and maintenance, where the bulk of TCO materializes, FOSS may have significant advantages. For deployment and use, costs will ultimately depend on local labour costs, which in many developing countries may be an advantage for FOSS exploitation. The availability of source code makes it possible to use in-house expertise to fix bugs or change configurations, as well as to hire external support from a competitive market that anyone can enter. What seems clear is that FOSS can help a business or public institution avoid getting locked into a vicious circle of hardware and software upgrades and changes in data formats that require investing in new license fees and significant retraining and can provoke major down time.

Ultimately, the software markets may decide which process makes better software, provided piracy, anti-competitive practices and monopolies can be curbed by government regulators. The steady growth of market share for the GNU/Linux operating system indicates that many organizations are betting that the open-source process will, over time, produce better solutions for their IT needs. Proprietary software is rarely seen taking market share away from open-source solutions where FOSS solutions exist. The final test of quality is in the numbers, and the

next section describes FOSS uptake for various ICT tasks.

E. FOSS within markets

FOSS is very common, but non-expert computer users may not be very familiar with it because it has not yet made significant inroads onto the personal computer desktop in the form of an operating system or office software applications, such as word processors or spreadsheets. Typical estimates give the Microsoft Windows environment just over 90 per cent of market share, with the rest split between the Apple Macintosh and GNU/Linux-based systems. Recent IDC reports indicate that up to 15.5 per cent of businesses are considering a switch to a GNU/Linux desktop.[28] Whether this will happen is another issue. However, as many users bring their IT habits home from the workplace (along with pirated software), Linux desktop penetration in firms and government offices may generate additional growth in the household computer market. The question of desktop metrics is further complicated by the fact that, while a large number of GNU/Linux installations are downloaded from the Internet, it is not clear whether they get installed at all and, if so, where – over existing proprietary or FOSS installations, or on new computers?

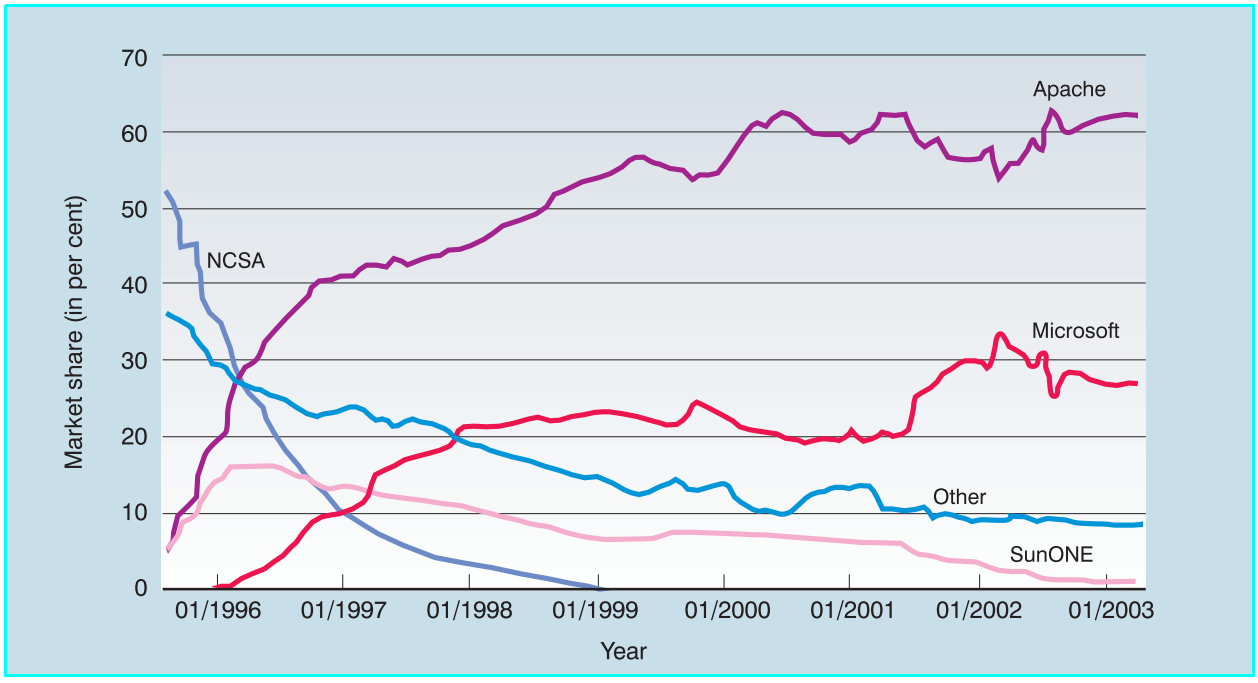
Even so, many users are not aware that they may be regularly using FOSS software and data formats simply by browsing the Internet and using email, the two most common household uses of computer technology that would be unworkable without FOSS. This subsection explains why FOSS is increasingly prevalent.

The growth and, in some cases, prevalence of FOSS in important IT sectors is remarkable.[29] The open-source Web server software Apache, which sends Web pages to the computer of someone accessing a site, has dominated its market segment since 1996 and now holds at least twice the market share of its nearest competitor. A survey published in June 2003 on market share for active Web servers shows similar numbers, with Apache at 65.3 per cent.[30] Chart 4.1 shows the market shares for Web server software from 1996 to April 2003.

GNU/Linux has long been popular as an operating system[31] running computers that perform as Web servers. Recent surveys show that GNU/Linux runs 29.6 per cent of Web servers, while various versions of Windows run 49.6 per cent, with Sun's proprietary

Chart 4.1

Market share of Web server software



Source: Netcraft http://www.netcraft.com.

Box 4.3

Examples of Free and open-source software

- Open-source software is often used in mission-critical environments. Many industry standard applications are in fact open-source programmes. Following is a list of selected notable open-source programmes in addition to GNU/Linux and Apache, which are described earlier in the chapter.
- The BSD/OS/FreeBSD/NetBSD/OpenBSD[35] family of operating systems are UNIX-based, free/open-source operating systems similar to GNU/Linux. Developed at the University of California-Berkeley in the 1970s, BSD is considered one of the most secure and stable operating systems and runs a large percentage of Internet servers. The core of Apple's Macintosh operating system, Darwin, is based on FreeBSD and has remained in the open-source realm. (See table 4.2 for details of Apple's open-source activities.)
- GNU was the predecessor of GNU/Linux. It is a free version of UNIX tools created by Richard Stallman in 1984. GNU stands for "GNU is not UNIX".
- Sendmail is a free/open-source programme used for routing approximately 40 per cent of the email that travels over the Internet.
- Perl (Practical Extraction and Report Language) is a scripting language freely available for UNIX, MS/DOS, Macintosh, OS/2 and GNU/Linux, among others. Perl has powerful text-manipulation functions and is used extensively for programming Web electronic forms, and generally for generating interfaces between systems, databases and users exchanging data on the Internet.
- BIND (Berkeley Internet Name Domain) is a free/open-source programme that allows Internet domain names to be entered as text-based names instead of as IP addresses, or series of numbers, making it easier for users to reach sites on the Internet.
- The Beowulf Project is a method of connecting computers to form a high-performance computer (Beowulf cluster) that approaches "super-computer" performance. Since a Beowulf cluster can be developed from common, off-the-shelf computers utilizing FOSS, a Beowulf cluster "super-computer" can be built and implemented at a fraction of the cost of other systems with similar computing capacity.
- OpenOffice.org is a software suite that provides basic office and administrative automation. An offshoot of Sun Microsystems' StarOffice, OpenOffice runs on all major operating systems, including MS Windows, as its cross-platform functionality is based on open XML standard file formats.
- GNOME and KDE are desktop GUIs that run on top of GNU/Linux and UNIX, providing user-friendly computing to the non-programmer open-source community.
- MySOL is a relational database server.
- The Gimp is a graphics programme widely distributed with GNU/Linux. (A version for the Windows operating system also exists.) It is sometimes called "free Photoshop".

version of UNIX (Solaris) running 7.1 per cent and various BSD derivatives (which are, like GNU/Linux, open-source) running 6.1 per cent.[32]

In the last few years GNU/Linux has increasingly penetrated both the high and low ends of the enterprise market for operating systems. Nearly 40 per cent of large American companies and 65 per cent of Japanese corporations use GNU/Linux in some form, and it may now run as much as 15 per cent of the large server market overall (*Business Week* 2003). A study from October 2002 found that 59 per cent of software developers surveyed internationally expected to write applications for GNU/Linux at some point during the next year.[33] The EU-sponsored FLOSS survey (Berlecon/III 2002) found 43.7 per cent of German companies and 31.5 per cent of British companies using FOSS. It is notable that, according to several studies, Internet service providers (ISPs), large companies, small companies, and CIOs in financial services, retail and the public sector all believe that GNU/Linux use is set to increase rapidly both in their own organizations and in the market as a whole over the next several years.[34] Box 4.3 gives a more detailed overview of important FOSS available and in use today.

Amazon, E*TRADE, Reuters and Merrill Lynch are examples of multinational companies that have recently switched to GNU/Linux and Apache Web server software for their back-end computer systems. A large proportion of US Government agencies and departments, including the Department of Defense, the Department of Energy, and the National Security Agency, works with FOSS. National, state and municipal governments from China to Germany to Peru are

considering, and in some cases mandating, the use of FOSS for e-government applications. A fuller description of developing countries' involvement in FOSS is presented in the survey in section H of this chapter.

E. The rationale for FOSS

While a convincing argument has been made for why someone would wish to *use* FOSS, another important question is why anyone would want to *produce* FOSS, and how this motivation translates into coherent output. Before discussing the motivations, it is worth considering some real-world indications and evidence.

1. Open evidence

Users rarely buy only software licenses; they also buy services related to the software. Organizations and firms normally buy solutions involving a combination of software, hardware and services. The services surrounding software products range from consulting, implementation, support, and training to application administration. In fact, even Microsoft has reportedly conceded that, in line with the findings of a survey by the Gartner Group, the cost of software licenses amounts to only 8 per cent of the total cost of ownership, and the other 92 per cent reflects the costs of installation, maintenance, management, and repairs after failures.[36] In what seems to be a matching estimate, Raymond (1999b) asserts that a very small portion, perhaps even less than 10 per cent, of software is developed for prepackaged retail sale. The outstanding majority consists of in-house code that is so highly integrated with firms' business and IT environments that reusing or copying the code "as is" is difficult or unfeasible.

The conclusion is clear: The majority of software development does not make money by selling licenses for prepackaged software. The opposite perception is encouraged by the fact that prepackaged proprietary software generates large revenues; however, it does so because a few producers can charge monopoly prices. For an IT services firm, the extra earnings gained by getting a commission from reselling a proprietary license may be so marginal that they may not significantly influence their choice of a proprietary over an FOSS platform for a particular client account. What should influence their choice is how precisely they can respond to clients' demands and the level of customizability, ease of maintenance and robustness a platform has to offer. From the point of view of developing countries, this issue alone is sufficient to ease worries that using FOSS platforms will diminish business opportunities.

Supporting this notion is the fact that a large part of the IT industry is developing FOSS-based activity. IBM is now a major champion of open-source software, after publicly making in 2001 a $1 billion commitment to developing technology for and reconfiguring central parts of its business models around GNU/Linux and other open-source programmes. Already in 2002, IBM announced that it had earned revenues in excess of $1 billion from sales of Linux-based software, hardware and services.[37] Other technology leaders, including Hewlett-Packard, Motorola, Dell, Oracle, Intel and Sun Microsystems, have made major commitments to FOSS for operating systems, embedded systems, cluster supercomputing, and corporate-class applications software. Table 4.3 gives a more detailed overview of mainstream IT firms' involvement in FOSS.

2. Supply motivations

Software is a digital product that can be copied an infinite number of times at zero cost, with no decrease in quality or usefulness, and is thus purely non-rival in economic terms. Freeing the source code makes software non-excludable as well, and as a result software acquires the characteristics of a public good.[38] Yet public goods normally encourage free riding. Why would people voluntarily contribute to a public good that they could otherwise use as free riders? If everyone has the same attitude, the system should unravel to the point where no one makes substantial contributions and the good never gets produced. Why do highly talented programmers choose to allocate substantial portions of their time and intellect, both of which are scarce and valuable resources, to a joint project for which they will not be directly compensated?

A great deal of effort has gone into mapping the motivations of developers. Certain studies affirm that these can be accounted for by standard economic theory. An open-source programmer's code is often precisely associated with the author and well recognized, providing a certain level of ego gratification. Personnel managers from commercial companies frequently review contributions to and participation in FOSS

Table 4.3

IT industry leaders' involvement in FOSS

Company	FOSS involvement
IBM	IBM hosts a variety of open-source projects, all under open-source licenses approved by the OSI. *http://www-124.ibm.com/developerworks/oss/*
Microsoft	Microsoft proposes a model of "shared source" as an alternative to open source. *http://www microsoft.com/licensing/sharedsource/* Microsoft Interix technology, now integrated into Windows Services for UNIX 3.0, provides an environment, under GPL license, to run both Windows and UNIX applications on a single system. *http://www.microsoft.com/windows/sfu/howtobuy/default.asp*
Pricewaterhouse-Coopers	FOSS topics are discussed on the site from a consulting perspective. *http://www.pwcglobal.com/Extweb/service.nsf/docid/30F66202E467710C85256B990072FC55*
EDS	EDS has occasional FOSS activities. Dynamator, a server page maintenance programme developed by an EDS programmer, is FOSS. *http://www.eds.com/about_eds/homepage/home_page_dynamator.shtml*
Oracle	Oracle does not have visible FOSS activities but has ported database products for Linux. *http://www.oracle.com/linux/*
Hewlett-Packard	Hewlett-Packard hosts several FOSS projects. *http://opensource.hp.com/*
Accenture	The topic of FOSS is discussed on the site from a consulting perspective. *http://www.accenture.com/xdoc/en/ideas/outlook/pov/open_source_pov_rev.pdf*
SAP	The mySAP Business Suite runs on Linux. *http://www.sap.com/solutions/netweaver/linux/* SAP DB is a free/open-source enterprise database. *http://www.sapdb.org*
Computer Associates	Computer Associates is a co-founder of Open Source Development Lab. *http://www.osdl.org*
Hitachi	Hitachi participates in FOSS projects. *http://oss.hitachi.co.jp/index-e.html*
Sun Microsystems	Sun sponsors a number of FOSS projects, including OpenOffice.org and NetBeans. *http://www.sunsource.net*
Compuware	Compuware has no FOSS activities, but the development environment shipped with its OptimaIJ product is based on the open-source integrated development environment (IDE) NetBeans. *http://www.compuware.com/products/optimalj/1811_ENG_HTML.htm*
BMC Software	BMC is cooperating with The Open Group to develop an open-source Management Service Broker. *http://www.bmc.com/corporate/nr2001/032701_2.html* *http://www.opengroup.org/*
EMC	EMC has no visible FOSS activities, but development of FOSS is part of the job descriptions for currently open positions. It has also ported certain products for Linux. *http://www.emc.com/technology/auto_advice.jsp*
Cadence Design	Cadence supports open exchange among in-house developers, commercial developers and academia. Its Systems TestBuilder C++ test bench class library is available through an open-source license. *http://www.testbuilder.net* Cadence contributes to the OpenAccess coalition for standard electronic design database. *http://www.cadence.com/feature/open_access.html and http://OpenEDA.org*
Adobe	Adobe has occasional FOSS activities, mostly focusing on Python plug-ins for Adobe products. *http://opensource.adobe.com/*
Silicon Graphics SGI	SGI supports a large number of open-source projects. *http://oss.sgi.com/*
Apple	Darwin is the core of Apple's Mac OS X operating system. Based on FreeBSD, Darwin remains in the open-source domain realm under Apple Public Source License. A number of other open-source projects are supported. *http://developer.apple.com/darwin/*

projects when assessing employability. Established open-source authorities may get access to financing and attract attention from venture capital. Former open-source programmers established both Sun and Netscape. Thus, career incentives may figure prominently in motivating programmers to contribute. These phenomena, often called "signaling incentives", can appear when inputs may be judged and rewarded in one or multiple future periods even when a contract is lacking at the present (Lerner and Tirole 2000 and 2001; Holmström 1999).

Raymond (1999b) explains the open-source process as a gift economy whereby programmers make voluntary contributions as a reaction to abundance rather than scarcity, the abundance being that of knowledge and information as well as of network bandwidth and computing power. This implies the existence of win-neutral (i.e. benefit at no cost) as well as win-win (mutual benefit) and win-lose (benefit at a cost, where the cost needs to be financially reimbursed) situations.

Another way of rationalizing the existence of FOSS is the so-called cooking-pot model (Ghosh 1998). The model suggests that FOSS comes about as a direct result of the distributed structure of the Internet, where users do not want to pay or charge for goods and services that thrive on the Internet. The cooking-pot model is not a barter economy, as it does not require bilateral transactions. Further, discarding the equality between costless and valuable makes sense of the fact that the millions of people on the Internet publish on matters interesting them and contribute to communities, including those involved in FOSS software. While they will not get any cash in return, their "payment" might come in the form of complementary contributions from others, or the valuable outcomes of esteem and attention. Indeed, it has been suggested that what is increasingly scarce today is attention, while other factors, such as information and even financing, are becoming more abundant, if unevenly distributed (Goldhaber 1997).

Other studies have focused more closely on the actual FOSS developer community. The modal GNU/Linux developer appears to be a person who feels part of a technical community, who is committed to improving programming skills, facilitating his or her own work through better software, and having enjoyable and rewarding intellectual and social experiences. This person recognizes the opportunity costs of open-source programming in terms of time and money invested, but simply does not seem to value these (particularly in financial terms) as much as mainstream professionals do.[39] Individual learning, work efficiency, and collective, or "pro-social", motivations are the main reasons why these programmers choose to contribute time and effort to FOSS projects. Box 4.4 describes two recent surveys on developers' motivations.

Box 4.4

What motivates open-source developers?

A 2001 survey by the Boston Consulting Group produced additional insights by segmenting developers' responses into four characteristic groups.[40] About a third of the respondents to this survey are "believers" who say they are strongly motivated by the conviction that source code should be open. A quarter are "fun-seekers" who contribute code mainly for intellectual stimulation. About a fifth of respondents are "professionals" who work on open source because it helps them in their jobs. Another fifth are "skill enhancers" who emphasize the learning and experience they get from open-source programming. The survey also found that open-source programmers seem to cluster heavily (70.4 per cent) in the age range between 22 and 37, with about 14 per cent being younger or older. Most are not novices: more than half are professional programmers, system administrators or IT managers. (Only 20 per cent self-identify as students.)

A 2002 study sponsored by the European Union (FLOSS) surveyed about 2,800 developers online.[41] This survey reveals a group that is predominantly male and mostly under age 40. About a third of the respondents have university bachelor's degrees, another 28 per cent have master's degrees, and 9 per cent have a doctorate. The vast majority of respondents work in the IT sector for private companies or universities or are self-employed. Students make up 17 per cent of the population and unemployed developers about 4 per cent. They are widely distributed among many countries in the world, not predominantly in the United States, and exhibit high mobility as they move across national borders to work in different settings.

Each of these surveys should be approached with care, as the samples from which they gather data may be skewed by distribution of the survey instrument, inadequate response levels, and other kinds of selection bias that make accurate interpretation difficult.

3. From motivation to output

The research on individual motivation provides interesting evidence on the question of how developers think about their individual choices. But individual motivations do not by themselves add up to large-scale, coordinated action. The organization of the community has received less attention but is just as important. The vast majority of open-source projects involve a small number of developers. These projects typically depend on intensive communication and the persuasiveness of the de facto project leader to coordinate the work of the group. More explicit and formal governance structures have evolved to manage the larger projects.

What is distinctive about these governance structures is a subtle twist on decision-making authority and its relationship to hierarchy. The notion that there is no hierarchy in the division of labour lies at the heart of the open-source process. However, there can be a hierarchy of decision-making for vetting and incorporating the results of distributed work. Yet participation in that decision-making hierarchy remains voluntary for any individual developer.

The governance of the Apache FOSS project is one example. Starting with just eight people in early 1995, the Apache Group grew quickly to several dozen core developers working in loose association with hundreds of other developers who occasionally contributed ideas, code and documentation to the project. Decisions early on were made by informal email-driven consensus. This informal system came under pressure with increasing numbers of participants, and with the "burstiness" of participation: developers might be doing something else for a week before they could come back to their Apache work. However, the progress of the project as a whole could not be held up to wait for everyone's "bursts" to coincide.

The answer in practice was a system of email voting based on a minimum quorum consensus rule.[42] In 1999 the Apache Group formally incorporated as a non-profit corporation, The Apache Software Foundation.[43] It now serves as an organizational and management umbrella for a range of Web-relevant open-source projects (including the original Apache Web server as well as Jakarta, Perl, TCL and others).

GNU/Linux, as it expanded, developed a semi-formal organization for decision making about code. Clearly differentiated role structures exist within the GNU/Linux community. As the programme and the community of developers grew, Torvalds delegated responsibility for sub-systems and components to other developers, who became known as lieutenants. Some of the lieutenants onward-delegate responsibility to "area" owners whose work has a narrower focus. The organic result is what looks and functions very much like a hierarchical structure where decision making flows through a fairly well defined pyramid. The GNU/Linux pyramid works imperfectly but is evolving through trial and error towards greater scalability.

G. FOSS and development

The digital era presents significant opportunities and real risks for developing countries. One risk is being sidelined from software trends that drive the increasingly digital global economy. The combination of rapid increases in hardware processing power at declining prices and positive network externalities, whereby the value of the network increases disproportionately as it grows, suggests that markets can grow intensively and dramatically *within* the developed world, without necessarily having to expand geographically into developing countries.

As developed economies increasingly create networked purchasing and production systems that depend on advanced ICT infrastructure, countries that are not connected on favourable terms, and businesses within those countries, may be deeply disadvantaged. International organizations and non-governmental organizations are increasingly computer-enabled as well and may interact better with countries and organizations in the developing world that are similarly ICT-enabled.

This implies that decisions Governments make about procurement, standard setting and ICT adoption, technology investments, and training are critical. Over the past five years Governments around the world have begun considering legislation that would require the use of FOSS when it provides a feasible alternative to proprietary software. This phenomenon has been particularly pronounced in the developing world as these nations, struggling with limited IT budgets, look to FOSS solutions. In addition, proponents of FOSS have articulated its advantages in dealing with the mounting security concerns around networks and

in providing public data accountability and transparency. Should there be any doubts as to the functionality of the data formats or processing software for critical government activities such as taxation or voting, independent experts may be requested to, without restrictions, inspect the open code and data formats. Governments have also considered the potential contribution of FOSS deployment to nascent local software industries and ICT human resource capacity building, as well as its potential spillover effects into other sectors of the economy.

Developing-country public sectors have begun to embrace the use of FOSS and encourage it in the private sector for a number of observable motivations. These motivations can be loosely grouped into three clusters: a desire for independence, the drive for security and autonomy, and new IPR enforcement. This section considers each of these motivating factors in turn.

1. Towards ICT sustainability

FOSS advocates have pointed out the technological dependency created by reliance on a few major software suppliers located in other countries. The policy debate was greatly accelerated when Peruvian Congressman Edgar Villanueva Nuñez, together with Congressman Jacques Rodrich Ackerman, tabled a bill on "Use of Free Software in Government Agencies" on 9 April 2002. Bill 1609, as it is called, would, if enacted, require all State agencies to use exclusively FOSS software in their computing systems and equipment. The Peruvian case is discussed further under "Security and Autonomy" (later in this section) and in box 4.6. A significant number of developing-country Governments have undertaken initiatives to explore FOSS. In South Africa, the Government Information Officer's Council has cited reduced costs, decreased technological dependency, promotion of universal ICT access, avoidance of proprietary software vendor lock-in and customizability to local languages and cultures as the main benefits of adopting open-source software as part of its e-government strategy.[44] In India, the Department of Information Technology, Ministry of Communication and Information Technology, is encouraging GNU/Linux and open-source software as standards in academic institutions, while the state of West Bengal is reviewing its FOSS agenda.[45] China is also examining the issue and has been providing strategic support for Red Flag Linux, a local distributor.[46] In the Brazilian state of Pernambuco, the world's first-ever law regarding the use of open-source software was passed in March 2000.[47] An extensive list of FOSS policies and initiatives is provided in the survey presented in section H of this chapter.

Countries are interested not only in the potential long-term cost savings of FOSS solutions, but also in precisely where IT expenditures are actually going. Governments should minimize their reliance on single suppliers. FOSS also helps avoid getting locked into financially disadvantageous long-term relationships with particular proprietary software vendors or producers. While the jury is still out on the cost debate, the use of free software means that installation, training, support and maintenance can be flexibly contracted out to a range of local suppliers competing on quality and price. With the use of FOSS, more domestic talent can participate in the development of local software. This makes it possible to keep IT expenditures, as well as experts and promising young talent, at home and contributing to a nascent local software industry. At the same time there is a motivation to upgrade the country's human resource capacity and technological skill base.

FOSS eliminates the national-level economic loss resulting from duplication of work, in particular if such development has been done in a public or academic institution. Sharing applications and their source code across ministries, government offices and schools and universities can be a public policy stance. A variety of positive spillover effects to other technology and non-technology sectors are also possible and are discussed in box 4.5.

Finally, promoting FOSS can have an anti-monopolistic effect on the IT market and industry in a country. Network externalities in the software industry, whereby the value of a product such as a word processor or operating system increases with the number of people using it, may result in monopolies with inferior products. The prevalence of a particular software application is seen as a dominant quality in itself, and this can motivate developers to port new programmes or upgrades specifically to it, regardless of its underlying technical qualities. FOSS allows anyone to provide IT services and thus reduces barriers to entry. While a certain open-source programme may come to dominate its market niche, no particular institution or business can use it to build a monopoly market position.

Hesitation, in particular among accustomed users, should be expected if a Government decides to move away from existing proprietary solutions. However, ease of use, bred through familiarity, may seem less

Box 4.5

Open-source processes outside the software sector

Two notable areas where open- and free-source philosophies are making inroads are publishing and biology, in particular in the research work on the human genome.

Open-source publishing is often referred to as open-content publishing. Open content is the content production process together with the content itself, when it is distributed according to an open-content license agreement. The basis for open-content licensing is that content is freely available for modification, use and redistribution, with certain restrictions aimed at supporting its freedom from the threat of proprietary closing (Keats 2003). A number of open-content directories and projects have sprung up,[48] inspired in part by dissatisfaction among teachers and lecturers with the rising cost and decreasing quality of new editions of textbooks.[49] In the development context, given the cost of content as well as the under-funding of schools and lack of expertise in many countries, collaborative development of content in an open environment and process could improve access to high-quality, locally relevant content. Open content has great potential to contribute to a "knowledge commons" that can positively affect economic development. Governments and the UN system could contribute to a reusable global body of knowledge by declaring many of their publications, documents and other content, produced with members' contributions, government or public funds, to be open content.

The FOSS programme that allowed the public Human Genome Project at the Sanger Institute to assemble the genome, in parallel with Celera's commercial effort, ensured that the human genome data would remain in the public domain.[50] Jim Kent wrote the programme to stop the genome data from getting locked up by commercial patents. This situation demonstrated the need to think about more than just open-source code; in the scientific community there is awareness of the importance of open data and procedures, as replicability is the only guarantor of scientific validity.[51] However, there have been assertions that without a public open-source competitor, the human genome may still be in the proprietary domain, available to those capable of paying for a subscription to what many consider the common knowledge of humanity.

Other organizations have been mimicking the FOSS model as well. Bioinformatics.org affirms in its mission statement that it aims to "promote freedom and openness in the field of bioinformatics [and] hopes to lower the barrier to entering and participating in the field of bioinformatics, as access to cutting-edge resources can be prohibitively expensive for those working individually, in small groups, at poorly funded institutions or in developing nations".[52] In another example, the Alliance for Cellular Signaling will build a virtual cell that will allow scientists to perform experiments completely on their computers. Replicating the FOSS process, several laboratories will act as central coordinators, and hundreds of researchers are expected to contribute over the Internet..[53]

advantageous when new licenses have to be purchased for upgrades that in turn often require corresponding upgrades in hardware.

2. Security and autonomy

Security of public data is a leading concern of Governments, particularly in the wake of recent worldwide computer virus attacks and growing fears of cyberterrorism and cybercrime, as well as spyware.[54] At a minimum, introducing diversity into the base of functioning software code reduces the possibility of catastrophic failures caused by viruses that attack a software monoculture. Finally, because Governments cannot choose their customers or citizens, it follows that they should not oblige them to use costly proprietary software and closed data formats.

The need for open public data formats is directly relevant to calls for increased accountability and transparency in public sector governance. As was mentioned earlier, Peruvian Congressman Edgar Villanueva introduced a bill to mandate the use of FOSS in public administration. In an exchange of letters with Microsoft Peru,[55] he stressed that, to guarantee free access by citizens to public information, it is indispensable that the encoding and processing of data not be tied to any single provider. The use of standard and open formats guarantees free access. If one is to guarantee the permanence of public data, the usability and maintenance of software should not depend on the goodwill of suppliers or on conditions imposed by them in a monopoly market. At a fundamental level, nations must, in order to guarantee national security, be able to rely on systems without elements controlled at a distance. Box 4.6 provides a summary of the

Box 4.6

Summary of main points of E. Villanueva's letter to Microsoft Peru

Bill Number 1609 (The Use of Free Software in Public Administration), introduced by Congressman Edgar Villanueva, is intended to require the use of FOSS in all government systems, when there is a choice between FOSS and proprietary software.

Congressman Villanueva's letter to Microsoft Peru (8 April 2002) expressed the following principles:

- To guarantee free access by citizens to public information, it is indispensable that the encoding of data not be tied to a single provider. The use of standard and open formats guarantees free access.
- To guarantee the permanence of public data, the usability and maintenance of the software should not depend on the goodwill of suppliers or on monopoly conditions imposed by them.
- To guarantee national security, the State must be able to rely on systems without elements controlled from a distance. Systems with open-source code allow the State and citizens to inspect the code themselves and check for back doors and spyware.

In response to the concerns raised by Microsoft Peru, Congressman Villanueva argues the following:

- The bill does not meddle in private-sector transactions and protects equality under the law (i.e. nobody is denied the right to offer these goods to the State). There is no discrimination, since the bill specifies only how the goods are to be provided, not who has to provide them. Proprietary software companies are free to offer FOSS solutions to the Government in a competitive tender.
- The bill stimulates competition, since it tends to generate a supply of software with better conditions of usability, and to enhance existing work, in a process of continuous improvement.
- Proprietary software creates mainly "technical tasks of little aggregate value" in countries like Peru; free and open software creates more technically qualified employment, stimulates the market, and increases the shared fund of knowledge, opening up service alternatives to the benefit of producers, service organizations and consumers.
- As for security, bugs in free software are rarer and are fixed much more quickly than in proprietary software.
- Free software in no way implies ignorance of intellectual property laws; the great majority of free software is covered by copyright.
- The bill is not mistaken regarding the costs of free software: while the possibility for savings in payments for proprietary software licenses is mentioned, the foundations of the bill clearly refer to the fundamental guarantees to be preserved (free access, permanence and security) and the stimulus to local technological development.
- The use of free software contributes significantly to reducing life-cycle costs: support and maintenance can be freely contracted out to a range of suppliers competing on quality and cost for installation, enabling, support and maintenance; maintenance carried out is easily replicable without incurring large costs, since modifications can be included in the common fund of knowledge; and the huge costs created by non-functioning software are reduced by using more stable software, which is one of the virtues of free software.
- Migration to new systems is in fact cheaper when FOSS is used, since all data are stored in an open format.
- Interoperability is guaranteed as much by standard formats (as required by the bill) as by the possibility of creating interoperable software given the availability of the source code.

positions taken in response to Microsoft's discussion of the disadvantages of legislating against proprietary software use in Peru's public institutions.

The need to have public and open standards for software applications and data files that handle public information is now universally accepted. Software that is used to handle public records, taxation or, in the future, voting may need to follow FOSS standards. Further, Governments need to maintain certain key public data and be accountable for its processing. With closed-source proprietary software and data file formats, should the vendor choose to discontinue support for technical reasons (e.g. because maintaining backward compatibility is burdening the source code of current and new versions) or financial reasons (e.g. an unsatisfactory revenue stream or bankruptcy), public offices may find themselves forced to upgrade hardware or software (often both) or convert to another system, with the resulting cost implications.

A study on government use of FOSS in Europe (Berlecon/III 2002) expresses many of the same concerns

as Congressman Villanueva. It argues that FOSS, by its nature, better fulfils government responsibilities such as satisfying the public's right to access certain information and know how that information is processed, and maintaining the security and permanence of public data.

