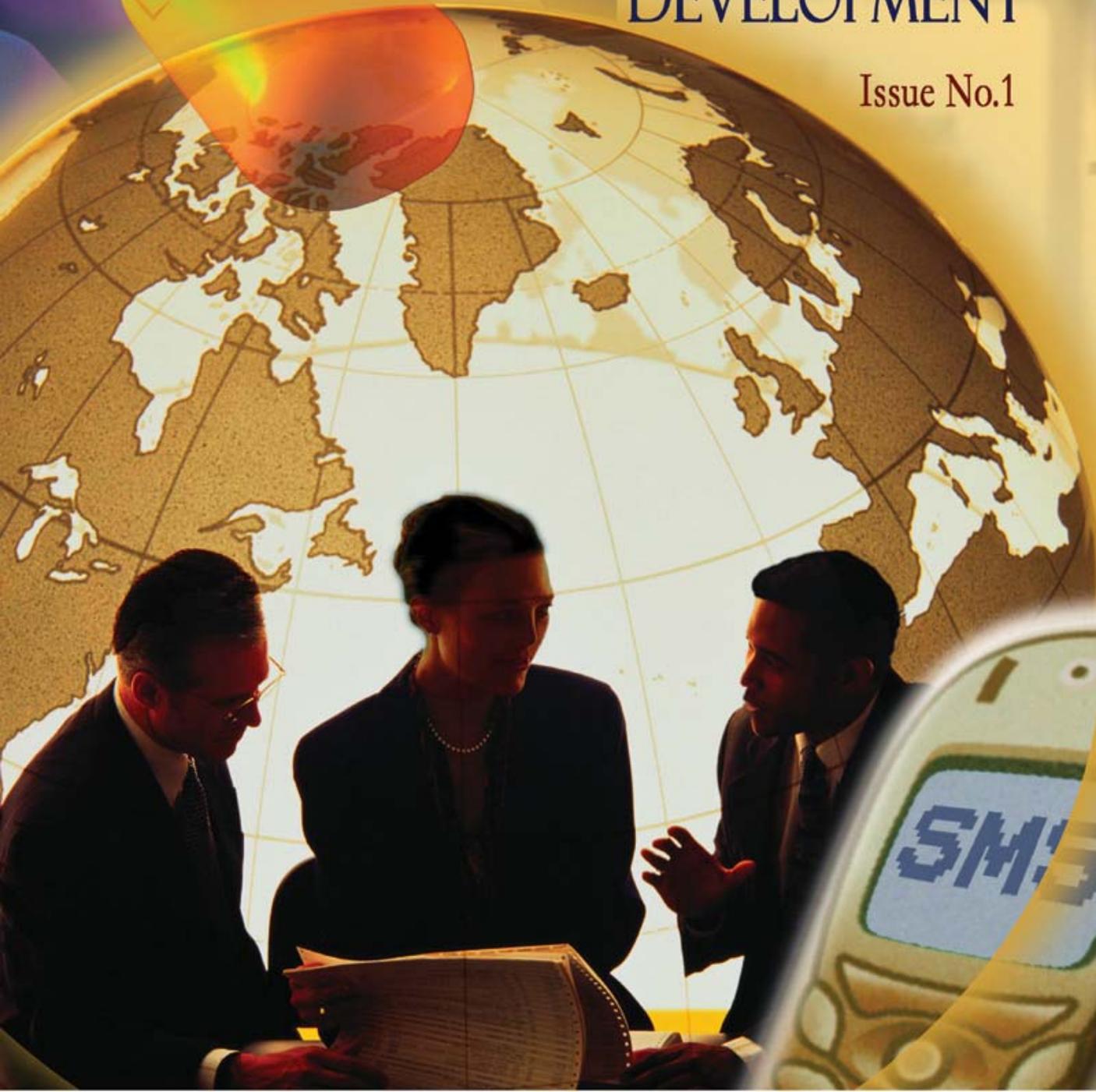


UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA - ESCWA



REVIEW OF INFORMATION AND COMMUNICATIONS TECHNOLOGY AND DEVELOPMENT

Issue No.1



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ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

**REVIEW OF INFORMATION AND COMMUNICATIONS
TECHNOLOGY AND DEVELOPMENT**

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TECHNOLOGY AND DEVELOPMENT**

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Foreword

This first issue of *Review of Information and Communications Technology and Development* serves as an introduction to the work programme of the Information and Communications Technology Division (ICTD) of the Economic and Social Commission for Western Asia (ESCWA). It covers the major issues of concern for the Division during the first year of the biennium 2002-2003.

ICTD aspires to play a major role in the transformation of Arab countries into knowledge-based societies. Furthermore, it endeavours to ensure that countries in the region are able to become increasingly competitive within a global context, whilst reducing poverty and enhancing quality of life through state-of-the-art information and communications technology (ICT) and its application.

The objectives of the ICTD work programme are to increase the capability of member countries with regard to harnessing ICT and to streamline these efforts within the framework of the related global initiative that is led by the United Nations. This work programme identifies ICT-related priorities, examines ICT infrastructure and applications and highlights tools and techniques for increasing Arabic digital content on the World Wide Web (the Web).

Intended end-users and beneficiaries of this work programme are public authorities concerned with ICT infrastructure in ESCWA member countries; decision makers concerned with ICT applications as inputs into the development process; private sector firms and institutions in areas related to ICT and its application; civil society institutions; and the general public.

Within this framework, this first issue of the annual *Review* highlights a number of topical issues related to the following themes:

- (a) ICT infrastructure in the region;
- (b) ICT applications in ESCWA member countries;
- (c) ICT policies, strategies and related legislation;
- (d) Sectoral ICT needs;
- (e) ICT in relation to employment and the alleviation of poverty.

The *Review* describes the manner in which ESCWA member countries are able to employ ICT in a timely and effective manner, thereby providing a means of narrowing the digital divide. Furthermore, it identifies selected social, economic and political implications related to the adoption of national and regional ICT initiatives. It also considers how ICT can be used effectively with regard to solving the development issues in the region. Moreover, the *Review* examines, through qualitative and quantitative analyses, the extent to which ICT has been adopted by ESCWA member countries and identifies important areas where growth is possible. Finally, the papers included as chapters in the first issue of the *Review* provide suggestions and ideas on how ESCWA member countries can best use ICT within the framework of sustainable socio-economic development.

CONTENTS

	<i>Page</i>
Foreword	iii
Abbreviations and explanatory notes	viii
Introduction	1
 <i>Part One</i> 	
<i>Chapter</i>	
I. INFORMATION AND COMMUNICATION INFRASTRUCTURES OF ESCWA MEMBER COUNTRIES	5
A. The gap between developed and developing countries	5
B. Regional development trends and initiatives taken by ESCWA member countries.....	8
C. Conclusion.....	11
II. INFORMATION AND COMMUNICATIONS TECHNOLOGY AND SECTORAL DEVELOPMENT IN ESCWA MEMBER AND ARAB COUNTRIES	12
A. Introduction: ICT, competitiveness and productivity	12
B. ICT policies and strategies in ESCWA member and Arab countries	12
C. Sectoral needs and priorities.....	14
D. Conclusion.....	19
III. INFORMATION AND COMMUNICATIONS TECHNOLOGY AND DEVELOPMENT	20
A. ICT and sustainable development: an introduction	20
B. ICT infrastructures in ESCWA member countries	21
C. The future of modern ICT infrastructures	26
D. Notes on selected ICT applications in ESCWA member countries.....	27
E. ICT legislation, standards and regulatory arrangements	32
F. New roles and cooperation modalities for actors involved in the capacity-building of ICT	33
G. Conclusion.....	34
IV. INFORMATION AND COMMUNICATIONS TECHNOLOGY AND E-BUSINESS RELATING TO TRANSPORTATION AND CUSTOMS ADMINISTRATIONS	36
A. ICT and e-business relating to transportation and customs administrations: the case for a cooperative development strategy	36
B. ICT and e-business in transportation	37
C. E-business: step by step.....	38
D. ICT and e-business applications in transport.....	44
E. ICT and e-business in customs	48
F. Conclusion.....	52

CONTENTS (continued)

Page

Part Two

V. THE BEIRUT DECLARATION: TOWARDS AN INFORMATION SOCIETY IN WESTERN ASIA	55
A. Preamble	55
B. Regional vision of the information society	55
C. Objectives	56
D. Principles for developing an information society	56
E. ICT priorities for action	60
F. Towards an ICT strategy	60
G. Follow-up	61

Part Three

VI. INFORMATION AND COMMUNICATIONS TECHNOLOGY PRIORITY ISSUES FOR ARAB COUNTRIES	65
A. Introduction: ICT and development	65
B. Socio-economic development needs in the region	66
C. Status of ICT in the region: a brief	67
D. Adequate ICT solutions for Arab countries	68
E. The suitability of selected ICT solutions for Arab countries	70
F. Conclusion	77
VII. THE SOFTWARE INDUSTRY IN LEBANON: A ROADMAP FOR THE FUTURE	86
A. Where is the software industry today?	86
B. Where does the software industry want to be tomorrow?	87
C. How should the software industry get there?	88
D. Conclusion	89

LIST OF TABLES

1. The transaction capabilities of web sites pertaining to ocean carriers	44
2. The needs of the ESCWA region, based on the Medium-term Plan 2002-2005	66
3. Internet users as a percentage of population	68
4. Ranked characteristics of suitable ICT solutions	68
5. Ranked ICT solutions most suitable for the ESCWA region	69
6. Ranked ICT solutions related to Arabization	72
7. Supporting factors for ICT solutions	72
8. Ranked suitable ICT solutions	74
9. Supporting factors for ICT solutions: ISP/hosting/data centres	74
10. Supporting factors for ICT solutions for call/contact centres	74
11. Specific ranked ICT solutions in the electronics industry	76
12. Supporting factors with regard to system design and integration	77

CONTENTS (continued)

	<i>Page</i>
13. Adequate characteristics of ICT solutions for the ESCWA region.....	80
14. Assessment of suitable ICT solutions for ESCWA member countries.....	81
15. Selection of suitable solutions for the Arab countries	83
16. Selection of suitable ICT solutions for the Arab countries for ISP hosting/data centres.....	84
17. Selection of suitable ICT solutions for Arabization and Arabic ICT content development..	85

LIST OF FIGURES

I. Broadband availability among regions of the world, 2000.....	6
II. Broadband in selected OECD countries, 2001	6
III. Estimated teledensity for fixed and mobile telephone lines, 2001	7
IV. Penetration of ICT, 2000	8
V. Private versus State-owned telecommunications in regions of the world, 2000	8
VI. Internet access by region, 2000	9
VII. Mobile and Internet growth worldwide.....	10
VIII. Voice and data growth worldwide.....	10
IX. Main telephone lines per 100 people, 1995-2001.....	22
X. Fixed cellular and telephone lines per 100 people, 2001	22
XI. Cellular subscribers per 100 people, 1995-2001	23
XII. Personal computers per 100 people, 2001	23
XIII. Personal computers per 100 people, 1995-2001.....	24
XIV. Internet users per 1,000 people, 2001.....	24
XV. Top-level domain names per 10,000 people, 2001.....	25
XVI. Top-level domain names per 10,000 people, 1995-2001	26
XVII. E-commerce in transportation	37
XVIII. E-commerce: the starting point	39
XIX. E-commerce web storefronts.....	40
XX. E-commerce portals.....	42
XXI. Multipoint B2B e-commerce.....	43
XXII. Maersk Sealand Internet-based rate calculation service.....	45
XXIII. Combined infrastructure, ESCWA member countries in relation to the world average, 2000-2002	67

ANNEXES

I. Information and communications technology indicators in selected ESCWA member countries	90
II. ESCWA initiative for technology parks, incubators and high-technology clusters.....	93

ABBREVIATIONS AND EXPLANATORY NOTES

ADSL	asymmetric digital subscriber line
ALSI	Association of Lebanese Software Industry
ASYCUDA	automated system for customs data
B2B	business-to-business
B2C	business-to-consumer
BOT	build-operate-transfer
CAE	computer aided engineering
CNC	computerized numerical control
CPFR	collaborative planning, forecasting and replenishment
EDI	electronic data interchange
ERP	enterprise resources planning
FS	flexible specialization
GCC	Gulf Cooperation Council
GDP	gross domestic product
GEIS	general electric information services
GSM	global system for mobile communications
ICT	information and communications technology
IP	Internet Protocol
IPRs	intellectual property rights
ISP	Internet service provider
ITCC	information technology community centre
ITU	International Telecommunication Union
JIT	just in time
Mbit/s	megabit per second
MCT	multipurpose community telecentre
MNE	multinational enterprise
MRP	material resources planning
NGO	non-governmental organization
OECD	Organization for Economic Cooperation and Development
PABX	private automatic branch exchange
PC	personal computer
QFD	quality function deployment
R&D	research and development
S&T	science and technology
SCM	supply chain management
SMEs	small and medium-sized enterprises
STE	Syrian Telecommunications Establishment
TACC	technology access community centres
TLDN	top-level domain name
VAN	value-added networks
WSIS	World Summit on the Information Society
WTO	World Trade Organization
XML	extensible mark-up language

The word 'electronic' is replaced by the letter 'e' in terms that include, *inter alia*, e-commerce, e-business and e-mail.

References to dollars (\$) are to United States dollars, unless otherwise stated.

A hyphen (-) indicates that the amount is not applicable.

Introduction

The present issue of *Review of Information and Communications Technology and Development* is divided into three parts. Part One includes chapters on key ICT themes. Part Two highlights the main outcomes of the Western Asia Preparatory Conference for the World Summit on the Information Society (WSIS) and Part Three includes chapters prepared by external experts on ICT priority issues in the region.

Part One contains four chapters, which are based on four papers. These were prepared by ICTD of ESCWA and are summarized below.

Chapter I, Information and Communication Infrastructures of ESCWA Member Countries, assesses telecommunications profiles in the ESCWA region. It highlights the fact that indicators for mobile cellular, personal computers (PCs) and Internet usage reveal that ESCWA member countries are below world averages in most categories. Within this context, telecommunication authorities and the private sector are encouraged to endeavour to provide global, affordable and unrestricted access to the public and the business community.

Chapter II, Information and Communications Technology and Sectoral Development in ESCWA Member and Arab Countries, reviews relevant economic sectors in the region and analyses specific ICT needs and opportunities with regard to development. In the past, clearly defined and carefully prioritized long-term national ICT policies were rare. This scenario was compounded by a lack of policies related to the application of ICT and science and technology (S&T) strategies in certain areas of socio-economic activity. Furthermore, while the ICT sector has made a certain degree of progress, it would benefit from national and regional strategies that are able to support the private sector. There has been very little ICT penetration within agriculture-related and traditional industries owing to illiteracy and poor infrastructure. However, the commerce sector is in the process of moving towards a knowledge-based economy. In this regard, e-banking and e-commerce are becoming increasingly available. Moreover, while public administrations are undergoing some form of modernization process, complexity and bureaucracy remain obstacles to efficiency in the area of civil services and with regard to e-government applications in the majority of Arab countries. Within this framework, and with the aim of meeting these challenges, this chapter recommends that key policies be implemented at the national and regional levels. This can be achieved by launching initiatives for the rapid dissemination of ICT.

Chapter III, Information and Communications Technology and Development, is an update of the *Report on Information and Communications Technology and Development*. This paper presents substantial evidence with regard to the gap between existing and potential infrastructure in the region and highlights the status of such infrastructure in an ideal state of development. In addition, it outlines best practices and gives examples of technologies that have been successfully applied in ESCWA member countries. For example, e-government initiatives have been announced in Egypt, Bahrain, Qatar and the United Arab Emirates. Moreover, some banking institutions in the region offer e-banking services. With regard to healthcare, notable efforts have been made in Egypt and Saudi Arabia, and telemedicine initiatives have been reported in several countries. Finally, the paper recommends that Governments, non-governmental organizations (NGOs) and the private sector must take concerted action to further such efforts.

Chapter IV, Information and Communications Technology and E-Business Relating to Transportation and Customs Administrations, explains the manner in which the Internet is being used to develop new methods of buying and selling goods and services in the transport sector. Companies in this sector must be encouraged to coordinate operations, with the objective that a collective approach can maximize the benefits of new technologies. This chapter also discusses the importance of updating ICT within customs administrations. At the national level, ICT ensures greater efficiency with regard to the import and export process. At the international level, ICT allows for greater interconnectivity between customs administrations and permits the standardization of protocols, thereby ensuring that the movement of goods is made more efficient. The objective of combined ICT applications with regard to the transport industry and to customs administrations is the creation of a modern and efficient infrastructure, which will allow individual companies to achieve sufficient market liquidity and remain globally competitive.

Part Two includes the Beirut Declaration: Towards an Information Society in Western Asia. It summarizes the issues discussed at the Western Asia Preparatory Conference for the World Summit on the Information Society (Beirut, 4-6 February 2003). In addition, it reviews the main recommendations related to policies, preliminary plans and initiatives that address key issues and tackle the problems that have been identified with regard to building the information society. The Declaration was submitted as a regional contribution to the Second Meeting of the WSIS Preparatory Committee (PrepCom 2) (Geneva, Switzerland, 17-28 February 2003). At the same time, it provides guidelines and directions for Governments and enterprises. These are related to endeavours to formulate policies and to take actions to ensure the proactive inclusion of the region within the framework of the knowledge age.

Part Three includes two chapters, which are based on papers and cover several key topics that are of concern to ICTD:

Chapter VI, Information and Communications Technology Priority Issues for Arab Countries, is based on a paper that was prepared by Fouad Mrad of the American University of Beirut. It reviews the findings of a team effort to identify suitable ICT solutions to problems that have been encountered by Arab countries. Using a quality function deployment (QFD) methodology, the team attempted to build a consensus on major problems in the region, discussed related solutions and identified suitable technologies for application. Furthermore, the chapter summarizes the socio-economic needs of the region and the applicability of proposed ICT solutions for various ESCWA member countries, benchmarked against international country reference models.

Chapter VII, The Software Industry in Lebanon: A Roadmap for the Future, was based on a paper prepared by Patrick Frick of the Association of Lebanese Software Industry (ALSI). This paper advances the theory that the software industry has long been hailed as a focal point of hope in Lebanon, and is therefore in need of a strategy for development. The paper discusses the implementation of a national strategy and suggests means for achieving this.

In conclusion, the material included in this *Review* covers themes and issues that are central to the relationship between ICT and development in the ESCWA region and reflects the work carried out by ICTD.

PART ONE

I. INFORMATION AND COMMUNICATION INFRASTRUCTURES OF ESCWA MEMBER COUNTRIES

The importance of the telecommunications sector has been emphasized during the past decade. The United Nations Secretary-General Kofi Annan delivered a message at the World Telecommunication Development Conference held in Valletta, Malta in March 1998, in which he described the telecommunication sector as “one of the most important sectors of the modern age”. He went on to assert that communications technology “has a great democratising power waiting to be harnessed to our global struggle for peace and development”. The challenge for developing countries is to make information available to all despite economic inequality and fear of freedom.¹

Telecommunications is one of the most important supporting sectors with regard to trade efficiency. Moreover, within the context of the present and expected growth of e-commerce, the central role of both telecommunications and information technology (IT) with regard to other supporting services related to trade, must be stressed.

A. THE GAP BETWEEN DEVELOPED AND DEVELOPING COUNTRIES

Despite the fact that many developed nations are experiencing a boom in telecommunication services, the vast majority of people do not have easy access to a simple telephone. As of 1997, only 20 per cent of the 600 million phone lines installed worldwide were in developing countries, which accounted for 85 per cent of the population of the world in that year. In 1996, the average number of lines per 100 people (teledensity), ranged from 0.07 in Cambodia, to 99 in Monaco, and amounted to a rather misleading world average of 13.3. The developed countries, however, which constituted 15 per cent of the population of the world at that time, had an 81 per cent share of mobile cellular telephones, a 91 per cent share of fax machines and a 97 per cent share of Internet hosts.²

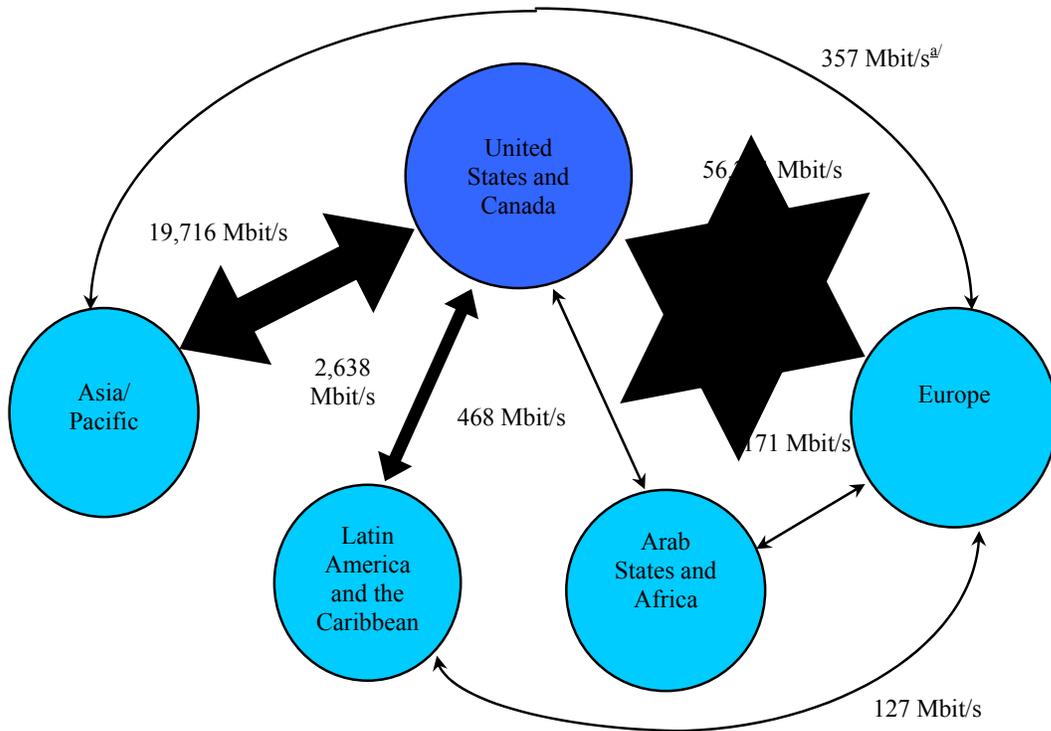
Given that new services for data, images and multimedia are increasingly part of the global infrastructure, teledensity is no longer a sufficient measurement with regard to the state of the telecommunication sector. Measurements related to mobile cellular phones, PCs and Internet users are becoming essential components of assessments related to telecommunication profiles at national, regional and global levels. Moreover, these measurements vary greatly in developed and developing countries. For example, international Internet bandwidth is increasing every year. However, it is not evenly distributed among countries (see figure I). Furthermore, broadband is an issue at the level of local access. Broadband statistics related to subscribers in ESCWA member countries are not available. Therefore, figure II illustrates broadband diversity in selected Organization for Economic Cooperation and Development (OECD) countries.

In 1994, only 3 million people, most of them located in the United States of America, used the Internet. By the end of 2001, approximately 500 million people around the world were using the Internet. Experts predict that 1 billion people could be connected to the Internet by 2005.

¹ International Telecommunication Union (ITU), Press Release, 1 April 1998. Available at: http://www.itu.int/newsarchive/press_releases/1998/16.html.

² ITU, *Restructuring towards universal access; Governance, Markets, Technology* (ITU and Telecommunication Development Bureau (BDT), 1998).

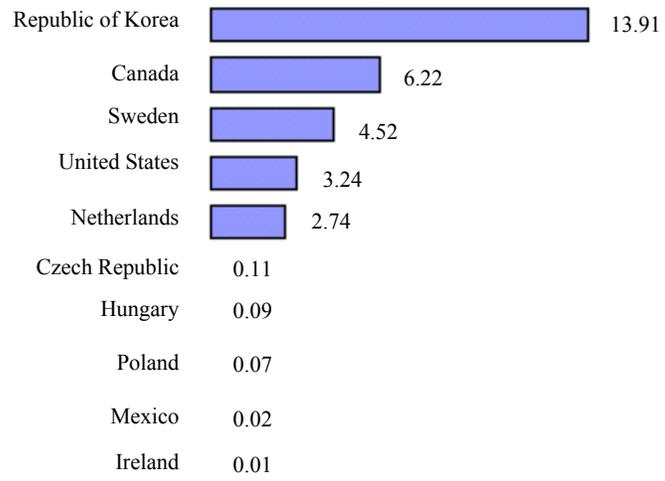
Figure I. Broadband availability among regions of the world, 2000



Source: International Telecommunication Union (ITU), *World Telecommunication Development Report; Reinventing Telecoms* (Geneva, ITU, 2002).

a/ Megabit per second.

**Figure II. Broadband in selected OECD countries, 2001
(Broadband subscribers per 100 people)**

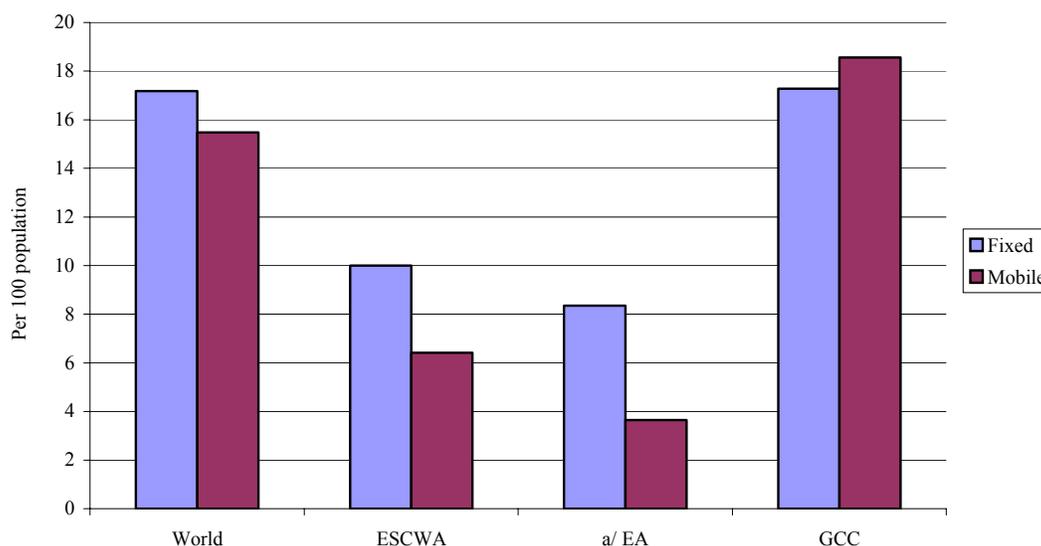


Source: ITU, *World Telecommunication Development Report; Reinventing Telecoms* (Geneva, ITU, 2002).

The use of computers and communication networks for business started in the 1960s and 1970s. In the 1980s large organizations began to use electronic data interchange (EDI) rather than private or value-added networks (VAN) for business applications that required data sharing among trading partners. At that time, such technologies were only affordable to large business enterprises and government administrations. This type of data interchange was the early form of e-commerce. However, it was only when the Internet became a viable alternative for business transactions that e-commerce started to spread at its current rate. Early users have already reported significant productivity improvements. In 2002, the Internet handled more than \$300 billion worth of commerce between businesses according to various sources.

The telecommunication profile of the ESCWA region does not compare favourably with the world profile. Moreover, ESCWA region averages are below world averages in many categories of services. However, the situation varies within the region, with the Gulf Cooperation Council (GCC) countries producing better averages than other countries in the region, though not in proportion to levels of income. Moreover, the remaining countries of the region fall well below world averages in most services.³ Figure III illustrates the density of fixed and mobile lines in the ESCWA region and its two basic subregions, namely, the GCC and the Eastern Arab countries.

Figure III. Estimated teledensity for fixed and mobile telephone lines, 2001



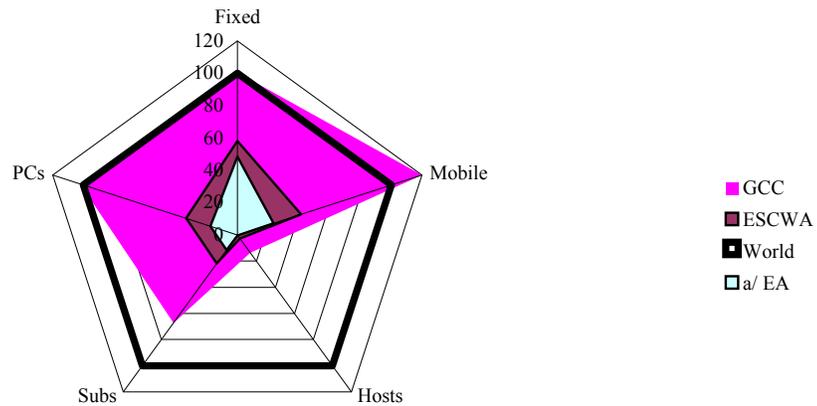
Source: ITU, *World Telecommunication Indicators*, (Geneva, ITU, 2001).

a/ Eastern Arab countries.

The five most important parameters for ICT infrastructure measurements, namely, fixed lines, mobile lines, Internet subscribers, Internet hosts and PCs can be combined in the graphical radar format (see figure IV below). This figure illustrates that the positioning of each parameter is relative to the value of the parameter for the world average. It also highlights the position of ESCWA region and its subregions, the GCC countries and the Eastern Arab countries. The numbers in the figure refer to percentages. Similar diagrams can be devised for every country in the region. This means that it is possible to compare the infrastructure of any given country with regional and world averages.

³ Economic and Social Commission for Western Asia (ESCWA), *Trade Efficiency in ESCWA Member Countries: A Comprehensive Study* (E/ESCWA/ED/1999/6).

Figure IV. Penetration of ICT, 2001
(Percentage)

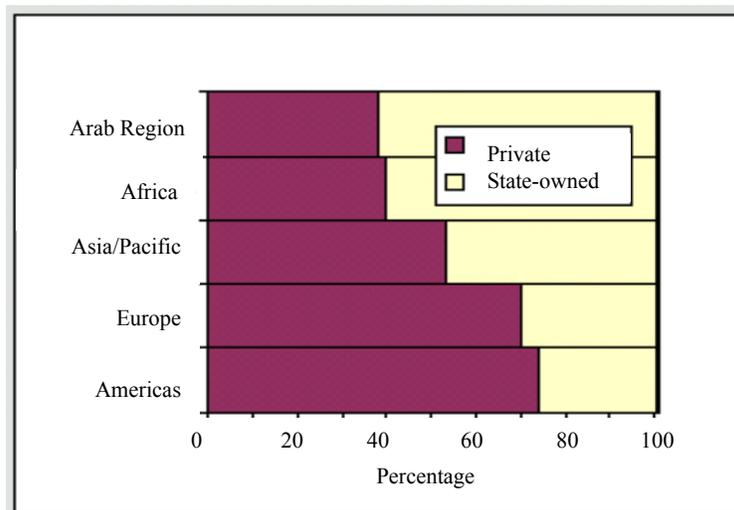


Source: Compiled by ESCWA from ITU, *World Telecommunication Indicators* (Geneva, ITU, 2001).
a/ Eastern Arab countries.

B. REGIONAL DEVELOPMENT TRENDS AND INITIATIVES TAKEN BY ESCWA MEMBER COUNTRIES

There is a move towards privatization and the deregulation of basic services in many ESCWA member countries. In addition, mobile cellular services have been established as private or joint venture operations in the majority of countries in the region. This is also the case for Internet service providers (ISPs). However, Government monopolies on telecommunication services exist in many countries in the region, even in those GCC countries that have advanced telecommunication services (see figure V).

Figure V. Private versus State-owned telecommunications in regions of the world, 2000

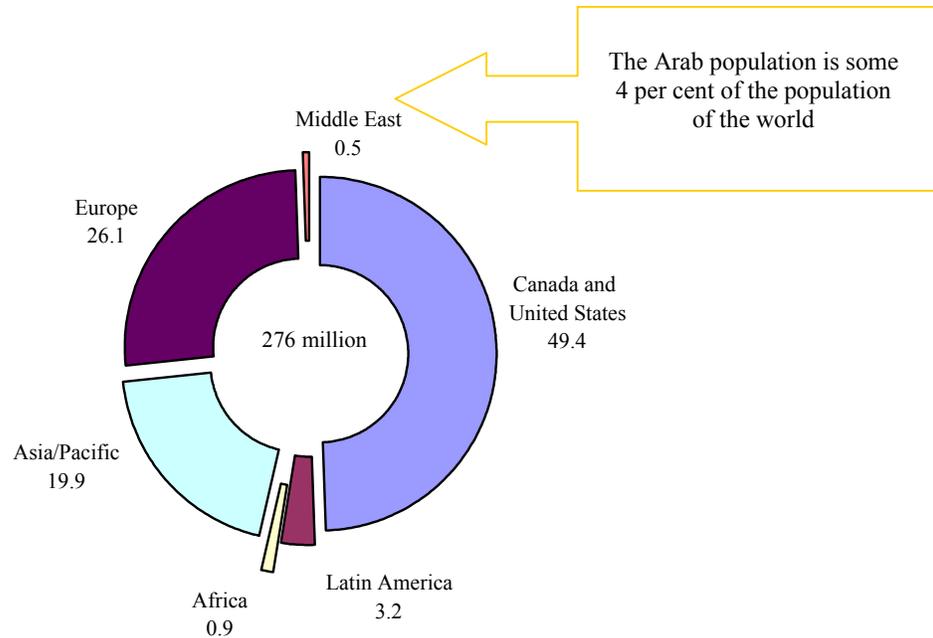


Source: ITU, "Arab region telecom reform trends", a paper prepared for the Preparatory Meeting of the Arab Region for the World Telecommunication Development Conference, Alexandria, Egypt, 17-19 October 2000.

Despite attempts by several telecommunication authorities in ESCWA member countries to reduce tariffs and eliminate discriminatory charges with regard to domestic users, charges for most services in the region remain high. The subject of high tariffs has been of concern to business communities. Moreover, within the framework of the World Trade Organization (WTO) Telecommunication Agreement, ESCWA countries must seriously endeavour to ensure that the reduction of tariffs occurs at a faster rate than is happening at present.

Recent statistics on Internet access by regions of the world revealed that access in Arab countries amounted to 0.5 per cent of the total world access in 2000. This is despite the fact that the combined population of Arab countries is more than 4 per cent of the world total (see figure VI).⁴ However, with the exception of Iraq, growth of new services for mobile cellular lines and the Internet between 1999 and 2002 has been impressive in all ESCWA member countries. However, growth has not been as high as other countries and regions with similar economies.

**Figure VI. Internet access by region, 2000
(Percentage)**

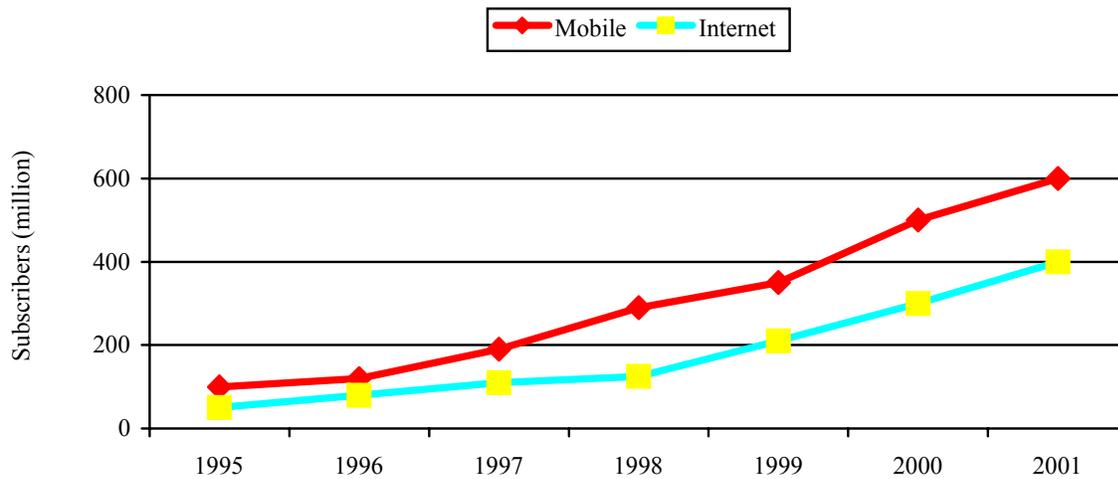


Source: Compiled by ESCWA from United Nations, “Development and international cooperation in the twenty-first century: The role of information technology in the context of a knowledge-based economy: Report of the Secretary-General”, Economic and Social Council, New York, 5 July – 1 August 2000.

Present trends related to both Internet and mobile growth reveals that their patterns of growth are similar (see figure VII). In fact, these two technologies are converging. This has resulted in the mobile phone becoming the dominant terminal for the Internet. Furthermore, data traffic on telecommunication networks has exceeded voice traffic in many developed countries (see figure VIII). Indeed, mobile penetration in several countries has already surpassed fixed line telephones.

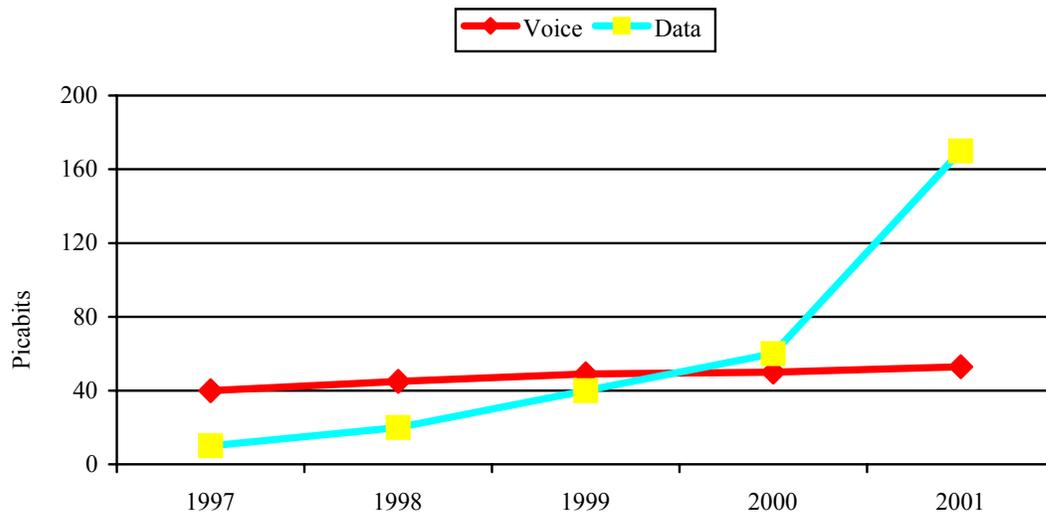
⁴ United Nations, “Development and international cooperation in the twenty-first century: The role of information technology in the context of a knowledge-based economy: Report of the Secretary-General”, Economic and Social Council, New York, 5 July – 1 August 2000.

Figure VII. Mobile and Internet growth worldwide



Source: ITU, "Universal access", a paper prepared by Michael Minges for the Preparatory Meeting of the Arab region for the World Telecommunications Development Conference, Alexandria, Egypt, 17-19 October 2000.

Figure VIII. Voice and data growth worldwide



Source: ITU, "Mobile Internet", a paper prepared by Michael Minges for the Arab Region Internet and Telcom Summit, Muscat, 28-30 May 2001.

For example, Egypt achieved 115 per cent compound annual growth for Internet users and 280 per cent growth for mobile subscribers during the period 1997-2000. However, in relation to the population of Egypt, densities remain well below world averages. At the end of 2001, the estimated number of mobile subscribers in Egypt was close to 2.8 million according to newspaper reports and statistics from Government officials.

In 1998, the Government of Saudi Arabia permitted the public use of the Internet. The number of Internet users was expected to amount to 140,000. However, owing to high tariffs and restricted access, the number of users did not exceed 100,000. By the end of 2001 Saudi Arabia had 300,000 subscribers, 32 private sector companies were offering Internet services and the number of mobile subscribers had climbed to over 2.5 million. Observers of the telecommunications sector in Saudi Arabia anticipate a growth in mobile users to well over 3 million by the end of 2003.⁵

The Syrian Arab Republic has recently expanded its telecommunications network by adding some 1.65 million new lines, thereby increasing its teledensity to more than 14 per 100 people. The Syrian Arab Republic was a late starter in mobile networks; however, in 2000 and 2001, the number of mobile subscribers grew from 60,000 to 200,000 and plans to provide Internet access to the private sector and to individuals were initiated in 2001. As of 2002, there were only two ISPs in the country. These are managed by Syrian Computer Society and the Syrian Telecommunication Establishment (STE). Recently, STE extended an invitation to the private sector to apply for ISP licences.

During the 1990s, Iraq, which had one of the best telecommunication networks in the 1980s, lagged behind countries in the region as a result of the imposed embargo on the country. Iraq had less than 350,000 lines in good condition as of 2000. However, approximately 500,000 lines were installed recently. This brought the total number of fixed lines to some 800,000 and the teledensity to some 2.5 in 2002. Furthermore, Iraq was also struggling to install its first global system of mobile communications (GSM) network. Delays in approving the project by the United Nations sanctions committee, in addition to the reluctance of several telecommunication companies to undertake the project, made Iraq the only country in the ESCWA region to have no mobile services. A conservative pre-2003 estimate of the cost to bring Iraq up to an acceptable level in telecommunication services was \$2 billion. The Government of Iraq established Internet services in ministries and selected Government institutions during the last quarter of 1999. In 2001, the Government ISP permitted subscribers in homes and e-mail facilities in the private sector, and by 2002 it had permitted Internet browsing. The subscriber count was approximately 30,000 in 2002.

C. CONCLUSION

The telecommunication authorities in ESCWA member countries must endeavour to provide global, affordable and unrestricted access to the public and the business community. Enterprises in these countries tend to be small- and medium-sized, and would therefore benefit from Internet exposure and the use of Internet commerce. Moreover, unless businesses are encouraged to rely increasingly on Internet commerce, improvements in trade efficiency will be difficult to achieve. In addition, electronic Government applications are still in their infancy in most countries of the region.