Other developing countries have also expressed dissatisfaction with the proprietary software development and marketing model, in particular pointing to the negligible influence they, as "smaller" customers, have on how software develops. FOSS is expected to provide more flexibility and allow more autonomous input into software development. This can be conceived of as an ownership issue: developing nations desire an opportunity to articulate their software needs and participate in the innovation process as end users of software products. In addition, they welcome the possibility that an indigenous industry can participate in both identifying and meeting those software development needs.

3. Intellectual property rights

With increased emphasis on and pursuit of IPR enforcement at the international level, the choices available to software users are becoming more distinct. As countries move away from the gray options of software piracy toward a stricter implementation of standard intellectual property rules, this forces real choices. While proprietary desktop software is still largely considered more user-friendly than the alternatives, its market penetration and price are not related in countries where software piracy is commonplace. Thus, all efforts by international proprietary software producers to decrease piracy in fact improve the fundamental conditions for increased adoption of open-source software.

It should also be kept in mind that, historically, the basic precondition for the appearance, as a concept, of IPR and law with regard to creative goods and services has been the high cost of reproducing the carrier mediums (printed books, vinyl records, film stock and magnetic and optical digital media), not the ability of states and Governments to enforce the accompanying legislation. Technology has relegated this condition to history's dustbin, and Governments are now faced with acting on their own law, something that was not a practical consideration until a few years ago.

Conversely, to think FOSS presents an alternative to respecting IPR is a gross misunderstanding. In fact, FOSS requests users to, without exception, respect the intellectual property of the software's author(s) as outlined in the enclosed GPL or OSD license, and it needs Governments to provide legal protection and remedy when this is necessary and deserved. The full text of the GNU General Public License and the criteria for OSD licenses are contained in annexes I and II of this chapter.

There is a broader issue here for Governments than simple tolerance (or lack thereof) of a certain degree of software piracy. The question is what regime for ownership and distribution of IT tools best serves the interests of developing countries and of the global economy as a whole. To think of FOSS as simply a less expensive alternative to proprietary software misses an important aspect of what FOSS enables. In an FOSS environment, the degree to which a software tool can be utilized and expanded is limited only by the knowledge, learning and innovative energy of the potential users and not by exclusionary property rights, prices or the power of countries and corporations.

The current debate often pits proprietary licensing against the GPL. Commercial software producers argue that promoting the GPL means locking out any software development from possible future commercialization. As the previous section indicated, the bulk of software revenues come from customization, servicing or hardware, or all of the above bundled in solutions. Indeed, IBM *did* earn $1 billion on the back of GPL GNU/Linux. Finally, proprietary licensing allows only the owner to commercialize the intellectual property at stake and makes it inaccessible to anyone else. Anyone seeking to redistribute a derivative version of a proprietary programme would be prohibited from doing so under the terms of the license. Thus, the formal outcome is not that different from that of the GPL (Lessig 2002). In terms of ICT strategy and its relation to innovation and development, there have been indications that the proprietary model may encourage excessive copyrighting and patent hoarding, with the final outcome being reduced investment in research and development (R&D) activities and a decline in innovation as funds for R&D are redirected towards patent acquisition and royalty payments (Bessen 2002, Bessen and Hunt 2003).

FOSS presents a significant development opportunity because of the critical role that users can play in determining new products and the overall trajectory of technology evolution. Software innovations can and should come increasingly from developing countries.

Developing countries are not implicitly stuck relying on commoditized, hand-me-down innovation from the developed world. In an FOSS environment, their own lead users could push technology development towards applications that specifically fit local needs and demands. However, for indigenous demand to be expressed, users need to understand the possibilities they have and the ways in which a digital infrastructure could contribute to their lives.

When those possibilities are evolving as quickly as they are today, it seems certain that IT consumers generate demand primarily through a process of learning by doing.[56] With increasing familiarity, users can gradually come to understand what the technologies can do for them, and then to imagine new possibilities, provided they are fully aware of their options and the existing technical options. Thus, an environment where software is normally used under restrictive intellectual property licensing may not be the most conducive for ICT development and bridging the digital divide. The empowerment that comes with free access to source code is not a simple price advantage, but may rather be a necessary economic prerequisite for evolving demand. The applications that find widespread acceptance and drive technology and infrastructure deployment forward in developing economies may certainly come from within those countries.

H. Policy options for FOSS

There are two general areas of policy implementation options to be considered by Governments, each with different public-sector, civil-society and private-sector dynamics. Each of these potential paths has constraints or obstacles that developing countries in particular must be aware of when considering the various policy options available to them in adopting FOSS.

- **Formal vs. informal approaches:** Formal approaches such as legislation or a government strategic plan may be weighed against more informal, flexible approaches to letting FOSS use evolve without normative patronage.

- **Strategy and level of involvement:** Strategy initiatives may be carried out at sub-national, national or regional levels, and they may also entail different degrees of involvement, from awareness building to procurement to funding of R&D.

These options are not mutually exclusive but rather represent spectrums along which Governments can choose to array specific policies or a more general approach to FOSS use. The relationship between government, civil society and industry may also be varied, with initiatives coming in a mixture of strengths from any given stakeholder. There is no prescription or tried-and-tested scheme: policy makers will have to consider their national circumstances and ICT development priorities. This chapter considers several options and offers examples of applications throughout the world.

1. Formal involment

A number of Governments have pursued formal approaches to the adoption of FOSS in the public sector, considering legislation to mandate the use of open-source solutions in government applications or at least seriously consider them as an alternative to proprietary software. In the industrialized world, this trend has been strongest in Europe, particularly France and Germany. The French Parliament proposed a bill concerned with both the use of open standards and the availability of source code for software used by the Government. An Italian bill under consideration mandates a preference for FOSS in all government offices, and a Spanish bill requires regional governments to prefer and promote open-source products. In April 2002, the administration of the Spanish district of Extremadura put in place a plan to switch all computer systems in government offices, businesses and homes to Linux and FOSS applications.[57] The Government of the United Kingdom has set out policy to consider open-source solutions alongside proprietary ones in IT procurement; to use products that support open standards and specifications in all future IT development; to consider obtaining full rights to bespoke and customized software code for proprietary software it procures; and to explore further the possibilities of using FOSS as the default exploitation route for government-funded R&D software.[58]

A number of Latin American governments at the national and local levels have introduced or passed and introduced legislation on the use of FOSS solutions in the public sector. The Peruvian case was discussed above. Argentina's Parliament reviewed a proposal that mandates, with a few exceptions, the use of FOSS in all government offices and state-owned enterprises, but the Parliament collapsed in the fiscal crisis of 2001 before a decision was taken on this bill. In Brazil, four cities – Amparo, Recife, Ribeirao Pires

and Solonopole – have passed laws giving preference to or requiring the use of FOSS, and other municipalities and states, as well as the national Government, have considered similar legislation.

Other countries have taken slightly less formal steps towards using FOSS in government. France, in addition to considering legislation, has created an Agency for Technologies of Information and Communication in Administration (ATICA), which seeks, among other things, to encourage the use of free software and open standards.

A less formal, more flexible approach has its advantages. Foremost of these is the value of allowing the FOSS phenomenon to develop by itself, along with the attendant organizational innovation that could bring. Different user communities have the opportunity, through the open-source process, to come up with unique and contextually appropriate technological and organizational models, building indigenous commitment and ownership along the way.

It is often argued that Governments do not have an enviable record of successfully legislating and promoting industrial policy and that thriving software developments are best left alone (Evans 2002). While this issue may have some relevance in countries with developed market economies, within the development context one cannot help but wonder whether the market purist and non-interventionist concepts of the Washington consensus are for export only. A different issue is, if a Government does decide to adopt a pro-FOSS legislative bias, how this should be implemented and how formal it should be from a normative viewpoint.

2. Strategy and direct involvement

Since Governments are important consumers of ICT in developing countries, their participation is crucial for the success of any open-source initiative. Government can be involved at the level of strategic policy, building awareness and promoting conscious and informed choice among its administration as well as industries and civil society. It may act as a procurer, and it may directly finance R&D. This section considers different levels at which Governments can implement an FOSS strategy.

A good example of high-level strategic thinking is the case of the Government of South Africa. A council to consider the use of FOSS was convened in early 2003. The council delivered an official recommendation promoting the use of open-source applications when proprietary alternatives did not offer a compelling advantage. The recommendations were formulated at a strategic level and are described in box 4.7. The advantage of a strategic approach lies in the nature of

Box 4.7

Summary of strategic steps highlighted by South Africa's government council on open-source policy

South Africa's Government Information Technology Officer's council's FOSS strategy includes steps to consolidate and expand the capacity needed to implement and support FOSS solutions, including:

- Provision of information to key decision makers (bearing in mind the need to demonstrate convincingly the security measures and business principles of FOSS)
- Generation of expert advice on the suitability of FOSS solutions
- Trouble-shooting for newly implemented FOSS solutions
- Software development assistance
- Training for FOSS developers and users (concentrated in existing learning institutions)
- Development of a research programme to enable optimal understanding of and decision making regarding FOSS (built on the networking nature of the FOSS development model)
- Creation of FOSS support structures (some institutional development will be necessary)

Source: Open Source Software in Government, www.oss.gov.za.

software provision. As a complex knowledge product, software requires a technological and social infrastructure to facilitate its provision. A strategic approach would allow Governments to work in collaboration with donors to map out potential areas for development assistance, in particular identifying potential human resource capacity-building and technical assistance needs.

The report recommends creating strong linkages with higher education institutions to build a national collaborative network that can be extended internationally. It also emphasizes building partnerships within the public and private sectors and civil society, as well as regionally within Africa and globally. The strategy emphasizes the importance of building support among key stakeholders, including the political level, senior management, IT professionals and government users.

Still at the strategic level but with the stakes raised to international collaboration, FOSS may have the potential to generate large economies of scale and positive spillover effects in regional capacity building and infrastructure development. A number of regions have taken steps toward collaborating on FOSS, and such cooperation has been most pronounced in Africa. In early 2003, African countries from across the continent launched the Free and Open Source Software Foundation for Africa (FOSSFA), an organization aimed at promoting the use of FOSS throughout the continent.[59] Box 4.8 presents FOSSFA's recommendations for formulating a policy regarding FOSS use.

FOSSFA anticipates that FOSS will provide opportunities to develop local programmes built by Africans for use in Africa. Regional organizations such as FOSSFA thus see the development value of open source in broad terms. An important aspect of such strategies is to emphasize the capacity-building dimension associated with open-source technology. Regional organizations have the potential to work with educators on a broad scale to introduce open source into schools where young people can learn to use, maintain and modify software. The vision for the future is one of a regional technical revolution of sorts, in which Governments and the private sector embrace FOSS and can rely on regionally developed software and expertise.

As far as practical measures are concerned, a number of Governments have piloted the deployment of FOSS in government service delivery agencies at the subnational level. In South Africa, for example, some provinces and national departments are using GNU/Linux and other FOSS applications on a trial basis, and the Department of Health has implemented an FOSS health information system in both national and provincial departments that is now also used in some other African countries.

Some European Governments have begun shifting serious national-level support to open source. For example, France's ministries of Defense, Culture, and Economy have shifted to open-source operating systems. Germany's Federal Institute for Agriculture and Food has installed open-source operating systems on servers and workstations. In Britain, the National Health Service has adopted an open-source standard.[60]

Some developing countries have seen the private sector taking the initiative in cooperating with the Government in open-source software development. In India, for example, while government agencies have begun to explore the potential of FOSS applications, especially in education, private entrepreneurs have developed the Simputer, an FOSS-based handheld device. (See chapter 3 for a discussion of the Simputer.) Collaboration between the public and private sectors is essential to a successful systematic adoption of FOSS solutions. The Simputer demonstrates that innovative private-sector FOSS solutions are possible. Yet even in this case, the developers anticipated needing government assistance to help disseminate the device. They realized that the Government would have to act as a major consumer in order to achieve the necessary critical mass for popularizing the product.

Some countries have more explicitly encouraged collaboration between the public and private sectors in the production and adoption of open-source applications. Attempting to encourage the continued development of the local software industry, the Government of Germany has struck a deal with IBM that offers government offices discounts on IBM computers with preinstalled GNU/Linux software provided by the German GNU/Linux distributor SuSE. Singapore, through its Economic Development Board, which is charged with executing strategies to boost the Singaporean economy, is offering tax breaks to companies that use the GNU/Linux operating system instead of proprietary alternatives.

Finally, one needs to look at the issue of direct funding of FOSS project and development needs. A number of examples are listed in the survey that follows. An important question is whether, for software

Box 4.8

The Free and Open Source Software Foundation for Africa policy recommendations for FOSS

In its Action Plan for June 2003 – June 2005, FOSSFA proposes three distinct approaches a Government might take in formulating its FOSS policy. It argues that any particular country should seek the mix of these approaches that best reflects its ICT and development reality. (See annex III of this chapter for the text of FOSSFA's founding statement.)

1. ***The neutral approach***

- Governments can adopt a neutral approach ensuring that choice is supported and discrimination against FOSS is eliminated. Governments should:
- Adopt policies to ensure that FOSS is carefully considered in IT procurement processes.
- Implement criteria for evaluating open-source products, and procedures for adopting and maintaining open standards.
- Allow open-source software to compete on an equal basis with proprietary alternatives.
- Initiate communication to enhance knowledge and understanding of FOSS.

2. ***The enabling approach***

- In an enabling approach, policies are geared towards creation of the capacity to use FOSS. Governments should, in addition to the neutral approach:
- Develop the capability to give guidance on selecting and implementing FOSS.
- Promote education and training for the use of FOSS products.
- Support the establishment of partnerships between users and developers.

3. ***The aggressive approach***

In an aggressive approach, Governments actively encourage the development of FOSS through both legislation and policy. Governments should:

- Actively support FOSS developers' communities and projects.
- Adopt strategies to increase commitment to open-source products.
- Conduct regular auditing of the impact of FOSS on government service delivery.
- Participate in programmes that can minimize risks associated with FOSS.
- Standardize FOSS where analysis shows it to be the best alternative.

Source: FOSSFA Action Plan 2003-2005, www.fossfa.org/resources.html.

produced with public funds, there should be any preference for a specific licensing model. Policy makers should scrutinize the available OSD licenses as well as the GPL and reflect on the details of the debate between Microsoft Peru and Peruvian Congressman Villanueva. While there is sometimes a temptation to prefer the "copyleft" spirit of the GPL, let it be noted that the very successful Apache server software and the BSD operating system are distributed under less restrictive OSD licenses that actually allow proprietary use of the source code. Yet these programmes remain the frontrunners in their domains.

3. Examples of FOSS policy action in developing countries

The following are examples of FOSS use in developing countries. Where relevant, the policy framework is described and the main forms of involvement are

noted. The survey is not comprehensive and is based on information found by conducting keyword searches on the Internet.

Argentina[61]

- A bill "Policy for Free Software Use for the Federal State" presented to Argentina's House of Congress in April 2001 called for mandatory government use of FOSS. The economic crisis forced the Government out before a vote could be taken. A similar bill was submitted in March 2002 and is under review.
- The current bill proposes FOSS as a component of the national campaign against software piracy.

Brazil[62]

- Rio Grande do Sul was the first administration to pass a law making FOSS use mandatory in both government agencies and non-government-managed utilities.
- Four cities in Brazil have passed legislation requiring preference for "software libre" where an open-source option is available.
- The national health care system plans to release 10 million lines of source code.
- The first annual Free Software International Forum was held in Brazil in May 2000.
- In the province of Pernambuco, the world's first law regarding the use of open-source software was passed in March 2000.

China[63]

- The Government-supported China Academy of Science together with Government-owned Shanghai New Margin Venture Capital established Red Flag Linux, a Chinese-language Linux distribution.
- The Beijing Software Industry Productivity Center was established by the Beijing municipal government and has launched a project named "Yangfan" to improve the performance of local distributions of GNU/Linux.
- The strong presence of international FOSS developers, including Turbo Linux, Red Hat and IBM, is noticeable.

India[64]

- A growing attraction to Linux in India has persuaded Microsoft to share source code with a particular government body.
- The Simputer was developed by a group of scientists from the Indian Institute of Science and Encore Software. (See box 3.3 in chapter 3.)
- Government agencies promote the use of localized solutions such as Indian-language computing. The Centre for Development of Advanced Computing and the Department of Information Technology are supporting the development of a Hindi GNU/Linux distribution called Indix.
- The Department of Information Technology has expressed an intention to introduce Linux as the de facto standard in academic institutions; research establishments will develop distributable toolboxes; central and state governments will be asked to use Linux-based offerings.
- The West Bengal Electronics Industry Development Corp Ltd., the state's nodal IT body, has formed a Linux cell to support various government IT projects inside and outside the state.
- Talks with major FOSS industry players on joint projects are in progress.

Malaysia[65]

- The Government committed in November 2001 to using FOSS in key agencies, such as the Treasury, and in areas such as e-procurement.
- The Malaysian National Computer Confederation operates an FOSS special interest group.
- The Prime Minister launched the Komnas (Komputer Nasional) Twenty20 Personal Computer, built on FOSS by the private sector.
- The Malaysia Institute of Electronic Systems, the ICT advisor to the Government, is pushing the shift towards FOSS, including an attempt to build a low-cost PC based on GNU/Linux.

Pakistan[66]

- The Government Technology Resources Mobilization Unit has created a "Linux Force" task force that is expected to help Pakistan move toward FOSS. This would include funding for R&D programmes for client software, training and local-language application development.

Peru[67]

- Congressman Edgar Villanueva has introduced Bill 1609, "The Use of Free Software in Public Administration", to mandate the use of FOSS in all government systems.
- Congressman Villanueva's open confrontation with Microsoft Peru has earned him and Peru the reputation of being the developing world's FOSS radical.

The Philippines[68]

- Bayanihan Linux, developed under the Open Source Project of the Advanced Science and Technology Institute of the Philippines, has had its second release and is bundled with the latest office suite, image and text editors, Internet and networking tools and multimedia applications. Bayanihan is a single-CD installation tailored to local demand.

Republic of Korea[69]

- The local company HancomLinux signed a deal in January 2003 with the country's Central Procurement Office to supply the Government with 120,000 copies of its Linux desktop office productivity software, HancomOffice. The open-source software, which is compatible with Microsoft's Office applications, including Word and Excel, is expected to save the Government money in the long run and stimulate business for local companies competing against Microsoft in the software industry.

South Africa[70]

- A Government council convened to consider the use of FOSS published an official recommendation promoting the use of open-source applications when proprietary alternatives do not offer a compelling advantage, and highlighted the necessary strategic steps.
- In January 2003, the Government declared that it would use FOSS and set up a council for scientific and industrial research to help develop programming skills.
- South Africa has taken the lead in regional collaboration on OSS, including the Free and Open Source Software Foundation for Africa.

Thailand[71]

- The Government-supported technology development group NECTEC has developed a GNU/Linux distribution for schools and government desktops and servers – the Linux-SIS (School Internet Server) for servers and the Linux TLE (Thai Linux Extension) for government desktops. The project aims to narrow the gap between use of pirated and legal software, and to promote local business development.

Viet Nam[72]

- Government delegates to a software seminar in Hanoi concluded that Viet Nam could save hundreds of millions of dollars annually and better guarantee information security by switching to FOSS.
- Vietnamese IT companies are working on FOSS projects by subcontracting with foreign companies
- FOSS was included in the National Program on Information Technology.

I. Conclusions

The Internet, or the rapid introduction into human affairs of extensive telecommunications bandwidth configured as a neutral and public network, changes some very important things about the constraints and opportunities that individuals, organizations and countries encounter as they move towards increasingly knowledge-intensive economies. Developing countries will simultaneously confront new and old problems: the promise of information-enabled development; the challenge of managing complex, techno-

logically embedded relationships with multinational firms and the developed world; and the question of how to configure IPR regimes that are increasingly crucial pillars of economic growth. The advantages for developing countries of promoting policy that will provide a positive environment for open-source IT are manifold, and any differences in comparison with the developed world are generally ones of degree, not of direction.

FOSS is here to stay for the foreseeable future. Experience so far has shown that open-source environments often produce reliable, secure and upgradable software at a relatively low cost. By definition, FOSS provides an improved approach to security issues and to the need for public and open standards, a subject of concern in government institutions. Open source eliminates the national-level economic loss that otherwise results from duplication of software development, in particular if it has been done in a public or academic institution. Supporting FOSS can have an anti-monopolistic effect on the IT market and industry in a country and globally, thereby reducing the threat of technological and financial lock-in.

Governments, after considering the experience of those developing and developed countries that have initiated FOSS policy and activities, should decide which approach suits their environment best. While some countries may have large numbers of technically qualified and interested experts, this may not necessarily be the case throughout the developing world. Thus, government policy on human resources for ICT development may need to include an FOSS agenda. While its low cost does not drive the development of FOSS globally, in developing countries it may well speed adoption, particularly given the increasingly stringent enforcement of IPR demanded by proprietary software producers. Money spent on licenses may be better used in training ICT experts who can perform real software development, rather than just "click on the menu". Finally, the increasing adoption of FOSS in the developed world is creating export opportunities for customized software from nascent IT industries in developing countries.

Ultimately there are many different ways to manage the transition to a knowledge or information economy. But if the production, flow and control of information are defining features of a community, an economy and a society, then the rules that govern information become foundational. Software is one of the most important sources of those rules. As with any set of rules, what matters is not just what the rules say but how they come to be written and who can change them under what conditions. FOSS should be seen, then, as more than just a different kind of product. It is a different kind of process for building, maintaining and changing the rules that govern information flows.

Notes

1. Moving a software programme from the operating system environment in which it was developed to another operating system environment; writing a version that runs on another system.

2. For a critical evaluation of the data see Tuomi (2002).

3. The competition as indicated by Hoover's (www.hoovers.com) consists of the following 10 firms in order of revenue size: Siebel, BMC Software, Novell, Network Associates, Activision, Sage Group, Infosys (Bangalore), Business Objects, Legato Systems and RSA Security.

4. The term *packaged* means that the software is written for mass retailing and is not customized for specific user needs. It typically includes operating systems, utilities, applications and programming languages.

5. See *www.businessweek.com/magazine/content/03_02/b3815723.htm.*

6. Total revenues for IBM, Sun Microsystems, EMC, Dell, Hewlett-Packard, Gateway, Apple, Fujitsu and NEC approach $276 billion, but it is difficult to determine what portion comes from software-related activities.

7. This analogy has been attributed to Mitchell Stoltz of Mozilla.org.

8. It may be included in the software package or on the CD-ROMs, or it may be posted on the Internet and its location (URL) indicated.

9. A frequently asked question is why software developers would choose to share source code in this unprotected, non-proprietary fashion. This discussion has a number of economic and sociological aspects and is discussed in some detail in section F of this chapter.

10. The implied meaning of "Fordist" has its origins in Adam Smith's discussions on the division of labour. The manufacturing process for any product can be broken down into steps, and having each worker specialize in one of these steps leads to substantial productivity gains. The approach was perfected in Ford's automotive factories, thus the term.

11. One of the most pervasive and detrimental legacies of the Internet hype of the late 1990s was the popularity of an over-simplified idea of "self-organization". New technologies seemed to be undermining or at least presenting alternatives to traditional command-and-control hierarchies in business, government and elsewhere.

12. Ken Thompson is usually given credit for being the "inventor" of UNIX and Dennis Ritchie is given credit for C. Both were employees of Bell Labs.

13. The group at the University of California at Berkeley was particularly influential. Bill Joy, who would go on to found Sun Microsystems, headed the first Berkeley Software Distribution (BSD) project of UNIX in 1978.

14. This case would drag on for 13 years before finally being dismissed by the Reagan administration in 1981. See DeLamarter (1986).

15. In Stallman's view, "the sharing of recipes is as old as cooking", but proprietary software meant "that the first step in using a computer was a promise not to help your neighbor". He saw this as "dividing the public and keeping users helpless" (1999, p. 54). For a fuller statement see *www.gnu.org/philosophy/why-free.html.*

16. For a description of GNU see box 4.1 in the text.

17. GNU.org, at *www.gnu.org/licenses/gpl.html.*

18. There have been several modifications to these specific provisions, but the general principle is unchanged.

19. In the Acknowledgements section of the *Open Sources: Voices from the Open Source Revolution* (1999) omnibus, Emacs is described at some length: "Calling Emacs editor an editor is like calling the Earth a nice hunk of dirt. Emacs is an editor, a web browser, a news reader, a mail reader, a personal information manager, a typesetting program, a programming editor, a hex editor, a word processor, and a number of video games. Many programmers use a kitchen sink as an icon for their copy of Emacs. There are many programmers who enter Emacs and don't have to do anything else on the computer. Emacs, you'll find, isn't just a program, but a religion, and RMS (Richard M. Stallman) is its saint."

20. See *http://gcc.gnu.org* for more details.

21. See *http://sources.redhat.com/gdb/* for more details.

22. See *http://opensource.org/osd.html* for more details.

23. "We think the economic self-interest arguments for Open Source are strong enough that nobody needs to go on any moral crusades about it". See *www.opensource.org* for more details.

24. Gomes L (1998), Microsoft acknowledges growing threat of free software for popular functions, *Wall Street Journal*, 3 November: B6; and the "Halloween Memo", at GNU/Linux.miningco.com/library/blhalloween.html.

25. An unauthorized text of the so-called Halloween Memo can be found in unabridged format at *www.scripting.com/misc/halloweenMemo.html.* The OSI has posted the leaked version of the memo with commentary at *www.opensource.org/halloween/halloween1.php.* The OSI reported that the Microsoft Halloween Memo explicitly stated:

    "OSS is long term credible…. [because] the real key to GNU/Linux isn't the static version of the product but the process around it. This process lends credibility and an air of future-safeness to customer GNU/Linux investments. GNU/Linux has been deployed in mission critical, commercial environments with an excellent pool of public testimonials…. Recent case studies provide very dramatic evidence that commercial quality can be achieved/exceeded by OSS projects. The Internet provides an ideal, high visibility showcase for the OSS world. The ability of the OSS process to collect and harness the collective IQ of thousands of individuals across the Internet is simply amazing. More importantly, OSS evangelization scales with the size of the Internet much faster than [Microsoft's] evangelization efforts appear to scale."

    In 2002 and 2003 Microsoft began experimenting with allowing limited viewing of its source code to large customers and Governments that in particular may wish to audit for security concerns, under particular agreements relating to non-disclosure and non-competition.

26. See note 3.

27. For a discussion of an empirical test of bugginess that compares FOSS and a proprietary platform, see Kuan (2003).

28. See *www.computerworld.com.au/index.php?id=2110919358&fp=16&fpid=0*.

29. Market share numbers for software should always be read cautiously, as sampling and measurement issues complicate any straightforward assessment of who is actually using what software in these highly distributed markets. The data discussed here come primarily from industrialized counties. Market share data for developing countries are not currently available.

30. E-soft, *www.securityspace.com/s_survey/data/200303/index.html.*

31. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers. Most computer users are familiar only with the Microsoft Windows operating system.

32. See *www.netcraft.com/Survey/index-200106.html#computers*; see also *www.oss-institute.org/reference.html.*

33. See *www.businesswire.com/cgi-bin/f_headline.cgi?bw.111301/213170209.*

34. See *www.dwheeler.com/oss_fs_why.html.*

35. Berkeley Software Distribution.

36. This concession comes from the letter that Microsoft addressed to Peruvian Congressman Edgar Villanueva, arguing against his ambition to legally designate FOSS a preferred option for government procurement.

37. See *www.eweek.com/article2/0,3959,840669,00.asp for more details.*

38. More precisely, consumption of a non-rival good by one consumer does not decrease its utility for another consumer. Non-excludability implies that it is difficult, if not impossible, to charge people money for the use of the good, much as for breathing air or walking through a public park. Public goods are those that satisfy both the criteria of non-rivalry and non-excludability.

39. Full results are at *www.psychologie.uni-kiel.de/GNU/Linux-study/.* The three most important gains (all scoring 4.6 on a scale of 1 (very unimportant) to 5 (very important)) were "having fun programming", "improving my programming skills", and "facilitating my daily work due to better software." "Lack of payment" was much less important (2.2); "time lost due to my involvement in GNU/Linux was a bit more important" (2.6).

40. The Boston Consulting Group Hacker Survey, Release 0.3. was presented at GNU/LinuxWorld on 31 January 2002; *www.bcg.com/opensource/BCGHACKERSURVEY.pdf* . BCG surveyed a random selection of developers from SourceForge; the results are based on 526 respondents (a 34.2% response rate).

41. See Berlecon/III (2002), Part 4.

42. Any participating developer can express an opinion by casting a vote on any issue facing the project, but only the votes of Apache Group members are binding. Code changes require a minimum of three positive votes and no negative votes; vetoes are expected to carry with them a convincing explanation. Other decisions require a minimum of three positive votes and an overall majority in favor. Election to the Apache Group is on the principle of a peer-based meritocracy: someone who does a lot of good work on a piece of the code may be nominated by a member of the group and added to the group by a unanimous vote of existing members. Interview with Apache Group members; Fielding (1999).

43. For more details browse *www.apache.org.*

44. For more on the South African position see Government IT Officers Council of South Africa (2002), *Using Open Source Software in Government*; and National Advisory Council on Innovation of South Africa (2002), *Open Software and Open Standards in South Africa.*

45. See *http://tdil.mit.gov.in/* with a link to Indix (the Hindi version of GNU/Linux); see also *www.crn-india.com/features/stories/39090.html* and *www.zdnetindia.com/techzone/linuxcentre/stories/70365.html.*

46. See *www.redflag-linux.com/.*

47. For more information see *www.pernambuco.com/tecnologia/arquivo/softlivre1.html*.

48. See *www.wikipedia.org/wiki/Open_content* for a list of open content projects and links.

49. See *www.lightandmatter.com/article/article.html.*

50. See *www.sanger.ac.uk/HGP/.*

51. See *www.oreillynet.com/pub/a/network/2002/04/05/kent.html* and *www.wired.com/news/medtech/0,1286,46154,00.html* for more details.

52. See *http://bioinformatics.org/.*

53. See *www.newamerica.net/index.cfm?pg=article&pubID=901* and *www.cellularsignaling.org/.*

54. Programming that secretly gathers information about a computer's user and sends it to advertisers or other interested parties.

55. For the detailed text see *www.theregister.co.uk/content/4/25157.html* and *www.pimientolinux.com/peru2ms/.*

56. See Bar F and Borrus M (1998), The path not yet taken: User-driven innovation and U.S. telecommunications policy, Fourth Annual CRTPS Conference, University of Michigan Business School, Ann Arbor, Michigan, 5–6 June.

57. For more information see the Extreamadura FOSS site *www.linex.org* or refer to *The Washington Post* (2002), Europe's Microsoft alternative: Region in Spain abandons windows, embraces Linux (3 November) and *Wired,* Extremadura measures: Linux, at *www.wired.com/news/business/0,1367,51994,00.html.*

58. Office of the E-Envoy, Open Source Software Use in UK Government, *www.e-envoy.gov.uk/oee/oee.nsf/sections/frameworks-oss-policy/$file/oss-policy.htm.*

59. See *www.fossfa.org.*

60. For more details see ZDNet at *http://news.zdnet.co.uk/story/0,,t269-s2121266,00.html.*

61. See *www.lugcos.org.ar/serv/mirrors/proposicion/proyecto/leyes/#ref.#1.*

62. See *www.softwarelivre.org/index.php?menu=projeto* and *www.pernambuco.com/tecnologia/arquivo/softlivre1.html*.

63. See *www.redflag-linux.com/eindex.html* and *www.bsw.gov.*cn.

64. See *www.zdnetindia.com/techzone/enterprise/stories/74137.html;*
www.simputer.org/simputer/;
http://rohini.ncst.ernet.in/indix/;

http://economictimes.indiatimes.com/cms.dll/xml/uncomp/articleshow?artid=24598339; www.zdnetindia.com/news/national/stories/71697.html; and *http://ebb.antville.org/stories/362705/.*

65. See *http://asia.cnet.com/newstech/systems/0,39001153,39071821,00.htm; http://star-techcentral.com/tech/story.asp?file=/2002/9/9/technology/09oss&sec=technology; www.mncc.com.my/oscc/oscc-main.html;* and *http://opensource.mimos.my/.*

66. See *www.tremu.gov.pk/task/Linux.htm.*

67. See *http://odfi.org/archives/000004.html#4.*

68. See *http://bayanihan.asti.dost.gov.ph/.*

69. See *http://en.hancom.com/index.html.*

70. See *www.oss.gov.za/.*

71. See *www.nectec.or.th/linux-sis/.*

72. See *www.idg.com.sg/idgwww.nsf/unidlookup/21744381DA98B64148256CA80007772E?OpenDocument.*

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ANNEX I

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To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

> <one line to give the program's name and a brief idea of what it does.> Copyright© <year> <name of author>
>
> This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.
>
> This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.
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Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

> Gnomovision version 69, Copyright© year name of author
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> Yoyodyne, Inc., hereby disclaims all copyright interest in the program `Gnomovision' (which makes passes at compilers) written by James Hacker.
>
> <signature of Ty Coon>, 1 April 1989
> Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

Annex II

The text of the Open Source Definition is reproduced here in the form in which it appeared on the Open Source Initiative site http://www.opensource.org/docs/definition.php on 13 August 2003.