Furthermore, telecommunication authorities have a number of common issues that must be shared and discussed at the regional level. They must acquire up-to-date information that would allow them to assess and compare their respective telecommunication infrastructures with other countries or regions of the world. A large amount of data can be obtained from the International Telecommunication Union (ITU). However, efforts must be exerted at national and regional levels to set up databases that are more frequently updated. This would enable decision makers to monitor the development of the telecommunication sector.⁶

In addition, the private telecommunication sector must be encouraged to play a more proactive role. The creation of large telecommunication enterprises based within the private sector of the region must be promoted as an alternative, and complementary initiative, to strategic alliances with the international telecommunication giants of the developed world.

⁵ *Al Hayat*, 5 April 2000 (in Arabic).

⁶ ESCWA, *Trade Efficiency in ESCWA Member Countries: A Comprehensive Study* (E/ESCWA/ED/1999/6).

II. INFORMATION AND COMMUNICATIONS TECHNOLOGY AND SECTORAL DEVELOPMENT IN ESCWA MEMBER AND ARAB COUNTRIES

A. INTRODUCTION: ICT, COMPETITIVENESS AND PRODUCTIVITY

The success of some developed countries with regard to maintaining high gross domestic product (GDP) growth per capita and high labour productivity over the past decade has been associated with high levels of investment in ICT.⁷ At the firm level, higher productivity has varied depending on fields of application. In particular, companies in the United States that integrated the Internet into their operations increased productivity 2.5 times more than similar companies without the Internet according to information published in 2001. In addition, market-share growth was at least 2.5 times more likely when companies used the Internet.⁸

New ICT is enabling complex projects to be implemented more quickly, cheaply and reliably than was previously possible, thereby initiating fast and positive feedback mechanisms. In addition, large and small organizations alike are able to embark on ambitious projects with diminished expectations of the delays and failures that routinely frustrated such ventures in the recent past. Quite often, remarkable strategic and structural transformations have been achieved as a result of using ICT. When this is combined with the use of appropriate measures, competitiveness and productivity are enhanced.

In particular, advanced integrated application software and new Internet-based applications, provide substantive systems that are designed to ensure improvements in terms of cost, time, quality and flexibility. Such systems emphasize value chain efficiency and customer intimacy, enhance competitiveness and increase productivity in enterprises by achieving the following:

- (a) Improving work processes and workplaces, using for example, workflow management systems that can integrate other specialized applications to close the computerization cycle;
- (b) Enabling virtual workplaces, through networking in general, and the Internet in particular;
- (c) Allowing organizations to produce, market and sell their products anywhere in the world with few or no constraints on geographic location, by means of e-business and e-commerce tools and methodologies;
- (d) Fostering collaboration among a variety of organizations, and within establishments, thereby developing competitive advantages.

B. ICT POLICIES AND STRATEGIES IN ESCWA MEMBER AND ARAB COUNTRIES

ICT policies and more generally, S&T policies in ESCWA member countries have been affected by two principal drawbacks. The first of these relates to what can be described as difficulties that are inherent in the field of S&T. In other words policies have suffered from an inherent lack of clarity with regard to long-term objectives, means of implementation and priorities. The second type of drawback, which can be described as a problem that is exogenous to the field of S&T, relates to the lack, in most cases, of clear and prioritized policies related to the application of ICT and S&T strategies to certain areas of socio-economic activity.

⁷ Commission of the European Communities (EC), "Better, but not yet the best; Enterprise policy action to improve Europe's competitiveness". Commission Staff Working Paper (Brussels, EC, 2000).

⁸ ESCWA, *New Technologies for Enhancing Competiveness and Productivity in Selected Sectors* (E/ESCWA/TECH/2001/4).

Transformations are under way. Egypt, Jordan, Kuwait, Lebanon and Saudi Arabia have already taken significant steps to formulate clearer and more highly prioritized S&T policies. Other ESCWA member countries are liable to follow suit. Such endeavours will eliminate, to a limited extent, inherent difficulties. However, before policies in this category can be shaped and adapted to serve sustainable national socio-economic development in an integrated manner, efforts must be exerted with regard to the second type of drawback, the exogenous problems. It is only at this point that ESCWA member countries will be able take the first step towards forging systems of national innovation, rather than merely possessing a set of functioning components in a traditional S&T system.

Indeed, few ESCWA member countries have clearly defined ICT policies and strategies. However, the Government of Egypt has realized that there is a need to prioritize ICT within the context of the development of the national economy. Moreover, it is aware that this can improve productivity and enhance global competitiveness. To this end, and in recognition of its responsibility with regard to promoting ICT, it established the Ministry of Communications and Information Technology in 1999. This Ministry was charged with defining the strategies of the Government, including the five-year National Plan for Telecommunications and Information.⁹ This focused on the following:

- (a) Promoting the use of ICT and developing sectoral projects;
- (b) Facilitating the emergence of a national software industry that is of international stature and export-orientated;
- (c) Developing human resources and skills in ICT;
- (d) Establishing international partnerships and alliances with renowned ICT players;
- (e) Modernizing the communication infrastructure;
- (f) Defining a legislative framework related to the development of ICT and its applications.

Furthermore, the national policy and strategy to enhance ICT in Egypt has focused on the gradual liberalization of the telecommunication sector and on efforts to increase competition.

The implementation of this plan is based on a partnership between the public and private sectors. The Government of Egypt has spent some 1.2 billion Egyptian pounds (LE) (nearly US\$ 338 million) on various projects, including those related to the development of human resources. The private sector is expected to fund other ICT-based projects.

Other countries have also been exerting efforts. Since the mid-1990s, Jordan has been implementing a technology policy that is largely geared towards new technologies, with special reference to ICT. This policy stresses the importance of adopting appropriate technologies in development sectors, with the objective of achieving the following goals:

- (a) Raising performance levels and sustaining growth in these sectors;
- (b) Enhancing technological capacity and capabilities;

⁹ Government of Egypt, Ministry of Communications and Information Technology. Available at: <http://www.mcit.gov.eg/>.

- (c) Increasing productivity and competitiveness.¹⁰

In addition, strategies were developed to implement the aforementioned policy in various socio-economic sectors. These strategies pertained to the following:

- (a) The teaching of new technology concepts and ways of using these concepts to: solve problems and remove obstacles; provide suitable laboratory equipment in schools, community colleges and universities; and train those who provide instruction in this field;

- (b) The development and support of technology management programmes and cooperation with the private sector;

- (c) The establishment of S&T parks in coordination with universities to promote technology transfer in various fields;

- (d) The use of the latest technologies, particularly ICT, in the health, agriculture and industrial sectors;

- (e) The development of technologies that increase job opportunities;

- (f) The promotion of the use of new technologies with regard to quality control of manufactured goods, thereby increasing competitiveness;

- (g) The use of IT with regard to agricultural documentation and information storage and retrieval;

- (h) The use of IT with regard to preserving heritage and documenting and restoring archaeological sites and monuments.

More recently, the Ministry of Information and Communications Technology was established for the first time in Jordan.

C. SECTORAL NEEDS AND PRIORITIES

A sectoral approach can be used to analyse the potential ICT contribution to the economies of ESCWA and Arab countries. In addition, ICT can advance the transition towards the global knowledge-based or new economy in selected sectors. These sectors are reviewed below.

1. *ICT industry*

The ICT industry, of which software development is an essential component, is an emerging industry in the Arab region. With regard to hardware, PC assembly lines exist in many Arab countries. However, within the global context and given the relatively low level of computer use in the region, a fully-fledged industrial cycle for the manufacture of ICT equipment that is economically feasible does not exist. Moreover, existing assembly lines are uncompetitive, with prices above international levels for similar equipment and technologies. The manufacture of communication cables—including optical fibre cables—and equipment, in addition to electronic modules, telephone exchanges and control equipment is developing in several Arab countries. However, microelectronics, which is considered a major component of ICT industries at the global level, has not shown signs of significant penetration in the region.

¹⁰ Government of Jordan, “Jordan’s Information Policies and Strategies”. Available at: http://www.nis.gov.jo/st_policy.html.

Software development, which is widespread in Arab countries, is mostly limited to ad hoc development and confined to local markets. With some exceptions, including a few well established companies that have succeeded in packaging a variety of software items, the quality of software produced in the Arab countries leaves a good deal to be desired. Lack of methodology and token quality assurance procedures with regard to the design and implementation phases, employed primarily with a view to cutting costs, are the main reasons for the low quality of locally developed software. Consequently, such software is mainly limited to local consumption.

The private sector is the main contributor to software development. However, very few firms carry out research and development (R&D) activities related to Arabization and the development of indigenous application software with an Arabic interface.¹¹ This can be attributed to the relative absence of national and regional strategies for the promotion of software industries. This is despite the fact that Governments are aware of the importance of a strong software industry in the region. Moreover, the lack of intellectual property rights (IPRs) or the enforcement of those rights is certainly a contributing factor to this state of affairs. However, more recently, Egypt and Jordan embarked on national initiatives to promote the development of quality software for export.

The experience of India with regard to building an internationally recognized software industry reveals that with proper policies, including investment in building expertise and access to information, it is possible to possess a significant share of the global software business.¹² This indicates that it is feasible for ESCWA member countries to build a viable international software industry with a high rate of export. They can do this through the establishment of appropriate ICT policies, including incentives for the software industry, and the provision of suitable attention and guidance to young entrepreneurs in the form of software industry incubators. Moreover, the Internet serves as a valuable reservoir of knowledge for the software industry and e-commerce practices simplify exchange procedures related to information and software products.

Indeed, as a result of the expansion of the Internet and mobile telephony, and the related need to service imported or locally assembled equipment, an ICT service industry is growing in the Arab countries. In particular, private ISPs, which exist in the majority of Arab countries, are increasing as the number of Internet users rises. In addition, the aforementioned expansion of mobile telephony in all Arab countries is leading to growth in private GSM operators and services. Moreover, ICT training and technical support establishments are growing in number, though in many cases, without the necessary national regulatory and accreditation frameworks.

Finally, it is important to note that locally produced software, designed according to the specific needs of public administrations is often necessary to accommodate local laws and regulations. This fact has been a motivating factor in the development of an emerging software industry in various Arab countries. In this regard, local software industries must be encouraged to take into account local culture, laws and regulations. Moreover, such industries must be brought up to international standards with the objective of facilitating the transition of public administrations in the Arab region to the information age.

2. Agriculture

Agriculture continues to be a vital sector for the majority of ESCWA member and other Arab countries. Indeed, a large proportion of the populations in countries such as Egypt and the Syrian Arab Republic are active in agriculture and farming. While ICT is steadily infiltrating this sector in developed countries, with applications in a wide range of areas, its penetration in developing countries is rather low. This can be largely attributed to the fragmented nature of the sector in ESCWA member and Arab countries in addition to poor infrastructure, limited resources, high illiteracy rates and deficiencies in skills.

At the local farm level, open and modular information systems can be used to facilitate integration within, and between production units. Both small and large farms can benefit from such systems. This is on

¹¹ Such firms include the Al-Alamieh Group, which produces Sakhr Software. In addition, R&D is being carried out in Kuwait and Egypt.

¹² Australian Trade Commission (Austrade), *Emerging Opportunities in Information and Technology for Australia and India*, Austrade and Ernst and Young, March 2000.

the basis that modularity allows for the ad hoc design of a system, which can then be adapted to the immediate needs of a farm and which can become increasingly complex and sophisticated as the farm grows. Integrated farm systems are commercially available in standard packages in Europe and are largely based on standard communication and user interfaces. The utilization of materials, including pesticide applications and animal feed consumption can be optimized through the use of such agricultural/farming information systems, thereby promoting environmental protection and animal welfare. Other benefits include the simplification of business administrations, analysis of tasks and better planning in medium and large farms.

Furthermore, greenhouses are becoming important agricultural production units in ESCWA member countries and they too can benefit from ICT solutions in many respects, including the optimization of design and the actual running and monitoring of operations. Greenhouse software systems that are geared towards sunny and arid climates allow for the optimization of passive microclimate control, which results in reduced energy consumption. This improves the quality of the product and the reliability of the output. Moreover, the use of such software means that existing greenhouse designs can be evaluated with a view to advising growers on optimal choices of crops.

ESCWA member countries also face modernization challenges with regard to controlling irrigation, water consumption, recycling and wastewater treatment. In this regard, ICT-based systems are valuable in relation to optimizing the use of scarce resources, enhancing water quality and improving supply networks.

In addition, the multipurpose community telecentre (MCT) concept is of great interest to the agriculture sectors in developing countries on the basis that it is considered a major promoter of integrated rural development. MCTs, which are adapted to the conditions in remote and rural villages, provide basic telecommunication and information processing equipment and services, including telephone, fax, e-mail and Internet facilities, in addition to support and training. MCTs are based on the concept of cooperative organization. They are self-sustainable and cost effective and also serve as rural business centres. Moreover, MCTs offer farmers, in particular those who are young, access to local, regional, and international information and sources of advice. This is available at a low cost and provides assistance to improve farm production and sell products. With regard to ESCWA member countries, both Egypt and Jordan have launched initiatives related to telecentres, with the objective of empowering rural and remote communities.

In Egypt, three technology access community centres (TACCs), located in the Sharkeya Governorate, were launched in 2000. They were conceived as pilot projects within the framework of a United Nations Development Programme (UNDP) project, IT for Development Programme. TACCs are based on a partnership between various stakeholders, including the Government of Egypt (Information and Decision Support Centre and the Sharkeya Governorate), the Investors Association of the 10th of Ramadan City, and the Sharkeya Chamber of Commerce. The primary objective of these telecentres is community development and empowerment. Moreover, they aim to play an important role in the continuous training and lifelong education of all community members. TACCs are designed to benefit, in general, civil society at the village/city level, and in particular, youth and women, unemployed, small and medium-sized entrepreneurs and traders, educators and educational institutions.

In Jordan, 75 IT community centres (ITCCs) have been established. They tend to be located in remote and rural areas, and in information-deprived urban areas. ITCCs provide information and communication resources and training, as well as assistance to the population. The goal is to connect these centres through a wide area network, thereby allowing for distribution of content, physical set-up, capacity-building and management practices. This initial network aims to constitute the backbone of a national network of ITCCs, which is expected to cover all rural and remote areas.

3. Traditional industries

Traditional manufacturing industries, namely, textile and food processing are important segments of the economies of Arab countries. However, the quality of the products produced in these countries remains inferior to international standards. Moreover, protected local markets are often forced to accept such goods. Industries that target internal markets use fewer ICTs and advanced technologies to reduce costs and prices. In addition, Governments rarely offer incentives to local industries to modernize their processes by means of

implementing modern ICT or by conducting relevant R&D activities. Industries are therefore finding it increasingly difficult to enter demanding and highly competitive international markets.

There are many examples, including several from the Arab countries, in which ICT has been shown to provide assistance with regard to improving the quality of products in traditional manufacturing segments. Within this context, several activities clearly reflect the immense benefits that can be reaped through the introduction of ICT in some traditional manufacturing segments. Relatively recent examples from Egypt, Jordan,¹³ the Syrian Arab Republic¹⁴ and Tunisia highlight the manner in which ICT has helped the textile and garment industry to improve quality of products, and therefore, regain some lost markets.

Modern ICT has shifted the automation boundary with regard to production, namely, by using computer-controlled production systems to reduce costs, enhance quality and decrease time-to-market. As of 2002, computerized numerical control (CNC) was integrated into most imported manufacturing machinery systems. Upgrading old machinery, by introducing CNC modules, is practised in industries where quality and productivity justify the necessary investment. In addition, more advanced IT components are becoming available for quality assurance. These use automated visual inspection and with regard to optimizing computer-controlled machinery, computer-aided engineering (CAE) tools with rapid modelling capabilities.

With regard to management, manufacturing management systems permit a plant to respond quickly and accurately to the requirements of a customer. Using a database of information that incorporates materials, supplies and processes, the software is able to generate various production scenarios. This allows the manager to choose the optimal schedule for a particular order. Such systems have the ability to improve operations, thereby allowing manufacturers to process information more accurately with regard to delivery dates and to respond more flexibly and efficiently to fluctuations in demand. Moreover, computer-based maintenance management systems ensure that the process of machinery maintenance in plants is rendered more efficient by automating, *inter alia*, tasks related to preventive maintenance, availability of spare parts and statistics related to faults and maintenance operations.

Certain branches of traditional industries will require other ICT-based technologies to retain competitiveness in the twenty-first century. These include standardized systems for EDI and product design data. The use of EDI in Arab countries is still at an embryonic stage. However, a Euro-Mediterranean pilot project, known as MEDEDI is attempting to introduce EDI and some limited forms of e-commerce into the textile industry in Tunisia, with the hope of extending such systems to other Mediterranean countries.¹⁵

Some of the obstacles faced by businesses in the Arab countries in developing and implementing ICT innovations are related to the weak links between industry and academic institutions. This situation appears to be particularly detrimental with regard to the transfer and wide dissemination of ICT technologies. The lack of specialized IT courses in the majority of higher education institutes is another serious issue of concern. Furthermore, opportunities related to IT literacy are rare for staff at manufacturing plants, despite its importance.

In conclusion, demonstration centres must provide assistance to traditional manufacturing segments, with regard to modernizing their production capabilities. Moreover, regulations that encourage venture capital must also play an important role in improving the dissemination of ICT in these segments.

4. *Banking and commercial institutions*

The banking sector, which has always been the driving force of the economy of any given country, will play an even more important role in the emerging knowledge-based economy. However, in many

¹³ The Bani Hamida project uses computer-aided design work stations to select designs and colours for carpets, and to calculate the quantity of material required for a project and manufacturing costs.

¹⁴ A locally developed PC-based computer-aided design and manufacturing system linked to a Jacquard loom led to a six-fold increase in the production of new carpet designs in the Syrian Arab Republic and encouraged creativity.

¹⁵ Amin El Saleh, "MEDEDI: The first pilot in e-commerce: its achievements and extension in the framework of EUMEDIS Programme", Proceedings of the First Syrian-Lebanese Symposium on ICT Development, 25-29 April 2000.

countries of the region, banks are not evolving in line with the needs of the economy. This places constraints on development and the promotion of business. In many cases, local laws and regulations hamper progress. In addition, the absence of a basic information and communication infrastructure in developing countries prevents banks from providing their customers with modern e-banking services.

The increasing availability of e-banking has resulted in a greater demand for high security ICT-based authentication and encryption devices. Indeed, the introduction of smart cards, e-purse, Internet banking and other ICT-based services must be coupled with initiatives that ensure that bank staff have a higher level of awareness of ICT issues; technical bank staff have a greater knowledge of ICT; and that legal and regulatory frameworks related to electronic transactions are improved. Furthermore, small and medium-sized enterprises (SMEs) and ordinary citizens must attain a higher awareness level of ICT issues, with the aim of fully benefiting from e-commerce practices that utilize new technologies and in order to prepare themselves for the information society of the future. This can be achieved through well-planned national campaigns, including the distribution of leaflets, demonstrations and workshops. These must be implemented by Government agencies, chambers of commerce and industries in addition to relevant establishments.

In fact, commercial institutions in the Arab countries, led by the United Arab Emirates, are starting to use e-commerce. Meanwhile, the developed world, particularly the United States, has taken giant steps towards e-business and will soon reach what has been described as a “hyper-growth” threshold.¹⁶ Moreover, e-commerce will largely be conducted on an inter-company basis, namely, business-to-business (B2B), with earnings expected to rise from \$45 billion in 1998 to \$3,200 billion in 2003. However, business-to-consumer (B2C) Internet trading in the United States was worth nearly \$20 billion in 1999 and is expected to reach \$184 billion in 2004.¹⁷

In the new global economy, though not yet in the Arab countries, companies are starting to incorporate a large virtual dimension into their activities and in some cases, are becoming completely virtual entities. For example, some large companies operate as e-business hubs. However, it is worth noting that old economy companies are systematically incorporating the Internet into their business models as a first step towards the use of e-commerce practices.

Certain developing countries, including some Arab countries, are expected to follow similar trends in the next few years and must be prepared to take full advantage of them. Indeed, the Internet provides small firms in emerging economies with an immediate and great opportunity to sell into a global market, either to other businesses or directly to consumers located in wealthy countries.

5. Public administration

Public administration in the region, with its increasing complexity and bureaucracy, remains an obstacle to an efficient and enhanced civil service. The use of PCs, networking, databases and management information systems in some public agencies has slightly improved internal efficiency. However, in most cases, this has not satisfied the demands of citizens. Indeed, as long as public administrations in most Arab countries fail to computerize and network activities, growth in the economic sector will continue to be slow as a result of reduced productivity. Positive impacts on regional economies and the application of e-government solutions can only be realized when countries achieve a significant level of computerization.

Indeed, while public administrations are often under pressure from Governments to improve services through the use of ICT, budget constraints, low levels of expertise and motivation, in addition to resistance on the part of personnel to the introduction of IT, often ensure that the transition to the information age is rendered slow and difficult. Awareness and training remain key factors in the success of such an endeavour.

It must be stressed that swift and effective handling of information is vital in modern administration environments. Work flow management software, which can be applied in any organization to manage

¹⁶ Matthew Symonds, “Business and the Internet”, *The Economist*, 26 June 1999.

¹⁷ Ibid.

electronic dossiers, decreases processing time, prevents loss of information and simplifies communication among staff members. Modern workflow systems usually cover all stages of document management, from creation to the final result. They improve the productivity of the office by guiding employees, ensuring consistency and automating routing tasks.

The use of geographic information systems (GIS) at the level of municipalities, public works and utilities improves performance in administrations. These systems enable non-technical users to retrieve maps, statistics, legal documents and other information from a variety of different sources, and to integrate them into effective documents. Moreover, public sector bodies, namely, urban planning, public transport departments and tourist information offices can benefit from such systems by accessing and analysing data from a large number of sources, including online and traditional databases. This facilitates decision making.

Ultimately, computerization and networking in public administrations, in the form of Intranets and Extranets, combined with the use of a variety of software applications, could lead to e-government. In such a system, citizens and businesses can deal with government agencies electronically, increasing their productivity by reducing paperwork and saving time with regard to administrative formalities.

D. CONCLUSION

ICT is a vital component in the development of various sectors of the economy, particularly within the context of globalization. In this regard, ICT capacity-building is of particular importance to those Arab countries that desire to make the transition towards a knowledge-based economy. At the same time, such capacity-building is essential to countries that aim to advance beyond the limits of merely importing and consuming technologies. Therefore, ICT policies and strategies that lead to dynamic systems of national innovation, and which allow for the integration of new technologies into the fabric of national economic activity, must be devised. Such policies and strategies must strive to achieve the following goals:

- (a) Raise awareness and develop training programmes related to ICT, and promote lifelong learning and the upgrading of skills;
- (b) Enhance ICT at all levels of education;
- (c) Develop infrastructure at the national level, including broadband communications, and ensure harmonization at the regional level;
- (d) Modernize telecommunication legislation and regulations to allow easier and cheaper access, particularly to the Internet;
- (e) Provide incentives for private firms to innovate, particularly with regard to ICT applications that pertain to national needs, and to build bridges with international markets;
- (f) Enhance ICT-related industries, particularly those related to the development of Arabized software, namely education software;
- (g) Invest in innovative inputs to boost the productivity and competitiveness of existing firms and to encourage ICT start-up firms.

The implementation of such policies and strategies at the national and regional levels requires, and can be facilitated by, the launching of initiatives for the rapid dissemination of ICT and national capacity-building. In particular, such actions as enhancing national ICT infrastructures, including creating new ICT-based institutional forms, such as technology parks and incubators, in addition to building adequate human development institutions and R&D structures are essential. Furthermore, networks to increase collaboration between similar sectors at the regional and international levels are of primary value.

III. INFORMATION AND COMMUNICATIONS TECHNOLOGY AND DEVELOPMENT

A. ICT AND SUSTAINABLE DEVELOPMENT: AN INTRODUCTION

The progress that has been made during the past three decades in ICT has engendered considerable changes in many fields of social and economic development. Moreover, the fact that performance and cost benchmarks are virtually exceeded on a daily basis means that ICT devices and software items promise wider and even farther-reaching transformations. Indeed, the profound socio-economic and cultural implications of ICT innovations are already apparent. In particular, the explosive expansion of the Internet and the Web, in addition to the growth of wireless communications are the most visible manifestations of what is often termed the ICT revolution.

It is possible that the ICT revolution will plunge many developing countries into a period of turbulent change: a period in which both challenges and opportunities will materialize. Countries that fail to keep up with the transformations engendered by this process, whether as a result of ill-conceived policies or inadequate resources, will suffer a number of negative consequences, including the serious curtailment of development efforts. Such countries will inevitably occupy a weaker position within the knowledge-based global market. This could be reflected in diminished resources for development and the generation of instabilities caused by enhanced expectations on the one hand, and missed opportunities and widening gaps between rich and poor, on the other hand. Even countries with sufficient resources are expected to experience strains related to the impact of ICT on their economies, social patterns and cultural norms.

However, judicious approaches, based on comprehensive national ICT policies and novel strategies that incorporate practical capacity-building initiatives, will enable determined developing countries to reap the diverse benefits of the ICT revolution.

With regard to devising national policies and strategies for such purposes, due attention must be afforded to a combination of technological, regulatory and demand-side developments that have accelerated the progress of ICT in the developed countries. In those countries, ICT supply and demand relationships have given rise to dynamic transformations with positive feedback characteristics. These have resulted in rapid rates of change and unpredictable outcomes. The ways in which a number of interacting factors are exerting, and will continue to exert their influence in the near and long-term future, are reviewed below.

(a) *Technology cost, extent of dissemination and effects of innovation*

Continuing innovation and economies of scale are at the root of dramatic decreases in the unit costs of many ICTs. Quantifying the macroeconomic impact of such developments may be illusive, but it is highly likely that this impact will be considerable in the short- to medium-term future.

(b) *System development cost, risks and time-scale effects*

New ICT is enabling complex applications to be developed more quickly, cheaply and reliably than was previously possible, thereby initiating positive feedback mechanisms. Large and small organizations alike are able to embark on ambitious projects with diminished expectations of delays and failures that routinely plagued such ventures in the recent past. This has engendered dramatic, sometimes highly disruptive structural and strategic transformations at the corporate and national levels, leading, when appropriate measures are undertaken, to enhanced competitiveness and productivity.

(c) *User expectations*

Users of ICT are aware of its possible benefits, and as such, have become a significant driving force with regard to future demand. Indeed, they are the driving force behind deeper and faster technological change. A general tendency to embrace the latest trends is exploited in a number of developed country markets. This has led to frequent changes in products and services with little or no recourse to a rational trade-off of costs and benefits.

(d) *Competition and innovation cycles*

The high returns to new business enterprises have tended to encourage new entrants and innovative contributions. Enhanced competitive intensity encourages the pursuit of benchmarks of higher efficiency and the astute balancing of supply and demand. While this trend is ultimately unsustainable owing to inevitable over-capacity and diminishing returns, it is likely that it will result in considerable progress over the next few years.

(e) *E-commerce*

As participation in e-commerce becomes more widespread and penalties associated with non-participation become more prohibitive, its benefits will grow. Despite the fact that only those actors with access to e-commerce infrastructures are able to participate therein, macroscopic impacts are likely to acquire considerable proportions within the coming few years. Significant disruptions, instabilities, and hence challenges and opportunities, will arise.

(f) *Industry restructuring and financial market behaviour*

Enterprises in many sectors are reviewing their strategies in the global knowledge-based economy. The momentum created by prevailing trends is likely to force hesitant players to copy and conform and then innovate rather than adopt marginal attitudes.

The aforementioned issues must be taken into account with regard to drafting national ICT policies and strategies. In addition, a number of important national issues relating to the status of ICT infrastructures, manpower development and legislative and regulatory frameworks resources for enterprise development, must be addressed. ICTs in ESCWA member countries are reviewed in the following section. While the situation in these countries tends to be negative, there are some positive indications.

B. ICT INFRASTRUCTURES IN ESCWA MEMBER COUNTRIES

The availability of ICT infrastructure plays a crucial role with regard to attempts to join the global knowledge-based economy. Fixed and mobile telephone line densities, the rate of access to PCs and Internet penetration are some of the principal indicators of infrastructure adequacy. Furthermore, indicators that denote quality of infrastructures and associated services in a comprehensive assessment of connectivity must be compiled.

As a group, ESCWA member countries score below world averages on all connectivity indicators. However, GCC countries consistently perform far better than the non-GCC ESCWA member countries. In fact, at least one GCC country, namely the United Arab Emirates, has exceeded world averages in terms of the number of connectivity indicators. The radar plots and tables in annex I provide an overall picture of the status of ICT infrastructures in selected ESCWA member countries as compared to world averages.

ICT infrastructures in ESCWA member countries can be summarized as follows:

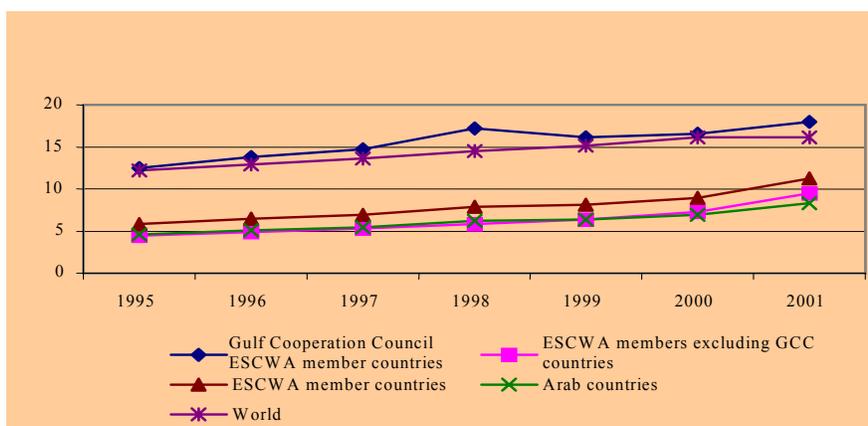
(a) *Telephone lines*

The world average with regard to main telephone lines in 2001 was 16.19 per 100 people. However, the corresponding figure for ESCWA member countries did not exceed 11.26 per 100 people. ESCWA member countries, with the exception of GCC countries, possess even smaller values for this indicator, with Yemen averaging 2.21 telephone lines per 100 people according to ITU.¹⁸ Figure IX indicates growth rates in the numbers of main telephone lines per 100 people in the period 1995-2001. Growth rates in all groups of

¹⁸ It is estimated that a country that wishes to be integrated into the world information economy requires 50-70 telephone lines per 100 people and a modern, computerized communications system.

countries included in this figure are comparable to the world average growth. However, the fact that all ESCWA members, with the exception of GCC countries, and ESCWA member countries as a whole, started from much smaller densities is clearly evident.

Figure IX. Main telephone lines per 100 people, 1995-2001



Source: ITU, *Arab States Telecommunication Indicators*, 2000 and *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

Note: Data for 1995-1999 has been extracted from ITU, *Arab States Telecommunication Indicators* (Geneva, ITU, 2000) and for 2000 and 2001 from ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

On a more positive note, significant investments in upgrading fixed line networks appear to have been made in most ESCWA member countries. Furthermore, digital networks have been introduced in many of these countries.

With regard to mobile telephony, the number of cellular subscriptions varies greatly among ESCWA member countries. In terms of absolute numbers, Egypt is at the forefront with approximately 2.79 million subscriptions according to ITU. In relation to populations however, figures released by ITU for 2000 indicate that the GCC countries and Lebanon led ESCWA member countries in terms of the number of fixed and mobile phones per 100 people. Indeed, Lebanon has an almost equal number of mobile subscribers and fixed line connections (see figure X).

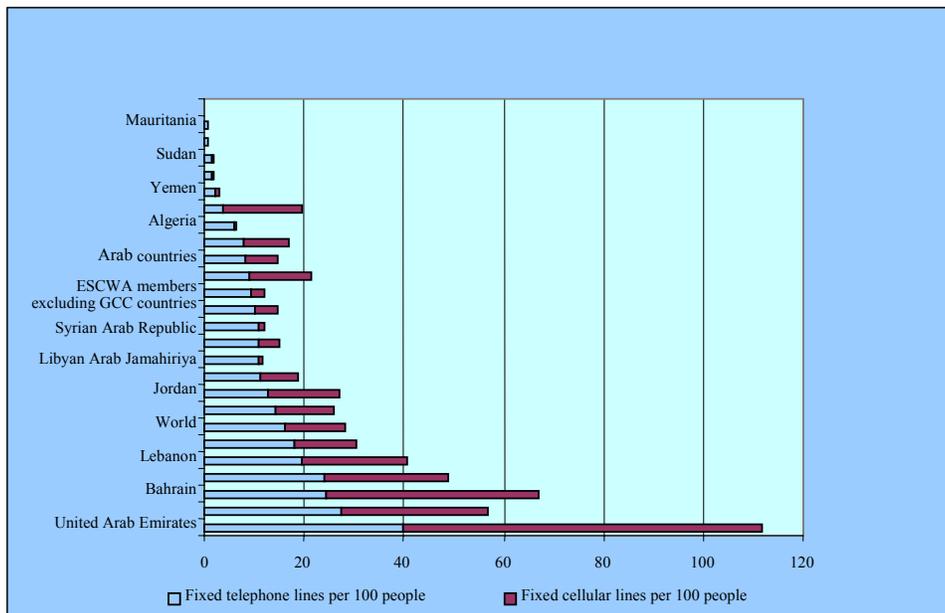
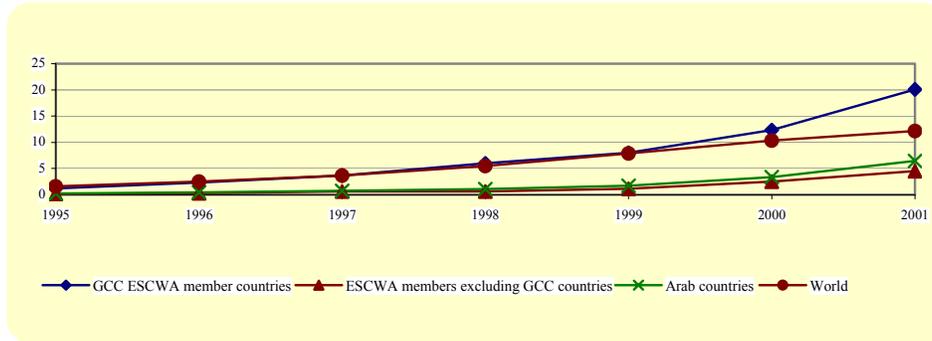


Figure X. Fixed cellular and telephone lines per 100 people, 2001

Source: ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

Figure XI indicates growth rates in the numbers of cellular subscribers per 100 people during the period 1995-2001. It illustrates that all ESCWA members, with the exception of GCC countries, ESCWA member countries as a whole and Arab countries possess smaller growth rates as compared with the world and particularly with GCC country averages during this period. Furthermore, the fact that GCC countries have surpassed growth rates that are comparable to world averages is evident. A recent decline, indicating below average world growth is reflected in the figures for 2000.

Figure XI. Cellular subscribers per 100 people, 1995-2001



Source: ITU, *Arab States Telecommunication Indicators*, 2000 and *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

Note: Data for 1995-1999 has been extracted from ITU, *Arab States Telecommunication Indicators* (Geneva, ITU, 2000) and for 2000 and 2001 from ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

(b) *PCs*

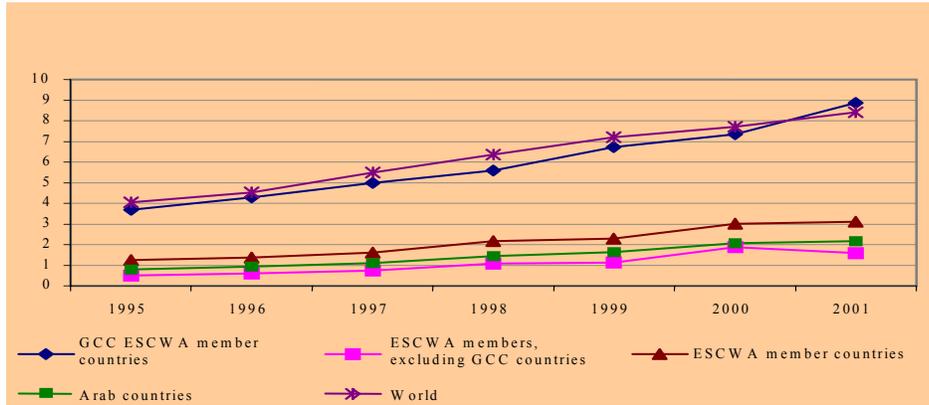
In 2001, there were 3 PCs per 100 people in ESCWA member countries. This amounted to a little over a third of the world average of 8.4. ESCWA member countries, with the exception of the GCC countries possessed an even lower average of around 1.6 per 100 people (see figure XII). The situation in the GCC countries was considerably better in that year, with an average that rivalled the world figure of 8.9 PCs per 100 people.

Figure XIII indicates growth rates in the numbers of PCs per 100 people during the period 1995-2001 in ESCWA members, with the exception of GCC countries. ESCWA member countries as a whole and the Arab countries maintained inferior growth rates during this period.

Figure XII. Personal computers per 100 people, 2001

Source: ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

Figure XIII. Personal computers per 100 people, 1995-2001



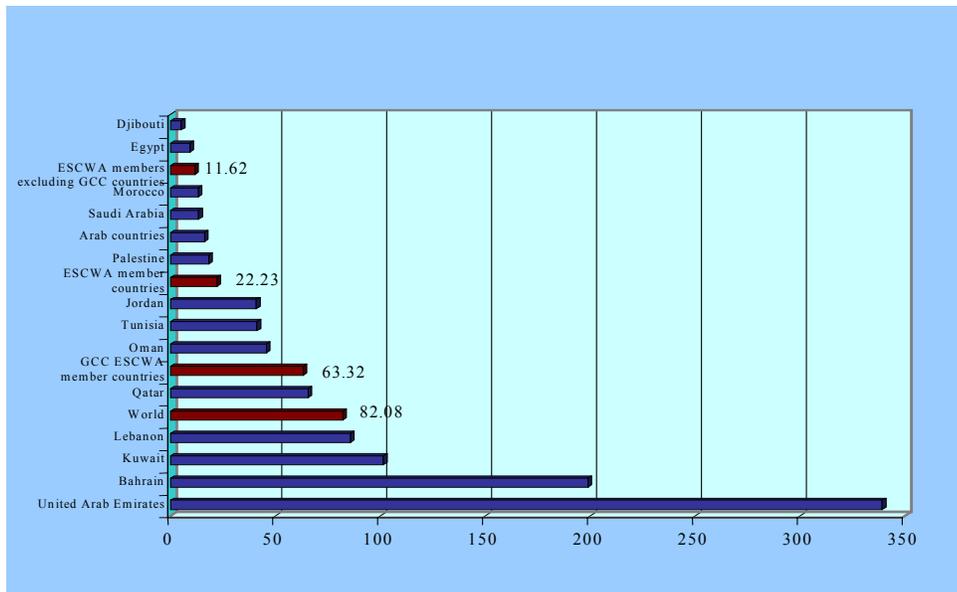
Source: ITU, *Arab States Telecommunication Indicators*, 2000 and *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

Note: Data for 1995-1999 has been extracted from ITU, *Arab States Telecommunication Indicators* (Geneva, ITU, 2000) and for 2000 and 2001 from ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

(c) *Internet access*

Telephone densities and the number of available computers place an upper limit on Internet access when conventional wire-based technologies are in use. Nevertheless, Government policies are clearly instrumental in facilitating access to the Internet. In the Syrian Arab Republic, for example, Internet use is still nascent. In 2001, there was a density of approximately 3.61 per 1,000 people in the Syrian Arab Republic, compared to a density of 339 per 1,000 people in the United Arab Emirates. The average number of Internet users in ESCWA member countries in 2001 was some 22 per 1,000 people. This amounts to an average of 12 per 1,000 people for all ESCWA members, with the exception of the GCC countries and 63 per 1,000 for GCC countries. The world average was approximately 82 per 1,000 people in 2001 (see figure XIV).

Figure XIV. Internet users per 1,000 people, 2001



Source: ITU, *World Telecommunication Indicators Database*, sixth edition, (Geneva, ITU, 2002).