The Open Source Definition
Version 1.9

The indented, italicized sections below appear as annotations to the Open Source Definition (OSD) and are ***not*** a part of the OSD.

Introduction

Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following criteria:

1. Free Redistribution

The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

> ***Rationale:*** *By constraining the license to require free redistribution, we eliminate the temptation to throw away many long-term gains in order to make a few short-term sales dollars. If we didn't do this, there would be lots of pressure for cooperators to defect.*

2. Source Code

The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost–preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

> ***Rationale:*** *We require access to un-obfuscated source code because you can't evolve programs without modifying them. Since our purpose is to make evolution easy, we require that modification be made easy.*

3. Derived Works

The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

> ***Rationale:*** *The mere ability to read source isn't enough to support independent peer review and rapid evolutionary selection. For rapid evolution to happen, people need to be able to experiment with and redistribute modifications.*

4. Integrity of the Author's Source Code

The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The

license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

> ***Rationale:*** *Encouraging lots of improvement is a good thing, but users have a right to know who is responsible for the software they are using. Authors and maintainers have reciprocal right to know what they're being asked to support and protect their reputations.*
>
> *Accordingly, an open-source license must guarantee that source be readily available, but may require that it be distributed as pristine base sources plus patches. In this way, "unofficial" changes can be made available but readily distinguished from the base source.*

5. No Discrimination against Persons or Groups

The license must not discriminate against any person or group of persons.

> ***Rationale:*** *In order to get the maximum benefit from the process, the maximum diversity of persons and groups should be equally eligible to contribute to open sources. Therefore we forbid any open-source license from locking anybody out of the process.*
>
> *Some countries, including the United States, have export restrictions for certain types of software. An OSD-conformant license may warn licensees of applicable restrictions and remind them that they are obliged to obey the law; however, it may not incorporate such restrictions itself.*

6. No Discrimination against Fields of Endeavor

The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

> ***Rationale:*** *The major intention of this clause is to prohibit license traps that prevent open source from being used commercially. We want commercial users to join our community, not feel excluded from it.*

7. Distribution of License

The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

> ***Rationale:*** *This clause is intended to forbid closing up software by indirect means such as requiring a non-disclosure agreement.*

8. License Must Not Be Specific to a Product

The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

> ***Rationale:*** *This clause forecloses yet another class of license traps.*

9. The License Must Not Restrict Other Software

The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

Rationale: *Distributors of open-source software have the right to make their own choices about their own software.*

Yes, the GPL is conformant with this requirement. Software linked with GPLed libraries only inherits the GPL if it forms a single work, not any software with which they are merely distributed.

10. The License Must Be Technology-Neutral

No provision of the license may be predicated on any individual technology or style of interface.

Rationale: This provision is aimed specifically aimed at licenses which require an explicit gesture of assent in order to establish a contract between licensor and licensee. Provisions mandating so-called "click-wrap" may conflict with important methods of software distribution such as FTP download, CD-ROM anthologies, and Web mirroring; such provisions may also hinder code re-use. Conformant licenses must allow for the possibility that (a) redistribution of the software will take place over non-Web channels that do not support click-wrapping of the download, and that (b) the covered code (or re-used portions of covered code) may run in a non-GUI environment that cannot support popup dialogues.

Annex III

Statement of the Free and Open Source Software Foundation for Africa (FOSSFA)

The text is reproduced here in the form in which it appeared at http://www.prepcom.net/wsis/1046170300 on 13 August 2003.

Preamble

The potential of open source will improve productivity and quality of life in developing countries. The process of transformation into information societies requires the full participation of all member states.

Vision

Our vision is to promote sustainable, viable and cost-effective software products for Africa through education and local capacity building.

Principles

Africa should investigate how to leverage the opportunities presented by the emergence of open-source software in the context of limited financial resources and expertise.

Specifics

Africa can bridge the "digital divide" by adopting open source, thus narrowing the effect of techno-colonialism.

Plan of action

It is envisaged FOSSFA, in partnership with Governments, intergovernmental organizations, civil societies and other stakeholders, will spearhead initiatives that build skills through education and empowerment of women and youth.

Lobby all stakeholders to adopt open source as the platform to engineer solutions that meet the needs of the people.

Strategies

FOSSFA will:

iii. Create an awareness of free software and open source in Africa.
ii. Build capacity in free software and open source.
iii. Develop a knowledge warehouse of expertise in Africa.
iv. Develop the African Open Source Portal.

We intend to achieve these by:

i. Lobbying key organs such as Africa Union, UNECA, UNDP, Agence la Francophonie and NEPAD among others to support open-source development in Africa.
ii. Leveraging various free and open-source capacities and resources in Africa.
iii. Lobbying donor governments and other institutions to tie ICT funding to free and open-source software.
iv. Lobbying African governments to adopt free and open-source software.
v. Promoting open-source capacity and skill development in Africa through education with emphasis on women and youth.

Chapter 5

BUSINESS PROCESS OUTSOURCING SERVICES FOR ECONOMIC DEVELOPMENT

Outsourcing has been used for decades, especially in manufacturing, as a way to reduce costs and decrease investment in capital assets. Outsourcing the production of goods to developing countries already plays a key strategic role for companies seeking to reduce costs and streamline operations. Advances in information and communication technologies (ICT) and their business applications, together with the globalization of the world economy, have led to a rapid internationalization of information-technology-enabled services (ITES), including business process outsourcing (BPO). The growth of BPO services specifically in developing countries results from a combination of various factors, including recent ICT developments in these countries, and it mirrors increasing demand from enterprises located mainly in the United States and Europe to outsource non-core business functions at a low cost in order to focus on their main core operations. Case studies indicate that developing-country entrepreneurs seeking to enter the BPO business need to assess infrastructure and skills requirements, define a business plan, and develop marketing strategies to promote local competencies. Governments wishing to support the development of a BPO sector may, as a matter of policy, address issues related to ICT infrastructure, education, regulatory environment and taxation.

A. Introduction

In the late 1980s, outsourcing became common among large businesses located in the United States. Originally, they were driven to look for long-term ongoing support to manage their ever-changing information technology (IT) infrastructure. Large companies whose core business was not related to IT, such as manufacturing companies, outsourced their IT functions in order to focus on their core business and increase process efficiencies. IT outsourcing consists of contracting a service provider to completely manage, deliver and operate one or more IT functions such as data centres, networks, desktop computers, and software applications. Initially these services were performed primarily at the client's site.

With advances in network technology and high-speed data networks, as well as increases in bandwidth capacity, remote management services developed. Remote management services are IT services that can be performed away from the client's location and computing technology. Companies located in developed countries have rapidly increased the scope of the operations they outsource from single aspects of IT to the offloading of entire business functions. In BPO, the company that provides BPO services to its clients is usually called the outsourcer or outsourcing vendor, or the BPO service provider. The company that buys outsourcing services or shifts functionality to an outsourcing vendor is usually called the client. To ensure consistency, this chapter uses the terms *BPO service provider* and *client*.

Moving functions such as call centres and customer support centres offering remote services providing Internet and Web-enabled applications to countries with a lower cost base emerged as a new business model for enterprises in developed countries. As a consequence, many companies in certain developing countries (mainly India) have flourished by providing, in particular, software application development and management services to clients worldwide (See section B.). With an English-speaking skilled workforce and salaries up to 80 per cent lower than in developed countries (*Libération* 2003b), India has managed to capture 80 per cent of the international outsourcing market (*Le Monde* 2003b). The savings linked to low-wage labour has always been a major incentive to outsource to developing countries.

This chapter focuses on BPO as a strategic choice for enterprises seeking access to quality services and cost predictability while focusing increasingly on their main line of business. Because BPO is an expanding sector and the most recent trend in the outsourcing

market, it raises expectations in terms of economic development for developing countries. Gartner Inc. predicts that ITES/BPO will be a $300 billion market by 2004 (Berkman 2002). Its annual growth rate since 1999 has been 23 per cent. Goldman Sachs has said that by 2005 worldwide BPO will be a $585 billion market and will include a wide range of functions along a company's value chain (Gupta 2002). Estimates and forecasts by many Internet research firms concur that in the next few years, BPO will continue to grow internationally, becoming one of the fastest-growing e-commerce and e-business services.

However, to succeed in this promising niche, enterprises and Governments in developing countries need to focus on a certain number of prerequisites. After discussing BPO and the services currently offered by companies located or originating in developing countries, the chapter reviews some critical factors for ensuring the success of BPO in developing countries. It concludes with strategic recommendations designed to help enterprises and Governments in developing countries enable and support a sustainable environment that will permit BPO to expand.

B. ICT outsourcing opportunities

The emerging forms of outsourcing in developing countries, such as BPO, have developed along with the expansion of ICT and new business models that have dramatically changed business and communication in the information society. Lowering the costs of employing skilled and specialized workers is said to reduce operational costs up to 60 per cent (Gupta 2002), which explains why outsourcing service providers have emerged in many industries. The increasing number of enterprises that choose BPO in multiple sectors, as well as the level of complexity of the processes being outsourced, gives developing countries a chance to exploit higher-value niches.

Creating awareness of the new opportunities generated by ICT is still necessary in some developing countries, as well as in many of their enterprises. In particular, small- and medium-sized enterprises (SMEs) are not yet familiar with these opportunities. Nevertheless, several developing countries have already started to benefit from ICT opportunities. Outsourcing using new technologies such as IT outsourcing and BPO is a business-driven phenomenon. Enterprises in the United States are at the origin of the new forms of outsourcing, and India is the main outsourcing provider among developing countries. The following section reviews the history of BPO and focuses on the reasons that have led some enterprises to outsource, in particular to India.

1. The history of BPO

Since its inception, the outsourcing marketplace has been very competitive. Large companies in the United States first began outsourcing their non-core IT services to large companies domestically, preferring to have these services provided securely and reliably from the outside, rather than building up in-house expertise. The large IT and BPO service providers and intermediaries in developed countries include Accenture, Computer Sciences Corporation, Cap Gemini Ernst & Young, Deloitte Consulting, Electronic Data Systems Corp., IBM Global Services, Keane and PricewaterhouseCoopers. These corporations, as well as other global and regional clients in the United States and Europe, have progressively built, acquired or partnered with delivery companies in developing countries. US companies are expanding offshore through partnerships, acquisitions and local subsidiaries. The term *offshore outsourcing* was coined by US companies to describe outsourcing abroad, beyond the shores of the United States. The term is now in wide use globally to describe outsourcing to a provider in another country.[1]

Outsourcing business processes to developing countries had its beginning in the early 1990s, when US companies began outsourcing to India the conversion of custom-made software programs from one operating system to another (Gupta 2002). This tedious and time-consuming operation could easily be transferred to a provider in a developing country. US companies found that programmers in India could perform the work with the necessary skill, speed and attention to detail, and outsourcing was much less costly than performing those tasks in the United States. Once the outsourcing of programming was perceived to be successful, an increasing number of IT tasks were outsourced abroad, including applications management, applications development and help desk support.

However, depending on the level of complexity of the outsourced business functions, location can become an important issue for outsourcing clients and BPO service providers. Many companies in the United States, for example, want to be able to easily "touch and feel" the facility where their services are delivered, and to easily contact or visit the service pro-

vider. Practice shows that some enterprises still prefer to outsource complex functions in relatively close offshore locations. For example, enterprises in Western Europe are said to often outsource in Eastern Europe, and some US enterprises choose to outsource complex functions to Mexico rather than India.

In addition to India, BPO service providers are emerging in countries such as Bangladesh, Brazil, China, the Philippines, Romania, Russia, Singapore, Thailand, Venezuela and Viet Nam, to name a few.[2] These countries are increasingly considered as outsourcing destinations by enterprises in the United States but also the United Kingdom and other European countries, as they offer competitive BPO services on the outsourcing marketplace. Some of these countries may soon be able to compete with Indian BPO providers.

While most developing countries throughout the world provide basic BPO services such as data entry (see table 5.1), a few have been able to improve the quality of their expertise so as to provide more complex services. BPO service providers in some least developed countries are also reportedly trying to tap the available opportunities offered (see section C).

Since BPO agreements typically span three to 10 years, political stability is especially important to the client. Risk is a key factor in choosing with whom and where to do business. Potential clients will avoid a country or region where there is political unrest or conflict, as it is considered too risky for a company to move even its most basic business functions to a country with significant instability.

Giving a precise definition of BPO becomes more and more difficult (and less and less useful) as its scope expands to integrate various business functions such as human resources, logistics, procurement, engineering, marketing, sales, facility operations and management, legal work, finance and accounting. Frequently, estimates of the BPO market also include software services (UNCTAD 2002: 238). This discussion will treat the two as a single area, particularly since Indian IT outsourcing providers are quickly moving to BPO, tapping into new opportunities available in the outsourcing marketplace. Box 5.1 gives definitions of BPO by three firms that are simultaneously BPO vendors and BPO clients.

BPO is a varied and flexible process. Service providers may provide rudimental data entry services, or they may take over management functions or operations and become responsible for the entire process. Clients may outsource to several outsourcing providers. They may outsource data centre management functions to one provider, network management functions to another, and business processes and help desk functions to still others. The BPO vendor may be a small local business or a large company, perhaps larger than the client.

2. BPO: The Indian experience

India is often cited for its successful specialization in the provision of IT software and related services (UNCTAD 2002: 238). ITES/BPO service providers in India are well recognized by the outsourcing clients, and India is a primary outsourcing destination for software contracts. The bulk of its clients are from

BOX 5.1

How three firms define BPO

Accenture defines BPO as "contracting with an external organization to take primary responsibility for providing a business process or function" (Linder JC and Cantrell S 2002).

For PricewaterhouseCoopers, BPO "is the long-term contracting out of non-core business processes to an outside provider to help achieve increased shareholder value".[3]

Gartner defines it as "the delegation of one or more IT-intensive business processes to an external provider that, in turn, owns, administrates and manages the selected processes based on defined and measurable performance metrics" (2003).

the United States, while 26 per cent are European, mainly in the United Kingdom (*Le Monde* 2003a).

Large IT and BPO vendors in developed countries are also increasingly moving their outsourcing business to enterprises in developing countries, mainly the big Indian cities of Bangalore, Mumbai and New Delhi, thus generating significant employment opportunities. Low labour costs, a sizeable skilled English-speaking workforce that has demonstrated its capacities in the field of software development, an appropriate ICT environment, and a time zone difference convenient for developed countries are the main reasons to outsource IT and business processes to India.

The development perspective

From a development perspective, outsourcing has demonstrated its viability and success in India. The Indian IT industry continues to expand and is now one of the most competitive domestic sectors. Indian software export revenues increased by 30 per cent in 2002–2003, while the global market increased only 5 to 10 per cent during the same period (*Le Monde* 2003a). Software exports accounted for around 20.4 per cent of India's overall exports during 2002–2003 (Nasscom 2003a), in comparison with 16 per cent during 2001–2002 (UNCTAD 2002: 238).

Indian exports of software and IT services in 2002–2003 reached $9.5 billion, $26.3 billion more than in 2001–2002. Of this, IT services and products grew at an annual rate of 18.3 per cent to $7.2 billion, and outsourcing of IT-enabled services and business processes grew by 59 per cent to reach $2.3 billion (Nasscom 2003b), employing 100,000 people (Wipro 2003).[4] This figure is expected to reach between $21 billion and $24 billion by 2008. IT-enabled services are projected to employ up to 1.1 million people by 2008. In the software services industry proper, direct job creation is forecast to reach 2.2 million by 2008 (*Libération* 2003b).

A few large Indian outsourcing providers are well known in the outsourcing marketplace: GE Capital International services, Infosys, e-Serve, Wipro Technologies, Tata Consulting Group (TCS), Satyam Computer Services and HCL Technologies. The last four alone represented 40 per cent of the Indian outsourcing business in 2002. For example, the revenues of TCS are estimated to reach $1 billion in 2003 (*Economist* 2003b), and Infosys and Wipro are not far behind. To meet demand, these enterprises are heavily recruiting additional staff. Wipro, which has over 5,000 employees, is planning to recruit 1,000 more by May 2004 (*Financial Times* 2003a).

These corporations deal with various BPO functions, from the very basic to the most sophisticated, and have received a lot of business from large IT companies such as Accenture, EDS and IBM (*Economist* 2003b). Most of the larger BPO service providers in India boast an employee base of 2,000 or more. IBM, Accenture and EDS are expected to employ between 5,000 and 6,500 people in Indian offshore development centres by 2004 (Mortstead and Blount 2003).

In fact, the competitiveness of Indian vendors has been so impressive that six states in the United States have proposed bills to limit offshore outsourcing for state contracts and decrease the number of visas issued to foreign workers. In four states the legislation has passed, and starting in 2004 the annual quota for such visas will be 65,000 instead of 195,000 (*Libération* 2003a). Box 5.2 looks at this issue in more detail.

A gender perspective

Outsourcing plays a big role in creating job opportunities, in particular for women, who may be employed largely at the low end of BPO services, working in call centres or performing data entry (see chart 5.1) and other operations requiring low-level skills. As UNCTAD's *E-Commerce and Development Report 2002* demonstrated, the global expansion of software and IT-enabled services has broadened job prospects for women, who can now work from home (assuming adequate infrastructure and bandwidth are available) or in a data centre or telecentre close to home (UNCTAD 2002, chapter 3). The Indian BPO sector, for instance, employs a large number of women. Of Wipro's total workforce of 5,000 employees, 49 per cent are female, while ICICI OneSource's workforce of over 2,400 employees is 60 per cent female. Daksh E-Services also claims that 60 per cent of its employees are women (Aggarwal 2003).

Major obstacles remain in this area, and the policy recommendations made in last year's *E-Commerce and Development Report* remain valid. Women generally have to confront the problems of access to education, infrastructure and finance in order to participate fully in the digital economy. Efforts should be pursued to encourage the participation of women at all levels of BPO services. Enhancing women's awareness of BPO opportunities, their technical and mana-

BOX 5.2

Job migration: A threat to offshore outsourcing?

While developing countries devise national policies and sector-specific strategies to harness the opportunities offered by ICT, there is concern about job migration, mainly in the United States, the largest outsourcing client in the world. A November 2002 study by Forrester Research (2002) estimates that offshore outsourcing will displace 3.3 million jobs from the United States by 2015; 2.31 million of these are expected to go to India.

To minimize job losses in the United States, a recent bill proposal by the US state of New Jersey required that workers hired under state contracts be American citizens or legal aliens, or fill a specialty niche Americans could not, prompting at least four other states to consider similar bills. If the ban on outsourcing is not a danger at this stage, since the deals mainly occur between private companies on both sides, there is nevertheless a fear that further legislation will be enacted to regulate the sector at the business level. The recent debate highlighted the economic potential of BPO and was a preview of the potential protectionist backlash. Commentators are comparing this current fear of migration flow to the one created by the outsourcing of manufacturing a few decades ago and predict that it will not have a very large impact on the future of BPO in developing countries.

Meanwhile, the number of large outsourcing contracts between well-known US companies and service providers in India is increasing. Delta Air Lines has recently outsourced some of its reservation functions to two Indian companies, a move predicted to save about $12 million in costs by 2005. The service providers will handle simple reservations, while complex ones will be taken care of by agents based in the United States.

Source: New York Times (2003).

gerial skills (through training) and their self-confidence (by involving them at decision-making levels) is still paramount for enabling them to generate sufficient income and significantly improve their quality of life.

C. BPO: What is on offer?

Large businesses in developed countries that started by outsourcing back-office functions and those requiring lower-level skills (see chart 5.1) are now increasingly outsourcing more complex functions related to human resources, billing, finance, payroll administration, training, telemarketing, order entry and so on. While large firms may have been the pioneers, increasingly SMEs in developed countries are also choosing outsourcing as a business policy in order to obtain quality services flexibly and a low cost, rather than setting up new internal departments to perform the services.

Some countries' accumulated experience in providing BPO and their workers' ability to carry out complicated tasks could help these countries take advantage of these new opportunities and thus diversify and improve their economic development. The case studies presented in the next section present a sample of BPO providers, including SMEs, in various developing countries. Since BPO is an industry where startup capital expenditures are low, it is a promising niche for SMEs, as long as the necessary telecommunications infrastructure and a low-cost workforce with the ability to execute basic functions are available.

As was mentioned earlier, BPO services span finance, banking, insurance, human resources, e-training, health care, mortgage services, credit card services, asset management, customer care, logistics and distribution, real estate, sales and marketing, and Web-related services (*Financial Express* 2002). Table 5.1 provides a list of the business process services currently offered by BPO service providers originating or operating primarily in developing countries (Goolesby and Parrino 2003). While this list may not be exhaustive, it offers a description of the current situation in the BPO marketplace. According to a recent report by Gartner Inc. (Scholl 2003), the largest single business process being outsourced is the field of human resources services. The market is estimated to grow by 18 per cent in 2003, to $46 billion (DeMocker 2003).

The types of skills, expertise and knowledge needed to be a vendor depend on the complexity and type of the BPO functions being offered to the client. A hierarchy of BPO services by skills level is available for virtually every function within a corporation or

business, whether small or large. The evolution of a complex BPO market with offered and demanded services requiring different levels of skills, knowledge and expertise, depending on the type of business, is a complex process involving multiple long-term critical factors such as education, technological trends, cultural and IT capacity building, trust and confidence, adaptability and flexibility, and a competitive cost structure. Several BPO vendors in India have gained enough maturity and experience to be able to provide more sophisticated services, such as those required by the banking and insurance industries.

Chart 5.1 provides a pyramid of BPO services arranged by level of complexity. It supports the idea that BPO service providers in developing countries should focus on the delivery of services offering higher value, rather than striving to increase their earnings though greater volume. (This is discussed in more detail later in this section).

Many BPO services are basic back-office functions consisting primarily of data entry, data transfer or data conversion tasks; tasks such as moving data from a document or database to a general ledger; and billing services. These tasks require basic clerical skills and can usually be fully accomplished offsite. They are well defined, and their successful completion can be easily measured. In table 5.1, account information capture is an example of a data entry service. However, even in performing basic functions, it is essential to understand the client's instructions. Clients from developed countries may be used to a high level of service and may assume that the instructions they are providing a developing-country company are clear and that terminology in particular is explained clearly enough; in fact, however, this may not always be the case.

BPO vendors may also offer advanced data and accounting services where basic administrative functions (e.g. data entry and billing services) and data conversion tasks (e.g. moving data from a document or database to a general ledger) are performed. As the BPO vendor establishes itself as a reputable business, it may venture to offer more complex BPO services appearing higher up in the value chain (see chart 5.1). However, investment in knowledge and expertise is required for the addition of new and more complex processes such as accounting.

The next level of services involves the ability to follow rule-based and decision-making processes. These processes are clearly defined and their successful

Chart 5.1

BPO hierarchy of services

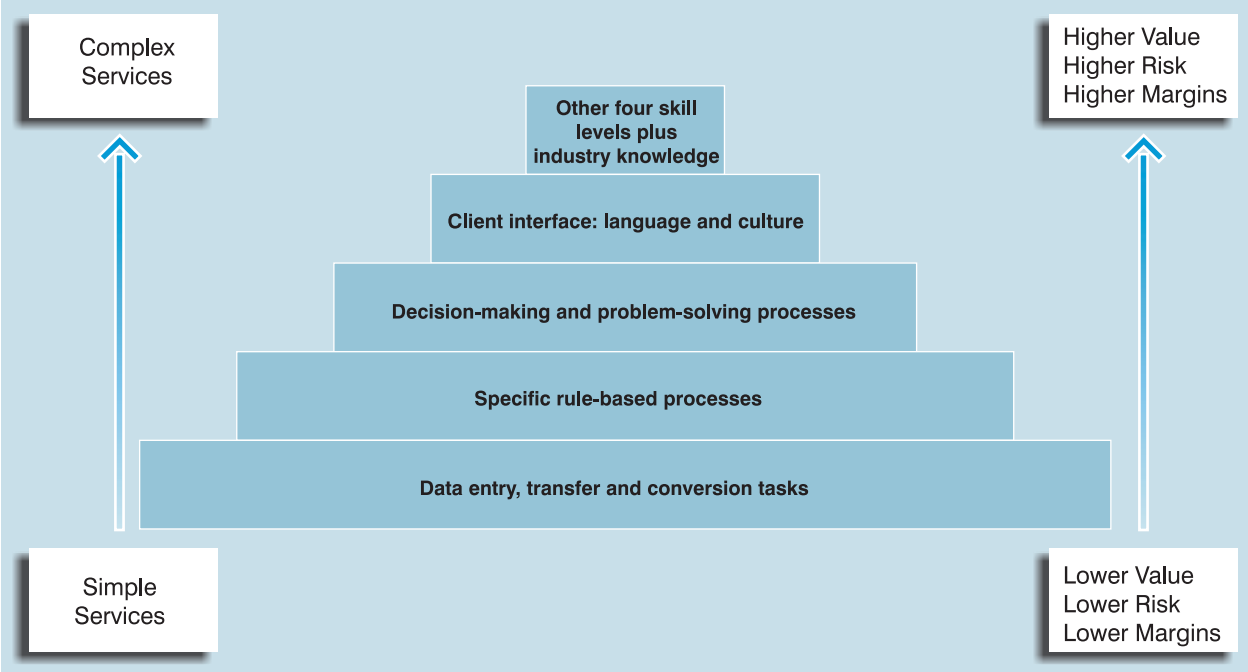

Table 5.1

List of typical BPO services

Banking Services

Account opening services
Account information capture
Customer queries
Check clearing
Check payment reconciliation
Statement processing
ATM reconciliation
Investment account management
Management reporting
Loan administration
Credit debits card services
Check processing
Collections
Customer Account Management

Mortgage Services

Application verification and processing
Disbursals and collections
Payment reconciliation
Account information updates
Mortgage Loan Servicing

Finance Services

Document management
Billing
Shareholder services
Claims processing
Accounts Receivable
Accounts Payable
General ledger
Accounting services
Treasury Operations Management

Credit Card Services

Applications screening and card issuance
Customer account management
Collections and customer follow-up
Account queries and limit enhancements
Accounting and payment reconciliation

Insurance Services

Policy Owner services
Claims processing
Transaction & Re-insurance Accounting
Statutory reporting
Annuities Processing
Benefit Administration
Customer information capture
Risk assessment and premium computation
Policy processing and account monitoring
Claims management
Payment reconciliation

Asset management Services

Account creation
Account maintenance
Transfers and additions
Dividend payments
Brokerage payment
MIS reporting
Customer service

Health Care

Medical Transcription Services

Customer Care

Customer service
Customer analysis
Call centers
Consumer information services
Customer Relationship Mgt

Human Resources Services

Payroll and benefits processing
Training and development
Retirement investment and benefits management
Hiring and staffing
Recruitment screening,
Administration and relocation services
Payroll processing
Compensation administration
Benefits planning
Administration and regulating compliance

Sales and Marketing Services

Telemarketing Services
Direct Marketing and Sales campaigns

Web-related Services

Website designing
Website management
Site personalization
Site marketing
Search Engine, Directory Optimization and Positioning Services
Catalog / content management
Web analytics
Database Design
Web security services and integration with CRM
Back-office systems for inventory management
Web enablement of legacy applications
Electronic bill presentment and payment services
Graphics/Animation
Web-based Email Processing
Web-based Help Desk
Web-based Chat Support
e-Learning :Web based online education services [4]
e-publishing

completion requires a certain level of discipline and focus. In table 5.1, account opening services are an example of a rule-based process service. Screening credit card applications and issuing cards are examples of a decision-making process.

When the BPO service includes direct contact with clients, as do telemarketing, e-publishing, and customer support through a call centre, the skill requirements increase dramatically. BPO service providers working with clients worldwide must have not only

excellent communication skills but also knowledge of the client's language(s), mindset and native industry. When the service provider offers consulting or advisory services, complex specialized business skills and relationship-building skills are required.

BPO clients are now going beyond transaction processing and expect to achieve a degree of business processes transformation through outsourcing. As the skill and knowledge requirements increase, the cost of the employees providing the services also increases. So does the value of the service, and profit margins may increase significantly as well. This is partly owing to the cost the client would incur by retaining highly skilled employees to perform advanced functions in-house. Competition in this new market is high. With an increasing number of developing countries offering low-cost skilled labour for BPO services, primary BPO vendors need to upgrade the scope and level of their services.

D. Case studies from developing countries

The previous section demonstrated that once the minimum telecommunications infrastructure, including Internet access, is in place, BPO can materialize in developing countries, including least developed countries, at least in the form of basic data entry services, where the required skill level is low.

The case studies presented in this section demonstrate various strategies that BPO service providers in the developing world have used to implement and run their businesses. They illustrate different issues covered in the previous section. The first case is that of a social enterprise offering digitization and data entry services in Cambodia with a view to providing jobs and educational opportunities for disabled people. The second case relates to a Kenyan woman who created her own enterprise to provide BPO services worldwide in the form of simple data mining assignments and more specialized Internet research. The third case refers to an Indian enterprise, Daksh, that is well established in the outsourcing market as a BPO service provider for integrated customer care services and is preparing to offer BPO services in the area of travel and leisure. The last case focuses on the recent initiative by the Government of Mauritius to build up a Cybercity, involving IT outsourcing and BPO service providers in an effort to make the ICT sector the fifth pillar of the economy after sugar, textiles, tourism and the financial services sector.

1. DDD Cambodia[5]

DDD (Digital Divide Data)[6] is based in Phnom Penh and describes itself as a social enterprise for creating skilled entry-level jobs and educational opportunities. It provides outsourced data services, mainly data entry, to business and public-sector customers domestically and internationally. From January to may 2003, DDD has won 15 contracts, and its annual revenue for 2002 totalled $150,000.

Created in July 2001, DDD is a charity-funded project initiated by a local Cambodian non-governmental organization (NGO) and assisted by a US foundation, Global Catalyst, which granted $25,000. Another $25,000 was to be raised by DDD to purchase needed equipment and to pay salaries in order to start operating. The idea was to use ICT to provide job opportunities to disadvantaged groups, including people with disabilities, land mine and polio victims, orphans and women. In July 2001, DDD started business with 20 employees and its first client, Harvard University in the United States, which had decided to digitize some of its archives.

DDD offers to digitize documents into different formats and send them back via email (connected at a sufficient and workable 64 kilobits per second) or FTP (file transfer protocol) or on CD-ROMs delivered by courier. One of the company's main concerns when it began operations was to understand clients' technical requirements. DDD started by concentrating on a few projects in order to ensure quality results. The staff members undergo continuous training to provide quality services and ensure client satisfaction. Considering India's positive experience with outsourcing, the manager of DDD has undergone training at Cyberdata, a BPO company in New Delhi that specializes in data conversion and digitization. To ensure high-quality work and compensate for expertise that it lacked when it started operations, DDD entered into partnership with Cyberdata, which will get clients though DDD in exchange for providing software and IT and management training. In 2002, DDD outsourced 60 per cent of its activities to Cyberdata, as compared with 30 per cent in 2003. About 70 per cent of DDD's clients are from the United States, mainly universities (submitting library archives, microfilm, etc.) and law firms (submitting telephone records); the remaining 30 per cent are

local SMEs, NGOs and the National Library of Cambodia.

DDD maintains that it is run "as a self-sustaining co-operative, with all profits going back into the business to provide fair salaries, ongoing training and health services for its employees". DDD allows staff members to work flexible hours, including part-time, so that they can continue their studies, and it pays them an average of $65 a month. (A factory worker earns around $40 a month.) In April 2003, DDD was employing 93 people, 50 per cent of them women, at all levels of responsibility. Ten employees have already benefited from career advancement opportunities, moved to another enterprise, and been replaced by DDD. DDD is planning to open offices in Battambang (Cambodia) and Vientiane (Laos) and hopes to employ 500 people by 2005. DDD has also engaged a representative in the United States to promoting DDD's services at trade shows and by telephone and email marketing.

2. PrecissPatrol Kenya

Founded by Mugure Mugo, a young Kenyan woman entrepreneur, E-Business Solutions Ltd. began operations in 1998 and was formally registered in Kenya in January 1999. It started by offering website development solutions, targeting the East African market. In November 2001, it became involved with the UCTAD/WTO International Trade Centre (ITC)[7] through the Kenya Nationwide Task Force on E-Commerce, of which Mugo was a board member. Recognizing the benefits of BPO, Mugo registered Preciss Services in April 2002 as a subsidiary of E-Business Solutions Ltd. and began operations as PrecissPatrol in July 2002. With $5,000 and the support of E-Business Solutions Ltd. in terms of human resources, office space and telecommunications equipment, she went on to register the company in the United States in July 2002, after which PrecissPatrol was able to open a small liaison office in Massachusetts. The existence of this office greatly facilitated various operations such as marketing, banking and communicating with potential clients. In four or five months, PrecissPatrol was able to cover its operating costs and was no longer relying on E-Business Solutions Ltd. for support.