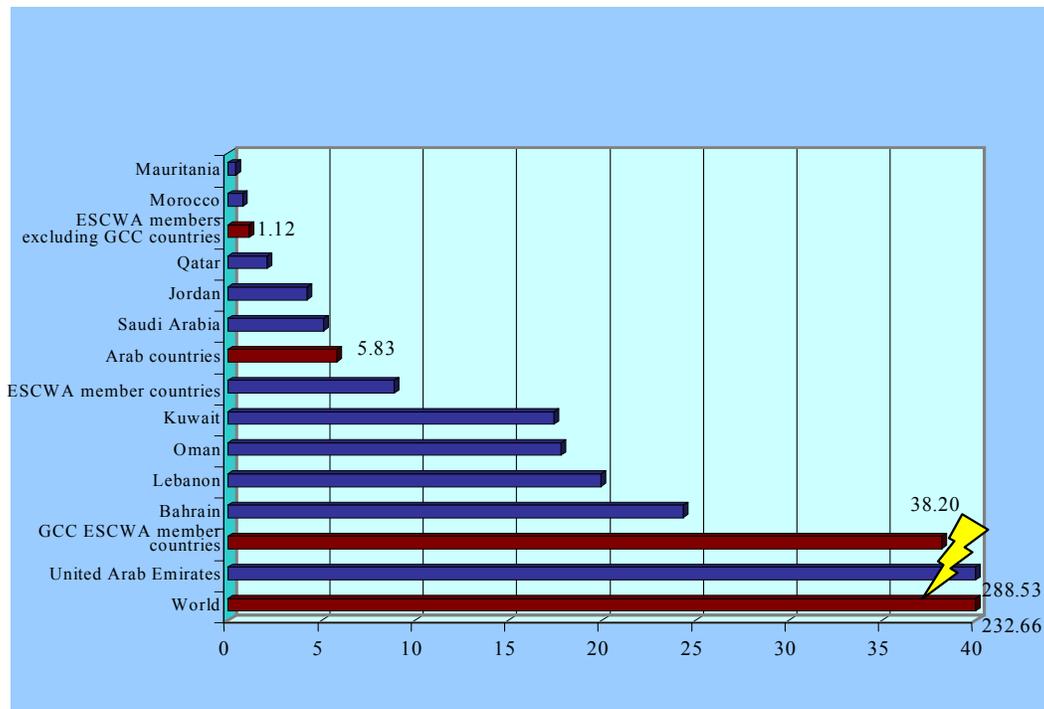
(d) ISPs

Private sector ISPs are prevalent in most ESCWA member countries. Indeed, more licences are available for ISPs than for mobile phones and there is a much more competitive market in this regard.¹⁹ In the Syrian Arab Republic, STE is the only public ISP.²⁰ In this case, high prices and limited access are believed to have contributed to restricting the growth in the number of users. Sole providers are available in four other ESCWA member countries, namely, Oman, Qatar, the United Arab Emirates and Yemen. According to information released in 2000, in Saudi Arabia, where Internet service had only been provided for approximately four years, there were 25 ISPs at that time, whereas in Lebanon, which established its first ISP before Saudi Arabia, there were approximately 16. Egypt led the other ESCWA member countries, with 34 ISPs during this period.²¹

(e) Top-level domain names

In 2001, the number of top-level domain names (TLDNs) per 10,000 inhabitants was approximately 9 in ESCWA member countries, with an average of approximately 38 in GCC countries. The average for ESCWA member countries represents less than 4 per cent of the world average, which amounted to 232 TLDNs per 10,000 inhabitants in 2001 (see figure XV).

Figure XV. Top-level domain names per 10,000 people, 2001



Source: ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

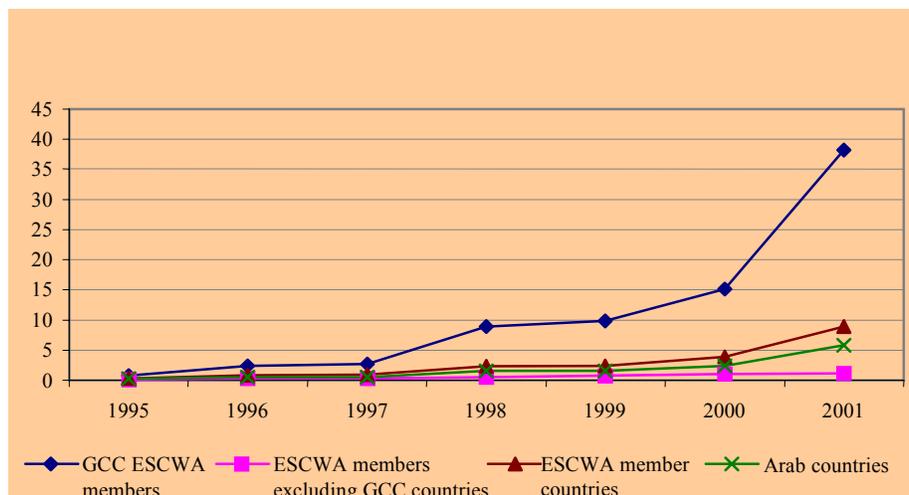
¹⁹ In Lebanon there have been numerous price wars between ISPs, but little activity with regard to mobile phone operators.

²⁰ The Syrian Computer Society provides Internet access to its professional members.

²¹ *Internet Arab World Magazine*, June 2000 (web address no longer available).

Figure XVI indicates growth in the number of TLDNs per 10,000 inhabitants for the period 1995-2001. The high rate of growth in the GCC ESCWA member countries can largely be attributed to phenomenal growth in just one country, namely, the United Arab Emirates. Growth in the ESCWA members excluding GCC countries has been relatively low compared to world averages.

Figure XVI. Top-level domain names per 10,000 people, 1995-2001



Source: ITU, *Arab States Telecommunication Indicators* (Geneva, ITU, 2000) and *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

Note: Data for 1995-1999 has been extracted from ITU, *Arab States Telecommunication Indicators* (Geneva, ITU, 2000) and for 2000 and 2001 from ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

(f) *Local content*

Recently, Government sites, Arabic portals, discussion sites and hobby sites have proliferated in ESCWA member countries. In this regard, numerous sites in Egypt, Kuwait, Lebanon and Saudi Arabia offer services pertaining to libraries, newspaper articles, encyclopaedias and information on religious affairs.

(g) *Language*

English is the first language for 92 per cent of web users; Arabic language users account for only 0.07 per cent of total web users, despite the fact that the Arabic-speaking population amounts to 4.4 per cent of the population of the world. This indicates that the Arab web-surfing contingent is underrepresented by a factor of 63 according to ITU.

(h) *Satellite systems*

With regard to satellite communications, Egypt has launched its first communications satellite and is scheduled to launch a second. Meanwhile, the Arab Satellite Communications Organization (ARABSAT), launched a third generation satellite in 1999, for the diffusion of television programmes to all the Arab countries and to a number of European countries.

C. THE FUTURE OF MODERN ICT INFRASTRUCTURES

Governments in ESCWA member countries tend to have a monopoly on their respective telecommunication sectors, despite the fact that privatization is firmly on the telecommunication policy agenda in a number of those countries. This is particularly true with regard to fixed line telephony. However, Jordan is a notable exception. This is borne out by the fact that the recently created Telecommunication

Regulatory Commission oversees its privatized monopoly service provider. In Lebanon Parliament has approved a privatization bill, the objective of which is to ensure the privatization of the telecommunication authority.

However, greater diversity is evident with specific regard to mobile phone services. At one end of the spectrum, such services are still Government monopolies. For example, in the Syrian Arab Republic, mobile telephone services are provided within the framework of a pilot build-operate-transfer (BOT) scheme launched by the public sector. At the other end of the spectrum, in Egypt and a number of other countries, several licences have been issued to private companies. Moreover, in Lebanon, two mobile phone licences have been made available to the private sector.

The construction of modern ICT infrastructures in the future will increasingly involve participatory approaches. Alliances must be formed among a variety of institutional entities, including Government departments, local and international enterprises, technology holders and research organizations, and even NGOs concerned with building ICT infrastructure. In this regard, the relevant actors must endeavour:

(a) To bring information infrastructures within reach of the general population by a variety of means, including the provision of access systems in public places;

(b) To prioritize building activities related to communications infrastructure in accordance with the requirements of specific application areas including, e-commerce, e-governance and telemedicine;

(c) To provide low-cost dissemination of information in areas that have an inadequate telecommunication infrastructure;

(d) To introduce, adapt and disseminate new technologies, namely, terrestrial wireless and satellite communication systems, to allow reliable access to global information infrastructures;

(e) To adopt telephone dial-up fees that are not metered within the same local or metropolitan area code;

(f) To ensure broadband services in various forms and provide bandwidth-on-demand facilities for low cost multimedia applications.

D. NOTES ON SELECTED ICT APPLICATIONS IN ESCWA MEMBER COUNTRIES

This section provides examples of efforts pertaining to the introduction of ICT-based applications in ESCWA member countries.²² In addition to the summaries reviewed below on the status of ICT applications, this section outlines proposals related to promising approaches for future development.²³

1. *E-government*

The introduction of computers, and more recently PCs in Government services has been an ongoing process for a large part of the past three decades in ESCWA member countries. However, there are significant variations among these countries, both in terms of overall IT dissemination, and the selection of services that have been granted permission to introduce IT capabilities into their operations. As of 2000 in Jordan, 92 per cent of Governmental agencies had introduced IT into their daily operations, while in Saudi

²² A more detailed account of such efforts is reviewed in ESCWA, *New Technologies for Enhancing Competitiveness and Productivity in Selected Sectors* (E/ESCWA/TECH/2001/4).

²³ A number of these proposals have been compiled from substantive papers and discussions which were presented, and which took place, at relevant ESCWA meetings, in particular, the Expert Panel on Information Technology and Development Priorities; *Competing in the Knowledge-Based Global Economy*, Beirut, 15-16 May 2000.

Arabia many Government services, including national records, had benefited from similar developments, according to ITU. In the Syrian Arab Republic, the Ministry of Finance and the public banking sector have been active in introducing IT into Government operations.

However, only a limited number of ESCWA member countries have embarked on projects that endeavour to introduce integrated ICT capabilities into Government institutions, with a view to rendering Government services more accessible to citizens. In this regard, notable efforts are being made in Egypt and the United Arab Emirates.

Within this context, an ambitious scheme was announced in 2000 in Dubai, in the United Arab Emirates, the objective of which was to install a network of centres to facilitate access to Government services. A number of such services are already accessible through the Internet.

In Egypt, attempts are being made to introduce ICT into Government activities. To this end, the Ministry of Communication and Information is in the process of formulating a comprehensive plan aimed at introducing e-government. This plan is expected to be implemented in five stages. The first stage will be carried out in cooperation with the Ministry of State for Administrative Development, which has already launched a new service that enables citizens to access information related to a variety of Government services by telephone and through the web site of the Government. In addition, more than 1,500 information and decision support centres and 200 web sites have been established.

ICT supports democratic development. However, relatively high costs render it inaccessible to large cross sections of populations in developing countries. The level of penetration of ICT-based systems in the management of community affairs at any level can be determined within the context of two factors: (a) national and local policies that permit the utilization of such systems; and (b) schemes that render such systems more accessible to the general population. In addition to cost-related hindrances in ESCWA member countries, language difficulties and basic skills are factors that need to be taken into account in e-government schemes. While issues related to cost can be worked out with regard to short-term solutions, issues related to languages and skills require sustained efforts over longer periods.

Indeed, it is possible that gradual multilateral approaches are more suitable with regard to disseminating e-governance in ESCWA member countries. In essence, the fact that significant dissemination of e-governance schemes is contingent upon various developments in a variety of areas, including machine translation and digital literacy, lends further support to the argument for broad-based national ICT initiatives that highlight the following:

- (a) Promotion of rational mechanisms related to gradual public participation in information retrieval and exchange;
- (b) Introduction of regulation/mediation to monitor the contents of forums to conserve local values and traditions;
- (c) Provision of support for R&D efforts that aim to enhance digital literacy and to reduce language and cost barriers to the dissemination of e-governance schemes;
- (d) Adoption of technologies for protecting privacy and personal information;
- (e) Promotion of specialized forums with a view to creating online seed communities;
- (f) Extension of national information networks to all areas in ESCWA member countries.

In this regard, several actors must work together to promote e-government initiatives. The application of ICT to streamline Government operations is a task that cannot be left to one party. In other words, it must

include Governments, private enterprises and civil society institutions. A participatory approach is essential for success and must, therefore, be adopted as the core of strategic initiatives that strive for the realization of e-government objectives.

2. E-commerce

A significant number of businesses in several ESCWA member countries have acquired a presence on the Internet. With the exception of a limited number of retail enterprises that are engaged in selling their products through their web sites, limited information is available concerning the volume of transactions concluded over the Internet by businesses in ESCWA member countries. However, despite this fact, figures indicate that the total volume of e-commerce in the Arab countries in 1999 was approximately \$100 million.

One salient point about e-commerce orientations is that preliminary observations appear to indicate that a sizeable proportion of e-commerce is based on B2C transactions, with foreign businesses dominating the electronic Arab marketplace. This highlights the fact that B2B transactions that involve local enterprises are crucial with regard to vitalizing e-commerce and ensuring optimal results in development.

In addition, e-banking is still in its early stages in ESCWA member countries, where only a few services are being offered on the Internet by a small number of banking institutions.

Egypt and the United Arab Emirates are two of a small number of ESCWA member countries that are making embryonic efforts that target the promotion of e-commerce. To this end and largely as a result of private sector concerns, an e-commerce initiative was launched by Egypt to enhance its share in global e-commerce. In addition the Dubai Internet City has made considerable progress in encouraging a variety of e-commerce ventures.

Advances in ICT, led by the Internet, offer enterprises the opportunity to gain considerable visibility, to access remote markets and reduce costs, whilst ensuring that they are exposed to stiff global competition. In general, enterprises that do not take advantage of ICT advances will play a marginal role in the future and will face dire consequences with regard to socio-economic development.

The issue of taxing electronic transactions remains to be resolved. This is not only a concern for ESCWA member countries, but for all nations worldwide. In general, developments on several fronts will foster the widespread use of the Internet with regard to concluding business transactions. Policy issues that have to be addressed in ESCWA member countries include the following:

- (a) Wider dissemination of the capacity to use the Internet by a variety of business enterprises;
- (b) Agreement on systems that allow for secure Internet transactions;
- (c) Acceptable modalities for taxing Internet transactions;
- (d) Drafting and ratification of legal measures for dispute settlement.

3. ICT in education

There are a number of initiatives that target the application of ICT in education in ESCWA member countries. These vary in terms of the extent of their dissemination. Emphasis on the introduction of PCs, and less often the Internet, in secondary schools and universities is evident. For example, Jordan, has established computer labs in all of its secondary schools; and in the Syrian Arab Republic, computer-training courses are being introduced at a number of levels by initiatives, which in some cases, target the general population. In Lebanon where the private sector is relatively active in education, variations among schools are more heavily pronounced. In addition, several GCC countries have taken steps to integrate computers into curricula.

In this regard, distance education has the following distinct advantages:

- (a) The ability to reach a wider student audience;
- (b) The ability to meet the needs of students who are unable to attend on-campus classes;

(c) The ability to link students from different social, cultural, economic and experiential backgrounds.

The Internet and the Web, which are characterized by their base modern user-friendly capabilities, including the ability to integrate graphics, text and sound into a single tool, provide students with instructional possibilities, including:

(a) The ability to use e-mail and PCs for faster feedback than any other means of communications and as a convenient means for reading and storing messages;

(b) The ability to encourage interaction among students, faculty and researchers;

(c) The ability to acquire instant updates related to class activities;

(d) The ability to connect with library catalogues and other institutional/individual home pages.

Building a relationship between distance learning and modern computer-aided instruction (CAI) is a means of facilitating self-paced learning, by individualizing learning and providing immediate reinforcement and feedback. This is particularly true with regard to applications that target tertiary education. As a result of integrated graphic, print, audio, and video capabilities, computers can effectively link software packages, with the objective of maximizing learner control. Indeed, innovations are constantly emerging, while costs are dropping. Clearly, this is a situation that offers invaluable opportunities for creating local, national, regional and international networks to link resources and individuals, whatever their location.

4. *ICT in healthcare*

Adequate infrastructural arrangements are important prerequisites for the realization of ICT potential in healthcare. In this regard, notable efforts have been exerted in Egypt and Saudi Arabia. In particular, Egypt has established a decentralized health information system that links a number of centres, by making use of its communication satellites.

In addition, telemedicine initiatives have been reported in all ESCWA members, with the exceptions of Bahrain, Iraq and Palestine. These initiatives vary in nature and maturity: in Qatar and the Syrian Arab Republic, they are reportedly experimental; while in Egypt and Saudi Arabia, they are considerably more advanced. Virtually all ESCWA member countries are developing applications that permit the acquisition of patient information. In Jordan, health insurance records and disease surveillance are now supported by ICT-based national systems.

With proper infrastructures, adequate institutional arrangements and long-term planning, ICT has the capacity to advance health services in terms of quality and extent of dissemination. In this regard, the computerization of national health information systems and health insurance schemes appears to constitute a starting point in a number of ESCWA member countries. Moreover, there is a need to establish schemes that target other ICT applications in a variety of services sectors.

It is envisaged that telemedicine applications will require significant restructuring and integration at the policy, institutional and management levels. Indeed, it is possible that policies pertaining to the building of national capabilities in telemedicine may have to incorporate a heuristic and gradual approach, with well-defined targets and close monitoring arrangements. Pilot projects, preferably of regional, international and national character, could be conducted in selected priority areas in cooperation with the United Nations and other international organizations, namely, World Health Organization (WHO), United Nations Children's Fund (UNICEF) and ITU. Such projects would be capable of facilitating the accumulation of useful experience with regard to telemedicine applications.

An assessment of the values inherent in developing national skills for the design and implementation of telemedicine initiatives is vital to selecting telemedicine pilot projects. It is also essential to ensure that such projects incorporate well-defined objectives and respond to established needs.

5. Policies, strategies and action plans

ESCWA member countries have recently established ministries, high level Governmental and non-governmental bodies, in addition to national information centres to promote certain aspects of ICT development. In addition, a certain degree of activity has been reported at the ICT policy/strategy-making level in a number of ESCWA member countries. In this regard, Oman and Saudi Arabia are engaged in formulating ICT policies and related strategies, and a draft policy was approved in Lebanon in 1999 and a national ICT committee was approved in 2000. However, an attempt to formulate and launch an ICT policy in Lebanon in 2000 was deferred.

In Egypt, the Information and Decision Support Center is exerting efforts to establish a national ICT policy. This entity was created in 1985, with the specific goal of supporting decision-making through IT. The establishment of a ministry devoted entirely to IT is expected to add momentum to this endeavour.

Furthermore, a protracted initiative is being launched in Jordan with a view to developing a national information strategy, in addition to a number of sectoral ICT strategies. Furthermore, fast-track projects that aim to disseminate ICT in rural areas are planned.

Nevertheless, there is an urgent need to devote more attention and an increased amount of resources to the formulation of coherent policies, strategies and plans of action pertaining to ICT capacity-building and the sustained development of existing capabilities. The principal goals of such policies, strategies and action plans must be to ensure that ESCWA member countries improve competitiveness within the context of the knowledge-based global economy and that they are supported with regard to attempts concerned with the creation of knowledge-based societies.

However, decision makers engaged in formulating and implementing national policies and related strategies face certain difficulties. One of these is that such policies and strategies cannot be based on statistical observations and analyses. Indeed, many of the issues being faced by both developed and developing countries with regard to formulating and implementing novel ICT policies and strategies are being encountered for the first time. Furthermore, the emulation of successes that have been achieved in developing countries is not always possible. This is based on a number of factors, not least of which is that only a few developing countries have enacted policies and implemented strategies over a sufficient period of time that permits ultimate outcomes and benefits to become apparent.

However, waiting for results, a strategic approach of preference in some developing countries, is not necessarily the best solution. Indeed, by the time the dynamics of the ICT revolution have been assessed, patterns will have been established and opportunities for influencing outcomes will have been lost. In short, inaction and inadequate policy responses with regard to the ICT revolution will simply serve to widen the development gap and significantly augment internal inequalities.

Moreover, efforts exerted in the formulation of cross-cutting national ICT policies that address overall socio-economic development goals must take into account targets set by explicit sectoral development policies, in addition to catering for supra- and intersectoral development objectives.

Indeed, national ICT policies and related strategies must address objectives within at least two time frames. In the long term, goals such as instituting a change in attitudes and revolutionizing educational systems must be considered. In the short term, goals must include the implementation of interim ICT capacity-building measures, including specialized institution-building, urgent development of human resources programmes and the achievement of specific ICT capabilities in selected priority sectors/segments.

Overall ICT policies and implementation strategies, with the objective of attaining their goals, must tackle the following:

- (a) The building of ICT infrastructure, in its various forms and orientations;
- (b) The development of human resources goals in all ICT disciplines and related application areas;

(c) The provision of financial resources for sustainable ICT development and the role of the private sector in securing resources;

(d) The fundamental issues related to the creation and management of content, from an economic, social, cultural and linguistic viewpoint;

(e) The outlining of R&D requirements pertaining to ICT capacity-building, including research in the social science field, with a view to designing optimal intervention strategies and linking R&D activities in ICT with industry;

(f) The definition of regulatory and legal aspects pertaining to ICT capacity-building and knowledge-based societies, which must emphasize, in particular, the following:

(i) IPRs;

(ii) The establishment of foundations for e-governance and public access to information;

(iii) Security, privacy and human rights;

(iv) Criteria for establishing taxation and tariff systems in relation to the use of ICT and their secure application with regard to e-commerce and e-banking.

Furthermore, the implementation of national and sectoral ICT policy objectives that are firmly based on actual demand considerations and established needs, must be emphasized. In particular, policy makers and regulators concerned with ICT in countries where market forces are still dormant, must aim to monitor, and where necessary intervene, to promote and facilitate expansion of ICT services. Indeed, the issues that sectoral ICT policies and strategies must focus on include the following:

(a) Sector and segment ICT priorities, special needs and resource allocations;

(b) ICT alliances and cooperative ventures with operators in and beyond ESCWA member countries;

(c) Issues related to the development of human resources, in particular, those related to the sector/segment in question;

(d) Promoting public domain information facilities and ensuring that these provide information and applications that improve education, health, the environment and Government functions.

E. ICT LEGISLATION, STANDARDS AND REGULATORY ARRANGEMENTS

The fact that many Governments have yet to formulate national ICT policies and associated strategies explains the lack of effort that has been exerted with regard to ICT legislation. Nevertheless, legislation that is conducive to the capacity-building and dissemination of ICT is urgently required in ESCWA member countries. In particular, attention must be focused on the need to accelerate the deregulation of the telecommunication sector in ESCWA member countries, with a view to promoting competition and providing a wider range of services at lower costs.

Within this context, a number of countries have passed IPR legislation, including Kuwait, Lebanon, Saudi Arabia and the United Arab Emirates. The objective of this is to facilitate the evolution of ICT applications that are in need of legislative reform on the IPR front.

Indeed, the adoption of national and regional standards that conform to international norms and which can be easily upgraded in the future to accommodate technological change, are essential requirements with

regard to ICT capacity-building. Moreover, the adoption of standard international procedures for encryption and digital signatures will facilitate and ensure the security of Web-based transactions.

Suggestions that may be singled out for priority attention concern the formulation of the following:

- (a) Laws on IPRs and corresponding regulations related to enforcement;
- (b) Laws to regulate transactions over the Internet, including commercial exchange, paying particular attention to consumer protection and the prevention of fraud;
- (c) Legislation that provides ICT industries with incentives that are on a par with industrial sectors;
- (d) Laws and relevant regulations in the field of communications that allow firms ready and affordable access to the Internet and to international telecommunication carriers, with an emphasis on promoting e-commerce.

F. NEW ROLES AND COOPERATION MODALITIES FOR ACTORS INVOLVED IN THE CAPACITY-BUILDING OF ICT

The need for concerted action by Governments, NGOs, enterprises, media organizations, in addition to international and regional organizations concerned with promoting sustainable socio-economic development with regard to the capacity-building of ICT, can be qualified by the experiences of several developing and developed countries.

1. *Role for Governments*

Nevertheless, a number of tasks aimed at the capacity-building of ICT, namely, the promulgation of relevant legislation, the creation of incentives for private enterprise, the introduction and enforcement of standards and the promotion of specific applications, including telemedicine, distance learning and e-governance, require the active support and direct participation of national Governments.

To this end, Governments must become more involved in the following endeavours:

- (a) Formulating national and sectoral ICT policies and strategies;
- (b) Supporting the building of modern ICT infrastructure, both directly and by means of adopting and disseminating measures to facilitate national, regional and international investment in the building of ICT infrastructure;
- (c) Ensuring national, regional and international interconnectivity and interoperability of telecommunication networks and protocols through relevant coordination bodies and corresponding activities;
- (d) Introducing reforms to provide tax cuts and incentives for start-up ICT enterprises, with the aim of encouraging participation in national and international bids;
- (e) Reducing the cost of telecommunication services, levels of taxation and import duties on ICT products and services;
- (f) Developing and implementing national plans for ICT applications in the social services and commercial practices, including e-commerce and e-banking;
- (g) Introducing reforms pertaining to ICT in public administration and e-government schemes;

- (h) Adopting international best practices with regard to resolving disputes relating to online transaction trade and participating in the continual evolution of such practices;
- (i) Enforcing international rules in the area of registration of patents and trademarks.

2. Role for the private sector

The private sector must become involved in the development and capacity-building of ICT. Indeed, there is an increasing need for the public and private sectors to enter into partnerships that aim to accelerate the building of ICT infrastructure, the objective of which is to lower costs related to the continued development of ICT and to render the process more profitable in both economic and social terms. The outcome of such efforts must be based upon the following actions:

- (a) The establishment of integrated national information systems that link centres engaged in collecting information in the public and private sectors;
- (b) The nurturing of technology incubators, technology start-ups and free technology zones with an emphasis on selected priority areas, including the development of the software that will service the numerous applications that are expected to come into existence in the near future;
- (c) The creation of joint public/private sector ICT and R&D institutions and participation in long-term R&D activities that aim to tackle ambitious development initiatives that include language interfaces and translators to overcome language barriers;
- (d) The implementation of prospective research on international market needs;
- (e) The promotion of joint public/private sector projects, including the establishment of multi-purpose community telecentres, particularly in rural and remote areas.

3. Role for NGOs

A variety of NGOs have played an important role in the development of ICT in all parts of the world. Even in a selection of ESCWA countries, national computer societies and professional associations have played an exceedingly important role in the initial stages of the dissemination of ICT. Areas in which NGOs can be particularly effective include the following:

- (a) Promoting the adoption of adequate standards, norms and regulations pertaining to the following:
 - (i) Facilitating the dissemination of ICT;
 - (ii) Protecting IPRs;
 - (iii) Safeguarding privacy and the rights of the individual;
- (b) Introducing and disseminating ICT applications in areas in which Governments and the private sector are not prepared, or able, to devote the required degree of attention;
- (c) Providing assistance with regard to national and local computer literacy programmes;
- (d) Implementing programmes to promote the re-employment of qualified women in fields that are related to ICT;
- (e) Facilitating the use of ICT services, including e-commerce and e-government services, with regard to disadvantaged groups.

G. CONCLUSION

In essence, ICT has the ability to provide bases for economic growth, wider dissemination of social services and democratic and participatory practices by means of a variety of digital opportunities. However, they also have the means to engender wider income disparities and alienation. Therefore, and within the context of achieving sustainable socio-economic development objectives, the promise of modern ICTs must

be handled with care and responsibility. Indeed, the need to fashion and adopt approaches that maximize benefits and avoid or reduce negative impacts, is posing challenges for policy makers all over the world.

Indeed, there are certain issues that ESCWA member countries in particular, must tackle in order to join the global knowledge-based economy. These largely relate to the following:

- (a) Inadequate ICT infrastructures;
- (b) Meagre public and private sector resources for the development of such infrastructures;
- (c) Insufficient legislative frameworks;
- (d) Limited partnerships among institutions, within and between countries.

With respect to item (d) above, the cultural and linguistic characteristics of ESCWA member countries, which are shared by non-ESCWA Arab countries in Africa, render this cooperation particularly valuable. Indeed, the effective utilization of modern ICTs hinges on the manner in which they are adapted, rather than reliance on the mere importation of hardware and software items. The implementation of such an adaptation process, with the limited resources that are available, necessitates cooperative approaches. One method of tackling the constraints related to wider dissemination and effective implementation of ICT is to encourage collaborative ventures that involve ESCWA member countries in addition to other Arab and developing countries in the region.²⁴

In this regard, the various forms of cooperation at the regional and international levels could include the following:

- (a) The exchange of experiences and best practices related to the formulation of ICT policies, strategies and action plans;
- (b) Fostering strategic alliances involving public and private firms, and reputable international firms in key ICT industry segments, including advanced software development, telecommunication services and products, voice-over Internet Protocol (IP) licences and modern hardware manufacturing ventures;
- (c) The creation of international and regional partnerships to promote dissemination of existing ICT applications and Internet standards and to influence emerging open standards that would benefit the public;
- (d) Strengthening intraregional networks;²⁵
- (e) Conducting outreach programmes, with the objective of benefiting from the expertise of expatriate nationals in assisting the development of ICT enterprises.

Within the context of a number of the aforementioned points, ESCWA recently launched an initiative aimed at technological capacity-building, by means of establishing new institutional forms, namely, technology parks, incubation schemes, high-technology industry clusters and innovation centres (see annex II). The institutional forms of the type targeted by this initiative are primarily oriented towards national needs. However, they are also expected to play an important role in promoting regional cooperation and encouraging the involvement of firms and multinationals in developed countries in the area of capacity-building in new technologies in general, and in ICT in particular.

²⁴ Cooperative ventures are particularly relevant with regard to the Arabization of software systems and interfaces. More generally, cooperation among developing countries and with international sources of technology will contribute immensely to the capacity-building of ICT in the region.

²⁵ This specifically relates to the development of high capacity regional backbones that connect each country within the framework of a multi-hub global network in which no single entity is dominant.

IV. INFORMATION AND COMMUNICATIONS TECHNOLOGY AND E-BUSINESS RELATING TO TRANSPORTATION AND CUSTOMS ADMINISTRATIONS

A. ICT AND E-BUSINESS RELATING TO TRANSPORTATION AND CUSTOMS ADMINISTRATIONS: THE CASE FOR A COOPERATIVE DEVELOPMENT STRATEGY

This chapter aims to highlight the manner in which the Internet is being used to develop new ways of buying and selling goods and services in the transport sector. Unless a product is in digital form, the delivery of goods is still heavily dependent on efficient and low cost transportation. However, transportation and logistics services have also become increasingly dependent on IT to optimize operations, track shipments and automate the flow of documents related to the transfer of goods across borders. Therefore, Internet technologies and international transportation are closely interrelated and interdependent.

The Internet revolution has engendered new opportunities and challenges with regard to the transportation industry. However, the full exploitation of such opportunities can only be achieved by enhancing business, customer and consumer trust, improving access to Internet infrastructure and services and creating a stable and predictable regulatory environment.

Indeed, general maps and guidelines on e-commerce have already been issued. However, enterprises, public institutions and consumers concerned with the integration of the ESCWA region with the world of e-business require more than simple maps and guidelines. Winning strategies must have a sense of direction, and a clear vision of the steps that must be taken and their sequence. Therefore, successful e-commerce strategies require further operational definitions.

For the purposes of this chapter, operational definitions are understood as definitions that are likely to serve as a practical basis for action. This is particularly with regard to offering ESCWA member countries and more specifically, their transport enterprises, ways to design and implement appropriate strategies that will allow them to succeed in the world of global e-commerce. Therefore, three electronic business strategies are reviewed below, namely, web storefronts, e-business portals and multipoint B2B e-commerce. Furthermore, specific e-business applications are presented, namely, pricing, tariff and booking systems, bill of lading and freight exchanges. These have direct implications for the efficiency of planning in transport sectors and on the information flow within the transport industry.

It has been evident for some decades that the transport sector, in comparison with other sectors, is unique in the way that ICT has been used for the optimization of the supply chain, most notably with regard to EDI. These experiences and systems must not be disregarded. Rather, they must be built upon. Within this context, the following recommendations are made:

- (a) Governments and companies must take a step-by-step approach towards implementing e-business solutions. This approach must incorporate the use of (i) at the outset, simple web storefronts, containing static but important information for users; (ii) when appropriate, e-business portals that contain interactive or downloadable information; and (iii) fully fledged B2B solutions, when financially or strategically viable;
- (b) Actions must be initiated to guide companies and actors in the transport sector to test, implement and use Internet based applications. With particular regard to the area of customs, Governments bear the responsibility to facilitate trade and transport efficiently by introducing related automation and computerized systems.

While e-business has clearly been driven by technology related to the Internet and the Web, it is vital that both the public and private sectors in the ESCWA region recognize that they bear a responsibility to foster and exploit the benefits of such technology. International efforts are being exerted to tackle certain policy issues concerning the infrastructure of ICT, trade regulations, security and privacy. However, many of the challenges related to these endeavours require coordinated national and regional action by Governments, public actors and institutions, in cooperation with commercial actors and business partners.

B. ICT AND E-BUSINESS IN TRANSPORTATION

Modern ICT and e-business systems support operations that include ordering, booking, billing, charging tariffs, customs clearance, insurance claims, bill of lading, tracing/tracking and payment.

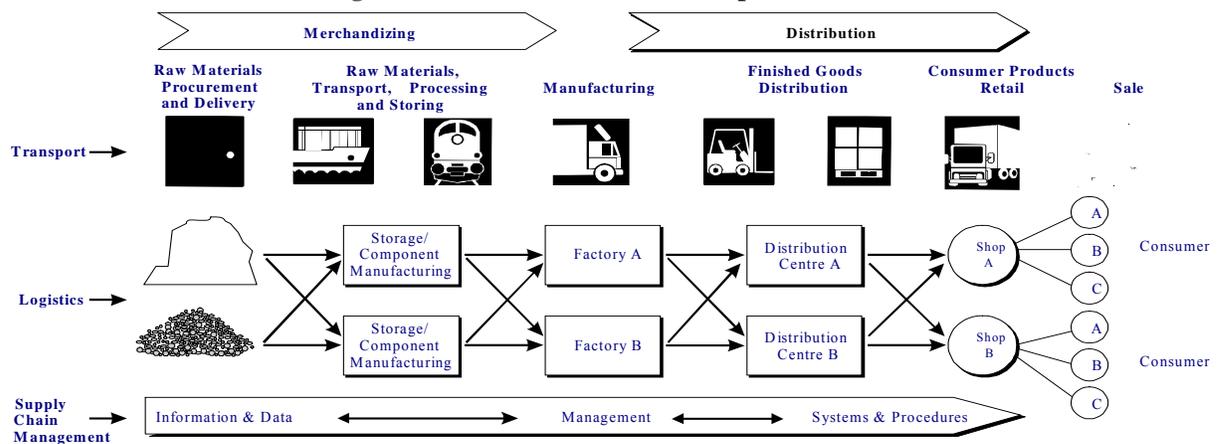
With regard to the effect of e-business on transport services, it must be borne in mind that the transport industry has, over the decades, been undergoing organizational and technological changes. These have been independent of any influence from e-commerce, particularly the Internet, which in this respect, is quite a recent phenomenon. More specifically, developments in industrial production systems such as just in time (JIT), flexible specialization, outsourcing and supply chain management (SCM), in addition to the globalization of economic activities have had a profound effect on the transportation business. In this regard, e-commerce tends to reinforce and accelerate developments that had already commenced in the transport industry some time ago.

With regard to the demand side of freight transport, in many sectors, namely, automobiles, electronics, petrochemical products and pharmaceuticals, a small number of very large and multinational enterprises (MNEs) dominate world trade and investments. These firms are often characterized by substantial intrafirm trade. Moreover, their competitiveness is supremely dependent on state-of-the-art logistics systems, both for internal coordination and for external connections with suppliers and customers. Given the enormous importance of the optimization of the logistics chain with regard to global competitiveness, large companies and MNEs are now systematically engaged in the re-engineering of the e-business process in relation to goods and flow of information. In this regard, e-commerce systems are used as a catalyst for the development of new ideas and the implementation of new opportunities. Large companies and MNEs such as General Motors, Volkswagen, Volvo, Phillips, the Dow Chemical Company and Johnson and Johnson, are instrumental in the development of, and the establishment of new targets for, e-commerce and supply chain management on the world market. This implies that transport operators, including those in the ESCWA region, must adjust to, and satisfy, global benchmarks in relation to e-commerce, namely, costs, quality, delivery characteristics and flexibility. Many transport operators are therefore confronted with new quality requirements and technological competencies imposed by large MNE clients.

On the supply side, e-commerce inevitably entails various fundamental changes. Providers of transport and related logistics services must adapt infrastructure, marketing, management and customer services, to fulfil the competitive requirements of their customers. The challenges facing the supply side of the transport sector are illustrated in figure XVII. This illustrates the manner in which e-commerce could influence the organization and management of all activities within the framework of transportation. These include the management of (a) the transport fleet, namely, trucks, vessels, airlines, trains and ships; (b) freight, from consigner to consignee; and (c) information, including data processing and transport documents.

All the supply side aspects of freight transport can be supported and streamlined by the implementation and use of e-commerce systems. However, certain barriers and obstacles remain.

Figure XVII. E-commerce in transportation



Source: ESCWA, *The Application of Advanced Information and Communications Technologies in the Transport Sector in the ESCWA Region* (E/ESCWA/TRANS/2001/6).

E-business challenges

Recent studies have revealed that the time delays caused solely by requirements pertaining to information, namely, documentation, inspection/clearance and completion of transactions, usually account for as much as 35-46 per cent of the door-to-door time in international trade flows.²⁶

These delays result in a loss of money and time. Suppliers of transport services find this unacceptable. Moreover, such delays can largely be prevented by the effective use of e-business and related technologies. However, there are still many obstacles to overcome, and the supply side, in particular, is often reluctant in this regard. Dutch e-business news provider, ECP.NL reported in August 2001 that many suppliers have been reluctant to adopt e-business solutions. Moreover, some have felt threatened by the concentration of purchasing power in new collaborative buying initiatives on Internet portals and freight exchanges. For example, the automotive e-marketplace Covisint.com, which is based in the United States, has found that suppliers are reluctant to participate in their initiative. This can be attributed to concerns that Covisint will be used as an instrument to squeeze prices, rather than realizing gains in efficiency by means of supply chain integration. Indeed, suppliers that feel threatened and want to defend their own interests, must reconsider their position in the supply chain and the value they attach to it. Suppliers must realize that without their participation, e-business is not viable and the success of e-procurement projects could be limited.

Furthermore, suppliers must realize that e-business offers the means for achieving attractive gains in efficiency within the supply chain for both transport suppliers and buyers. Integration of, and communication between, processes on both supply and demand sides is crucial to well-managed supply chains. Particular e-business systems provide the key to tailor these mutual integration efforts. The degree of integration can vary from mere electronic catalogues, by means of vendor-managed inventories, to collaborative planning, forecasting and replenishment (CPFR), joint product development and joint project management. Indeed, as the level of integration increases, transport companies are more likely to become partners of their customers. This demands a certain degree of automation on the part of suppliers. Indeed, they must be equipped to allow buyers to tap into their technical, logistical and management information systems, as if they were a single integrated system.

C. E-BUSINESS: STEP BY STEP

E-commerce in transport translates into a broad range of diverse technologies that can be applied to transportation operations that have the prime objective of saving time, money and to some degree, lives. The range of e-commerce technologies in this area includes, microelectronics, communications and computer informatics. These cut across disciplines such as transportation engineering, telecommunications, computer science, financing and manufacturing. Moreover, advances in e-commerce have, in some parts of the world, enabled the merging of the driver, vehicle and transport infrastructure into a single integrated system. This enhances the timing, efficiency and effectiveness of freight transport operations. As of 2002, e-commerce allowed transport companies to maximize the following:

- (a) Planning efficiency, namely, scheduling, routing, navigation and freight exchange, by means of transport planning and forecasting applications;
- (b) Administrative functions, namely, payroll and price calculations, by means of optimization software;
- (c) Tracking of vehicles and cargo, namely, vehicle identification, tracing and tracking systems and route guidance, by means of electronic two-way communication between equipment, infrastructure and central logistics coordination centres;
- (d) Transmission of transport-related documents, namely, manifests, bills of lading and invoices, by means of EDI or Internet systems;
- (e) Financial transaction efficiency, namely, digital billing, Internet payment and banking, by means of Web-based systems or EDI.

²⁶ Ernst Frankel, "Profitability through connectivity", *Managing Growth with Intelligence: The Quest for Profitable Capacity*, 2001.

The question, for many transport companies, has been how to implement these e-commerce features within the framework of operational strategies and practices pertaining to daily business processes and supply chains.

Some notable differences in the conditions for, and use of, e-business applications can be identified in various transport modes, namely, rail, road, sea and air. This can largely be attributed to differences in transport infrastructure, ownership structure, transport frequency, safety and document handling procedures.²⁷

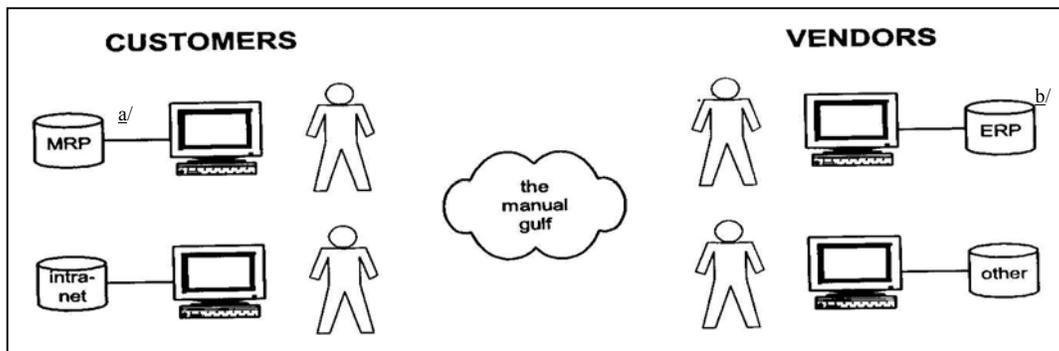
Three generic operational e-commerce strategies are reviewed below. These are directly applicable to, and can be utilized by, transport companies across those transport subsectors that aim to enter the electronic business market.

1. Bridging the manual gap

The objective of e-business is to eliminate manual trading processes by allowing the internal enterprise resources planning (ERP) applications of different companies to exchange information and trade products or services, directly. In traditional commerce and transportation, customers and vendors may benefit from an internal automation system. However, in most cases, their systems cannot communicate with each other. Therefore, trading partners must bridge the gap between each system through the use of manual processes such as mail, e-mail, fax, meetings and phone calls. In this regard, the objective of e-commerce is to minimize the manual gap. The initial stages of this process are illustrated in figure XVIII.

However, e-commerce is not a new concept in the transport sector. Indeed, the process of bridging the manual gap that exists between companies and customers actually began many years ago. For example, a number of, in the majority of cases, large transport companies have been using EDI with major trading partners for the past two decades. However, despite the relative success of these endeavours, EDI—in its original form—has proven to be too complicated and expensive for many small and medium-sized transport companies and has therefore, not been widely adopted. Given its complexity and expense, only 300,000 companies worldwide had adopted EDI as of 2002. As a result, the use of EDI has never been widespread enough to transform the way business is conducted electronically. In fact, most large retailers revealed that a maximum of only 20 per cent of their suppliers used EDI.²⁸ However, the basic premise of EDI is viable. EDI eliminates manual processes by allowing the internal applications of various companies to exchange information directly.