The staff of five full-time employees, each with a diploma in IT, is equipped with a high-speed multimedia computer and a permanent Internet connection. Additional workers are hired on a project-by-project basis. The projects handled by PrecissPatrol range from simple data mining to specialized research on the Internet. Website management and software testing services are also offered, and for the latter PrecissPatrol recently signed a partnership agreement with a United States-based software testing firm. Recently PrecissPatrol has serviced categories of enterprises ranging from market research firms, consulting and training firms, and online directories to Internet filter development firms. Their clients are mainly based in the United States, the United Kingdom and the Netherlands, and inquiries have recently been received from Australia, Canada and the European Union. Offering competitive prices is central to acquiring business, and PrecissPatrol has managed to undercut United States-based competition by almost 50 per cent (Bacon 2002).[8] In the future, PrecissPatrol plans to provide new services such as incoming and outbound call centre services and other back-office services.

PrecissPatrol has a bank account in the United States to facilitate payments by clients based there. For smaller projects and other countries, including the Australia, Canada, the Netherlands and the United Kingdom, PrecissPatrol receives payments through PayPal, an online payment service.[9] The main challenge has been the issue of credibility and trust in international markets. Potential clients sometimes feel uncomfortable paying for a service provided by a company thousands of miles away. PrecissPatrol has over time devised ways of overcoming this problem, usually by offering concessionary fees for a trial period during which clients are able to test the service to their satisfaction.

While BPO may be a new concept in Kenya, according to Mugo, Kenya has much of the necessary infrastructure and human resources to succeed as a destination for BPO vendors. In recent years Kenyan firms have been actively involved in exporting various types of services related to areas such as architecture, engineering and accounting. In order for Kenya to become a recognized destination for outsourced services, the support of institutions such as the Export Promotion Council, the Investment Promotion Centre and the Nationwide Task Force on E-Commerce (all national export support institutions) is paramount. While initially the success of BPO may be driven by companies, government support and a stable legal and business environment are important for fostering success in any country. Recognizing the opportunity, the Government of Kenya is now starting to get involved in supporting the sector. For example, in April 2003 the Export Processing Zone (EPZA) invited a number of firms involved in BPO

to discuss how the EPZA could help them. A number of other government and non-governmental organizations are also involved in assisting this emerging sector.

Mugo has developed a website to support the efforts of PrecissPatrol, as well as those of any Kenyan firm interested in marketing its services in the international BPO market (*www.outsourcetokenya.biz*). The site is a good example of a country-level marketing site and contains all the information that investors need to know if they are planning to do business in Kenya.

3. Daksh India

In November 2002, Daksh[10] was recognized as one of the top two contact centres in India in terms of revenues.[11] The outsourcing services offered by Daksh include the following:

- inbound customer service and technical support
- outbound collections and telemarketing
- back-office processing and customer feedback programs
- data analysis, reporting and processing
- customer interaction services (email, chat, etc.)

In the near future, Daksh plans to foray into new areas like travel and leisure and utilities. Daksh was founded in 2000 in response to high demand from companies (mainly based in the United States and the United Kingdom) looking for quality and cost advantages. On its website, Daksh claims to be the leading provider of BPO services to Fortune 500 companies.

Daksh has four service delivery centres – three in New Delhi and the fourth in Mumbai – and is evaluating the feasibility of setting up operations in South East Asia. Daksh also has two points of presence in the United States, in New York and Los Angeles. With 3,600 employees, Daksh claimed revenue of $18 million in 2002 and expects to reach $29 million by 2003, adding an average of six to eight clients a year. Its outsourcing contracts tend to vary from three to five years, and clients are found mostly through referrals by existing clients.

Daksh has multiple security systems in place to guarantee 24/7 services to its clients. It also has bandwidth provision via satellite for extremely critical services that may need to be operational during major outages of connectivity channels. Redundant hardware and power supplies are in place to counter any local deficiencies. In addition to telecommunications infrastructure, human resources play an important role in the BPO industry. The industry employs a large number of fresh graduates, and it is important to keep their interest and maintain retention levels through ongoing training. Daksh has developed a strong pool of in-house trainers who train customer care specialists in various subjects like voice and accent, soft skills and behavioural training, and product training.

According to Sanjeev Aggarwal, chief executive officer, the implementation of a well-prepared business plan, a combination of adequate funding and a sound infrastructure, and a few clients to jump-start the venture all contribute to a BPO venture's initial success. Since quality is a key component, stringent methods and checks aligned to the client's requirements should be in place. All these steps minimize the chances of encountering difficulties along the way, and they help to ensure long-term stability and ongoing success.

4. Cyber island Mauritius

The Government of Mauritius recognized very early that its ICT sector was an important key to the future development of the country, and it has embarked on ambitious long-range plans.

The Government plans to transform Mauritius into a "cyber island", as the adoption of ICT in all sectors is expected to enhance productivity and quality and improve competitiveness. The aim is to create an ICT sector that will enable Mauritius to participant fully in the digital economy by becoming a regional hub in the Indian Ocean.

The strategy to develop Mauritius into a cyber island revolves around the following:

- research and training institutions
- a local labour market with high-quality technicians, engineers and software developers
- favourable tax and credit incentives
- bureaucratic efficiency and institutional support
- world-class telecommunications infrastructure

There are about 150 companies in Mauritius working in areas as varied as hardware and software supply, software development, three-dimensional animation and multimedia development, IT training, back-office operations, call centres, data encrypting and electronic archiving, back-up centres, electronic publication and website development. The island has an ATM network and many other services such as ISDN (integrated services digital network), ADSL (asymmetric digital subscriber line), frame relay and the like. Mauritius Telecom has been privatized, and 40 per cent of shares are owned by France Telecom. Liberalization of the ICT sector has been implemented in a strategic and forceful way to boost investment in this sector. Internet service provider (ISP) licenses have been granted to 20 companies, and major developments are expected in the years to come.

The number of fixed telephone lines increased from 21.2 per 100 inhabitants in 1998 to 27 per 100 inhabitants in 2002. Mobile phone use increased from 5 per cent in 1998 to 30 per cent in 2002. The number of Internet subscribers rose from 35,000 among a total of 300,000 households (11.7 per cent) in 2000 to 50,000 (16.7 per cent) in 2002, while the number of Internet users increased from 123,000 in 2000 to 173,000 in 2002. Eighty-three per cent of businesses have at least one computer, 43 per cent have a network, 75 per cent have Internet access and 21 per cent have a website.

While BPO vendors and clients may certainly benefit from the modern telecommunications infrastructure available in Mauritius, Government support for ICT is seen as a key component for accelerating the development of this sector. A ministerial committee chaired by the Prime Minister has been set up to monitor progress in development of ICT, in particular the implementation of a "cyber city" project, know as "Ebene Ciber City".[12] The committee is also responsible for follow-up and coordination of action on the strategic partnership formed between India and Mauritius regarding IT development in Mauritius. India has granted Mauritius a credit line of $100 million to develop the ICT sector, and the agreement provides for support from Indian institutions such as the Software Technology Parks of India for the development of the island's ICT sector.

In addition, three ministerial task forces – chaired by the Deputy Prime Minister and Minister of Finance, the Minister of Information Technology and Telecommunications, and the Minister of Education and Scientific Research respectively – are to ensure the efficient development of Ebene Cybercity and business parks, e-government, e-education and training. Ebene Cybercity will offer state-of-the-art facilities for the development of software and multimedia, training in ICT, call centres, back-office operations, data encrypting and electronic archiving, back-up centres, e-publishing, and website development.

BPO has been identified as a niche area for ICT development, and a secretariat has been set up at the Government Board of Investment to handle BPO projects. ICT companies investing in Mauritius include Infosys, Satyam, IBM, Microsoft, HewlettPackard and Accenture, which (in partnership with DCDM Consulting) is currently managing BPO projects from a delivery centre. Others include Berger Levrault (information processing, publishing and information management), Centrefile (human resources and payroll services), Cendris (document management, imaging and data processing, database management, printing and mailing, scanning and retrieval, and e-commerce), Mondial Assistance Group (business-to-business assistance, travel insurance and service provider), Bowman Cybercity (call centres), Answer Plus (telephone answering services and tele-messaging) and Ingecom (development of radio frequency electronic systems and modules and radiolocalization).

Individual initiatives in the broader ICT sector are being encouraged by the Government. A number of start-ups by young entrepreneurs have already become operational in the Incubator Centre of the National Computer Board. The Development Bank of Mauritius is introducing a scheme to finance enterprises engaged in ICT-enabled services and development of ICT products.

E. Conclusions

Outsourcing to offshore vendors, or "offsourcing",[13] is expected to continue growing in the near future, since it represents a positive business option for reducing costs by employing workers in developing countries (Gartner 2003). The cost implications and real business process benefits for clients have not yet been fully assessed, and the level of BPO services provided by most developing countries is still low. However, competitive advantages and conomic pressures encourage companies located in the United States and Europe to look for partners in developing countries to deliver quality business services, and this trend is likely to continue.

Since its early stages, outsourcing has matured and has become a way for developing countries to exploit competitive advantages while embarking on e-business activities using ICT. Providing BPO services via the Internet allows a country to take advantage of an industry that does not have the logistical and geographic issues of other types of business that may require an individual to be physically present to deliver the product or service. India has managed to translate the success of its software services industry into ITES/BPO services, and Indian BPO vendors have already opened offices in the United Kingdom and are looking to set up IT services companies in France (*Le Monde* 2003a). However insightful, Indian BPO champions are not representative of a developing country that still has to discover its potential and start from scratch. While ICT play a central role in enabling developing countries to benefit from the digital economy, a number of countries affirm that government and international support can help ensure that the benefits of developing a BPO industry actually materialize.

The case studies demonstrate that potential BPO service providers need to assess infrastructure and skills requirements, define a rigorous business plan, develop marketing strategies to promote local competencies and find clients, and maintain competitiveness. BPO service providers should identify funding possibilities as well as potential local, regional and international partners, and should implement in-house or on-site training programmes aimed at continuously improving service quality and performance as well as knowledge of new technologies, while fostering a proactive policy on gender issues. Many BPO service providers have established points of presence in the United States or Europe and market their services online. The case studies also highlight the importance of national government support at the highest level to create an enabling environment for ICT opportunities, encourage policy reforms to build a climate of trust, and bring ICT to all citizens, including underprivileged communities. The conclusions provide suggestions for potential BPO providers, as well as Governments in developing countries that wish to develop their capacity to provide BPO services. These services have much in common with other types of opportunities deriving from ICT in general.

1. Enterprise-level strategies

To respond adequately to the challenges facing developing-country companies wishing to succeed as BPO providers, several issues need to be addressed.

Emphasis on high-quality services

Because BPO services have evolved in complexity, they present greater risks to clients in terms of quality delivery of services than IT outsourcing; thus care needs to be taken when embarking on BPO. When considering the creation of a BPO business, companies in developing countries should focus on one service type at a basic skill level as an entry point, such as data entry (see chart 5.1). Once this level has been mastered, services can be expanded to include more complex business processes. Starting at a lower skill level reduces the cost and risk, while trial run and phase-in services ensure quality implementation. Beginning with low-risk projects and paying special attention to the transition is what really matters. Equally important is to focus on a few projects to provide high-quality services and thereby learn the business mentality of BPO clients, build confidence, and successfully promote developing countries' capacities, even though locations may often be very far offshore.

In-house training should be provided to enable workers, in particular groups with special needs (e.g. women), to upgrade their professional skills, giving them a chance to participate at a higher level in the provision of BPO services. BPO service providers should supply career options in order to keep attrition rates low, which in turn enables retention of skills, expertise and client knowledge. Teamwork and trust are also essential for any outsourcing business to succeed, and the notion of a creative, as opposed to disruptive, relation between leadership and collective ambitions can be enhanced through training.

Communication with clients

Quality of service may be one of the main drivers to outsource offshore, but behind quality what really matters is communication between the clients and the BPO vendor. Good comprehension of the tasks to be accomplished is a key factor for succeeding in business. When offshore outsourcing is conducted though ICT (mainly email), such comprehension is even more crucial. Long distances increase the need for accurate guidelines and communication skills. They require an understanding of the outsourcing client's mindset, needs and business. The more the service involves interaction with the client or the client's customers, the more language and communication skills become a decisive factor in doing business with a company or within a country. They are critical in an

outsourcing environment, where problem solving and the communication of news are essential for the success of the business and the BPO services agreement. Being able to communicate with and understand the needs of the client and have the client understand the service provider are of key importance in selecting an outsourcing business partner.

To that end, BPO service providers should communicate early and often with foreign counterparts, as communication is crucial for the success of any project or relationship, especially when there are differences in language, culture and work style. Providers should make sure that project work requirements are well known and success criteria and outcomes are clearly defined, communicated and understood and are measurable. For each project, key performance indicators should be in place to regularly evaluate progress.

Diaspora as a network for outsourcing

Cultural understanding is also a very important element of success when BPO services require frequent communication with clients. BPO clients look for vendors that have a similar culture and mindset in order to ensure the viability of the business relationship.[14] Collaboration requires an understanding of cross-cultural social dynamics and their impact on communication. While the BPO service provider has primary responsibility to adapt to the cultural norms of the client, the client needs to be aware of cultural differences that may affect successful delivery of the service and the success of the outsourcing agreement. Challenges arise when the two sides are not conscious of many of their cultural differences. In that case behaviours and communications may be misinterpreted, with resulting actions that could disrupt business and jeopardize its success (Kearney 2000).

This explains why BPO deals often happen through diasporas. Executives originally from Bangladesh or India, for example, might be motivated to outsource to their respective countries. BPO vendors in turn need to target and organize their nationals working abroad, many of whom are fully aware of and comfortable with the cross-cultural issues involved and can overcome the potential communication problems. BPO service providers should establish strong linkages with overseas diaspora networks, universities, private-sector leaders, and consular and foreign trade authorities in their Governments.

Concise service requirements

It is imperative for outsourcing partners to invest time and money to ensure proper project management by ensuring the development and implementation of good processes. Clear and concise process requirements, work descriptions and agreements, and performance metrics diminish the risks involved in working with global teams. They define the expectations of both the service provider and the client and ensure the delivery of quality services (Terdiman 2002). Contracts may vary depending on legal requirements or on the business conventions of the client and vendor countries. The typical outsourcing agreement should be thorough enough to be read and understood by those who will be responsible for managing the contract during the lifetime of the outsourcing project, in particular since outsourcing agreements may be defined for up to 10 years.

Agreements should include a definition of the actual services to be performed, the performance requirements and service levels, the framework of a change management process (needed to track any changes that may occur in the program requirements during the years of service), the organizational structures of the vendor and client, and dynamics management and review meetings. A project management plan should be drawn up indicating programme milestones and project team contact information. An issue resolution process defining whom to contact and what to do when an issue cannot be resolved immediately, along with penalties for missing performance requirements and a glossary of terms, should be negotiated in order to avoid ambiguity.

Marketing, partnering and labelling

There are strong incentives for using ICT to promote BPO services, and going online is a fundamental for marketing companies' offerings. Developing a relevant Internet presence is now a common practice for BPO service providers in developing countries. A comprehensive website proposing well-defined services, clear prices, competitive advantages in terms of cost reduction and service quality for clients, and a client reference list helps create a trustworthy environment.

Many companies in the United States and Europe do not know where to search for a trustful and reliable partner. BPO vendors should develop partnerships

with major global clients as a way to enter the outsourcing market and establish their company in the BPO business. BPO service providers in developing countries also have to keep abreast of the latest technological trends in order to remain competitive in the global outsourcing marketplace.

Many BPO vendors have established points of presence in the countries where the majority of their clients are located. Participating in international business events – such as the conferences organized by the Outsourcing Center,[15] the Outsourcing Institute or its affiliate members[16] or CIO.com,[17] and specific organizations (e.g. the Global Offshore Outsourcing Summit held in India in April 2003) – should also be considered as a way to find potential clients and learn about strategies and good practice.

Creating an outsourcing certification label for companies that corresponds to the different types and levels of complexity of available BPO services may be a prerequisite for successfully matching providers' services with clients' needs.

2. Government policy options

The expansion of BPO services in a developing country depends to a certain extent on its capacity to identify potential niches and make the required investments in terms of telecommunications infrastructure, education, a legal framework, and tax incentives to attract overseas clients (see chapter 3). The importance of government support in enabling a favourable environment for ICT has been often recognized. Tailoring a national development strategy to benefit fully from the new BPO marketplace is crucial to ensure the development of a profitable market. National ICT policies and strategies embrace several sectors such as telecommunications, human resources, law and taxation, and finance and payment systems to promote the use of IT in commercial activities.

However, many government officials in developing countries are still not fully aware of the potential of developing a BPO industry, and some awareness building activities by international agencies and NGOs may be pursued needed. Tangible success in the BPO arena may encourage Governments to implement the necessary measures, and especially to help SMEs fully exploit ICT opportunities. Even if the overall impact of BPO on developing countries' economies cannot yet be assessed, at the community and firm levels, BPO has emerged as an economic driver for education, employment and social issues.

ICT infrastructure and access

Telecommunications infrastructure and access remain the main factors in ensuring delivery and maintaining the confidence of clients outsourcing to developing countries, thus making BPO economically viable. The technology needed to conduct outsourcing business is available in most developing countries and in urban areas of least developed countries. However, entrepreneurs in rural areas have little chance of getting a share of the outsourcing market, given the urban-rural divide in many developing countries. Fostering the development of ICT infrastructure in rural areas will be key to unlocking the development potential of BPO.

Governments should encourage computerization and automation in enterprises and should support cost-effective technologies such as voice-over Internet protocol (VoIP) that lower telecommunications costs, thus allowing local BPO vendors to offer services at a competitive price. With improved Internet access and increased bandwidth, VoIP telephony is set to expand rapidly, provided monopoly long-distance telecommunications operators are not given regulatory protection. If this technology is still treated as illegal by the laws of many developing countries, this is mainly because it damages the financial position of national telecommunications operators. However, there is often no practical way of enforcing the laws. The number of VoIP companies offering their services openly in Internet cafes is increasing in many developing countries. Some countries have already taken steps to legalize VoIP. For example, in Bangladesh the Telecommunication Regulatory Commission in May 2003 took a position in favour of the use of VoIP, and legalization of this technology that provides new opportunities for increasing access to communication services was expected to occur in 2003 (Rahman 2002).

While legalizing VoIP, some Governments in developing countries would like to give this technology a legal framework and collect revenues through possible taxation of VoIP, license fees and other taxes, or restricting its provision to the monopoly telecommunications operator. The risk is that regulation of VoIP will hinder its deployment in some countries, particularly if no liberalization occurs in the telecommunications sector.

Education

The growth of the BPO industry has offered employment opportunities in developing countries for both educated and uneducated workers, male and female, as most of the basic BPO services do not require a high level of education and can be learned on the job. However, as was mentioned in section B, the provision of certain BPO services, especially high-value ones, relies heavily on the skills and specialized expertise of the vendor country workforce.

Governments could prioritize education and e-education in their development policies and could reform the curriculum of their universities and schools to include subjects in support of a technology-enabled and export-oriented service sector. The developing countries that are recognized for their outsourcing capacities have certain standards for their higher education systems. This is true of Indian universities, which attract many foreign students from the Asian region to study computer-related subjects (*Le Monde* 2003a). Other educational reforms include the example of Romania, whose educational system promotes studies in mathematics, engineering and IT services (Overby 2002).

Governments could also encourage cultural exchange programmes with other countries that related to Internet-enabled businesses. They could, through their e-government umbrella, develop national portals to market the country's business capacities.

Tax incentives

Developing countries' Governments should consider offering tax incentives and financial backing to help develop a technology services industry. Like the Government of Mauritius, the Government of India has shown support for businesses entering the technology market – in India's case, through tax breaks and other financial support that encourages foreign-based companies to outsource part of their business, or to develop and own businesses in India. In September 2000, India's Ministry of Finance made IT-enabled services exempt from income taxes.

An increasing number of clients are looking to outsource business processes to reliable partners in developing countries, but they do not always know where to find these partners. UNCTAD has recently received requests from companies looking for a database of BPO service providers in several developing countries. In one case, a company in the United States wanted information about outsourcing software development for the mortgage industry in Chile, Israel or Ukraine. While demand is high and developments in India indicate rosy prospects for the future, the development of a BPO industry is intimately connected to the wider issue of ICT for development currently being discussed by the international community. Thus this issue needs to be addressed within the wider framework of government e-strategies and policies.

Notes

1. This use of the term offshore is different from how it is used in the financial industry.
2. Several sources mention current leading destinations. The countries listed are those most often quoted in the literature.
3. See www.pwcglobal.com.
4. See www.wipro.com/spectramind/why_bpo.htm.
5. This section draws on material from online interviews with selected DDD employees.
6. See www.digitaldividedata.org.
7. See www.intracen.org.
8. In this article the author, a PrecissPatrol client based in the United States, describes his experience with the company.
9. See www.paypal.com.
10. See www.daksh.com.
11. Calculated according to US GAAP (Generally Accepted Accounting Principles), as per Nasscom.
12. See Survey of On-Line Governance (1999/2000), a joint project by UNESCO and COMNET-IT, at www.comnet.mt/unesco/Country%20Profiles%20Project/mauritius.htm.
13. Mortstead and Blount (2003).
14. S. S. Cheng, General Manager of HP Outsourcing Southeast Asia, in an interview with the Computerworld Singapore IT Outsourcing Forum, www.computerworld.com.sg/pcwsg.nsf/unidlookup/E78AD5906A92B69648256BA5001E7896.
15. See www.outsourcing-events.com.
16. See www.outsourcing.com.
17. See www.cio.com.

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Chapter 6

Marketing Developing-Country Agricultural Exports via the Internet

A. Introduction

This chapter examines the possibilities for using information and communication technologies (ICT) and e-commerce in the marketing[1] of agricultural commodities exported by developing countries. In particular, it attempts to assess the extent to which prices and income accruing to commodity producers can be improved through the use of ICT and the Internet. In a wider sense, it strives to show possible applications of ICT and e-commerce to an economic activity that is fundamental to the economies of many developing countries. The study is motivated largely by the fact that a number of initiatives are already underway to use online marketing of agricultural commodities in developing countries – for example, coffee in Brazil and Kenya and tea in India and Sri Lanka. The study also responds to the ongoing crisis of declining commodity prices, which in many cases has been blamed on the prevailing market structures. While the problems of agricultural commodity markets in developing countries are complex and multidimensional and need to be addressed by a range of policies and strategies, online marketing may make an important contribution to those policies and strategies, taking into account the growth of Internet-based supply chain management functions.

The discussion is limited to Business-to-Business trade and uses coffee and tea as case studies. The two commodities are considered to be sufficiently representative, although variations exist in the importance of different commodities in different countries, and in the marketing systems used. Coffee and tea are major commodities produced by a large number of countries in all developing regions. Both commodities have seen prices fall drastically in the past two decades. The price crisis has directly adversely affected millions of people in developing countries, especially since the production of coffee and tea is labour-intensive; the planting and processing of both commodities involves substantial rural employment in producing countries. Both commodities have received a great deal of attention in debates concerning the economic problems of developing countries, and both are listed as Fair Trade commodities.[2]

To put the application of the Internet in perspective, the chapter describes the structure of the marketing/supply chains of coffee and tea, where a large number of intermediaries and a system of market relationships give greater market power to the import side than the export side. Such a disparity in market power results in prices that are largely determined by importers, and the share of total export earnings is disproportionately in favour of importing companies. As chart 6.1 shows, in recent years the coffee prices paid to producers (Brazilian/Naturals Group and Composite Indicator Price) declined, while retail prices in importing countries (Germany, Japan, UK and USA) have remained unchanged or have increased.

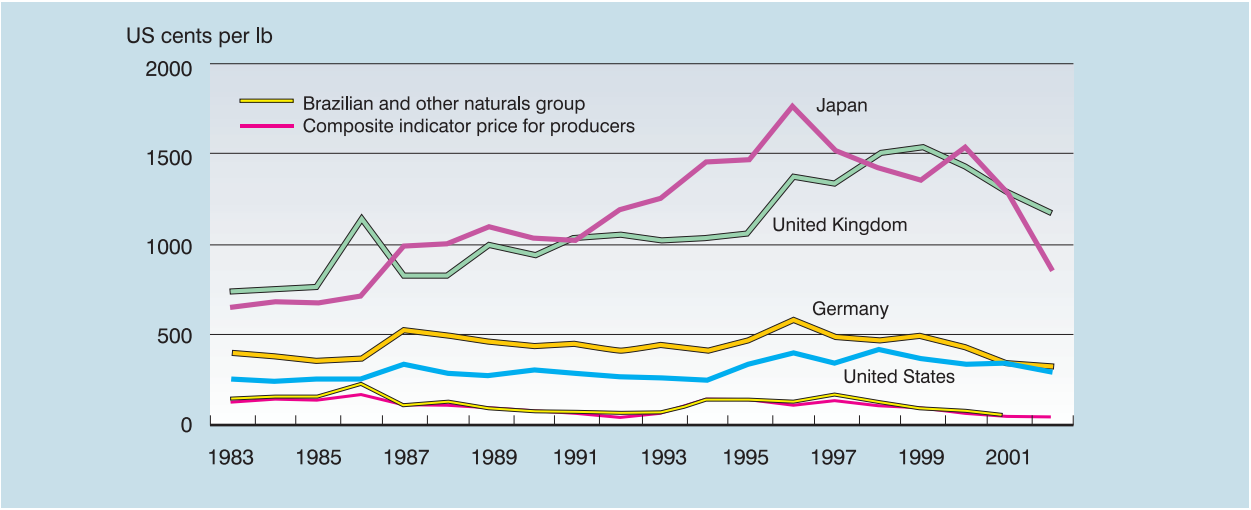
To date, most of the measures that have been proposed or implemented to address problems involving the export prices of developing-country agricultural commodities have focused on commodity supply management, improving quality, and liberalizing marketing. Little or no attention has been paid to measures to deal with the distribution of export earnings between small producers on the one hand and large importing firms on the other. The chapter considers whether the Internet can facilitate more direct marketing and bypass some intermediaries, thereby allowing producers to retain a larger share of the export price.

B. The importance of agricultural exports in developing countries

The production and export of agricultural commodities from developing countries deserve attention because of the central role that these commodities play in the economies of those countries. UNCTAD

Chart 6.1

Comparison of producer prices with retail prices



Source: International Coffee Organization

research (1994, 1995, 1999 and 2000) has highlighted the problems and policy issues of the international agricultural trade, using coffee and/or tea as examples.

In many developing countries, agricultural exports represent a considerable share of total export earnings and also of the total gross domestic product (GDP). Table 6.1 illustrates this heavy dependence on agricultural commodities for selected countries. Equally significant is the fact that in many of those countries only a few commodities play a key role in the national economy. For example, in 2001 in Sri Lanka tea accounted for 13 per cent of the country's merchandise exports. In Burundi, Ethiopia, Rwanda and Uganda, the share of coffee in the value of total exports exceeded 56 per cent over the period 1996 to 2003.[3]

Table 6.1

Agriculture products as percentage of total GDP

	1996-99	1991-95	1986-90	1981-85	1976-80	1970-75
Developed countries	2.00	2.20	3	4	5	6.00
Developing countries	13.75	14.00	17.6	17.6	19.4	24.33
Developing countries: America	7.75	7.80	9.8	10	11.4	12.67
Developing countries: Africa	22.75	22.80	23.8	22	22.2	25.50
North Africa	16.25	15.00	16.2	13.2	14.2	18.50
Algeria	11.25	12.40	13.2	9.8	10.6	10.17
Egypt	17.25	17.20	19.8	20	23.8	29.83
Morocco	16.50	16.80	17.2	15	18	20.50
Sudan	39.67		34.5	34.4	37.4	43.83
Tunisia	13.25	14.40	14	13.8	15.4	19.00
Other Africa	29.75	29.60	30.8	31.2	29	30.50
Angola	9.00	12.00	16	14	..	..
Benin	38.25	34.60	35	32.8	34	33.50
Botswana	4.00	4.40	5	7.6	15.8	27.67
Burkina Faso	32.50	34.40	32.4	34	34.4	35.67

Table 6.1 (*continued*)

	1996-99	1991-95	1986-90	1981-85	1976-80	1970-75
Burundi	53.75	50.60	55.6	59.4	62.6	67.50
Cameroon	42.25	32.00	24.6	25.6	31	30.67
Cape Verde	12.25	13.20	16.2	..	..	..
Central African Republic	52.25	45.60	47.8	42.4	39.8	37.67
Chad	36.75	35.40	32.8	38	38.8	39.17
Comoros	39.00	39.20	39.2	34.6	34	..
Congo	10.00	10.60	12.8	7.6	14	16.00
Côte d'Ivoire	27.25	31.80	30.8	24.8	25.2	29.50
Dem. Rep. of the Congo	58.00	51.00	29.6	29.6	24.8	14.83
Djibouti	4.00	3.00	3	..	..	..
Equatorial Guinea	24.25	51.80	64.4	69	..	..
Eritrea	13.00	17.25	..	..	..	..
Ethiopia	52.00	57.00	49.8	53.6	..	..
Gabon	7.25	8.20	9.2	6.4	6.2	12.00
Gambia	30.00	27.40	32.2	35.4	33	35.00
Ghana	36.50	41.00	48.6	52.8	57.2	47.67
Guinea	23.25	22.60	24	..	..	..
Guinea-Bissau	59.25	53.80	54.4	45	48.4	45.83
Kenya	26.50	30.00	31.2	33.4	37	33.83
Lesotho	17.67	17.80	23.4	24.2	30	36.17
Madagascar	31.25	34.40	34.2	34.6	31.6	28.00
Malawi	36.75	37.40	47	41.6	44	42.33
Mali	47.50	46.20	45.2	43	57.8	60.67
Mauritania	24.75	27.40	30.8	30.2	29.2	31.67
Mauritius	8.50	10.20	13.2	14.4	18.4	20.50
Mozambique	34.50	32.60	42.4	36.8	37	..
Namibia	12.25	11.60	11.4	10.6	12	..
Niger	40.50	39.40	34.8	41	48.8	61.00
Nigeria	34.67	27.80	36.2	33.2	27.8	36.33
Rwanda	47.50	40.40	40.4	43.6	51	62.50
Sao Tome and Principe	23.00	26.80	28	28	28	..
Senegal	18.75	19.20	21	19.4	24.2	24.17
Seychelles	4.00	4.20	5	6.8	8.2	..
Sierra Leone	44.00	41.20	50.4	40.6	35.4	32.50
Swaziland	17.50	14.20	16.6	20.6	28.8	34.33
Togo	40.75	37.00	33.6	31.2	28.6	30.17
Uganda	44.00	51.00	57	55.6	72	..
United Republic of Tanzania	46.25	47.20	46	..	..	..
Zambia	20.75	21.60	17	16.2	16.6	13.00
Zimbabwe	20.75	14.20	15.8	16.6	16.2	18.67
Developing countries: Asia	16.00	16.20	20.6	21.6	23.4	32.50
Developing countries: Oceania	23.25	18.60	26	30	30.6	30.33
Developing countries: Europe	8.25	9.00	3.8	4.4	5	6.83
High-income countries	6.25	6.60	7.8	7.6	8.8	10.83

Table 6.1 (*continued*)

	1996-99	1991-95	1986-90	1981-85	1976-80	1970-75
Middle-income countries	12.50	13.00	16.4	15.8	17.8	20.83
Low-income countries	23.50	26.40	29.8	33	33	36.50
Least developed countries	31.50	33.60	34.4	36	35.4	35.17
Heavily indebted poor countries	31.25	33.20	33.8	33.4	32.6	30.17
Land locked countries	27.25	30.60	35.8	35.6	34	35.00

Source: World Bank and FAO sources and UNCTAD calculation

Chart 6.2 shows the share of coffee in the total export receipts of selected major coffee-producing countries. In other countries, while the total share of export earnings accounted for by given commodities may be small, they nevertheless play a critical role in the economy in other ways, especially in creating employment opportunities in rural communities.

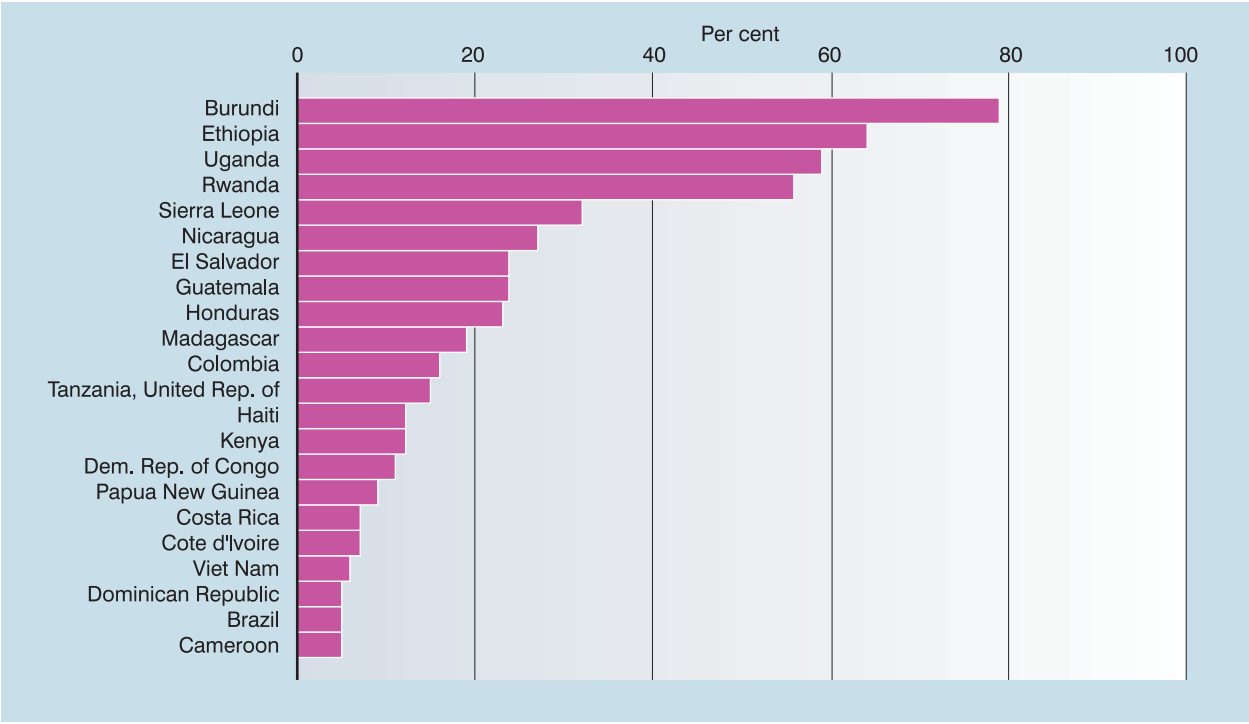
While over the past few decades many developing countries have diversified their economies by moving from exports of agricultural raw materials to commodity-based manufacturing, in many cases this has involved the processing of domestically produced raw materials, and thus agricultural production has continued to play a central role in the economy.

Over the years, a number of policies and strategies have been adopted at the national and international levels to help producers receive higher export prices so as to sustain production and promote overall economic development. These initiatives have included, for example, the UNCTAD Common Fund for Commodities as well as the work of the International Coffee Organization (ICO) and the Association of Coffee Producing Countries.

Developing-country agricultural exports, particularly coffee and tea, have tended to represent an important development issue because of their overall economic impact on the exporting countries and also they mirror the North/South divide in that the bulk of the

Chart 6.2

Share of coffee in total exports by value. Average 1996–2000



Source: International Coffee Organization

production takes place in developing countries while most of the consumption is in developed countries. For example, practically all of the world's coffee is grown in developing countries, while 80 per cent is sold to Western Europe, the United States and Japan. As for tea, 92.7 per cent of world exports come from 10 of the largest exporters, all of them developing countries: Argentina, China, India, Indonesia, Kenya, Malawi, Sri Lanka, Tanzania, Uganda and Viet Nam (International Tea Committee 2002a).

C. The marketing of developing-country agricultural exports

To assess the possible role of the Internet in contributing to improvements in commodity marketing, this section reviews the prevailing commodity marketing chains and structures. The discussion focuses on the selected sample commodities, coffee and tea. While the marketing of developing-country agricultural commodities has a number of important common features, there are equally important differences in so far as each commodity's marketing involves different players and marketing arrangements. Nevertheless, examining the marketing of coffee and tea can highlight key features that may apply to the marketing of other agricultural commodities from developing countries.

To better understand the current markets for coffee and tea, it is important to compare the structure of the marketing chains that existed in the early 1980s with those that emerged in the 1990s.[4] These two periods are characterized by distinctly different marketing arrangements for most developing-country agricultural exports.

1. The marketing of coffee

A typical pre-1980s marketing chain for coffee is represented in chart 6.3. It shows the key players in the commodity chain from the point of production to the consumer. A distinguishing feature of this period was the extensive involvement of statutory bodies, mainly marketing boards, in the marketing of agricultural commodities and influencing export prices. State involvement included the control of production and quality, combined with horizontal coordination between countries aimed at regulating international coffee prices. The horizontal coordination included the establishment of commodity agreements and international commodity organizations such as the ICO.[5] During the early 1980s, agricultural commodity chains were largely producer-driven in terms of price setting and quality maintenance (Ponte 2001). Also during this period, vertical coordination within the marketing chain was minimal, largely limited to informal and temporary agreements between individual buyers and sellers.

During the late 1980s and 1990s, major structural changes took place in agricultural commodity chains. This resulted from a number of factors. Structural adjustment policies meant that markets in producer countries had to be liberalized and, as a result, public intervention and regulation of commodity production and marketing at the national level almost disappeared. The state marketing institutions were commercialized, privatized or entirely eliminated. Most countries abandoned price support mechanisms such as stabilization funds and fixed producer prices. Competition increased with the entry of a large number of private exporters and traders.

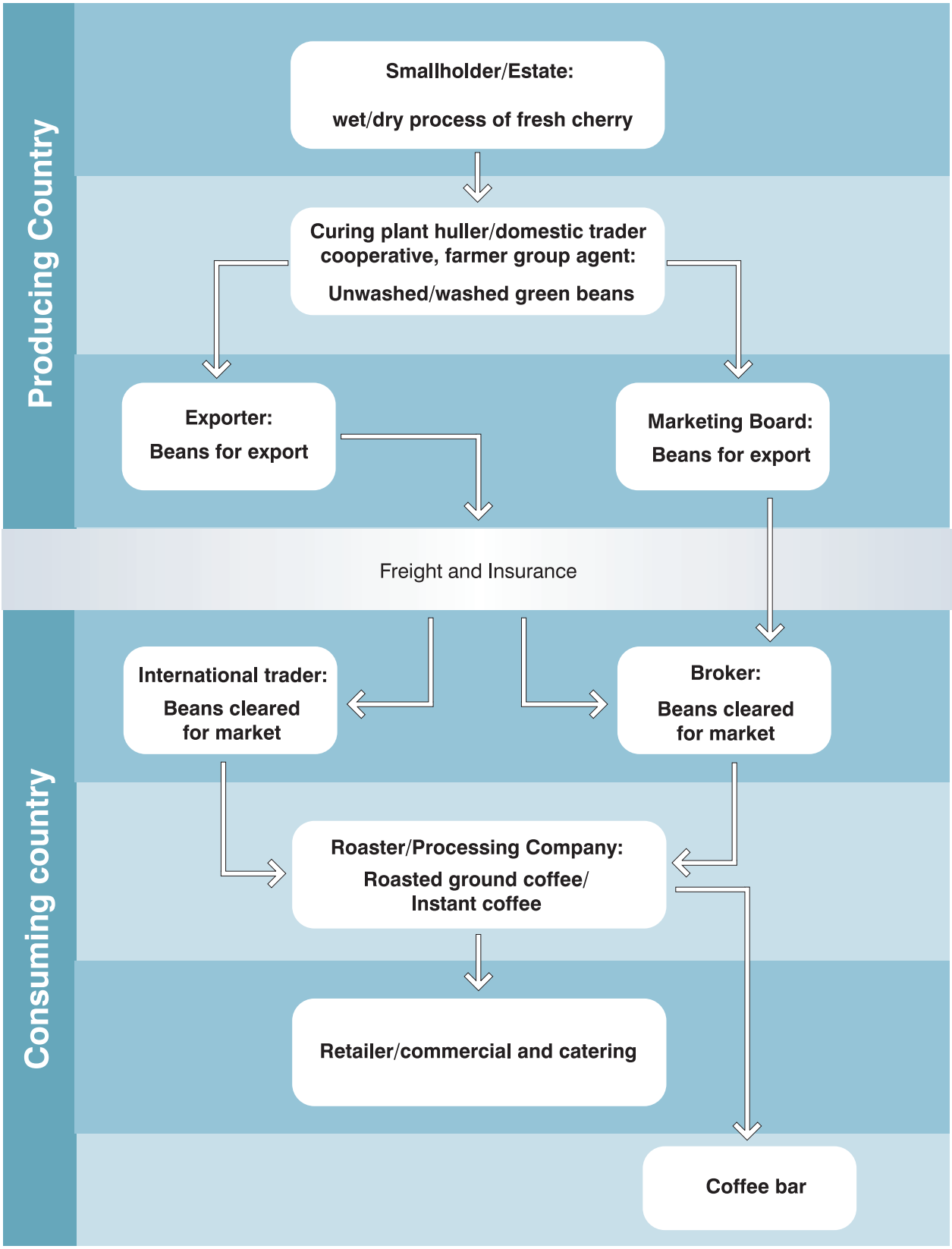
Similarly, horizontal coordination in the form of collective regulation of supply and prices by commodity-producing countries diminished, and producers lost control over the markets. Apart from the general liberalization of the global economy, the 1990s also saw the emergence of new producers, mainly from Asia, with a resulting increase in total world production. On the other hand consumption did not increase at a similar rate. This led coffee prices to decline to levels at which profitability for many small producers was not assured.[6] Yet retail prices in importing countries have remained largely unchanged. This has led to a widely held belief that coffee-importing multinational companies are making large profits while farmers' incomes in developing countries are declining.[7]

Other important changes also occurred on the commodity chain. The emergence of a large number of exporters led to intense competition that resulted in the failure of some exporters and the increased importance of large traders and importers. Oversupply and the competition led to a decline in prices and margins accruing to international coffee traders, reduced the predictability of supplies and increased the bargaining power of upstream coffee processors.

In the late 1990s, many small and medium-sized coffee traders suffered losses and were unable to compete with larger traders. As a result, the market continued to be concentrated. For example, the two largest international coffee traders, Neumann and Volcafe, controlled 29 per cent of the total market share in 1998, while the largest six traders controlled

Chart 6.3

Coffee supply chain



Source: based on Kaplinsky and Fitter (2001) and Ponte (2001b)

around 50 per cent (Coffee Price Crisis Response 2002). Similarly, along the chain, market concentration in the coffee roasting business has increased to even higher levels than that in international trading. For example, Nestle and Philip Morris are reported to control close to 50 per cent of the world market share for roasted and instant coffees. The top five holding companies affiliated with brands of roasted and instant coffees (Nestle, Philip Morris, Sara Lee, Procter & Gamble, and Tchibo) control around 70 per cent of the business (Coffee Price Crisis Response 2002).

Roasters tend to concentrate on controlling marketing and branding while relying on supplies from a network of traders. Also, some roasters obtain their coffee from a mixture of sources, including a variety of international traders and local exporters in producer countries, thus enhancing competition in producer countries between the major international traders and the local exporters. Furthermore, roasters increasingly prefer using coffee from suppliers in countries that can guarantee a reliable minimum amount of supply. They have also developed vertical cooperation with international traders and exporters for particular coffee origins or estates so as to ensure reliable supplies of specialty coffee. An additional element of the roasters' market power is the availability of roasting technology that gives them more flexibility in creating blends to achieve a particular flavour (Coffee Price Crisis Response 2002). As a result, they have greater freedom and control in determining the types and sources of coffee they buy.

While the level of vertical coordination in the coffee marketing chain has generally remained low, increasingly international coffee traders have been diversifying by entering into direct production, especially of premium coffee. International traders have also become more involved in direct procurement from producers, and in some cases they have become involved in local secondary processing as well. Another form of vertical coordination has been the establishment of links between coffee processors/roasters based in developed countries and dedicated suppliers in developing countries. Such links are usually initiated by large producers in developing countries, as these producers can support long-term partnerships with coffee roasters, particularly specialized mini-roasters.

The structure of the coffee commodity chain in the post-1990s period can be summarized as one characterized by widespread liberalization; movement of market power from exporting countries to large buyers; decline and instability in coffee prices; oversupply in export markets; and increased differentiation of coffee in terms of brands and sources of supply.

2. The marketing of tea

The world tea trade has been undergoing a process similar to that in the coffee market. Export prices have decreased over the last decade, in part owing to oversupply, while production has increased faster than demand and tea has continued to face competition from other beverages. There is a growing gap between the prices paid to tea growers and those paid by consumers in importing countries. The Three-Auction Average[8] indicates a 25 per cent decrease in tea prices; global prices declined 19 to 42 per cent from 1998 to mid-2002 (World Tea Markets Monthly 2002), as is shown in table 6.2. In 2002 alone, Indian auction prices fell by around 20 per cent (World Tea Markets Monthly 2003). Global tea exports have

Table 6.2
Tea prices in selected auctions (US cents)

Location	2002 Jan/ May	2001	Changes %01/02	2000	1998	Change % 98/02
Three auction average	147.1	159.8	-8	187.6	196.4	-29
Mombasa	147.4	151.7	-3	202.9	189	-22
Calcutta	134.5	166.1	-19	180.6	206	-35
Colombo	159.5	161.7	-1	179.3	197.2	-19
Jakarta	99.42	96.68	3	119.5	170	-42
Chittagong	98	105.34	-7	109.26	144.23	-32
Limbe	86.24	87.45	-1	102.01	119.21	-28

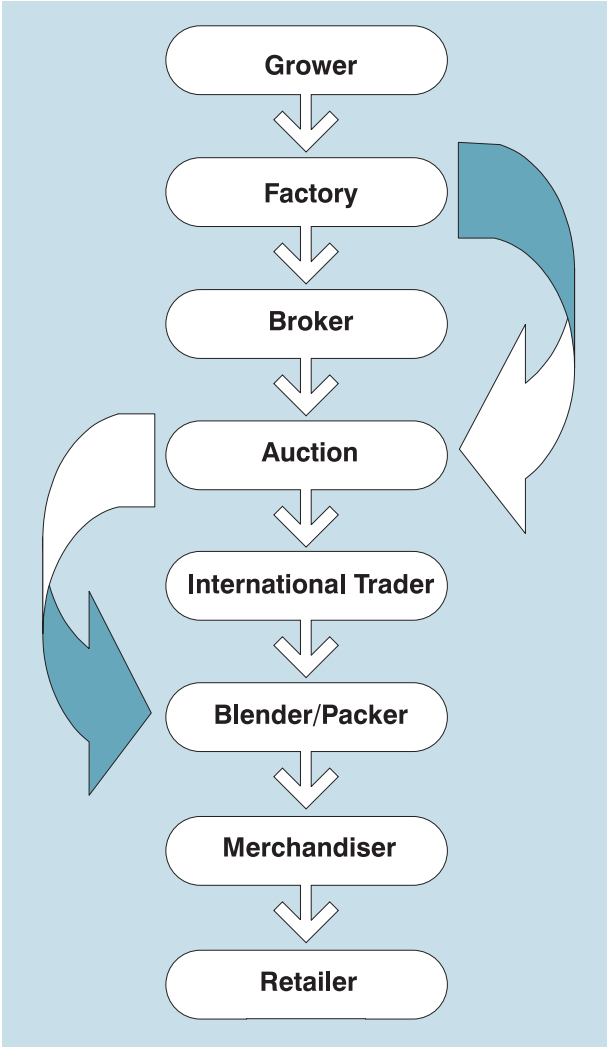
Source: F.O. Licht's World Tea Markets Monthly, August 2002

grown by 3.7 per cent annually in the past five years, in contrast to static demand, and exports are expected to increase in the future owing to expanded production (World Tea Markets Monthly 2003). The decline in prices is also attributed to the loss of control by statutory bodies over marketing activities.

Like that of coffee, the tea export chain consists of a large number of intermediaries (see chart 6.4). Tea growers are either large tea estates or smallholder farmers. All tea growers need to access a tea factory, since brokers and the tea auctions do not deal in green tea leaves. The large estates own factories that process the green leaves before selling the tea to agents or through brokers. The small farmers typically sell the unprocessed tea either to large estates or to factories that specialize in tea processing. In some cases, they sell the leaves to private companies that then resell them to the tea factories. The small farmers are generally in the weakest bargaining position, given their small production and their inability to influence prices and to add value through downstream activities such as processing, blending and packaging. They also lack market information that can allow them to bargain effectively over prices and other marketing conditions.

Chart 6.4

The tea value chain



Source: UK Department for International Development, Report on Africa Beverages Project, No. 3 London.

The processed tea is sold to brokers or auctioned directly for international sale. Brokers are internationally well-established firms with contacts in many consuming countries. Their role is to collect and disseminate tea data such as prices, yield, quality and export volumes. They also provide other services including grading; information on buyers' creditworthiness and reliability in making payments; and monitoring of such things as warehousing conditions, pests, damage and pilferage, and government regulations on tea trade. The tea brokerage business is highly concentrated; there are only a few major brokers in the tea-producing regions, although their market power is limited to some degree by the fact that large producers sell their produce directly without using brokers.

Tea auctions bring together major tea sellers and buyers who make open bids through brokers to reach a sale agreement. There are no reliable figures on the distribution of exports between those being channelled through the auctions and those going directly from garden (bypassing the auction). As an estimate, for example in the Indian trade in 1999, non-auction exports were 23.5 per cent of the total (ITC 2000).

Further processing or value addition takes place in importing countries by tea blenders and packers who purchase the tea either from the auctions in the producing countries or from international traders. A large share of the traded tea is imported directly by large tea packers and processors, some of which own the estates from which the tea is imported. As in the tea brokerage business, there is a high degree of concentration as regards international traders and final processing/blending and packaging. On the buying side, the auctions tend to be dominated by big buyers, who ensure that most of the tea is auctioned in large lots. Multinational companies, on the other hand, dominate the blending and packaging processes and they often seek to impose entry barriers on packaged and branded tea from producer countries (Ponte 2001).[9] The final stages of the tea marketing chain are handled by independent wholesalers and retailers, although some packers and processors undertake tea distribution as well. Box 6.1 provides an example of the marketing of tea using the Indian case.

Box 6.1

Tea production and marketing in India

India is the largest producer and consumer of tea in the world, with a production of 853.7 million kilograms in 2001, roughly twice the combined production of its next two largest black tea competitors, Kenya and Sri Lanka. Its output roughly accounts for 30 per cent of world production, and over 20 per cent of the output was exported.

The Indian Tea Board, which is under the control of the Ministry of Commerce, is the umbrella organization that regulates tea trading. The Tea Marketing Control Order passed by the Government provides the regulatory framework for processors and exporters of tea in the country.

In India, tea is sold primarily through the auction system, and, according to the Tea Marketing Control Order, until two years ago 75 per cent of the total produce of plantations had to be sold through the auction process. However, in 2002, approximately 55 per cent of the tea produced was sold through auction and the remaining 45 per cent was sold directly.

In the tea marketing system there are three distinct communities: tea producers, registered buyers and tea brokers. Tea brokers are established by organizations that organize the auction system by acting as middlemen and assuring returns to the producer within a stipulated time.

Generally there are two types of tea exporters: producer exporters and merchant exporters. Producer exporters are those producers that export tea directly to their agents based in importing countries. Many of these exporters are transnational companies such as Brooke Bond, Tetley and Unilever that deal in tea in various countries. Merchant exporters are intermediaries that do not grow tea; they are export houses that buy tea from producers or from auctions and sell it to their agents based in the markets abroad. Merchant exporters are involved in exports of tea and, in some cases, of other products/commodities as well; they also participate in the auctions.

Sources: Tea Board of India and International Tea Committee (2002a).

D. Using the Internet to market agricultural exports

The possible use of the Internet in the marketing of agricultural exports of developing countries can be considered along similar lines as the use of the Internet in the rest of the economy. While there are various types of online marketing models, the more commonly used ones (and those discussed in this chapter) are e-markets and online auctions. Online marketing can lead to reduced transaction costs, disintermediation or the emergence of new types of Internet-based intermediaries, price transparency, and the possible re-distribution of earnings along the supply chain.

Like many other areas of economic activity, the marketing of agricultural commodities has witnessed widespread adoption of the Internet. There are many business-to-business (B2B) e-markets dealing with agricultural and related commodities. Many of them engage in domestic trade in the United States, but there are also a number in international exchanges. The available information shows that the Internet is used widely by farmers to sell and advertise farm products, exchange information and buy farming inputs. According to Forrester, by 2004 the food and agricultural industry in the United States will conduct $211 billion in online B2B trade in the US food and agricultural industry, which will represent 12 per cent of total B2B online trade for all industrial sectors (Forrester 2000a, 2000b). Annex I of this chapter describes a sample of agricultural e-markets and online auctions in the United States, a country for which information was available. The sample provides information documented at the time it was published by the various sources; it does not indicate the performance or actual operational success of the e-market or auction in question. The sample is presented here to illustrate the commercial and technical possibilities that exist in the use of the Internet for marketing agricultural products.

1. E-markets

A general examination of B2B e-markets is contained in UNCTAD (2001), with an overview of their main

characteristics and an assessment of their overall potential for developing countries. The report gives a few examples of e-markets for commodities of interest to developing countries, but no detailed investigation was made, and at the time of publication such markets were in very early stages of their development.[10]

E-markets have been used as marketing channels for agricultural commodities in such countries as Australia, Canada and the United States, where markets have been established for a wide range of commodities such as cotton, grain, soybeans, wood products, cattle, dairy products and a variety of other food products.[11] In the various forms of online markets, transactions can be conducted in different ways, including the following:

- offer/request e-market models where many sellers trade with many buyers: the buyers request quotes and the sellers provide price information;
- one seller deals with multiple buyers and pricing is dynamic through a bidding process;
- sellers compete for the market of one buyer with dynamic pricing through bidding;
- single buyers negotiate with single sellers, usually involving long-term contractual sales; and
- many-to-many transactions where prices are determined instantaneously through auction-type bidding.

While e-markets largely focus on online trading or intermediating transactions, some tend to concentrate their functions on offering information and other value-added services.

E-markets in general have undergone ups and downs over the last few years, and there is no reliable assessment of the performance of those involved in trading agricultural commodities. Overall, the critical determinants of the success of e-markets include the following:[12]

If an industry is fragmented in the sense that there are many buyers and sellers, the e-market has better prospects of success, since the market creates value by aggregating the volume of trade in one trading platform, allowing buyers and sellers to discover each other more readily and to facilitate decisions on selling and buying. The agricultural industry, especially in developing countries, is highly fragmented, particularly on the sellers' side, and thus well suited to e-markets.

Where a product is fairly standard, as many agricultural commodities are, online marketing is feasible since such products do not require customization for particular buyers' needs. However, where producers sell a commodity that has unique characteristics or is highly differentiated as regards quality or other attributes, sellers may use e-markets but may prefer seller-driven marketplaces to open markets.

The volume of the commodity traded on the marketplace should be large enough to ensure that the marketplace is viable. This means that there must be a minimum number of buyers and sellers participating in order to provide a critical mass that can sustain the viability and operations of the marketplace.

2. Online auctions

Online auctions differ from e-markets in that they are one-off events and the participants do not retain an ongoing membership, as in e-markets. However, e-markets can use online auctions as one of the methods for organizing transactions between members. Quite a number of agricultural commodities, including many exported by developing countries, have traditionally been sold through floor-based offline auctions. Online auctions follow the same basic procedures as floor-based offline ones, although they provide benefits over traditional auctions.

During an online auction, lot numbers are displayed on a website and buyers present bids that are shown to all participants. Buyers can see their bids on the screen or can check later via e-mail how their bids compare with those of other bidders. After the winning bid is determined, the auction manager facilitates the arrangements for payment and delivery.[13] However, in some auctions such arrangements are left entirely to the buyers and sellers, after the auction site has collected its fees from the participants. Some online auctions maintain strict confidentiality so that bidding, sales, payment and delivery are effected without revealing the identity of the seller or the buyer. Online auctions may last from several hours to several days, depending on the volume of goods being auctioned.

Like e-markets, online auctions take different forms such as independent auctions, where buyers and sellers use third-party auction sites, and private auctions, where sellers auction their own goods to invited buy-

ers on their own auction sites. Some auction sites aggregate databases of a large number of other auction sites, thus enabling buyers to obtain information from many auctions through a single source.

3. The benefits of e-markets and online auctions

Reduced costs

Use of the Internet for marketing can reduce transaction costs in a number of ways. The first is the reduction of search costs. Agricultural marketing chains are characterized by multiple intermediaries, and buyers spend much time searching for information about suppliers, products and prices. The Internet may reduce search costs in terms of effort, time and money, because information can be exchanged more efficiently via the Internet than through traditional channels.

In e-markets, for example, a large number of agricultural commodity producers and buyers are brought together into a single trading community, which reduces search costs even further. In this connection, the Internet can play a vital role in the development and marketing of what are popularly known as specialty agricultural products.[14] There is a growing demand for differentiated food products in major food-importing countries in Europe and North America. On the demand side, specialty products cover a given consumer population whose size is growing but is not fully established. On the supply side, there are a variety of producers and traders who may be widely distributed in several countries. Because buyers and producers lack information about each other, it is difficult to match supply and demand. Use of the Internet can allow producers to match their products or planned production to the relevant "specialty" characteristics of the demand. It also allows prospective buyers to seek and exchange information with producers. Buyers can inform producers about the product characteristics that are most attractive to consumers, thus providing the producers with an indication of the demand.

Reduced or transformed use of intermediaries

The Internet can reduce the use of intermediaries in the traditional supply chain by enabling producers to interact and transact directly with buyers. This is largely because producers and buyers can obtain trade information from each other and can carry out transactions at a much lower cost than in an offline supply chain with multiple intermediaries.

Use of the Internet can also increase the efficiency of existing intermediaries to the extent that they adopt the new information technologies. Also, e-markets can be viewed as new intermediaries that can replace traditional offline intermediaries. Independent, third-party agricultural e-marketplaces are themselves intermediaries by definition, as they are situated between producers and buyers. On the other hand, many large farmers and producers tend to establish their own private exchanges to link up directly with the food traders and processor, with whom they have long-established trading relationships, thus effectively reducing the role of intermediaries (Forrester 2000a).

Price transparency and formation

By bringing together large numbers of producers and buyers, e-markets reveal market prices and other transaction information to all parties. By contrast, accessing information in offline markets is costly, and channelling it though various intermediaries may distort information on prices and other trade data. Increased price transparency reduces price differences prevailing in the marketplace. It also allows buyers to compare prices and make more informed purchasing decisions.

Online auctions provide bidders the convenience of bidding from their home or office without necessarily being on an auction floor. Also, while offline auctions oblige all bidders to participate at the same time and require them to be present for the duration of the auction, online auctions are more flexible as they allow bidders to submit bids at different times. This flexibility increases the market for the auctioned goods. Furthermore, online auctions can be organized at short notice and yet reach a large number of buyers. Also, buyers can readily search databases containing large numbers of goods being auctioned instead of going through the printed listings of traditional auctions. Finally, online auctions are much cheaper to run than traditional ones, thus making it feasible for more goods, including very low-value goods, to be auctioned.

The main disadvantage of online auctions is the difficulty faced by bidders in inspecting goods they want to buy. While this problem is being partly solved by sellers making available electronic images of the

goods being auctioned, for some agricultural commodities, such as coffee and tea, tasting is an essential factor in the buyer's decision. However, in some instances samples can be shipped in advance and tasting conducted offline. The results are then made available to prospective bidders in the auction.

E. Experiences in online marketing of coffee and tea

Section B outlined the importance of coffee and tea for developing countries' exports, while section D described the possibilities and benefits of using the Internet to market agricultural commodities. This section examines experiences gained in online coffee and tea marketing, focusing on B2B transactions in e-markets and online auctions. Examples of coffee marketing in Brazil, Guatemala, Kenya and Nicaragua and tea marketing in India are presented. By focusing on coffee and tea, the discussion strives to provide insights for those contemplating the online marketing of other developing-country agricultural commodities.

1. B2B e-markets for coffee

The 2000–2001 period saw a number of initiatives to create B2B e-markets for coffee trading (UNCTAD 2001). Examples of such initiatives included eGreenCoffee.com, InterCommercial Markets, CoffeeExchange.com and CoffeeX.com. A number of other e-markets have since been formed, including Comdaq.com, RawMart.com and ExImWare.com. Some of these operate as independent buying and selling platforms with no ownership affiliation with participating buyers and sellers. Others are funded and owned by buyers. For example, ExImWare is owned by major coffee concerns, including Louis Dreyfus, Volcafe, Mercon, the Colombian Coffee Federation and Brown Brothers Harriman.

While many coffee e-markets have been established since the Internet first began to be widely used, many have ceased to exist, while a few have been acquired by trading companies. For example, eGreenCoffee.com was acquired by Tradamax Group a year after it was established.

Currently, only a few coffee e-markets, such as the United States–based ExImWare, appear to be fully operational on a permanent basis in the green coffee trade. The case of ExImWare illustrates the interplay of issues in coffee e-markets. ExImWare merged with InterCommercial in early 2002, and its clients are mostly US companies. Some companies, for example Kraft and its suppliers use this marketplace for their green coffee purchases. A few other coffee-roasting companies use ExImWare mainly for obtaining price information, while a few small coffee-trading houses also use it on a regular basis. Box 6.2 provides more information about ExImWare.com.

2. The performance of coffee e-markets

E-markets in general have had variable performance. This also applies to coffee e-markets, whose lack of liquidity is a major cause of their slow growth. That is, the e-marketplaces have not been able to attract enough buyers and sellers to attain the critical mass needed for them to be viable. This is partly a result of security issues and of traders' aversion to risk. Also, the complexity and diversity of the marketing systems for coffee in producing countries have prevented sellers in developing countries from playing a direct role in transacting through e-markets.

Another factor that has limited the use of e-markets is the lack of information regarding the market efficiency generated through e-markets. Buyers and sellers need to see actual examples of efficiency gains arising from online transactions, specifically for coffee, before they will participate in e-markets.

Yet another issue is the importance attached by traders to traditional commercial relationships. Buyers and sellers prefer to maintain their long-established personal contacts in order to ensure repeat transactions on the basis of agreed quality and conditions of sale. Thus, while e-markets may promise considerable benefits, buyers and sellers tend to retain their traditional offline commercial links. In many cases, therefore, trading interests make use of the Internet for obtaining product and price information while the actual transactions are concluded through traditional channels such as fax, telephone and personal visits (IDS 2003).

In today's world coffee market, the dominance of buyers' market power reduces incentive for buyers to transacting online, unless a move to Internet-based transactions can generate higher returns. At the same time, the relative weakness of sellers does not provide them the resources needed to set up e-markets. Their weak position also means that they have limited scope

Box 6.2

ExImWare

ExImWare was founded in March 2000. It initially provided back-office solutions that enabled electronic processing of coffee and cocoa contracts. In August 2001, delivery information service was added to its functions. A year later, ExImWare merged with InterCommercial Markets, which had developed a coffee procurement platform. With this merger, the scope of ExImWare services was enlarged to cover everything from pre-transaction solutions through product delivery.

Registered members currently include over 20 buyers and sellers, who pay a small monthly fee in order to buy or sell coffee on ExImWare's InterCommercial Markets platform. They are mostly US roasters or multinational trading companies ranging from suppliers and roasters to coffee trading houses.

Although some of the participating trading companies are based in developing countries, they often sell coffee via their US- or Europe-based sales offices using the InterCommercial Markets platform. ExImWare's operational revenues come primarily from four sources: subscription revenue from InterCommercial Markets; subscription revenue from ExImWare Trade Management Lifecycle (TML) platform ; custom development of applications; and professional services that link trading companies/roasters to their counterparts or provide other integration services.

President and chief executive officer Girish Minocha believes that the key factors determining the success of an e-market for coffee are its compatibility with industry-specific processes and the commitment of its user base. The main advantages of ExImWare include its strong industry knowledge and the functionality of its platforms. It benefits both buyers and sellers by providing quick and global communication capability, efficient back-office management and enhanced ability to track transaction information.

Source: Based on an interview with Girish Minocha, founder of ExImWare.

to influence marketing arrangements, including the use of the Internet. Overall, while e-markets represent potential benefits for the marketing of exports, so far they have not developed into a major model for marketing coffee, largely owing to the factors outlined above. However, it is important to realise that Internet-based e-markets have been in existence for a relatively short time and in time their use, including on line coffee marketing, may expand.

3. Online B2B coffee auctions

Another form of online marketing is online coffee auctions which are to be distinguished from B2B coffee e-markets as was described in section D.

Brazilian online coffee auctions

Online coffee auctions have been organized in Brazil since 1999. While relatively new, they provide an example of the successful integration of ICT and traditional marketing to achieve improvements in export marketing of coffee. The first online auction is described in Box 6.3.