Figure XVIII. E-commerce: the starting point



Source: J.P. Morgenthal, “Implementing direct materials B2B exchanges”, White Paper, XML Solutions, 2000. Available at: <http://www.xmls.com>.

a/ Material resources planning.

b/ Enterprise resources planning.

²⁷ For an overview of these differences, see ESCWA, *The Application of Advanced Information and Communications Technologies in the Transport Sector in the ESCWA Region* (E/ESCWA/TRANS/2001/6).

²⁸ J.P. Morgenthal, “Implementing direct materials B2B exchanges”, White Paper, XML Solutions, 2000. Available at: <http://www.xmls.com>.

At the present time, there are cheaper ways of conducting business than by using EDI. The Internet has lowered the entry barriers with regard to e-commerce in terms of both cost and complexity; not by replacing EDI, but rather by extending or complementing its vision.

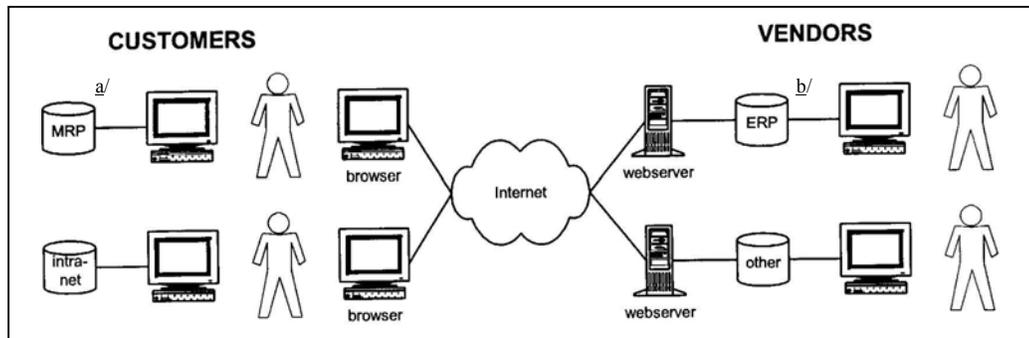
Three different approaches, namely, web storefronts, e-business portals and multipoint B2B e-business—which to some extent all benefit from the Internet, web technologies and the extensible mark-up language (XML), can be bracketed as distinctive e-commerce strategies. These three approaches illustrate, in various ways, direct applicable and operational technological strategies that enable transport companies to enter the electronic business market. However, the objectives, efficiency and functions of the three approaches vary.

2. Web storefronts

Many software companies are advertising web storefronts as e-commerce solutions. However, web storefronts only provide a web interface with regard to the catalogue of products or services of a vendor. The web storefront integrates the process of placing an order over the web with an internal processing system, such as an ERP system, to fill the order.

While this may be an acceptable solution for B2C e-commerce, web storefronts are inadequate for true large-scale B2B e-commerce in the transport sector. Customers presented with the web storefront solution must visit hundreds of web sites to fill orders. Moreover, potential customers are presented with manual searches and order entries by means of a web form. Once an order is placed, customers are required to update their internal ordering systems manually, or by means of ERP. Large transport, logistics and distribution companies, or manufacturing enterprises, which have hundreds of suppliers, cannot conduct business in this manner. The e-commerce strategy of web storefronts is illustrated in figure XIX.

Figure XIX. E-commerce web storefronts



Source: J.P. Morgenthal, “Implementing direct materials B2B exchanges”, White Paper, XML Solutions, 2000. Available at: <http://www.xmls.com>.

a/ Material resources planning.

b/ Enterprise resources planning.

3. E-commerce portals

In certain sectors, e-commerce portals that automate the buying and selling of goods and services for both vendors and customers, have been proposed by companies. E-commerce portals allow customers to browse through numerous catalogues of vendor services and/or products, and place orders, while only visiting one web site—the portal web site. Vendors visit the same portal web site to view and fill customer orders.

E-commerce portals have the ability to fulfil an important matchmaking role between buyer and seller. This is a role that has traditionally been in the hands of agents and brokers, who enable shippers and carriers to meet in the marketplace, thereby facilitating demand and supply with regard to transportation. The traditional matchmaking role of the agent was to unite cargo and shipping entities. This was a lengthy process, given that agents and brokers had to match the requirements of a multitude of shippers and carriers.

Recently however, groups of large companies in virtually every industry have been combining forces to buy goods and services through jointly sponsored and developed e-commerce web portals. These include, *inter alia*, WorldWide Retail Exchange (retail), Elemica (chemicals and plastics), Envera (chemicals) and ForestExpress (forest products). By the end of 2001, there were more than 120 freight exchange portals in the area of transportation.²⁹

Portals have very clear advantages over web storefronts. For example, it is not feasible for an automotive manufacturer who wants to purchase 1,000 pieces of hydro-formed steel tubing with a specific weight and diameter, to trawl through 10, 50 or 100 general catalogues of products, and order materials by part number owing to the fact that quality, condition and price may vary from supplier to supplier. However, if the purchase can be established through a direct materials exchange, for example, through Plasticnet, Esteel, PaperExchange, or through Covisint.com, the buyer would have the opportunity to request bids, or use the reverse auction process.³⁰ This enables the buyer to obtain a lower competitive price without compromising the integrity of the purchase. These options already exist in many sectors.

E-commerce portals do not eliminate the need for human interaction with regard to ensuring that manufacturers will deliver quality goods or services. However, once this type of information has been communicated, transport companies have the ability to incorporate new businesses into the trading partner community of the portals exchange system. This allows them to compete for business on the basis of price and performance. With regard to the buyer, this results in an exchange that produces lower costs of procurement. With regard to the seller, it provides increased sales opportunities combined with relatively low overheads.³¹

However, while these portals eliminate certain problems associated with web storefronts, major technical shortcomings remain. These are as follows:

- (a) In less advanced cases, both customers and vendors are required to update internal systems manually, after placing and retrieving orders from the portal;
- (b) While data is being updated and maintained by a third party on the portal web site, the critical information business of a company is outside its internal firewalls;
- (c) Portals charge companies for updates to catalogues of service and ensuing transactions, which means that companies are charged to access their own information;
- (d) Many portals have shut down owing to the bursting of the dot.com bubble. Only a fraction of the more than 120 different portals related to transport freight exchange, which were in existence at the end of 2000, are still on the market. The rest have either merged, closed or simply become unprofitable.

Portals can be effective tools over a certain period of time, for some transport companies and for certain businesses, namely, spot market, excess capacity and return load. However, portals are not necessarily an acceptable long-term solution—especially with regard to large or global operating transport

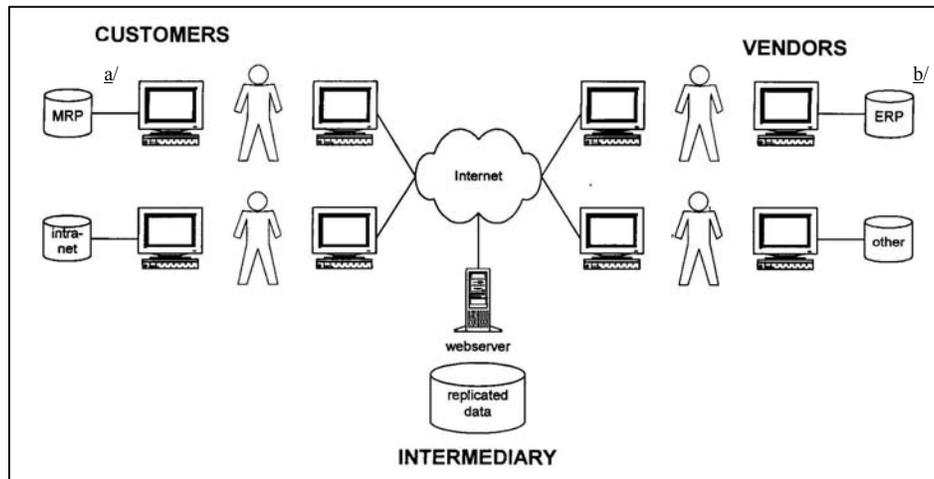
²⁹ Dean Wise and James Brennan, “E-commerce – taking stock”, *Containerisation International*, November 2000.

³⁰ Reverse auctions incorporate the use of bids that decrease, rather than increase, in value.

³¹ J.P. Morgenthal, “Implementing direct materials B2B exchanges”, White Paper, XML Solutions, 2000. Available at: <http://www.xmls.com>.

companies. Typically, large companies must ensure that their vital information resides within their own walls. E-commerce portals are illustrated in figure XX.

Figure XX. E-commerce portals



Source: J.P. Morgenthal, “Implementing direct materials B2B exchanges”, White Paper, XML Solutions, 2000. Available at: <http://www.xmls.com>.

- a/ Material resources planning.
- b/ Enterprise resources planning.

4. Multipoint B2B e-commerce

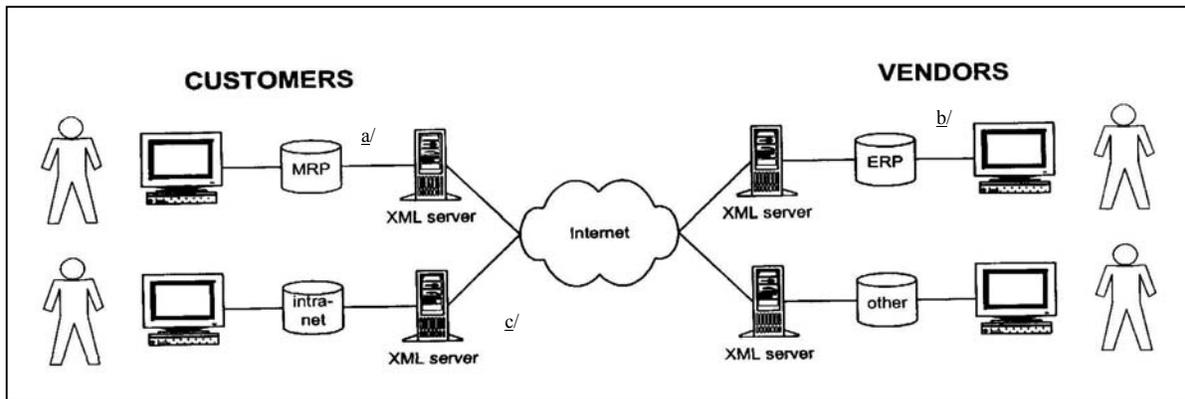
The multipoint B2B e-commerce solutions in this present chapter feature B2B e-commerce systems. This system architecture offers transport companies the opportunity to move from the traditional single point-to-point trading partner relationship to multipoint trading partner relationships. The multipoint relationship comprises one trading partner who communicates in a broadcast exchange simultaneously with multiple partners.

For example, in the transport sector, an online offer of road transportation services that have been developed by Internet-based transportation and logistics service providers enables a shipper to enter an order into its ERP system. The order is automatically processed through the transportation management system of the transport service provider, and is received by the carrier. The system is able to determine and approve the price, acknowledge the order, send messages related to collecting the shipment, notify the carrier and consignees and accept and pay the charges of the carrier—automatically. By accessing a single web site, the shipper is able to obtain a customized view of all shipments in transit, identify shipment status, read exceptions reports, arrange for pick-ups and update its purchasing department on the true landed cost of freight movements around the world.³² The system architecture of the multipoint B2B e-commerce is illustrated in figure XXI.

Once companies move from single point-to-point trading exchange relationships to a broadcast exchange, there are opportunities to create a more competitive environment. This lowers costs for procuring direct materials or transport services.

³² United Nations Conference on Trade and Development (UNCTAD), “Electronic commerce and international transport services” (TD/B/COM.3/EM.12/2), a report prepared for the Trade and Development Board Commission on Enterprise, Business Facilitation and Development Expert Group Meeting on Electronic Commerce and International Transport Services: Best Practices for Enhancing the Competitiveness of Developing Countries, Geneva, 26-28 September 2001.

Figure XXI. Multipoint B2B e-commerce



Source: J.P. Morgenthal, "Implementing direct materials B2B exchanges", White Paper, XML Solutions, 2000. Available at: <http://www.xmls.com>.

- a/ Material resources planning.
- b/ Enterprise resources planning.
- c/ Extensible mark-up language.

Within the framework of multipoint B2B e-commerce system architecture, both large and small transport companies are able to benefit from automation. Large companies that already use EDI are able to extend their existing electronic trading community beyond those companies that can afford EDI. Furthermore, they can leverage their current EDI investment by installing an EDI-XML translator on their web server. By adding this technology, companies can send XML documents, such as purchase orders to smaller trading partners, such as truckers, and retrieve invoices over the Web.

Moreover, small transport companies can mutually benefit from this move. The trade volume of a small company can usually handle the processing and accounting of paper forms. Additional manpower must be used with regard to operating computers, programmes and the networks for electronic forms. By extending EDI to XML, these small suppliers can access this information through a simple browser. This allows them to continue to print orders and to process them manually. The expected ease of implementation and the low cost of entry for XML mean that small suppliers will be able to leverage this new technology and download the XML data directly into their internal business systems.

This multipoint B2B e-commerce system architecture does not prevent companies from exploiting the advantages of the aforementioned freight exchange and material exchange portals. Indeed, many shippers seem to prefer a single interface that can be used to conduct business with multiple carriers; several carriers are responding positively to this desire by utilizing new approaches that permit multipoint competition. For example, FedEx's Ship Manager software saves shippers time by allowing them, simultaneously, to place bookings with other parcel carriers. Moreover, FedEx may soon broaden its Ship Manager to include other modes of transport. In addition, Transplace, an American motor carrier, and railroad companies Steelroads and Arzoon, are developing multi-carrier work flow management sites for shippers, while ocean carrier Maersk Sealand, is reported to be exploring this approach.³³

The following section examines various features related to the Internet and web-based multipoint e-commerce applications that are having a direct impact on planning efficiency, tracing and tracking of freight and equipment, and on flows of information within the transport industry.

³³ Dean Wise and James Brennan, "E-commerce – taking stock", *Containerisation International*, November 2000.

D. ICT AND E-BUSINESS APPLICATIONS IN TRANSPORT

It has been estimated that up to 25 interactions between transport companies and their customers can be turned into web-based self-service or e-business support functions. However, these interactions vary in importance, depending on the customer or market segment.³⁴

Recent surveys from the maritime transport sector indicate that the majority of web sites of leading ocean carriers have taken the first steps towards the automation of the multipoint and broadcast transaction process, on the Web. This is illustrated in table 1.

Table 1 highlights the fact that the transaction capabilities of the web sites of major shipping lines would appear to vary considerably depending on the carrier, despite the fact that basic information requirements are offered by practically all sites. This is clearly an important step in levelling the playing field for shippers in developing countries. However, the transaction capabilities offered by a number of sites, which are likely to become standard features in the near future are still not accessible to many traders. This can be largely attributed to the legal uncertainties surrounding web-based contracts and the use of non-paper documents.³⁵

TABLE 1. THE TRANSACTION CAPABILITIES OF WEB SITES PERTAINING TO OCEAN CARRIERS

	Container/ cargo tracking	Voyage/ schedule locator	Rate/tariff quote	Booking	Bill of lading	Customs report
Maersk	✓	✓	✓	✓	✓	
Evergreen	✓	✓	✓	✓	✓	
P&O Nedlloyd	✓	✓				
MSC						
APL	✓	✓	✓	✓	✓	✓
COSCO	✓	✓	✓			
Zim	✓	✓				
NYK	✓	✓			✓	✓
CMA-CGM			✓			
HMM	✓	✓		✓	✓	
Yang Ming	✓	✓	✓		✓	
OOCL	✓	✓	✓	✓	✓	
Hapag-Lloyd	✓	✓		✓		
K-Line	✓	✓	✓	✓		
MOL	✓	✓	✓	✓	✓	
Hanjin Shipping	✓	✓		✓	✓	

Source: Dean Wise and James Brennan, "E-commerce – taking stock", *Containerisation International*, November 2000.

Examples of e-business applications that support electronic business transactions with regard to transportation are reviewed in the following subsections. These include pricing, tariff calculation, booking, bill of lading and freight exchange.

1. *Tariff, pricing and booking*

The Internet offers new opportunities with regard to streamlining and increasing transparency in relation to the tariffs and pricing structures of transport carriers. With specific regard to maritime transport, transportation operators have traditionally used complex pricing structures. Indeed, the rates charged to the

³⁴ Ibid.

³⁵ UNCTAD, "Electronic commerce and international transport services" (TD/B/COM.3/EM.12/2), a report prepared for the Trade and Development Board Commission on Enterprise, Business Facilitation and Development Expert Group Meeting on Electronic Commerce and International Transport Services: Best Practices for Enhancing the Competitiveness of Developing Countries, Geneva, 26-28 September 2001.

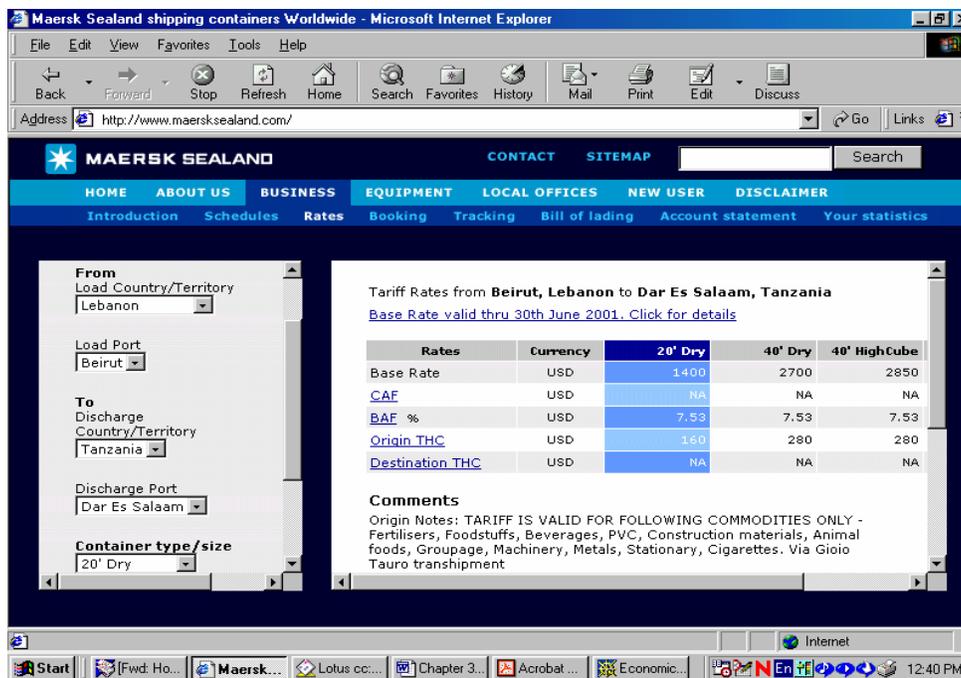
shipper are a function of many factors, including value, weight, stowage factors and port conditions. Carriers publish tariffs for individual commodities and trades. This results in the publication of voluminous tariff books. As markets change, tariffs are constantly amended. This produces additional costly paper work, which has to be distributed to agents and shippers.

An increasing number of maritime transport carriers and airline companies, in addition to third party firms, now offer tariff and pricing information on the Internet. This means that the previous market structures, namely, liner conferences, have largely disappeared and new pricing mechanisms have been established.³⁶

At the present time, tariff and pricing information is becoming increasingly available on the web sites of carriers or firms. Some of these provide online calculators, which enable the shipper to input details such as cargo origin and destination and cargo characteristics. Moreover, the calculator provides the required freight rate instantly. These systems are fully interactive and provide considerable benefit to shippers by simplifying and expediting the numerous tasks involved in freight rating. Otherwise, these tasks would be costly in terms of time, expense and human resources.

Maersk Sealand is a leading maritime carrier. It offers extensive rates, tariffs, booking opportunities and tracing of freight and vehicles. It is the largest provider of containerized transport solutions in the world. Visitors to the Maersk Sealand web site are able to calculate exact rates and tariffs. This is illustrated in figure XXII.³⁷

Figure XXII. Maersk Sealand Internet-based rate calculation service



Source: Maersk Sealand. Available at: <http://www.maersksealand.com>.

Figure XXII illustrates the fact that it takes less than a minute to enter the Maersk Sealand homepage and find the necessary tariff rate information. In the example contained within the web page shown above, the price for shipping one 20-foot dry container from the Port of Beirut in Lebanon to Dar Es Salaam in

³⁶ Ibid.

³⁷ The Maersk Sealand web site is <http://www.maersksealand.com>.

Tanzania was tested. In this case, the base rate and other charges were instantly screened. Once the tariffs are accepted the customer has the option to continue with online booking, which is executed in three simple steps. The only requirement for using the booking system is that the customer must become a registered user to obtain a digital certificate. Booking can then be made at any time. In addition, bookings that are added as favourites can be viewed and reused, thereby saving even more time for the customer, owing to the fact that no new data needs to be entered.