By the end of 2002, Brazil's Cup of Excellence auction had been held annually four times, and it is considered a great success by participants. These yearly auctions, which began in 1999, involve the sale of price premium and specialty quality coffee (Brazil Specialty Coffee Association 2003). Box 6.4 provides a detailed description of specialty coffee. A distinguishing feature in these auctions is the high levels of prices achieved. For example, the winning coffee in 2002 attained a record price of $12.85 per pound, more than 10 times the New York Board of Trade's Coffee "C" Futures Contract price,[15] which is a common price benchmark. The results of the Brazilian auctions have created high expectations among gourmet coffee growers, who have been suffering from a continuing worldwide slump in green coffee prices, and also among roasters and traders, who are seeking exclusive, high-quality coffee. Their success proves that new technology, when properly designed and thoroughly implemented, can influence the structure of a commodity market, including its price formation.

To encourage wide participation in the first Cup of Excellence competition in 1999, the Gourmet Coffee Project[18] established a guaranteed price of $0.30 per pound over the local market price as a premium for exemplary-quality coffee so as to ensure the entry of a large number of sample coffees. The premium encouraged participation in the auction by farmers

Box 6.3

First Internet auction of Brazilian coffees

The first Internet auction of Brazilian coffees took place in December 1999. It was supervised by the ICO and financed mainly by the Common Fund for Commodities. The ITC was the executing agency within the framework of the Gourmet Coffee Project. Other institutions involved in its organization were the Specialty Coffee Association of America (SCAA), the Brazilian Specialty Coffee Association (BSCA) and the Cooperativa Regional de Cafeicultores em Guaxupé (Cooxupé).[16]

The auction had two parts: the Cup of Excellence competition and the Internet coffee auction. The competition, which involved tasting the coffees, was a prelude to the auction and attracted numerous competing coffee growers nation-wide. An authoritative international jury was responsible for assessing participating coffees and selected 24 winners. The rigorous rules of cupping[17] guaranteed the transparency, impartiality and credibility of the evaluation process, which in turn had a decisive effect on final prices. The jury consisted of more than 10 "cuppers" (coffee experts) from Brazil, the United States, Europe and Japan. The winning samples were shipped to potential bidders for recognition before the online auction begins. Finally, 10 out of 24 samples were recognized as candidates for bidding in the auction.

The purpose of organizing a cupping competition before the actual auction was to encourage competition among farmers as well as among the buyers, who were willing to bid for exceptional-quality coffee. The whole event was rather like an international marketing campaign, and the use of the Internet evidently enhanced its transparency, efficiency and visibility.

Source: Based on an interview with Morten Scholer, ITC Senior Marketing Development Adviser.

who were otherwise hesitant to risk their earnings in the auction, given the rising futures contract at the time. The premium was paid by the buyers soon after the auction, effectively minimizing the price risks faced by the farmers.

An unprecedented number of 315 coffees, from six regions of Brazil, and from farms ranging from very large to small, participated in the first round of the contest. Twenty-four were selected as finalists to compete to be among the 10 coffees to be auctioned. As its prestige has expanded in international coffee circles, the Cup of Excellence has attracted more participants each year, so that in the 2001 and 2002 competitions over 800 coffees entered the first round.

The results of the auction

The price premiums resulting from the online auctions have been exceptionally high. For example, in the 1999 auction, the champion coffee was sold for $2.60 a pound. The average price for all auctioned coffees was $1.73 a pound, whereas the comparable New York Futures Market price was in the range of $1.32 to $1.34 a pound at the time. Based on each auction price, the net profit was distributed among farmers, the BSCA and exporters on a 40 per cent, 40 per cent and 20 per cent basis respectively. The 2002 auction set a new price record of $12.85 a pound, and the winning farms received as much as 85 per cent of the auction's proceeds. To date, Brazil's Cup of Excellence programme has auctioned nearly 6,000 bags of coffee worth at an average price of more than three times the commodity market price per bag.[19]

The role of intermediaries

Intermediaries do not play a role in the online auction. Cooxupé, a large, well-respected Brazilian company that already has close trade relationships with many of the bidders, is the sole exporter for all auctioned coffee. Bidders who are regular customers of the exporter are not required to submit letters of credit to the appointed exporter, a procedure that is normally quite complex and costly. As a result, a number of the supply chain's functional links, such as transportation, letters of credit, payments, documentation and shipping, which in conventional trading are normally operated by multiple intermediaries, are taken over by a single exporter. The supply chain therefore becomes simplified; the number of intermediaries between growers and roasters is reduced as potential risks are transferred immediately from producers to the exporter and importer. Producers are guaranteed minimum prices that are at least as high as internal Brazilian market prices. The established trust

Box 6.4

Specialty coffee: quality and price

Green coffees are generally categorized as arabica or robusta, either wet or dry processed. They account for 60 and 40 per cent of world production respectively, although the ratio may vary, particularly in poor harvest years, when the less hardy Arabica plant may fail disproportionately, bringing the share of Robusta to 70 per cent. The quality of coffee is broadly classified into exemplary quality, high quality, mainstream quality and under-grades. Exemplary and high-quality coffees represent less than 15 per cent of world consumption.

A major problem in specialty markets is the lack of an independently guaranteed quality standard. Coffee, especially specialty and gourmet coffee, is a very heterogeneous product in that its quality and characteristics differ from lot to lot because of botanical variety, topographical and weather conditions and the care given during growing and after harvesting. For this reason, the cost of quality evaluation and market investigation, which require extensive expertise and regular access to farms, is high even for large buying companies. Small buyers can hardly afford to identify top-quality products. Ironically, in international commodity markets, coffee is priced almost uniformly despite the heterogeneity of its quality.

In recent years, specialty coffee markets have taken off in major consuming countries such as the United States, the United Kingdom and other European countries. In 1999, 3 million out of 18 million bags of US imports went to specialty and gourmet markets.

Source: ITC (2002).

between the bidders and the exporter substantially mitigates the commercial risks that in a traditional distribution chain are usually shared among a number of intermediaries.

Other online coffee auctions based on the Brazilian model

The success of the Brazilian Internet auction has attracted the attention of other coffee-exporting countries, and the model has been followed by other coffee-producing countries such as Guatemala, Nicaragua and Kenya (see table 6.3).

The annual Guatemala Cup of Excellence contest, sponsored by the Guatemalan National Coffee Association, is considered to have been successful in both 2001 and 2002 competitions and auctions in terms of price increases. The 2001 Best Coffee was sold for $11 a pound, 20 times the New York Futures Market price. The average price for 2002 winning coffees rose by $3 a pound. The contest attracted much attention in the international coffee industry. The jury in 2002 included 23 cuppers from Australia, Brazil, Canada, Europe, Guatemala, Japan and the United States. The bidders were from many of the major coffee importing-countries.

The Nicaragua Cup of Excellence contest began in 2002 and is also considered a success. An international jury of 26 coffee experts selected 23 winners, which included many small-scale growers and cooperatives.

Africanlion cupping competitions

The Brazilian model has also been emulated in the export of Kenyan coffee mainly at the initiative of Kenya-based Africanlion.com (see Box 6.5). In the CUP-COM 2002 competition that was followed by the Internet auction organized by the Eastern African Fine Coffees Association and Kenyan Africanlion.com, a Japanese buyer offered $4.12 a pound for the champion coffee, nearly $1 higher than the price at Kenya's weekly physical auction. Exporters had to pay the farmers 50 per cent auction proceeds that exceeded the reserve price. However, only two of the 17 winning lots were sold in the first auction.

In February 2002 the EAFCA organized an Internet auction along the lines of the Brazilian model, in which Africanlion selected the finest coffees from various coffee-growing areas in the east African region. These were submitted to national competitions to select the best coffees at the national level. The top one or two coffees from each country were then forwarded to a regional competition in Kampala (Uganda). The competition involved regional and international cuppers from as far as Japan and the United Kingdom. Prospective buyers then received

Table 6.3

Details of coffee Internet auctions conducted in different countries

1. Brazil Cup of Excellence Internet Auction

	No. of Participants	No. of Winners	Champion Price (USD/lb)	Average Price (USD/lb)	C contract (USD/lb) December
1999	315	24	2.6	1.73	1.32-1.34
2000	--	18	3.04	1.38	--
2001	849	18	5.56	2.94	0.5-0.55
2002	826	28	12.85		

Source: BSCA, ITC

2. Guatemala Cup of Excellence Internet Auction

	No. of Participants	No. of Winners	Champion Price (USD/lb)	Average Price (USD/lb)	C contract (USD/lb) December
2001	--	30	11	--	0.5-0.55
2002	390	33	8.45	3	--

Source: www.guatemalancoffees.com

3. Nicaragua Cup of Excellence Internet Auction

	No. of Participants	No. of Winners	Champion Price (USD/lb)
2002	285	23	11.75

Source: www.nicaraguancoffees.com

4. EAFCA CUP-COM 2002 Internet Auction April

	No. of Winners	Champion Price (USD/lb)	Nairobi's weekly physical auction price	Time
2002	17	4.12	3.15	April

Source: EAFCA

Source: (1) BSCA, ITC; (2) www.guatemalancoffees.com; (3) www.nicaraguancoffees.com; (4) EAFCA

500-gram samples from winning lots. Instructions on how to bid and the auction date were e-mailed to buyers well in advance of the auction, giving them ample time to prepare. In addition to prospective buyers, Africanlion also registered many participants who were not able to trade (i.e. offer or bid).

The auction ended with only a small quantity of coffee being transacted, although a high price of $453 per 50-kilogram bag was achieved. According to the organizers, the small quantity of coffee traded resulted from the auction not being adequately marketed owing to budget constraints. They pointed out that the first Brazilian auction had registered more buyers largely because its funding had been adequate for financing the auction site and covering the costs of hiring panels of eminent experts. Despite the limited turnover, however, the organizers felt that there were adequate skilled human resources in Kenya to support an online auction.

Box 6.5

Africanlion.com

Africanlion.com was established in June 1999 by two Kenyan entrepreneurs, Titus Gitau and Stephen Njukia, who believed that Kenyan coffee had a niche market among coffee consumers in North America. Considering the large difference between retail prices in consuming countries and the prices local farmers were receiving, they set up an electronic B2B exchange that would enable local exporters to offer their coffees to the world. In 1999, Gitau and Njukia developed www.africanlion.com with technology support from SawaSawa.com, a Kenyan-owned Web development company.

Soon after establishing the platform, the founders made great effort to establish links with major players in the coffee industry, including specialty coffee associations in the United States and Europe and the SCAA. As part of the cooperation strategy, Africanlion.com helped set up the East Africa Fine Coffee Association (EAFCA), and later EAFCA appointed Africanlion.com as its IT and exchange partner for Internet auctions.

The exchange system was designed to facilitate the trading of coffee from East African countries. The database includes various categories of coffee such as Kenyan AA, Uganda Bugisus and Ethiopian Yirgacheffes. The exchange has two categories of subscribers: traders and observers. Observers merely watch the auction proceedings, while traders (buyers and sellers) participate through offers and bids. The exchange includes a trading floor where producers/exporters can post their offers on the Internet. The sellers post offers and can also reserve a price, which is the lowest price that a seller is willing to accept.

Source. Based on an interview with Titus Gitau, co-founder of Africanlion.com.

Africanlion has succeeded in developing its auction platform and has leveraged its contacts in the coffee community. Its pioneering trial proved that online marketing could be achieved using fairly inexpensive technology, which is a feature critically important for developing countries. After some legal battles involving issues such as the introduction of a law banning the sale of Kenyan coffee on secondary markets, Africanlion finally obtained a license permitting it to source coffee from marketing agents and post their offers on the Internet. Africanlion plans to hold three to four online auctions a year, showcasing specialty or gourmet coffees from different parts of Africa. In addition to coffee, it expects to trade online other soft commodities such as tea, flowers and pyrethrum, commodities for which East Africa possesses a competitive advantage.

The Brazilian and Kenyan experiences point to the following major conclusions:

The use of technology has to go hand in hand with quality controls, which are organized offline. For an auction to work, physical samples of the commodity must be sent beforehand, because buyers are unlikely to conclude a deal without physical inspection.

Sufficient support and funding must be available to provide confidence and price guarantees to farmers, at least for the initial auction. Such assistance may come from trusted entities such as international organizations, government, coffee associations and other private-sector interests. However, once established, online coffee auctions can expand by relying on private resources.

4. Online marketing of tea in India

The structure of the marketing chain for Indian tea was described in section C. Internet use by producers in India to market tea is still in its infancy, although some plantations have established websites linked to search engines and other commercial sites. Industry observers in India consider that more plantations might make use of the Internet for direct marketing if they were aware of the potential benefits.

Major tea exporters are planning to use the Internet to make deals and find business opportunities in external markets. For the time being, most of their existing business is conducted through stipulated agents. Also, the majority of exports are in bulk; value addition in terms of blending, packaging and branding is undertaken mostly by importers in the consuming countries. Producers are largely dependent on auctions, and exporters are dependent on agents, partly as a way of managing risk. The auction system ensures payment to the producer within a stipulated time frame, while use of an agent ensures timely pay-

ment to the exporter. For exporters, their risk of return through export is taken care of by letters of credit and by export certifying agencies.

In an interview conducted by UNCTAD with some major exporters in the Coimbatore region in India, the following challenges involved in the use of the Internet to market Indian tea were identified:[20]

In the present system, the letter of credit is used to cover the risk of non-payment by an importer. Exporters want to be assured that this facility can be available in online transactions. Also, the risks involved in handling payments and bank accounts via the Internet need to be addressed.

Exporters need to be assured that online transactions are supported by documentation that fulfils requirements as fully as offline documentation systems do.

In the same interview, the following developments were identified regarding the use of the Internet to market tea in India:

A growing number of exporters have their own websites that are listed with various search engines. However, many exporters also use traditional offline channels for tea exports, dealing with individuals or agents with whom they have long-established relationships.

While exporters receive some inquiries from importers through their websites, the objective of many of the inquiries is only to seek commercial information, not to effect transactions. Exporters have greater confidence in dealings conducted by telephone or by mail. While they acknowledge that the Internet has expanded market opportunities, they expect inquiries through the Internet to help them increase the value of their product to a much greater degree than has been the case so far. While exporters recognize that the use of the Internet can provide many benefits, the glut in the Indian tea industry of the last four years has tended to discourage exporters from trying new marketing methods, although they might do so when market conditions improve.

Factors that exporters consider essential for expanding the use of the Internet include raising exporters' awareness of the benefits of Internet marketing and the processes involved; overcoming inertia and resistance to change; and improving trade facilitation procedures and services along the export chain.

There are expectations that the use of the Internet will develop in the Indian tea trade. Because of the severe competition that Indian tea exports face from other producing countries and as a result of oversupply in the domestic market, the Government has undertaken a series of measures to address the situation. Strategic studies on tea exports have been conducted that have led to various plans to boost tea exports through marketing improvements, cost reduction and upgrading of activities. The implementation of some of these plans may rely to some degree on the increased use of the Internet and e-commerce. In particular, new information technologies and e-commerce are expected to be instrumental in increasing transparency in trading and reducing overall transaction costs.

Online tea auctions in India

While a large share of Indian tea exports are traded through traditional auctions, in recent years some exports have been auctioned online. This has been achieved through the country's main online tea auction site, Teauction.com, which was launched in 2000. According to the site's operators their auctions have led to savings in transaction costs amounting to Rs 1.60 per kilogram in comparison with conventional auctions. Also, the transaction time has been shortened from eight weeks to one week. From the beginning of 2002 to mid-2003 Teauction.com conducted 150 auctions, which accounted for 6 per cent of the total volume of tea auctioned in India. Overseas and local buyers such as Williamson Mago, Jayshree Tea, Nestle, Tata Tea and Tetley have participated in the auctions through their Indian agents.

According to observers, Teauction.com has maintained a steady market volume over the last three years, approximately $1.94 million. An auction takes place every Friday, and the number of transactions per auction fluctuates considerably, from 10 to 100 lots per day. Encouraging is the fact that renowned teahouses like Tata Tea and Goodricke use the system. As this report was being written, the site's owner indicated that there were 318 buyers and 110 producers registered with the site.

Assessment of the auction's performance

The system used by Teauction.com is also being used, with considerable success, to auction tea online in Sri Lanka. Observers believe that the Indian online auction could expand, given the various benefits of online auctions already observed in Sri Lanka. For buyers an online auction provides better service with-

out their needing to be physically present at the auction, and the time from crop production to receipt of cash is reduced from eight weeks to four weeks. Also, the size of the sample required for auction purposes is reduced from 11 kilograms in a conventional auction to around 3 kilograms in an online auction. This is due to the fact that online auctions involve a predictable number of buyers, while in offline auctions provision needs to be made for unexpected number of buyers.

Price comparison with conventional auctions

Up to now, the differences in prices between online and conventional auctions have been small, owing to the fact that the buyers involved in online auctions are also regular users of conventional auctions and have extensive knowledge of the prevailing prices for teas of various qualities.

Many traders expect that online auctions will succeed once the constraints outlined above have been overcome. At the same time, they consider that producers must have a guarantee that their produce will be sold within a given time and that prices are not being unduly influenced by major cartels or big buyers. Also, the tea community's awareness of online auctions needs to be enhanced in a way that will reduce their concerns regarding the potential risks of online trading.

F. Conclusions

Agricultural exports play a key role in the economies of many developing countries, but the prices of these exports have in the last two decades experienced considerable declines that have negatively affected the incomes and well being of producers. An examination of the coffee and tea trades shows that the price declines result largely from an oversupply and the existence of market structures that are buyer-driven, as producer countries have been losing their market power.

The Internet provides a window of opportunity for improving the marketing of agricultural exports in developing countries, as exemplified by the experience in some developed countries. Such use can generate significant benefits for producers in terms of reduced transaction costs and expanded market reach. Commodities such as coffee and tea are increasingly becoming differentiated as a result of changes in consumer demand. The growth of markets for specialty foods depends heavily on the availability of information about what the producers can and do grow, and what product characteristics are being demanded by consumers. The collection and dissemination of such information are complex and costly but can be greatly facilitated by the Internet.

The use of the Internet for marketing of coffee and tea is a relatively new business model. A sizeable number of coffee e-markets were established between the late 1990s and 2001, but many of them were not successful. A few e-markets are now well established, although the scale of their use will continue to be evolutionary as traders gradually realize their benefits and as confidence in online trading improves.

Online coffee auctions have attracted much interest, and their considerable success in Brazil and elsewhere is expected to encourage other developing countries to adopt such auctions. While online coffee auctions currently concentrate on specialty coffees, other segments of the coffee trade are also expected benefit from online auctions. The Brazilian case indicates that, in order for online auctions to take off, the private sector may need initial support from other stakeholders and donors.

Internet auctions in the Indian tea trade are at their initial stages, but India's tea industry is optimistic that such auctions will become well established, especially after the current glut in tea markets comes to an end. There is consensus that a number of supportive measures, such as awareness building and suitable trade facilitation systems, are required for online trading to develop and grow.

Since the production of coffee and tea is dominated by small farmers, and given the existing buyer-driven coffee and tea marketing structure, producers need to take measures that will give them the necessary capacity and critical mass to influence marketing arrangements, including the use of the Internet. The market concentration that exists at various stages of the coffee and tea supply chains may be a major impediment to producers' adoption of the Internet as a means of trading directly with consumers. In some cases, multinational companies engaged in food processing, labelling and packaging impose barriers to entry into such activities by producers in developing countries. The international community and Governments should address such forms of anti-competitive behaviour in their trade policies. Also, awareness of the scope and benefits of online marketing needs to

be increased among government officials and producers.

Support from Governments, international organizations and donors may play an essential role in providing the initial resources and trust needed to establish online marketing ventures, although in the long run such ventures are the domain of the private sector. Also, various stakeholders should support initiatives such as Fair Trade that are aimed at finding solutions to the agricultural commodity crisis faced by developing countries, a crisis that results partly from the marketing structures of the existing agricultural commodity supply chains. However, some of the underlying problems are caused by farmers' lack of access to market information and their resulting inability to bargain effectively. The development of commodity market information systems and the use of the Internet by producers themselves and by the appropriate government departments can enhance market intelligence to the benefit of agricultural producers.

Notes

1. The term marketing is used here to mean the process of buying and selling in a market, including the commercial functions involved in transferring goods from producer to consumer. Within this broad definition, this chapter focuses on the institutions involved in the supply chain in organizing sales and setting prices and the structure of market power in the supply chain.

2. Fair Trade is a movement aimed at compensating agricultural producers in developing countries more fairly by bypassing some of the intermediaries in the commodity chain. The scheme involves the formation of farmers' cooperatives that sell their produce directly to fair trade organizations in Asia, Europe and North America. Buyers and sellers establish long-term contracts in which they agree on prices and quantities for the commodities concerned, thus providing more stability for small farmers.

3. International Coffee Organization data.

4. For an extended discussion, see Gibbon (2001) and Ponte (2001a).

5. For example, up to 1989, under an export quota system established under the International Coffee Agreement, prices were regulated by setting a price band and allocating export quotas in relation to indicator prices issued by the ICO as a benchmark

6. See, for example, Oxfam Great Britain (2002).

7. See Mitra (2002).

8. The Three-Auction Average consists of the weighted average auction prices of Calcutta, Colombo and Mombasa.

9. By and large in producer countries tea is sold as a generic and shipped in bulk without branding and packaging, although some exporting countries such as Sri Lanka are now increasing value of exports through blending and packaging.

10. As used in this report, the term e-market is to be distinguished from traditional commodity exchanges even where the traditional exchanges use electronic platforms. In the industry e-markets are understood to mean online markets that have come into existence primarily with the introduction of the Internet. These are usually not listed in directories of traditional commodity exchanges. On the other hand, a restricted definition of commodity exchanges relates to centers that provide markets for trading standardized futures and options contracts. For reference on commodity exchanges, see, for example, UNCTAD (2002).

11. See, for example, Chambers et al. (2001); Pitis and Vlosky (1999); Ingwesen (2000); Market Watcher (2001); Babcock (2000); and Richardson (1997).

12. For a detailed discussion, see UNCTAD (2001).

13. For a detailed description of online auctions, see, for example, Fickel (1999) and Lucking-Reiley (2000).

14. Specialty products are a growing segment of the food industry. A given product such as coffee or tea can become differentiated into categories or brands according to differences in quality, flavour, crop breeding methods used, geographical origin or the climatic conditions under which a crop is grown, processing procedures and other characteristics. For a detailed discussion see, for example, Ponte (2002).

15. The New York Board of Trade Coffee Futures Contract is used by members of the world coffee trade to price and hedge price risk for arabica coffees (which make up over 60 per cent of global coffee production), and by speculative investors wishing to trade in coffee price movements. The contract allows for delivery of coffees from 19 African, Asian, Central American and South American countries. See www.houstoncoffeeassn.

16. www.cooxupe.com.br.

17. The art and science of tasting coffee or tea.

18. The project was sponsored by the ICO and managed by UNCTAD/WTO International Trade Center and financed mainly by the Common Fund for Commodities. Its aim is to assist a number of coffee exporting countries to produce and market high-quality coffees in order to improve their export earnings.

19. BSCA data.

20. Interview conducted by UNCTAD consultant.

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Annex

Selected examples of agricultural commodity e-markets

www.theseam.com is a US e-marketplace for cotton founded in December 2000 and owned by cotton merchants, marketing cooperatives and textile mills. It provides tools that facilitate price discovery, online negotiation and transaction. The marketplace has two sections, for domestic and international exchanges respectively.

www.cattlesale.com is a United States–based cattle-trading marketplace that provides both market exchange during trading hours and auction platforms. In addition to providing industry information, CattleSale.com gathers biographical information and photos of cattle, collects payment and coordinates delivery.

www.dairy.com was founded in 2000 by a group of US food and dairy firms. By 2003 it had expanded to include a wide range of dairy products including cream, milk, condensed skim milk, cheese and butter. Besides a spot market, the platform has also opened a transportation market that calls in carriers to facilitate shipment and delivery, thereby reducing transportation costs by up to 50 per cent.

www.iTradeNetwork.com is an online venue for perishable procurement based in the United States. It deals with online exchanges for produce, meat, seafood, deli/bakery goods, dry goods and floral products. Its services include price information, contract and rebate management, transportation and management solutions.

www.farms.com is a B2B exchange for the agriculture and food industry that primarily focuses on the beef cattle, swine, crop and feedstuffs markets in North America. The site offers a variety of services ranging from industry information and risk management to online transactions. Its wireless services has been integrated into the platform, enabling farmers to access its e-commerce solutions right from the farm. The site was voted "Best of the Web" for B2B marketplaces by Forbes Magazine in 2000.

Chapter 7

ONLINE DISPUTE RESOLUTION: E-COMMERCE AND BEYOND

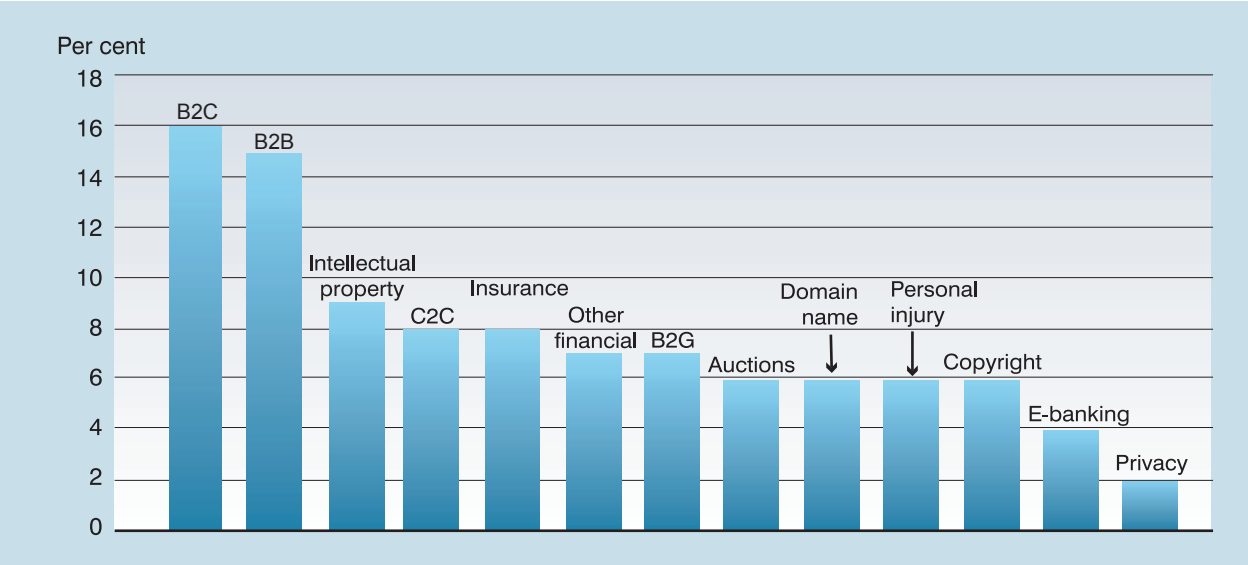
A. Introduction

One of the main challenges facing e-commerce is how to resolve cross-border disputes in the electronic business environment. Distances between parties, linguistic and cultural differences, difficulties determining the applicable law, and competent jurisdiction and enforcement of judgments are among the main obstacles that could significantly increase the cost of doing business online. Given that traditional dispute settlement mechanisms may not provide effective redress in e-commerce transactions, there is a need to consider alternative dispute resolution (ADR) mechanisms that would provide speedy, low-cost redress for claims arising from online interactions. Most if not all of the same laws and principles that apply to ADR in the brick-and-mortar regime will also apply to e-commerce disputes. When ADR takes place using computer-mediated communications in the online environment, it is often referred to as online dispute resolution (ODR). Both e-disputes and bricks-and-mortar disputes can be resolved using ODR. Using data extracted from a questionnaire administered by UNCTAD, chart 7.1 illustrates the wide range of type of services offered by ODR provides.

The main forms of ADR are arbitration, mediation and negotiation, processes that are effective in settling disputes out of court and in a manner that is less formal than litigation in court. During the past two decades, use of ADR has expanded greatly. Indeed, ADR processes are used much more often for commercial disputes than litigation in court.

Chart 7.1

Types of services offered by ODR providers



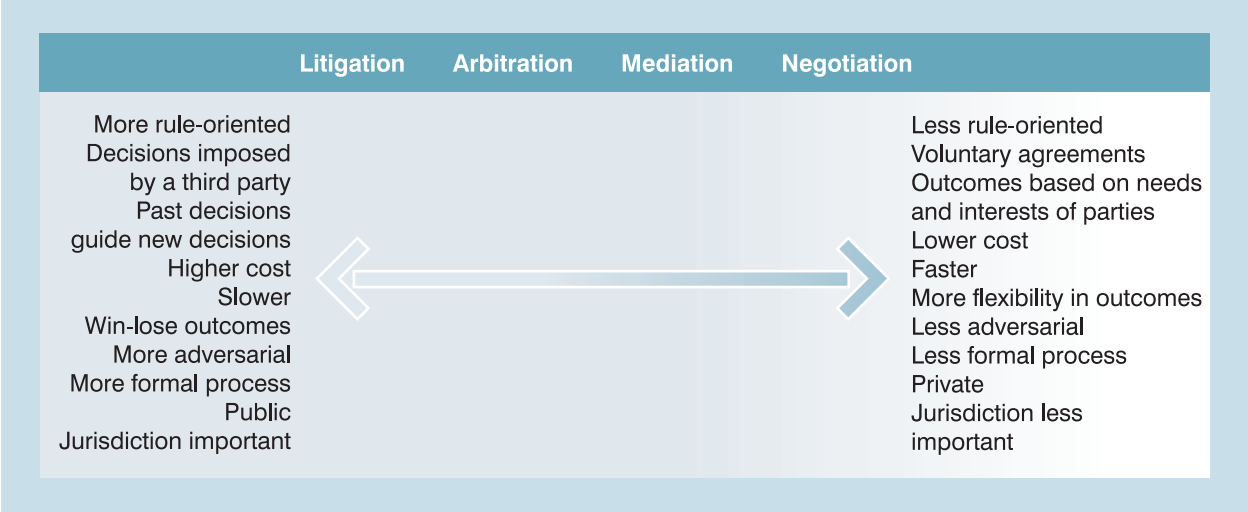
Source: UNCTAD questionnaire.

Following are the chief characteristics of the three principal methods of ADR:

- ***Arbitration*** - Traditional arbitration involves a neutral third party who makes a decision that is binding on the parties. The authority of the arbitrator comes from a dispute resolution clause in a contract that the parties have agreed to.
- ***Mediation*** - Mediation involves a neutral third party, but the mediator has no authority to issue binding decisions. Mediators work with the parties to fashion an agreement that is acceptable to the disputants.
- ***Negotiation*** - In negotiation, there is no third party present. The parties try to resolve the problem by themselves. When unsuccessful, negotiation may be a preliminary step to arbitration or mediation.
- Some of the differences between the various forms of ADR are illustrated in chart 7.2.

Chart 7.2

The dispute resolution continuum



Perhaps the most significant difference between litigation and the three primary forms of ADR is that, whereas participation in litigation more directly assumes that participation can be compelled by the state, participation in ADR and ODR occurs only if the parties have agreed, either voluntarily or through stipulation in a contract, to find a solution to the problem. Litigation, by definition, will not an option when, for any reason, a court is not available or accessible. When access to courts is difficult because of the parties' location or for some other reason, ODR may be the only possible means of resolving a dispute. Thus, ADR/ODR may take place in any country, in any language and with arbitrators/mediators of any nationality. Arbitration/mediation is faster and less expensive than litigation in the courts, and hearings are not public.

Decisions made by arbitrators generally need a method of enforcement. The 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards[1] allows courts in any country that has signed the convention to enforce an arbitral award. For this to happen, certain formalities must be followed. Problems may arise if any of the following questions cannot be answered in the affirmative.

- Does an arbitration agreement formed by electronic means satisfy the formal requirements of the New York Convention?
- Can electronic means be used to conduct the arbitration proceedings? If so, where is the seat of arbitration?
- Can the arbitrators deliberate by electronic means, rather than in person?
- Can an award issued in electronic form be considered to be in "writing"?

Despite these potential problems, there is little doubt that online arbitration will be used more and more widely as time passes.[2]

ODR has a bigger role to play in business-to-consumer (B2C) e-commerce than in business-to-business (B2B) e-commerce because, while an arbitration clause can be enforced among merchants (in B2B contracts), it may not be binding on the consumer (in B2C contracts). It should be noted that in most European jurisdictions, an arbitration clause contained in standard contract terms and binding the consumer to submit a dispute to arbitration is likely to be viewed as unfair. For this reason, a standard arbitration clause cannot be enforced against a consumer. Thus, the arbitration clause may be binding on the business but optional for the consumer. However, if the consumer so wishes, he or she can choose to go to arbitration.

By contrast, in the United States, consumer arbitration clauses are usually enforceable. The US courts will refuse to enforce a binding arbitration clause against a consumer only where it would be unconscionable to do so.[3] This would be the case if enforcing the arbitration clause deprived the consumer of access to a forum to vindicate his or her rights. The US courts have held in several decisions that an arbitration agreement in a consumer contract that forces the consumer to incur excessive arbitration fees is unconscionable. Since arbitration requires the intervention of a qualified and experienced human decision maker, but consumer claims are mostly of small value, excessive fees may be unavoidable. For this reason, arbitration may not be the first choice for small- and medium-value consumer disputes.

Agreements reached as a result of mediation generally do not require a legal infrastructure to enforce them. This is because the agreements are consensual and provide both parties at least part of what they originally wanted. Mediation is thought to be the primary ADR/ODR method for small-value consumer disputes. There are a number of reasons for this primacy of online mediation.

- The process is flexible; the mediator essentially uses his or her skill to help the parties to communicate and reach their own solution. This high degree of party control means that the parties are likely to feel comfortable with the online procedure.
- The fact that participation is voluntary means that the parties are more willing to participate, as they are not thereby compromising their position.
- Redress is not limited to monetary awards and could include, for example, a substantial discount on a future purchase or something similar.

ODR, like ADR, can take the form of any dispute resolution process, and the first choice that must be made in responding to any dispute or in designing a system is which process to use. As will be discussed below, for ODR to work, the parties must agree (or have agreed earlier contractually) on a particular process. The second important question is whether the whole dispute resolution process or only a part of it will be online. ODR can be a stand-alone system in which parties never meet face to face, or it can be used to enhance processes that include at least some face-to-face meetings.

E-commerce is an arena that has already demonstrated both a need for new dispute resolution approaches and the fact that new approaches are possible. Just as offline business is supported by an infrastructure that provides dispute resolution options when disputes occur, the online environment is building an infrastructure with an array of dispute resolution options that take into account the special qualities of cross-border transactions, in which much of the exchange is electronic in nature. ODR, as it is increasingly being called, was not in the minds of early e-commerce entrepreneurs, but during the last six to seven years the inevitability of disputes and the need for ODR processes has become increasingly clear. Recently, ODR has been acquiring new functionalities demonstrating its potential in an expanding range of situations.

ODR brings the resources of the network to the task of resolving conflict. These network resources have three novel elements:

1. Human expertise delivered from anywhere
2. Computer processing power delivered from anywhere
3. Delivery of human expertise and technological power at electronic speed

Dispute resolution is an ancient and fundamental activity not only of society at large but of institutions within society. Dispute resolution processes are present in state-based legal systems and in groups of all kinds and sizes, from small families to global economic enterprises. What can vary greatly are the methods and processes used to pursue the goal of resolving conflict. There are many different tools for

dispute resolution, and the needs of the parties and the group or community involved determine which of the available tools best fit the particular situation.

The Internet, by being both disruptive and facilitative, is the source of the problem and also the source of the solution. All the numerous and novel ways of interacting online in commercially productive ways allow disputes to occur, thus heightening the need for dispute resolution systems that can assist disputants who may be at a great distance from one another. At the same time, dispute resolution is an informational activity in which persons and groups need to identify common interests, share information, assess priorities, and evaluate areas of agreement. As technology improves, therefore, and as people engage in increasingly complex informational activities online, ODR processes can be expected to become more sophisticated as well.

The disputes that are traceable to the Internet may be more visible and are generally more publicized than the solutions made possible by the Internet. Part of the reason for this is that new systems are often built and implemented without anticipating the need to respond to disputes and conflicts that might arise. Fortunately, this is not always true, and notable achievements in the area of dispute resolution have already occurred and will be discussed in the following sections.

While the need for and value of ODR have become clear very quickly, the technological capabilities needed for broader use of ODR are expanding more slowly. Disputes occur inevitably and often quite quickly as new kinds of transactions and interactions emerge online. Dispute resolution processes, however, must be designed and constructed. Dispute resolution for complex disputes will also be more challenging than dispute resolution for simpler conflicts. One can already point to significant successes in applying ODR to relatively simple e-commerce disputes, and tools are being developed for use in more complex private and public disputes.

This chapter looks at the history of ODR, its nature and use in different contexts, and what role it can perform in fostering the trusting relationships that are necessary for e-commerce to grow in developing countries. In addition, it considers the growth and adoption of ODR in new environments such as government and other arenas where there is a need for new tools to respond to more complex multi-party disputes. The last part of the chapter focuses on the challenges involved in implementing ODR in developing countries. That section draws on data obtained through a questionnaire that UNCTAD secretariat circulated to ODR service providers. The questionnaire elicited 24 replies, including from all the major ODR providers.

B. A history of ODR

The history of ODR can be divided into three main time periods: pre-1995, 1995 to 1999 and post-1999.

1. Before 1995

During this period, disputes arose and dispute resolution was applied informally. Until 1992, the Internet was largely a US-centered network, and commercial activity was banned from it under that country's National Science Foundation's acceptable use policy (Kesan and Shah 2001). The Internet was used mainly by those in academic institutions for sending email and participating in listservs and, in the case of those with some technical expertise, for exchanging files. "Flaming" and violations of "netiquette"[4] were common, and some famous disputes occurred during this time involving individuals participating in role-playing games.[5] Various online mechanisms were used to deal with these conflicts, but there were no organized dispute resolution institutions devoted specifically to ODR. Indeed, the term had not yet been invented.

When the ban on commercial activity was removed, disputes related to commerce began to surface. In April 1994, for example, the first commercial spam occurred when two lawyers tried to recruit clients to participate in an immigration scam.[6]

2. From 1995– to 1999

The idea for ODR emerged out of a recognition that disputes would multiply as the range of online activities grew. The origins of ODR, therefore, are traceable to a very simple insight – that the more transactions there are, the more disputes there will be. In addition, as new entities began to appear in cyberspace, it was not clear what their legal liability would or should be. Thus, as Internet service providers (ISPs) began to provide subscribers with connectivity and storage, questions arose about whether the ISPs should be liable for subscribers' actions. What rights and responsibilities did ISPs have when subscribers,

for example, used their accounts to distribute copyrighted software? Did the ISPs have to check accounts to see if any illegal activity was occurring? Under what circumstances could ISPs terminate subscriptions? Out of these concerns developed an early online arbitration project called the Virtual Magistrate.[7]

As companies began exploring the Internet's commercial opportunities, interest also grew in domain names. As the number of domain name registrations increased, disputes also arose between trademark owners and domain name holders. In general, the more the Internet was used for any purpose, the more disputes arose. For example, use of the Internet for the distribution of pornography led not only to legislation and court cases but to disputes on college campuses about freedom of expression and access. Similarly, as the number of websites grew, disputes arose not only about domain names but about the legality of linking, and about various other intellectual property issues related to the use and copying of information.

During this period, recognition grew that the Internet needed some focused online institutions to address problems that were arising with increasing frequency. Various experimental projects, largely university-based and foundation-funded, were designed to allow those involved in a dispute to obtain expertise from a distance.[8] For example, in the first case mediated by the Online Ombuds Office, an online mediation project at the University of Massachusetts, an online mediator helped an individual website owner resolve a problem with a local newspaper claiming copyright infringement.[9]

3. From 1999 to the present

The last four years have been a period of significant activity and notable achievement for ODR. During this period, ODR has become accepted as a needed process in the online environment, and capabilities have been demonstrated that can be employed with traditional kinds of disputes originating offline. The key question concerning ODR now involves the cost of building and implementing systems, not viability or value. Costs have probably slowed the rate of growth in the deployment of ODR, but the number of firms offering some form of ODR continues to grow. As a result, the promise, potential and future value of ODR remain high.

As an ODR industry has begun to emerge, there has been growing recognition by both governmental and commercial interests that online resources can be a solution for many problems that originate in the online environment. Unlike five or six years ago, it is now accepted that it is appropriate – indeed, desirable – that ODR be the process of first choice for disputes generated in online activities. It is also recognized that technologies that work for online disputes can be used efficiently for offline disputes.

Table 7.1 contains a list of ODR companies and providers in March 2003. While some ODR providers have gone out of business, other companies and projects have taken their place. For example, three years earlier there were 24 ODR companies, of which 11 had gone out of business by March 2003. In addition, most major ADR organizations, such as the American Arbitration Association and the International Chamber of Commerce, have started or are planning to start using ODR.

Table 7.1

ODR providers as of March 2003

ADRonline	Australia	*www.adronline.com.au*
American Arbitration Association Web File	United States	*www.adr.org*
Arbitraje y MediaciÛn (AryME)	Spain	*www.aryme.com*
Asian Domain Name Dispute Resolution Centre	China	*www.adndrc.org*
Bankers Repository Corporation	United States	*www.thebrc.com*
Camera Arbitrale di Milano	Italy	*www.camera-arbitrale.com*
Chartered Institute of Arbitrators	United Kingdom	*www.arbitrators.org*
Cibertribunal Peruano	Peru	*www.cibertribunalperuano.org*

Table 7.1 (*continued*)

ClickNsettle	United States	*www.clicknsettle.com*
Consumers Association of Iceland	Iceland	*www.ns.is*
CPR Institute for Dispute Resolution	United States	*www.cpradr.org*
Cyberlaws.net	India	*www.cyberarbitration.com*
Cybersettle	United States	*www.cybersettle.com*
Dispute Manager	Singapore	*www.disputemanager.com*
e@dr	Singapore	*www.e-adr.org.sg*
Electronic Consumer Dispute Resolution	Ireland	*www.ecodir.org*
e-Mediator	United Kingdom	*www.consensusmediation.co.uk*
Eneutral	United States	*www.eneutral.com*
e-Settle.co.uk	United Kingdom	*www.e-settle.co.uk*
FSM	Germany	*www.fsm.de*
Global Arbitration Mediation Association	United States	*www.gama.com*
Icourthouse	United States	*www.i-courthouse.com*
Internet Ombudsman	Austria	*www.internetombudsmannen.se*
InternetNeutral	United States	*www.internetneutral.com*
Intersettle	United Kingdom	*www.intersettle.co.uk*
IRIS MÈdiation	France	*www.iris.sgdg.org/mediation*
Mediation Arbitration Resolution Services	United States	*www.resolvemydispute.com*
National Arbitration Forum	United States	*www.arbitration-forum.com*
Nova Forum	Canada	*www.novaforum.com*
Online Public Disputes	United States	*www.publicdisputes.org*
Online Resolution	United States	*www.onlineresolution.com*
Private Judge	United States	*www.privatejudge.com*
Resolution Canada	Canada	*www.resolutioncanada.ca*
Resolution Forum Inc.	United States	*www.resolutionforum.org*
Settlement Online	United States	*www.settlementonline.com*
SettleSmart	United States	*www.settlesmart.com*
SmartSettle	United States	*www.smartsettle.com*
SquareTrade	United States	*www.squaretrade.com*
The Claim Room	United Kingdom	*www.theclaimroom.com*
USSettle.com	United States	*www.ussettle.com*
WebAssured	United States	*www.webassured.com*
WEBdispute	United States	*www.webdispute.com*
WebMediate	United States	*www.webmediate.com*
WeCanSettle	United Kingdom	*www.wecansettle.com*
Word&Bond	United Kingdom	*www.wordandbond.com*
World Intellectual Property Organization	Switzerland	*www.wipo.int*

The focus of ODR at the beginning of the period in question was largely on consumer disputes resulting from e-commerce transactions. This continues to be an important area for ODR, but it has been joined by a growing number of disputing contexts. Most importantly, it has become clear that ODR is a resource that can be used in both online and offline disputes.

ODR, during the last few years, has become accepted as being both viable and valuable for many disputes for which no other means of dispute resolution are feasible. This has helped sustain the growth of ODR even in a difficult entrepreneurial environment. Yet, as the following discussion about the nature of ODR will show, there is a side of ODR that has been largely untapped. The value of ODR in using the network to deliver the dispute resolution skills of a third party has been demonstrated. What will take longer to develop are applications that enhance dispute resolution by exploiting and delivering technological capabilities embodied in machines at remote locations.

C. Choosing an ODR process for online disputes: The examples of eBay and ICANN

The two most widely known and widely used dispute resolution venues concerning cyberspace-related disputes are the online auction site eBay and the domain name dispute resolution process designed by the Internet Corporation for Assigned Names and Numbers (ICANN). Since March 2000, SquareTrade.com has handled over 300,000 disputes, mostly related to eBay transactions, through wholly online processes of negotiation and mediation. Over 7,000 domain name disputes between trademark owners and domain name holders have been resolved through ICANN's Uniform Dispute Resolution Policy, a non-binding arbitration process (see ICANN 2002).

1. eBay: Assisted negotiation, then mediation

eBay is an online auction site with over 61 million registered users where over 12 million items are offered for sale each day. eBay makes it possible for sellers anywhere to sell to buyers who may be located anywhere. eBay itself is not a party to any transaction and, in general, assumes no responsibility for problems that arise between buyers and sellers. eBay's earliest challenge was not to find people willing to put items up for auction or even to find buyers interested in the items listed. It was, rather, how to design a site where interested buyers would trust sellers enough to make payment and then wait for delivery. In other commercial contexts, brand names may build trust and, obviously, face-to-face transactions allow for immediate exchange of goods and money. eBay needed a system in which potential buyers would be confident in dealing with unknown sellers. Any such system would encourage purchases by indicating to potential buyers that they were dealing with someone with whom they were unlikely to have a dispute.

eBay created a feedback rating system in which any party to a transaction could post an assessment of how smoothly the transaction had been completed. While sellers might not have been well known, the rating system enabled participants to acquire a reputation concerning how they handled transactions and responded to problems. In 1999, eBay decided that having a dispute resolution process might further enhance trust. It therefore authorized the Center for Information Technology and Dispute Resolution[10] at the University of Massachusetts to conduct a pilot project to test the viability and value of a dispute resolution process that would allow parties who could not resolve a particular problem to receive expert assistance from a mediator.[11]

Any arbitral process requires a procedure for enforcing the decision of the arbitrator. With arbitration, there is a clear result and ruling at the end. In a context like eBay, the only realistic enforcer would have been eBay, which could have indicated that any loser who did not do what the arbitrator ordered would lose his or her eBay account. This was not a role that eBay desired to play and, therefore, it viewed mediation as a much more attractive process.

With mediation, the mediator helps the parties come to an agreement. There are no declared winners and losers, just an agreement at the end (or, if the process is unsuccessful, no agreement). Reaching an agreement signifies that there is something that each party wants and is receiving. The goal in mediation is a "win-win" outcome, one where the agreement will not need to be enforced because the parties find it in their interest to voluntarily do what they have promised to do.

Several months after the completion of the University of Massachusetts pilot project, eBay selected SquareTrade.com, an Internet start-up, as its preferred dispute resolution provider. SquareTrade's approach to ODR built on the University of Massachusetts approach but differed from it in two ways, each of which represented an important advance in ODR. First, SquareTrade added a technology-supported negotiation process in which parties could try to resolve the dispute themselves before requesting a mediator. Second, SquareTrade employed the Web rather than email as the means for communicating and working with the disputants.

On eBay, when a problem with a transaction surfaces (e.g. when an item does not arrive or arrives broken), buyers attempt to contact sellers and negotiate a solution. SquareTrade's dispute resolution process, therefore, is typically invoked only after an initial negotiation via email or telephone has been attempted and has failed.

SquareTrade is accessible from a link on eBay's Services page. SquareTrade employs a website, rather than email, as the main tool for negotiation and has the parties try the Web-based negotiation before requesting mediation and the assistance of a human third party. The advantage of Web-based negotiation over email exchanges is that the process is not simply com-

munication but what might be called "communication plus" or "communication added". The site provides a more structured set of exchanges between the parties than is possible with email. It provides forms that the parties fill out, and these forms clarify and highlight both what is dividing the parties and what solutions are desired. While parties do have an opportunity to describe concerns in their own words, the forms and the form summaries that parties receive inevitably reduce the amount of free-text complaining and demanding that occurs, a result that appears to have the effect of lowering the amount of anger and hostility between the parties.

Negotiation, by definition, occurs between the disputants, with no third party present. Using the Web in the SquareTrade manner adds a novel element to traditional negotiation, a kind of "virtual presence". The site, particularly the forms that are employed, frames the communication and provides some of the value that might otherwise be provided by a mediator. There are no algorithms at work that analyze responses, and thus this is only a first step toward a more sophisticated online negotiation process, something similar to SmartSettle (see the discussion later in this chapter). The more technology works with the parties in negotiation, however, the less clear the classic distinction between negotiation and mediation will be.

When Web-based negotiation fails, SquareTrade provides a human mediator for a fee of $20. The Web interface is still used, but the conversation is facilitated by a neutral third party. Table 7.2 provides a summary of what SquareTrade tells users about mediation.

Table 7.2
What is mediation?

What mediation IS:

- It is a voluntary process in which the parties work with a mediator (a neutral and impartial person) to find a mutually acceptable solution to the problem.
- It works when both parties participate and are willing to compromise.
- It can be very effective in resolving disputes and misunderstanding if both parties participate in the process and are willing to compromise and look for creative solution options.

What the mediator DOES

- The mediator communicates with the parties to understand both of their interests, perspectives and preferred solutions, and tries to help the parties understand each other's interests and perspectives on the issues.
- The mediator's role is to help the parties diffuse the emotions that are often part of any dispute, focus on the issues that they can work together to solve, and, if possible, build an agreement that works for both parties.
- The mediator will make a recommended resolution to the parties only *if* they *both* agree to have the mediator do so.

What mediation IS NOT:

- Mediation is not a court proceeding.
- Mediation is not arbitration.
- Mediation is not a process that should make you nervous or uncomfortable! The mediation process is designed to give both parties equal roles and responsibilities.

What the mediator DOES NOT DO

- The mediator does not make a decision.
- The mediator will *not* decide if one party is right or wrong.
- The mediator will not review the information or evidence that the parties send to him/her and decide whether either party has proven their case.
- The mediator does not act as a judge.
- The mediator does not act as an arbitrator.

Source: SquareTrade.com 2003.

2. ODR and arbitration: ICANN and domain name disputes

While domain names, such as eBay.com, make it easy for humans to remember Web addresses, they become a matter of concern to trademark owners when the domain name is similar or identical to a trademark. In 1999, ICANN adopted its Uniform Dispute Resolution Policy, a topic that is the subject of extended treatment in UNCTAD's *E-Commerce and Development Report 2002* (UNCTAD 2002). Both the approach ICANN chose, a modified arbitration process, and the systems that have implemented this approach represent another choice in moving dispute resolution online.

A domain name can be registered by anyone, and the cost is nominal. Those in charge of registering domain names could have avoided some conflict by making registrants aware that they might encounter problems if they registered a word that was trademarked. The US Patent and Trademark Office maintains a Web site enabling free searches of the US trademark database.[12] Such searches have generally not been done at registration, however, and, even today, anyone who wishes to register a trademarked word can do so. Whatever problems might arise will have to be faced later.

After ICANN took over management of the domain name system, it implemented a process for resolving domain name disputes. The Uniform Dispute Resolution Policy (UDRP) (see ICANN 2002) provides trademark holders with a process that is faster and less expensive than litigation. However, use of the UDRP is not mandatory, nor is the resulting arbitration binding. Trademark holders can still go to court instead of using the UDRP, and the party that loses the arbitration can go to court after the decision is handed down. Court cases, however, are relatively few compared to the number of disputes handled through the UDRP.

The factors affecting the outcome of a UDRP case are evident in the decision tree in chart 7.3. Approximately 7,000 cases have been decided using the UDRP. The large majority of UDRP cases are processed by two providers, the World Intellectual Property Forum and the National Arbitration Forum. The processes employed are interesting in a number of ways.

First, UDRP dispute resolution occurs without face-to-face meetings and, except in rare instances, without telephone communication. It is, in short, dispute resolution at a distance. However, the process used by the current dispute resolution providers involves limited use of the Internet. A now-bankrupt dispute resolution provider, eResolution.com, did use a completely online system, but it stopped handling cases in 2001. The two main providers, the World Intellectual Property Organization (WIPO) and the National Arbitration Forum (NAF), have online systems that could be used and probably will be used in the future. Currently, online filings are occurring with increasing frequency, and email is sometimes used. Unlike in the eBay mediations, however, the Web is not employed, and any added value that could be provided by Web-based processes is not yet present.

Second, the UDRP is not classic arbitration in that the decisions are not binding or enforceable in court. UDRP arbitrators are referred to as *panelists*, since the word *arbitrator* denotes someone who can make a binding decision enforceable in court. UDRP panellists are empowered by terms in the contract agreed to when a domain name is registered. The decisions of arbitrators are enforced by making necessary changes in the domain name registry. This is an efficient although somewhat unorthodox process, and not without controversy.[13]

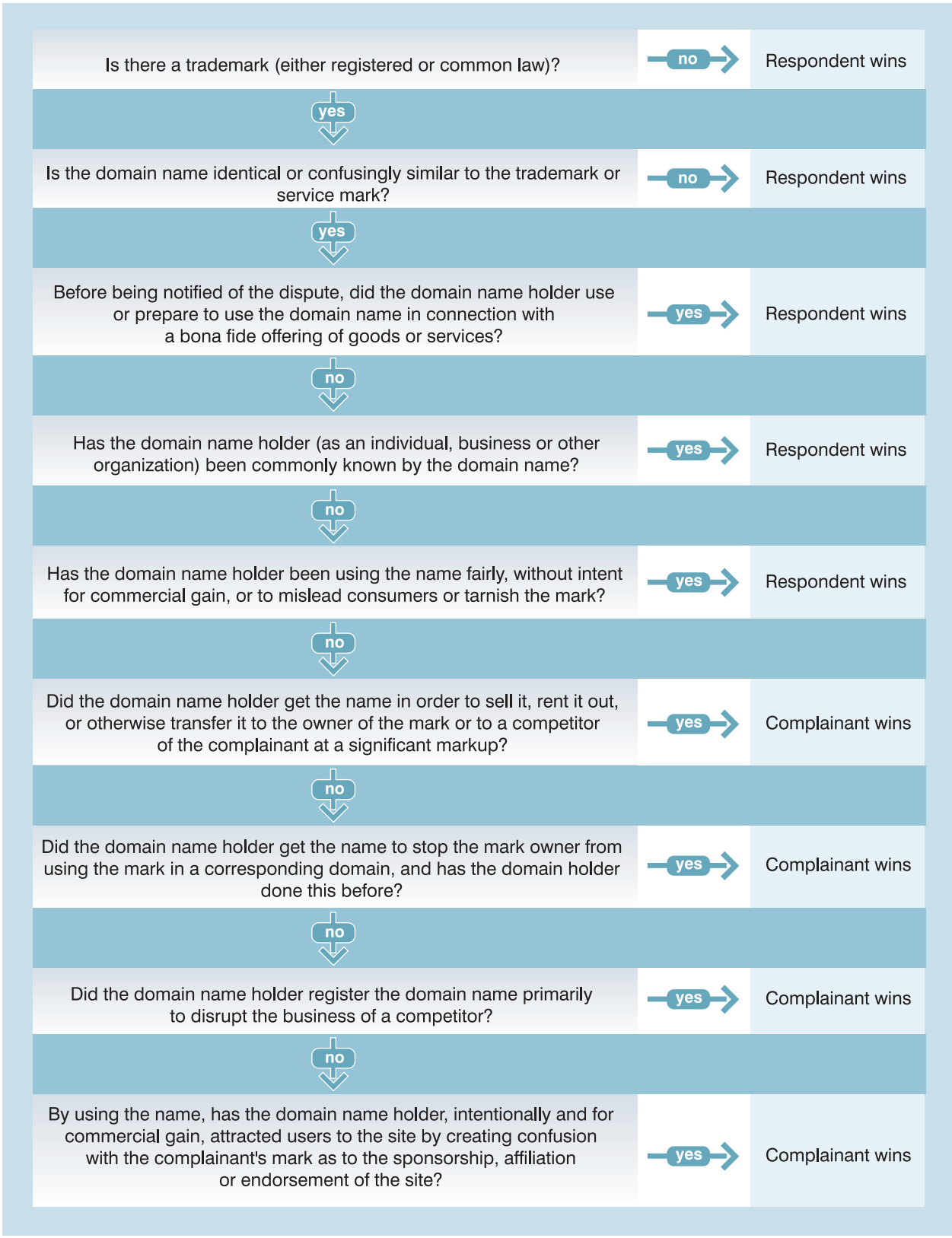
D. ODR for offline disputes: Enhancing ADR and unbundling ODR

The SquareTrade and ICANN processes involve no face-to-face meetings; they are conducted wholly at a distance. The need for ODR with no physical meetings is most obvious in cases that arise online and situations when, because of distance, it is not feasible to meet face to face or go to court. It is not surprising that ODR was first directed at such disputes.

ODR is growing in use not only because there is growth in online activities and online disputes but because ODR can also be employed for traditional offline disputes. SquareTrade, for example, now resolves real estate disputes between home buyers and sellers. When the power of the computer is added to the basic transmission qualities of the network, the result is an array of dispute resolution processes that can be used in any dispute, whether it arises, or is handled, online or offline. Any dispute resolution process can be viewed as a series of informational components. For a wholly online process, all the components must be available in electronic form. For a process that includes face-to-face meetings, the medi-

Chart 7.3

The ICANN Uniform Dispute Resolution Policy decision tree



Source: 2003 Center for Information Technology and Dispute Resolution.

ator must determine the manner in which technology can be used to enhance the process and move the parties towards agreement.

1. Two examples

A simple example: Automated blind bidding processes

Blind bidding systems allow parties to a dispute to submit settlement offers to a computer. If the offers are within a certain range (often 30 per cent) of each other, the parties agree to split the difference. What is attractive about blind bidding is that if no settlement is reached, the offers are never revealed to the other party. This is intended to encourage parties to be more truthful about what their "bottom line" might be.

Blind bidding can be looked at as a negotiation tool, a technique that, if used offline and without a computer, would be cumbersome. The efficiency of blind bidding is that the computer transmits and receives information, processes it, and determines what information can be made public and what should remain private. If the offers are within the 30 per cent range, the parties are informed that there is a settlement. If not, no information about the offer is revealed to the parties.

Thus far, blind bidding has been used mainly in claims against insurance companies. Such claims are generally settled at some point through negotiation, but the process that has been used traditionally, involving personal injury lawyers and insurance claim adjusters, can be lengthy and inefficient. The parties and their representatives may play phone tag and posture in ways that often take up time. There certainly could be a human third party who accepted offers similarly to how the computer does it, and t his is occasionally done, but never as efficiently as in the blind bidding systems.

Blind bidding systems may be efficient and simple to use, but they are also extremely limited, since they only work with disputes where a single variable is contested. This variable must also be one that uses numbers, so that the machine can make the necessary calculations. The insurance context is a perfect first arena for blind bidding, since differences often focus exclusively on money and the existing system is both expensive and inefficient.

There are a growing number of blind bidding companies, most notably Cybersettle.com and Clicknsettle.com. The technology underlying blind bidding is not very complex, and there may be differences in certain details among the different systems. Some systems may require representation by counsel and others not, some may allow unlimited bids and others not, some may allow bids in ranges and other not. It is possible for companies to differentiate themselves from other blind bidding systems, but all are built on the same basic conception.

The future of blind bidding will inevitably broaden beyond insurance company disputes. In many mediations or arbitrations, there may be many differences to start with but only a monetary issue at the end. Blind bidding technology could be helpful in such situations. In other situations, it might be desirable to offer blind bidding as an option before beginning a longer process. Blind bidding is a tool that can be injected into any phase of a dispute resolution process. OnlineResolution.com, for example, offers blind bidding as a standard feature in its Resolution Room process, considering it one of many possible tools that a mediator might employ.

Blind bidding was the first of what are likely to be many applications that use not only the communications capabilities of a network but the processing capabilities of the computers connected by the network. Like early ODR efforts, most such efforts even today use the network to enable parties at a distance to take advantage of a human mediator who is also at a distance. Thus, the network is a means for delivering human expertise. This alone is an impressive achievement, and the various ways in which human expertise is being delivered have persuaded skeptics that ODR is an important approach to conflict resolution. As the processing power of the computer is combined with human expertise, even more impressive results can be expected.

Blind bidding is not only a tool that can be used in negotiation but a process that raises the question of what else networked machines can do to assist parties involved in a dispute. Blind bidding is such a simple tool that, if viewed as simply a merging of a calculator with a network, it can easily be taken for granted. Computers, however, are much more than calculators, and systems can be built that will be able to process and evaluate qualitative information.

A more complex example: SmartSettle

SmartSettle,[14] originally called OneAccord, involves much more sophisticated negotiation software than the blind bidding systems. SmartSettle is intended for

use in disputes that are simple or complex, single-issue or multi-issue, two-party or multi-party, comprised of quantitative and/or qualitative issues, of short or long duration, or involving interdependent factors and issues. SmartSettle will never be as easy to use as blind bidding, and common and relatively simple disputes may not require it. However, it demonstrates how networked computers can be used to offer disputants solutions that may not have been apparent to them.

SmartSettle has disputants move through several stages, each of which clarifies what is at issue in the dispute, how strongly the parties feel about the different issues, and what ranges of outcomes might be acceptable. This information is placed on a "single negotiating form" that parties use to fashion proposals and, ideally, reach agreement. In the early phases, SmartSettle provides a structure for issue clarification and assessment that by itself can help parties reach consensus. Most novel about SmartSettle, however, is that it can take any tentative agreement and suggest alternative approaches that may give both sides more than they were willing to accept in a settlement.

Blind bidding involves only one issue, and that issue is quantifiable. SmartSettle may involve many issues, and at the beginning the parties must assign values to the different interests and demands. Once the interests have been identified and prioritized, they are combined into packages or groups, and negotiation can occur that permits adding to or removing from the package or changing its nature. What is novel about SmartSettle is that the computer can not only store the users' information and transmit it electronically but also suggest combinations attractive to them and that they may not have thought of themselves.

2. Technology as the "fourth party"

Email negotiations involve simply humans at two ends of a network, thus allowing quick communication among parties who might otherwise not have been able to communicate at all. Such negotiation with almost no overhead may remain the most common method for online negotiation. What the Web permits, and what blind bidding, SmartSettle and even SquareTrade demonstrate, is that there is value in adding computer-processing capabilities to the humans at the ends of the network.

The reason for adding computers to the mix is that there are things computers can do better and/or quicker than humans. Blind bidding is a simple example of this. Mediators and arbitrators are called "third-party neutrals", and a recent book (Katsh and Rifkin 2001) has suggested that technology be considered a "fourth party", something that influences the process of communication and negotiation and adds value to the third-party roles of mediators and arbitrators. This "fourth party" need not replace the third party, but it can displace it, in the sense that the third party will increasingly be working with an electronic ally or assistant alongside.

The "fourth party" is a metaphor for applications that enhance the process and thus do more than simply deliver the expertise of the human third party across the network. The metaphor views the network as a "communications network plus more". Systems are gradually being built that will help us understand how computers can enhance human involvement.

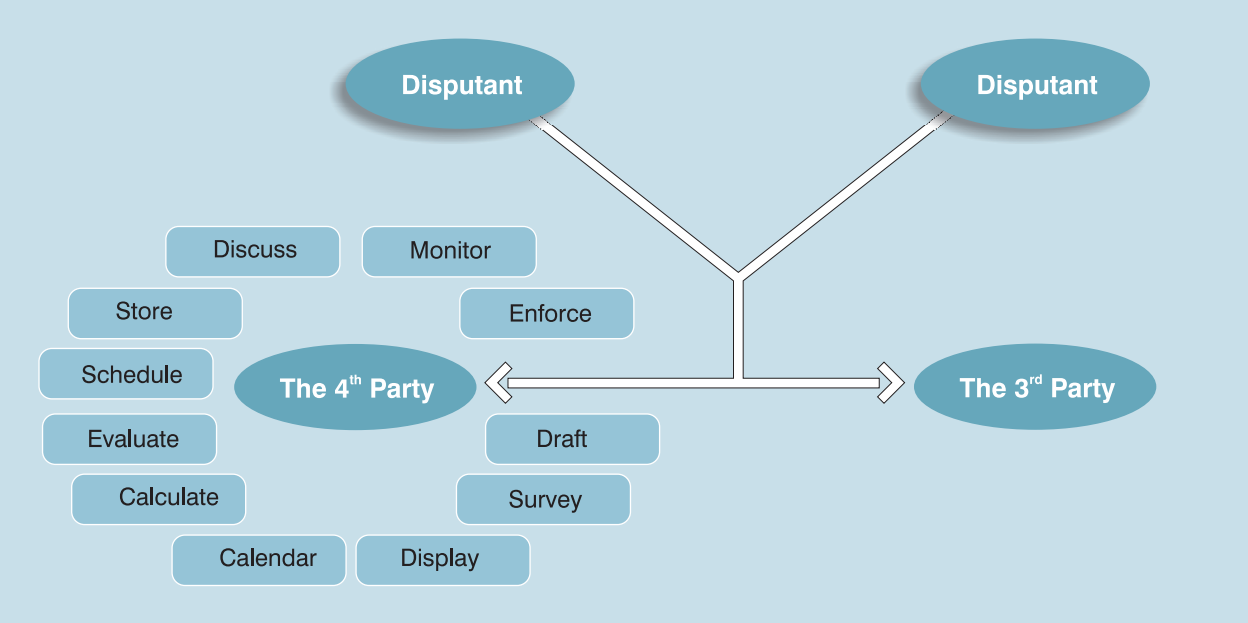
Chart 7.4 suggests that there are many informational activities that computers can assist with that are important elements in what mediators and arbitrators do. The activities in chart 7.4 are common, but until now, only been when the parties were physically together have these activities been performed with any degree of efficiency. For example, scheduling meetings with several parties can be done fairly quickly when all are in the same room and looking at calendars, but scheduling using paper or the telephone becomes cumbersome as the number of participants grows. A mediator meeting face-to-face with a few parties can survey opinions and may even be able to evaluate whether consensus exists by looking at facial expressions. When the parties are not together, however, ascertaining how parties feel grows difficult as the number of parties involved increases.

Chart 7.4 also provides some insight into why it is generally easier to design arbitration systems online than mediation systems. Mediation requires more frequent interaction among the parties and a more finely tuned system that will enable the mediator to assess emotions, interests and values. Any ODR system will consist of a series of linked and coordinated informational tasks. Arbitration systems will ordinarily require fewer elements in the chain and a more straightforward arrangement.

The three traditional ADR processes of arbitration, mediation and negotiation represent three different information management systems. In the past, however, they all used face-to-face exchanges, a form of exchange that is both rich and efficient. In face-to-

Chart 7.4

The "fourth party"



face meetings, not only is information being transmitted but the truth and sincerity of the parties are being evaluated, trust is increasing or decreasing, and "bottom lines" are being reassessed as offers and counter-offers are made.

Organizing and managing information are commonplace uses of computers, and many of the tasks in chart 7.4 are straightforward information management tasks, which largely add efficiency to the dispute resolution process. US-based lawyer Randall Butler has recognized that the more complex the dispute, the greater the need for assistance from a "fourth party". Butler mediates class action suits, which can involve hundreds of plaintiffs represented by many lawyers. He has pointed out that "mediation has become the preferred alternative for resolving most lawsuits. With the right leadership, mediation is generally faster, more effective and less expensive, stressful and intrusive. But the effectiveness of traditional mediation is inversely proportionate to the number of parties to the lawsuit."[15] ButlerMediation.com provides a website that allows a highly systematized process of exchanging information, freeing lawyers to participate when convenient and from any place that is convenient.

Information processing often involves linking several informational tasks. Thus, blind bidding is a system that involves communicating, calculating, evaluating and applying a rule to the results of the calculation. Similarly, SmartSettle takes data that have been entered and, using more sophisticated algorithms, evaluates and then responds to offers. The "fourth-party" approach assumes that, while face-to-face encounters provide a very rich and flexible opportunity for communication, they are not perfect. The "fourth party" will grow more and more useful, and the network will become more and more valuable in dispute resolution, as people gain experience in using information management and information-processing tools. Electronic documents will also start acquiring intelligence. Such "smart" documents will be able to send communications when particular events occur and also to gather information that is needed by participants.

Thus far ODR has been used most often in simple e-commerce disputes and domain name disputes. These disputes are simple in the sense that they usually involve only two parties and a relatively small set of issues. In such circumstances, all that may be needed is a means to communicate from afar. In the domain name disputes, for example, neither information management nor information processing are used, because the dispute providers do most of the information management, and the processing or decision making is done by the arbitrator.

SquareTrade's breakthrough of being able to process very large numbers of disputes is traceable to efficient information management and organization and the

displaying of information on the screen very effectively for the disputants. Thus, an important difference between email negotiation and SquareTrade's Web-based negotiation is that SquareTrade provides a much higher level of information management than routinely occurs with email. The purpose is not to evaluate positions and recommend solutions but to clarify issues and present information on screen in a way that may highlight areas of agreement and difference. What the software does is therefore very similar to what a mediator does: it keeps the parties talking to each other in a respectful way until the contours of a solution appear.

The network provides new capabilities for monitoring performance and enforcing the terms of an agreement. Monitoring performance has never been a very efficient process. If a check has not arrived, for example, should one call the other party? Or should one have a mediator or third party do it? How can one be certain that a check has arrived? In recent years, many have become accustomed to using the FedEx site to determine where a package is and whether it has been delivered. This is not merely a convenience provided by FedEx but a use of information to build confidence and prevent disputes. Obviously, the complexity of monitoring tools will have to be appropriate to the complexity of the performance required. Certainly, however, a "legal watchman" or early warning system of non-performance will be quite useful.

There are many ways in which the medium's visual capabilities can alert us to problems. Images and numbers can be used to show change in ways that are not possible with print. Increases and decreases can be demonstrated visually through changes in size, shape or color. In the contract context, for example, lack of performance might send a red flag to the attorney for one of the parties. This could be an actual image of a red flag, and the red flag, if ignored, could grow larger over time, something that would be both meaningful and attention-getting. Various new opportunities to use visuals (e.g. images, icons, charts, tables, diagrams, maps, sketches, blueprints, and colorful and animated graphics) will be available for use in dispute resolution processes.

3. Government's role in ODR

Government regulation versus self-regulation in ODR

Governments have been more involved in promoting ODR than in regulating it. In the late 1990s, it appeared that ODR was developing at an impressive pace without the involvement of government. The easy availability of venture capital allowed ODR companies to appear and grow quite rapidly, and those companies educated business leaders and consumers about the benefits of ODR systems. Many ODR providers and other dispute resolution organizations suggested that government should adopt a hands-off approach and that ODR services would take root on their own.

Europe identified the promise of ODR early, and several efforts encouraged self-regulation among companies. Some observed that government regulatory procedures moved much too slowly to put ODR mechanisms in place in a timely fashion, and that by the time any law promoting or regulating ODR came into effect, the e-commerce environment and technology would likely have changed so much that the law would be irrelevant at best or an obstacle to progress at worst.

When the Government of the United States convened its first conference on ODR in June 2000 at the Federal Trade Commission,[16] it was clear that it, too, was leaning toward industry self-regulation. In the freewheeling spirit of the Internet revolution, self-regulation seemed the logical course.

The first doubts regarding the self-regulation approach were raised by consumer groups, which had a long history of disagreement with corporate interests. Some companies were suggesting that ODR be integrated into their e-commerce systems as a mandatory step: that is, disputants would have to engage in ODR before being permitted to go to court. They also wanted to require payment of filing fees by consumers undertaking such a process. Some consumer groups suggested that this was merely an attempt by corporations to make legal challenges even more costly, time consuming, and complicated to undertake, so as to better insulate corporate interests from class action suits and other legal challenges. Some corporate representatives countered that without clear processes and reasonable filing fees they could be subject to an overwhelming tide of nuisance claims with little or no merit.

Several non-profit organizations convened working groups to examine these questions. In the United States, the American Bar Association's E-Commerce Working Group, the International Chamber of Commerce, the Better Business Bureau and several other prominent organizations all discussed these challenges at length, and many eventually issued standards

for ODR providers that they hoped would help to balance the competing interests of corporations and consumers.

One suggested way to enforce these standards (while at the same time educating the public about the benefits of ODR) was the widespread adoption of trustmarks. Trustmarks were visualized as graphical logos placed on the websites of e-commerce companies or ODR providers ensuring that a certain baseline quality assurance standard had been met. In the case of e-commerce companies, trustmarks could attest to the availability of ODR should a problem arise. In the case of ODR providers, trustmarks would attest to the quality and overall fairness of the dispute resolution system offered. It was envisioned that companies would pay for these trustmarks to encourage customers to do business with them, and that the revenue generated from the trustmarks would fund the operation of the ODR services.

Several other firms (e.g. Verisign and TRUST-e) had already demonstrated the viability of trustmark programs in other areas. A handful of companies (e.g. SquareTrade) and large non-profit organizations (e.g. BBBOnline) had implemented trustmark programs in the ODR arena quite successfully, eventually selling tens of thousands of the seals and generating significant revenue. ODR was frequently packaged as a component in a suite of trust-enhancing packages, including fraud protection, privacy guarantees and transaction feedback information. Some of these trustmark initiatives did achieve impressive penetration in certain market niches (e.g. SquareTrade in the eBay community).

The increasing numbers of ODR providers and the wide variety of trustmark and seal programs led to new problems as consumers quickly became confused about which ODR programs offered what services. It was easy for reputable programs that placed a high priority on fairness to be lost in the maze of ODR providers, some of which had questionable incentives and unbalanced processes. As a reaction to this confusion, several in-depth studies of ODR providers were conducted by government agencies and international organizations concerned with this new state of affairs. The studies often aimed at gathering detailed information about who funded the operations of individual providers, how they chose their panellists, and how they dealt with power and information imbalances between parties in disputes that they handled.

Most recent activity in the self-regulation area has been focused in Europe. Seed money has been provided for some government ODR projects (e.g. ECODIR) and for research centres (e.g. the JRC in Italy, which pioneered the conversation around creating an ODR XML standard). Government agencies (e.g. the Italian Chamber of Commerce) began to initiate construction of their own ODR platforms. Large non-profits also began experimenting with cooperative ODR systems such as the proposed global ODR Network discussed by the Better Business Bureau, EuroChambres, and the Federation of European Direct Marketing Associations (FEDMA). The International Chamber of Commerce (ICC) forged an innovative partnership with Consumers International (CI) to propose a global clearinghouse for e-commerce disputes. Only ODR providers that abided by strict quality standards developed by the ICC/CI partnership would receive cases, and those that let their standards slip would be taken out of the referral queue.

One force likely to affect future regulatory efforts is the adoption of ODR by government agencies. The most ODR-aware agency in the . Government of the United States, the Federal Mediation and Conciliation Service, is using technology not for e-commerce disputes but for workplace matters, disputes between labour and management, and regulatory negotiation. Eventually e-commerce companies may re-emerge as the innovators and drivers in the development of the ODR field, but, with a few exceptions, the most interesting applications of ODR in the next few years may come from government.

E-government and ODR: From consumer disputes to multi-party public disputes

A major function of government agencies is the resolution of disputes between citizens and government, or between citizens and other citizens. In addition, many government functions, such as rule making, may involve trying to achieve consensus among interested parties, a very familiar dispute resolution goal. While ODR has in the past few years been concerned mostly with the private sector, increasing efforts in the areas of e-government and e-democracy are focusing attention on the value of ODR. As technology is used to further the activities of government and as citizens employ the Internet to bring their views to the attention of government, the experience of ODR becomes very relevant.

During the last few years, governmental activity concerning ODR has been concentrated in two major

areas. Initial interest in ODR by governments arose out of concern for consumers who encountered problems in cross-border e-commerce transactions. As a result, between 1999 and 2003, a variety of conferences were held to discuss the appropriate role for government in this area.[17] More recently, various governments and government agencies have been exploring how ODR can be incorporated into offline and online governmental activities.

Most e-commerce disputes are fairly simple in that they usually concern two parties and a limited set of issues. The same types of problems turn up again and again, usually involving money, transaction terms or delivery problems. Disputes handled by government agencies range from the simple and relatively straightforward to the highly complex. Increasingly, ODR tools have the capacity to be used in complex disputes to facilitate resolution when there are many parties and a large set of issues.

ODR has much to offer in the multi-party context. Technology can help with information flow, making it easier to disseminate announcements, revise proposals and track versions of documents. Tools like threaded discussion applications and online presentation platforms can streamline many activities, making them more satisfying for parties and more efficient.

Complexity in dispute resolution processes often increases exponentially whenever an additional disputant becomes involved. Handling multi-party cases is very work-intensive for the facilitator, as all participants need to feel that they are being heard. As a result, multi-party processes are often many times more complicated and involved exercises than two- or three-party dispute resolution processes. The tools ODR provides to neutral parties may prove most useful in large public cases because there are so many individual communication channels to manage.

There are strong incentives to use dispute resolution, rather than courts, in multi-party situations. Courts may be appropriate when it is necessary to make findings of who is right and who is wrong, but they are not very efficient at sorting out matters where there might be dozens of involved parties. ADR is much more effective in these situations, because mediators can act as conveners and facilitators, working to build consensus behind a particular resolution as opposed to finding fault.

Much of the mediator's time in a multi-party process is spent in a convening role, getting the parties together, drafting and redrafting documents to build party support, and shuttling communications between the different parties. Often the deliberations in multi-party matters are very technical, requiring sophisticated analysis and extensive research. Many ADR organizations have built an impressive track record of successes during the last three decades, and ODR can enhance such processes.

Public dispute resolution processes can reap many clear benefits by incorporating ODR. Online technology can help with many of the key tasks in such processes, including administrative tasks such as circulating agendas and draft revisions, setting up meeting times and places, and tracking participants' contact information. An inordinate amount of time can be spent on coordinating the process, which is all separate from the actual work of making progress toward resolving the dispute. ODR can help streamline these tasks, freeing facilitators to focus on the substantive issues that need to be addressed.

For many multi-party processes the goal is to generate a document at the end of the process that all of the participants are willing to support. The drafting and redrafting that go into the creation of these documents are often very complex, involving the synthesis of myriad comments from many different participants. Simply keeping track of the suggested changes, much less integrating them into a coherent whole, can be a challenge. Online technology can help organize this drafting process so that the parties can make progress on language without relying on the facilitator to shuttle every proposed wording change around to everyone who might be interested. Because the deliberative process itself is text-based, it is easier to translate the discussion into text that all of the participants are likely to be satisfied with.

ODR also enables parties to make progress between meetings and thereby reduce the number of face-to-face meetings. Much of the time at the beginning of face-to-face meetings is spent reacquainting the participants with each other, reminding them what was covered in the last meeting, and filling in participants who were absent from prior gatherings. Because ODR happens in a more continuous way, the flow of the discussion does not stop for long periods of time. Also, because the discussions are automatically archived, if an individual does need to be reminded of what was discussed previously, he or she can easily access the information. Participants who might have to miss a meeting can consult the online record to see what was discussed.

ODR can also facilitate the consensus evaluation process. One of the challenges in multi-party disputes is the degree to which communications between the facilitator and the participants are public. In a large group meeting, it is very difficult for the mediator to speak one –on one with any of the participants, because the group as a whole needs to keep moving forward. If the facilitator wants to evaluate where the group is with regard to reaching agreement on a particular point, online tools make it easier to poll participants, share large quantities of information, and jointly edit documents. The ability to set up subsections of virtual meeting rooms permits spinning off work groups and caucus discussions. These discussions can happen concurrently with the joint discussion so that work group members can continue to participate in the overall dialogue while they work in their smaller group, unlike the procedure common in physical meetings. The facilitator also has the ability to simultaneously monitor multiple conversations and work groups, as he or she has access to all the electronic conversations going on.

Online communication can also open the door to input from people normally excluded from face-to-face deliberative discussions. Often group discussions are dominated by a handful of participants while others, perhaps even the majority, stay silent. Certain individuals are very comfortable with expressing their opinions forcefully in public situations, while others are reluctant to do so. Online communication options often lead to expressions of opinion by a wider range of people and reduce barriers for participants who would not contribute much in a face-to-face meeting. This can enrich the process for all involved, in addition to providing the facilitator with important information.

E. Challenges for the implementation of ODR in developing countries

To assess the impact of ODR in developing countries the UNCTAD secretariat circulated a questionnaire to 46 organizations (see chart 7.1's list of ODR providers as of March 2003) offering ODR services around the globe. The secretariat received 24 replies, including responses from all the major ODR providers. The survey confirms the following:

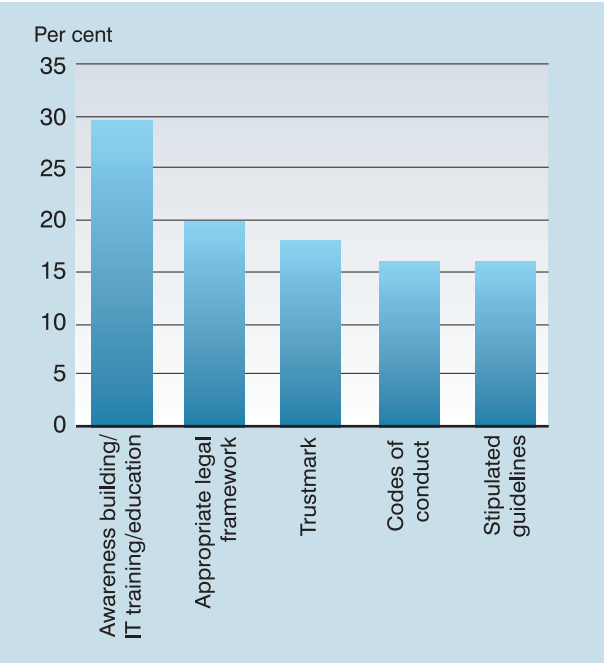
- For developing countries the market for ODR services is either incipient or non-existent. The vast majority of ODR providers are located in the United States and Europe.

- Awareness building, IT training and education are fundamental to the widespread and effective use of new technologies such as ODR. An appropriate legal framework that facilitates the use of out-of-court schemes, as well as the development of and adherence to trustmarks, codes of conduct and guidelines by e-business in developing countries, constitute the main strategies for promoting ODR in developing countries.

- Mediation, conciliation and automated negotiation are the most popular dispute resolution systems offered online. Arbitration remains more important in traditional offline ADR than it is in ODR.

- A majority of ODR providers (56% of survey respondents) offer a mix of online and offline services, which indicates that traditional ADR providers have begun offering ODR services to complement existing offline ADR mechanisms. The remaining 44 per cent of respondents provide only online services.

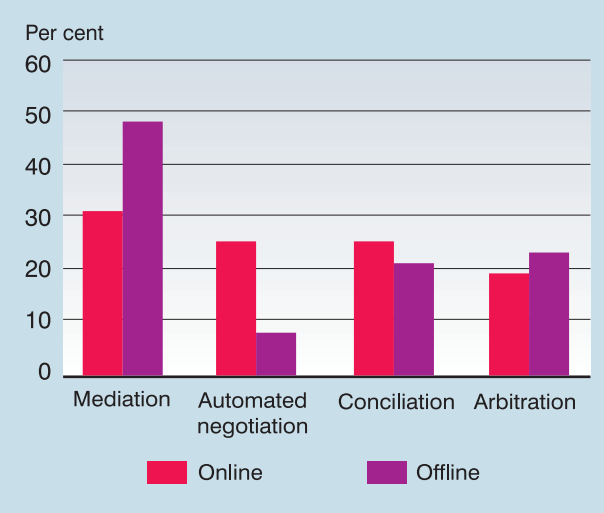
Chart 7.5
Means of promoting ODR



Source: UNCTAD questionnaire.

Chart 7.6

Online and offline services



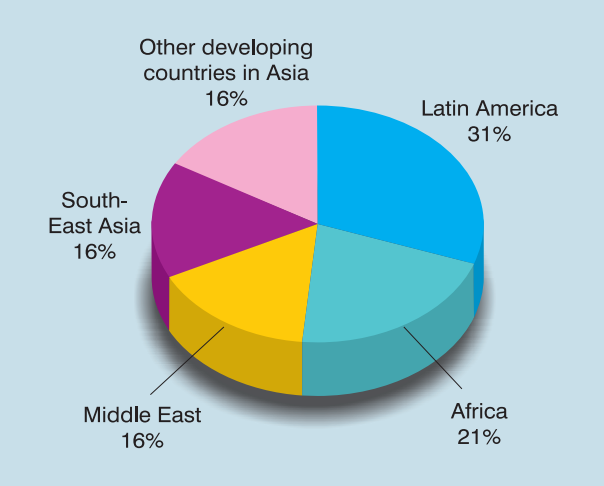
Source: UNCTAD questionnaire.

- Although ODR is not yet much used, the majority of ODR providers offer their services to developing countries.

For ODR to be implemented successfully in developing countries, both technological and legal challenges must be overcome

Chart 7.7

Developing regions where ODR services are offered



Source: UNCTAD questionnaire.

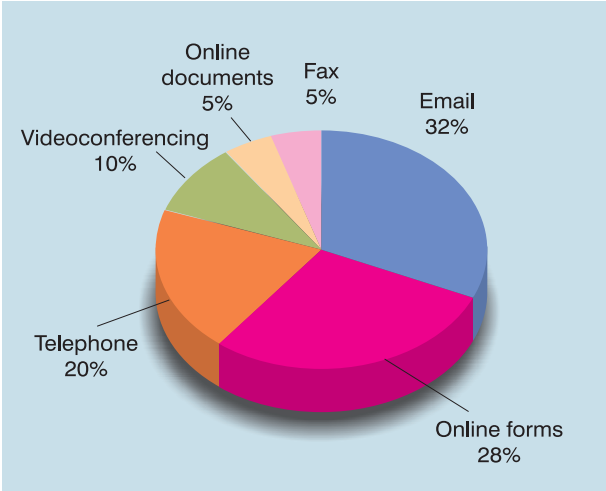
1. Technology infrastructure

ODR is, by its very nature, dependent on the availability of technology. Without easy access to computers and Internet connections, the ability of parties to utilize ODR tools is extremely limited.

ODR inevitably appeals more to users who are generally experienced in the online environment. It was not surprising that eBay users took advantage of ODR, since all eBay users have some access to and facility with using the Internet. A recent survey of eBay sellers in developing countries (see table 7.3) showed that there are people in almost every developing country who use eBay as a marketplace where they can sell goods at a distance. These vendors already have ODR options available to them to settle disputes, and as the

Chart 7.8

Online dispute resolution tools



Source: UNCTAD questionnaire.

number of transactions increases, use of ODR can be expected to increase as well.

Government initiatives that accelerate citizen access to the Internet, such as e-government projects, also facilitate access to ODR. It may be that some ODR platforms and applications will need to be developed to fit particular contexts in developing countries, but more often what has been developed and tested elsewhere can be imported and adapted to new entrepreneurial environments.

Box 7.1.

Main difficulties faced by developing countries in implementing ODR: A representative snapshot

ODR providers surveyed by UNCTAD highlighted the following concerns:

- In many cases it is still too early for ODR to be implemented in developing countries.
- It is unlikely that people in developing countries will use ODR unless they are clearly directed there by the context of their disputes. This would require the following:

  The merchant provides a link and agrees to participate if anything goes wrong; or

  The Government mandates and enforces participation.
- Government support and usage are a must for developing confidence in ODR.
- The cost of setting up an ODR is a major consideration.
- Promotion of ODR in developing countries should be envisaged with the collaboration of experienced ODR providers.
- People do not use online what they do not use offline; ODR services cannot interest those who have not shown an interest in conventional ADR.The biggest challenge is building a long-term self-sustainable business plan.
- Promoting ODR will prove more expensive than the technology itself.
- In many developing countries, businesspeople and lawyers over age 50 do not use computers and do not speak English, thus making it very difficult to conduct ODR. Further education in ICT is required for managers over 50.

Source: UNCTAD questionnaire.

2. Legal challenges

Uncertainty about the legal framework governing e-commerce may inhibit consumers from purchasing products or services over the Internet, and companies from entering into the electronic marketplace. As ODR is primarily conducted in cyberspace, data protection and security are often at the forefront of users' minds. Many developing countries currently lack the required legislative instruments (laws governing e-commerce, data protection and electronic signatures) to provide appropriate online legal protection. The absence of legal infrastructures to support e-commerce and a resulting public lack of trust in online transactions is one element inhibiting the use of the Internet as a business medium in the developing world.

Many developing countries understand that without appropriate legislation, they risk exclusion from the global online marketplace. These countries have found that statutory gaps related to the implementation of new technologies that enable electronic contracting, electronic storage of data and documents, fast processing of information, and so on can even spill over into the offline world. Thus, the need for an appropriate legal framework that is supportive of and conducive to the practice of e-commerce has been identified as a prerequisite for the growth of e-commerce in general and ODR in particular. In addition to the basic legal infrastructure recognizing the validity of electronic messages and providing equal treatment to users of paper-based documentation and users of computer-based information, it is important that Governments in developing countries become sensitive to the need for laws that have an impact on trust, such as those dealing with e-signatures. Enactment of such laws is leading to more robust trust systems.

Box 7.2 describes the experience of a developing country, Singapore, in creating ODR programmes.

F. Conclusions

Higher levels of e-commerce and entrepreneurship are a goal of almost all Governments. Because ODR can contribute to building trust, it is particularly

Table 7.3

Number of items offered for sale on eBay (by country)

Africa		Asia		North and Central America and the Caribbean	
Algeria	17	Afghanistan	70	Antigua and Barbuda	3
Angola	3	Bahrain	3	Bahamas	163
Benin	3	Bangladesh	74	Barbados	41
Botswana	23	Bhutan	27	Belize	11
Burundi	4	Brunei Darussalam	4	Costa Rica	98
Cameroon	2	Cambodia	4	Dominica	3
Cape Verde	7	China	15 417	Dominican Republic	33
Central African Republic	78	India	2 667	El Salvador	28
Djibouti	43	Indonesia	508	Grenada	29
Egypt	1 226	Jordan	240	Guatemala	11
Gambia	23	Kuwait	61	Haiti	17
Ghana	69	Lao People's Democratic Republic	3	Honduras	37
Kenya	57	Lebanon	427	Jamaica	86
Madagascar	19	Malaysia	5 034	Mexico	2 696
Malawi	42	Maldives	59	Panama	54
Mauritius	13	Mongolia	23	Saint Kitts and Nevis	1
Morocco	15	Myanmar	7	Saint Vincent and the Grenadines	11
Namibia	8	Nepal	92	Trinidad and Tobago	13
Nigeria	4	Oman	15		
Senegal	4	Pakistan	49	**South America**	
Seychelles	4	Philippines	2 016	Argentina	9 114
Swaziland	20	Qatar	23	Bolivia	72
Uganda	1	Republic of Korea	1 019	Brazil	6 154
United Rep. of Tanzania	6	Saudi Arabia	47	Chile	639
Zimbabwe	23	Singapore	12 809	Colombia	59
		Sri Lanka	61	Ecuador	188
		Syrian Arab Republic	304	Guyana	3
		Taiwan Province of China	101 686	Paraguay	26
		Thailand	15 329	Peru	419
		United Arab Emirates	110	Uruguay	917
		Viet Nam	132	Venezuela	179

Note: The data in this table were obtained by searching for items "by location" using eBay's advanced search tool. Because some sellers enter an incorrect country name in the location field, the numbers for some countries appear larger than they probably are. This table should, therefore, be viewed more as an indication of the level of activity in a particular country than as a collection of numerically accurate statistics.

needed in situations where new relationships are being formed and existing institutions for legal recourse are lacking or inefficient. International arbitration options have always been built into cross-border transactions of high value. ODR creates opportunities for new dispute resolution options in cross-border transactions of lesser value.

The emergence of ODR is closely linked to two trends: the appearance of powerful electronic networking capabilities and the broad acceptance of alternatives to litigation for resolving disputes. Cyberspace is an arena of both experimentation and competition. It is not now, and probably never will be, a harmonious place, but it is a place of rapid change and, even today, of extraordinary achievements. The emergence of effective online justice systems will require considerable creativity, but the larger and more active cyberspace becomes, the more likely it is that demand for ODR will grow. It has been written

Box 7.2.

Case study: Singapore

Singapore allows parties to participate in a program called e@dr. E@dr is an electronic dispute resolution process offered by Singapore's Subordinate Courts in partnership with the Ministry of Law, the Singapore Mediation Centre, the Singapore International Arbitration Centre, the Trade Development Board and the Economic Development Board. E@dr is for disputes that arise directly or indirectly out of e-commerce transactions (e.g. the sale of goods and services, intellectual property rights and domain names). The option is available to anyone with an email address and is relatively informal so that legal counsel is not necessarily required.

Singapore has also created the Electronic Court Dispute Resolution International (ECDRI) programme to help parties settle cross-border disputes. ECDRI is a voluntary electronic settlement conference conducted by a Singapore Subordinate Court Judge at the request of the parties. ECDRI is available for complex commercial, e-commerce, intellectual property, banking and insurance cases. Singapore's courts do not charge the parties additional fees to participate in ECDRI. After requesting ECDRI, parties submit relevant documents to the judge. The judge may request the assistance of a non-Singaporean judge at the request of the parties or if the judge considers it appropriate. The non-Singaporean judge will be drawn from a panel including judges from Australia, Europe and/or the United States. If appropriate, the Singaporean judge requests additional information from the parties. The two judges then communicate via email or videoconferencing and report their respective views to the parties. This co-mediation forum provides an additional judicial perspective on a cross-border dispute.

that, even though businessmen want to *do* business rather than argue about it, in the business world disputes cannot be avoided. In the online environment, loss of time often causes loss of opportunities, and people involved in e-commerce will want to resolve problems in the fastest possible way.

Cyberspace is increasingly a place offering its users *processes* as well as *information*. This should not be surprising, since processes are sets of informational transactions and exchanges, something that should be evident from looking at websites for online auctions, stores, casinos, and the like. The emergence and increasing use of ODR indicate that cyberspace is maturing and that human beings have the capabilities to build an array of civic institutions to complement commercial sites. It is in the interaction of civic and commercial institutions – something that is occurring with ODR – that opportunities for building and enhancing trust in the online environment will be found.

The value of ODR extends beyond the number of disputes actually resolved. Acknowledgement by a marketplace that disputes may occur, and the establishment of easily accessible procedures to handle problems, become part of the trust matrix that users will consider in deciding whether to use a site. Convenience and cost may bring potential users to a site, but assessments of trust and of risk will shape their willingness to engage in a transaction.

Early online marketplaces assumed that users would not require anything beyond heightened convenience and lower costs and prices. Today it is apparent that the availability of ODR is an asset that users will consider as they assess risks of participating in a new marketplace or other electronic environment. This is particularly important when the location or identity of the seller is unfamiliar or the item being sold lacks a well-known brand. Countries focused on expanding e-commerce activities should pay particular attention to the issue of dispute resolution.

Although ODR is still in its infancy or non-existent in a majority of developing countries, it has the potential to grow and to provide fair and inexpensive adjudication of disputes arising out of online transactions. Developing countries wishing to promote and facilitate ODR as an alternative to national litigation can consider the following recommendations:

- Treat as a priority education and awareness raising among merchants and consumers regarding the impact and increasing importance of ADR/ODR in resolving commercial disputes. Educational programmes aimed at promoting awareness and knowledge of out-of-court dispute settlement mechanisms in developing countries could play a crucial role in the development of ODR.

- Ensure that national legislation recognizes the validity and enforceability of electronic transactions.
- Ensure that national legislation facilitates the use of out-of-court dispute settlement schemes.
- Consider acceding to the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards,[18] which allows the enforcement of foreign arbitral awards.
- Promote voluntary adherence by e-businesses to trustmark and reliability programmes. (It is generally agreed that ADR/ODR services provided in conjunction with a trustmark scheme are more effective, since the threat of expulsion from the scheme and negative publicity for the trustmark's website may compel the supplier to comply with the scheme.)
- Give sufficient attention to cultural and linguistic differences in providing ODR services.

Notes

1. Over 130 countries have signed the convention. For its full text and status, see *www.uncitral.org/en-index.htm.*
2. An analysis of these issues is contained in Hill (1998).
3. In a case concerning the purchase of a computer and related software products, the arbitration agreement stipulated arbitration before the International Chamber of Commerce (ICC) Court of Arbitration. The ICC advance fee for the claim was $4,000, of which $2,000 was non-refundable. The New York Appellate Court held that the arbitration agreement was unenforceable and sent the case back to a lower court to encourage the parties to find an appropriate arbitration procedure for their small claims dispute. See *Brower v. Gateway Inc.*
4. For more on netiquette, see Shea (1997).
5. See, for example, Dibble (1993).
6. See Everett-Church (1999).
7. See http://www.vmag.org/
8. See mantle.sbs.umass.edu/vmag/disres.htm.
9. See Center for Information Technology and Dispute Resolution, *Online Ombuds Narrative I: The Web Site Developer and the Newspaper* at www.ombuds.org/narrative1.html.
10. See www.umass.edu/dispute.
11. See Katsh, Rifkin and Gaitenby (2000).
12. See www.uspto.gov.
13. For a critique of the UDRP see UNCTAD (2002), p. 46.
14. See www.smartsettle.com.
15. See www.butlermediation.com.
16. See www.ftc.gov/bcp/altdisresolution.
17. See www.ftc.gov/bcp/icpw/index.htm; www.ftc.gov/bcp/altdisresolution/index.htm; www.oecd.org/dsti/sti/it/secur/act/online_trust/hague-adr-report.pdf, www.gbde.org; www.law.washington.edu/aba-eadr/documentation/docs/FinalReport102802.doc; and www.unece.org.
18. For the convention's full text and its status, see www.uncitral.org/en-index.htm.

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