2. *Bill of lading*

A bill of lading is recognized as a document of title representing goods, and it is considered the fulcrum of international trade. A bill of lading is: (a) a receipt issued by the carrier for goods received from the shipper for carriage. This means that the buyer knows that the goods are in the physical possession of the carrier, who must in due course deliver them to the consignee; (b) it is evidence of the contract of carriage between the carrier and the cargo owner and sets out its terms and conditions. Thus, if the goods are lost or damaged during the voyage, the holder of the bill of lading can lodge a claim against the carrier; and (c) it is a document of title in the sense that it can be endorsed from one party to another, thereby transferring property of the goods if that is the intention of the parties. The bill of lading has therefore come to represent the goods that give the holder the right to claim delivery and the right of control.³⁸

Many international transport operators now offer and afford access to bills of lading, which contain details of shipment, including shipper, consignee, freight charges and purchase number, on the Internet. Moreover, shippers can view, print out and submit bills of lading from the web site of the carrier. The information on the bill of lading can be transmitted to the consignee in advance of the arrival of the cargo, thereby providing information concerning what is being shipped. The ability to post the bill of lading on the Internet serves several purposes. These include satisfying the traditional role of the bill as a contract, and providing carriers, shippers and consignees with data and information that can be used to schedule and record shipments and to process transactions through the transport chain.

For example, nine out of the leading sixteen ocean container carriers and a number of intermediaries offer bill of lading services on their web sites. These services include general electric information services (GEIS). OceanWide Incorporated, in coordination with General Electric, is marketing a system that provides an e-commerce solution that allows shippers, trucking companies and freight forwarders to exchange trade documents with ocean carriers and the Customs authorities in the United States.

Moreover, the Bolero System provides a mechanism that pertains to the exchange of trade documentation, including transfer of rights from the first holder of the bill of lading to a new holder, thereby replicating the functions of the traditional paper bill of lading in an electronic environment. This is the most complicated issue with regard to the law. In this regard, questions have arisen as to whether the law recognizes the validity of electronic signatures and authentication. Indeed, there are doubts as to whether an electronic bill of lading is a 'negotiable document of title', possessing the ability to facilitate the transfer of the ownership of goods. However, to avoid problems, Bolero initiated a system within which members who are subscribers can trade electronic bills of lading with each other, under a binding legal framework that is embodied in the Bolero Rule Book. This constitutes a multilateral contract between all the users of the Bolero system and is governed by English law.

3. *Freight exchange*

A number of organizations and firms have now established freight exchange web sites on which carriers and shippers can buy or sell transportation services. Since this type of exchange provides a real-time

³⁸ UNCTAD, "Electronic commerce and international transport services" (TD/B/COM.3/EM.12/2), a report prepared for the Trade and Development Board Commission on Enterprise, Business Facilitation and Development Expert Group Meeting on Electronic Commerce and International Transport Services: Best Practices for Enhancing the Competitiveness of Developing Countries, Geneva, 26-28 September 2001.

market, carriers and shippers are able to negotiate offers on the basis of the most up-to-date, market-driven freight rates.

Generally, freight exchanges play two valuable roles, namely, aggregation and facilitation. As aggregators, they unite a group of dispersed trading partners in a virtual marketplace. As facilitators, they provide software tools and protocols that enable traders to do business electronically, exchange information, process offers and bids, come to terms with regard to deals and follow through on them.

As mentioned above, when the dot.com wave was at its peak, there were more than 120 sites in the area of transportation. This has had the effect of overloading the market for Internet-based exchange, owing to the fact that these portals and services attempted to differentiate—or simply copy—functionalities from each other. However, the rationalization and fusion of sites have already reduced the number to a mere fraction of this figure.

In general, the least desirable format for carriers is the reverse auction. Given that carriers are reluctant to cut prices in public markets, many independent web sites are downplaying and moving away from sole reliance on spot market transactions owing to negative reactions from ocean carriers. Prominent sites such as Celarix.com and Neomodal.com recently shut down their public marketplaces. However, Celarix.com continues to offer private marketplaces to its customers.³⁹

Indeed, according to certain analysts, the first generation of transportation B2B exchanges has had a difficult time.⁴⁰ The reasons for this scenario are elaborated below.

First, the value proposition offered by most exchanges, namely, competitive bidding among suppliers, which permits buyers to obtain the lowest possible prices, runs counter to respected recent opinions on buyer/supplier relations. Indeed, the majority of companies have come to realize that winning suppliers at the lowest price may not be in their best economic interest. Other factors, such as quality, timing of deliveries and customization, are often more important than price with regard to determining the overall value provided by a supplier. Moreover, many companies have spent the past two decades methodically forging tighter, more strategic relationships with suppliers. Online exchanges, which focus on arm's length, price-driven transactions, work counter to this trend.

Second, such exchanges have so far delivered few benefits to sellers. In this regard, suppliers have access to more buyers with only a modest increase in marketing cost. However, that benefit tends to be overwhelmed by pressures related to pricing. Indeed, few suppliers wish to be anonymous contestants in bidding wars. As a result, the buyer-biased exchanges that currently characterize B2B will not be able to achieve a critical mass of participants. To be successful in the long run, B2B exchanges must offer strong incentives to both buyers and sellers.

Finally, many exchanges have not taken the time to conduct in-depth studies of the priorities of their customers, to create distinctive offerings, or even to map out paths to profitability. In actuality, they have simply used off-the-shelf software to set up basic auctions as quickly as possible. Given that the software is readily available and relatively cheap, the barriers to entry are low. Therefore, the resulting proliferation of new exchanges is undermining the margins of all players. Moreover, the input of new entrants is leading to the same type of market fragmentation that exchanges were originally designed to overcome.

However, it is envisaged that freight exchanges will evolve in two different ways. The first evolution will take advantage of the fact that the best means of achieving sufficient market liquidity is to enlist the support of every participant. Therefore, exchanges will move away from being for-profit entities and move towards being collective industry efforts, which are run for the benefit of all. The second evolution concerns the fact that freight exchanges will move beyond the execution of transactions to the creation of such infrastructure and standards that are necessary to streamline communication between buyers and sellers. This will address pressing issues of efficiency, such as accelerating the flow of product information, automating

³⁹ Dean Wise and James Brennan, "E-commerce – taking stock", *Containerisation International*, November 2000.

⁴⁰ Richard Wise and David Morrison, "Beyond the exchange: The future of B2B", *Harvard Business Review*, November-December 2000, Volume 78, Number 6.

billing and payment and linking buyer and seller business processes more closely. Furthermore, it will enable exchanges to handle both simple products, and complex custom components and services more closely. Covisint.com, the automotive mega-exchange, is already moving down this path. Conceived as a for-profit enterprise that aims to earn commission on the transaction volume generated by its founders, Covisint has transformed that proposition in the face of resistance from suppliers. To ensure broad participation, the exchange has expanded its services so that other auto manufacturers can become equity owners. In this regard, 40 suppliers have been given profit-sharing stakes.

Analysts predict that the second generation of freight exchanges will be structured very differently to contemporary models. Rather than being dominated by buyer-driven interest, future exchanges will encompass several distinct and yet interdependent business models.⁴¹

E. ICT AND E-BUSINESS IN CUSTOMS

Given that international supply chains must be in contact with customs authorities, and vice versa, transport and customs are mutually related.

Moreover, ICT is transforming the means by which customs administrations carry out their traditional national tasks of control and collection of revenues. Furthermore, ICT continues to stimulate radical adjustments to the ways in which the international customs community services world trade and transport.

Customs procedures have traditionally been concerned with goods. Moreover, the maritime transport of bulk and general merchandise, which practically monopolized international trade until a few decades ago, provided ample time for customs to lay out or sample and inspect cargo at both export and import points.

In addition, previous customs administrations procedures were complicated by the compulsory requirement to submit original copies of various forms. Subsequently, it has been the trend to reduce the contents of standard declarations to forms that are only one or two pages-long. Even so, this process requires the physical presentation of pieces of paper by the declarant or his/her representative, at a place and time convenient to, and specified by, customs.

At the present time, most customs administrations have developed controls that shift much of the focus from inspecting all goods to checking information contained on paper documents that are handled manually, and inspecting a reduced number of consignments.

The use of ICT by leading customs administrations has transformed procedural rules. ICT has allowed customs to separate fiscal and physical controls for their own, and commercial convenience. At present, customs administrations can receive physical control information well in advance of the arrival of goods and conversely, can postpone the collection of fiscal data for days or weeks after goods have been released.

Within the framework of major trading economies, customs administrations have obligations to ensure effective control, while maintaining reasonable concern for the legitimate requirements of honest business. In this regard, difficulties have been related to identifying and granting concessions to transactions that present the least risk to the collection of revenues and to other official concerns, namely, prohibited goods and the protection of IPRs and endangered species. Previously, this depended on comprehensive databases, skilled profiling and criteria provided by experts related to the identification of suspects and consignments. However, ICT is enabling customs administrations to respond to, and facilitate, a range of commercial innovations, including express and multimodal delivery services and global intra-company supply, production and distribution systems that are fed by JIT logistical networks. They do this by using and developing highly innovative techniques for the handling and communication of information. These developments are by no means complete. To date, the majority of customs procedures are electronic equivalents of the old documentary exchanges. Traders merely send EDI messages instead of handing over paper declaration forms. However, customs authorities do not always key in and reuse data within their own systems. Nevertheless, customs and operators alike have gradually discovered that the data required by

⁴¹ Ibid.

customs are usually, without exception, already present in the commercial information systems that service the business transaction. The most economical arrangement for all concerned is for customs to be able to rely on such systems for their own purposes, either by using the commercial data directly or by integrating data into the systems of the customs authorities.

To date, all ICT applications related to customs have been designed to improve the processing of export and import consignments in a purely national setting. However, customs administrations must recognize the fact that between one-third and a half of all international trade consists of intra-company transactions, in which materials, components, and partially-processed or finished products, are moved across national frontiers within an integrated commercial management system and are subject to increasingly diminishing time-frames. At present, the customs community still treats such movements as a series of unconnected exports and imports, or in other words, the export of one country, is the import of another country. The key is customs-to-customs mutual assistance by means of the application of a single transactional set of physical controls and fiscal procedures. Already, customs administrations and major international traders have initiated a number of pilot and prototype projects, the purposes of which are to examine various aspects of this single transaction set. These projects have demonstrated that the technology to support this concept does exist. Furthermore, such projects reveal that the existing legal framework, under which international trade is conducted, must be examined and revised as necessary.

Indeed, the implementation of JIT techniques has resulted in the trade of an even larger number of smaller consignments. This has had a serious impact on customs operations, owing to the fact that the processing of a consignment is the same regardless of the number of items it contains. Therefore, if customs administrations do not wish to be paralyzed by the resulting increase in traffic and paperwork, they must adopt e-commerce systems, including EDI, to handle these changes efficiently and effectively.

The development of new technologies and telecommunications infrastructures, such as those offered by e-commerce technologies, offers customs administrations the possibility to employ low cost methods to receive and disseminate information. The coordinated and strategic application of these technologies should ensure that customs administrations are able to offer a number of different methods of exchanging information.

It is also envisaged that the growth in the number of people using the Internet will have a significant effect on the quantity of goods, particularly small consignments that are moved across international boundaries. This is related to the fact that people can now log on to the Internet and go shopping in a virtual environment. Goods bought in this fashion have to be imported and exported.

Many administrations will implement EDI solutions using standard message formats, principally, the United Nations Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT). Some small or medium-sized trading partners have been reluctant to adopt EDI, owing to its perceived complexity and potentially high set-up costs. In this regard, other e-commerce technology solutions, such as electronic forms on the Web and the Internet, could offer more cost-effective alternatives.

Customs administrations can benefit from the introduction of ICT in the following areas:

- (a) Validation of data;
- (b) Control of cargo inventory;
- (c) Declaration and processing of goods (import and export);
- (d) Reconciliation of data;
- (e) Notification of release;
- (f) Enforcement of customs;
- (g) Selectivity filters;
- (h) Risk management;
- (i) Accounting of revenue;
- (j) External trade statistics;

- (k) Management information systems;
- (l) Trading partner registration systems.⁴²

1. *Automated System for Customs Data*

There are various computerized customs management systems on the market. For example, the Automated SYstem for CUstoms DAta (ASYCUDA) is a computerized customs management system that handles manifests and customs declarations, accounting procedures and transit and suspense procedures. In addition, ASYCUDA generates trade data that can be used for statistical and economic analysis. The ASYCUDA software is developed in Geneva by the United Nations Conference on Trade and Development (UNCTAD),⁴³ and is now implemented in over 80 countries. In the spring of 2002, an Internet-based version, AsycudaWorld, was launched.

AsycudaWorld is particularly useful with regard to developing countries, where poor fixed-line telecommunications can be a major problem for e-government applications. Moreover, AsycudaWorld is reportedly powerful enough to accommodate the operational and managerial needs of customs operations in any developed country.

The AsycudaWorld platform is based on a technical architecture that eliminates the need to maintain permanent connections with a national server—something that is particularly important for countries with unreliable telecommunications. In countries where telecommunications are more reliable, the traditional Web approach can be used. AsycudaWorld is compatible with several database management systems, including Oracle, Sybase, DB2, Informix and SQLServer, and with operating systems such as Linux, Windows and Solaris. The choices of software and hardware suppliers are left entirely to user countries. The use of XML allows documents to be exchanged within and beyond the system, between customs administrations and traders and between customs administrations in different countries. Moreover, it is Java-native, meaning that it was designed as an open standard to be used with Java. Countries can thus modify or extend the application without requesting assistance from UNCTAD. It is fully compatible with ASYCUDA++, thereby ensuring a smooth transition to e-customs for user countries. According to information available on the ASYCUDA web site in March 2002, the implementation of AsycudaWorld costs a maximum of \$2 million.

2. *Benefits of ICT in customs*

For customs administrations, many of the benefits that derive from the introduction of ICT can only be obtained with sound cooperation from the trading community. The introduction of certain types of ICT technologies, for example EDI, requires traders to invest resources in the development of the necessary interface software in their own systems and perhaps to pay additional ongoing costs, namely, network traffic charges. However, once fully implemented, the following benefits for customs administrations and the trading community can be expected.

(a) *More effective customs controls*

The main objective of effective customs control is to prevent duty/tax evasion, fraud and smuggling. However, given limited resources, it is not possible, or even feasible, to examine every consignment that enters a country. Therefore, customs administrations must be selective when carrying out their control function. Risk assessment and selectivity criteria can be applied in a manual system to identify those consignments that need to be examined and documents that need to be checked.

However, in cases where the functions of cargo control and/or the processing of the declaration of goods have been automated, such selectivity can be carried out on a much more informed and thorough basis. Intelligence gathered by customs can be fed into the computer system and be considered during the processing of selectivity data. The likelihood of uncovering fraudulent practices is therefore increased in an

⁴² World Customs Organization (WCO), "Application of information technology", *General Annex Guidelines*, Kyoto Convention, 2001.

⁴³ Available at: <http://www.asycuda.org>.

automated environment, owing to the fact that selectivity profiles can be analysed more systematically and accurately and in a timelier manner.

Furthermore, ICT can be of assistance with regard to identifying importations when the declared value of products falls outside predetermined parameters.

(b) *More efficient customs clearance*

The efficient processing of declarations of goods is one of the main benefits of automation, in that it provides the following:

- (a) Increased productivity for both customs and trading partners;
- (b) Better use of resources;
- (c) Reduction in costs for both customs and trading partners by ensuring the following:
 - (i) Expedited release of goods;
 - (ii) More accurate and timelier information;
 - (iii) Better enforcement capabilities;
 - (iv) Less congestion at ports and airports.

Automation of customs procedures in conjunction with electronic exchange of information, such as cargo data and declarations of goods, enables the processing of pre-arrival information. The processing of regulatory information in advance of physical goods arriving in the territory under the jurisdiction of customs, allows customs to verify the information and carry out an initial assessment of risk with regard to the consignment. Since the information is already available, decisions concerning the release status of the goods can be transmitted as soon as the goods arrive using e-commerce techniques.

(c) *Uniform application of customs law*

The increase in the quantity and complexity of the laws that customs are obliged to enforce is significant. In a manual environment, customs often finds it difficult to ascertain whether they have taken all existing regulations into account with regard to processing individual importations and exportations. Within the framework of a computerized system, all transactions are processed in a consistent manner. This ensures a uniform application of national laws and the equitable treatment of all trading partners.

(d) *More efficient collection of revenues*

The revenue that is collected by customs is a significant financial resource for Governments in many countries, and as such, must be collected and accounted for efficiently. The automation of the revenue collection process is one way of ensuring that revenue is collected and accounted for in a timely manner. In this regard, outstanding or bad debts can be quickly identified and dealt with. In a manual environment, reconciliation of revenues received and revenues due, is slow and prone to error.

(e) *More effective analysis of data*

Customs is the primary source of international trade data. Manually maintained information is bulky and time consuming to evaluate and organize properly. Indeed, it is extremely labour-intensive to extract meaningful or related data from a variety of files. This is not the case for data that is maintained in an IT system. The automation of customs systems allows customs administrations immediate access to up-to-date information and the application of management information systems (MIS), offers them the possibility of manipulating this information in a meaningful way. In addition, customs automation enables increasingly effective post-audit control at the national and local level.

Another advantage is that electronically captured data is likely to be more accurate owing to the validation and credibility checks that are built into the automated capture process. This in turn ensures that the analysis of data can be carried out in a more accurate fashion.

(f) *Efficient production of external trade statistics*

Virtually all customs administrations bear responsibility for the collection of trade data and many such administrations are responsible for the compilation of the external trade statistics of a country. Indeed, a number of important decisions, both political and economic, are taken in relation to the most recent trade statistics. It is difficult to perform this task efficiently and effectively without the use of IT techniques. Data pertaining to the compilation of external trade statistics is generally extracted from declarations of import and export goods. In cases where declarations of goods are not processed by computer for clearance purposes, the capture of data must take place at a later time. However, in cases where the automated processing of the declaration of goods takes place, trade statistics can be noted at the same time as data are captured, at the point of importation and exportation. This is extremely cost effective and produces more accurate and up-to-date statistics. This enables other government agencies to take any necessary action very quickly.

(g) *Improved quality of data*

A further benefit of IT pertains to improved accuracy of data. This is brought about by the validation of data, which is the process of ensuring incorrect information does not enter a computer application during the process of capturing it. Given that this process occurs while goods are under the control of customs, it is easier to resolve discrepancies. These checks ensure the reliability of the basic raw data that is contained in the computer system of the relevant customs administration.

Validation of data is of paramount importance with regard to realizing the benefits of IT. For example, any invalid data that is allowed to enter the system, renders the results of any processing worthless. This wastes money and resources.

F. CONCLUSION

This section summarizes some of the main points that have been made in this chapter, which has focused on some of the general trends that are driving the implementation and use of ICT and e-commerce systems in transport and customs.

While Internet and Web technology have clearly been the driving force behind e-business, it is important that both the public and private sectors in the ESCWA region recognize that they bear a responsibility to foster and exploit the benefits of the Internet revolution. In this regard, clear objectives, strategies and methods are vital. These must enable the transport sector, ports, airports and customs administrations in the ESCWA region to participate more actively in the world of e-commerce.

Moreover, while international efforts are being exerted to tackle certain policy issues concerning ICT infrastructure, trade regulations, security and privacy, many challenges remain. These require Governments, public actors and institutions, in cooperation with commercial actors and business partners, to take coordinated national and regional action and to outline operational definitions.

Indeed, compared to many other sectors, the transport sector is unique in the way that ICT has been used for the optimization of the supply chain for some decades, most notably with regard to EDI. These experiences and systems must not be overlooked. Rather they must be built upon.

Within this context, the following recommendations are made:

(a) Governments and companies must take a gradual approach towards implementing e-business solutions. This approach must begin with simple web storefronts containing static but important information for users, continuing when appropriate, with e-business portals that contain interactive or downloadable

information, and finally, must move towards fully fledged B2B solutions when financially or strategically viable;

(b) Actions must be initiated to guide companies and actors in the transport sector to test, implement and use these systems. Customs administrations in particular can play a key role in terms of good practices.

PART TWO

V. THE BEIRUT DECLARATION: TOWARDS AN INFORMATION SOCIETY IN WESTERN ASIA⁴⁴

A. PREAMBLE

The Western Asia Preparatory Conference for the World Summit on the Information Society (Beirut, 4-6 February 2003) was attended by representatives of ESCWA member countries, the United Nations Educational, Scientific and Cultural Organization (UNESCO) Cairo Office, which is the Regional Office for Science and Technology for the Arab States, international and regional agencies and organizations, the private sector and civil society. Participants discussed the status of ICT in Arab and Western Asia countries and worked towards developing a common vision, objectives, priorities, strategies and directions for action to accelerate the move towards the information society in countries of the region.

Furthermore, discussions took into account the fact that political instability has affected Western Asia and the Arab region as a whole. The past few decades have witnessed a number of crises, disputes, and hostilities that have resulted in a state of continuous instability in the region. This state of affairs has had a profound impact on the development and innovation of ICT in countries in the region.

Within this context, ICT-related achievements in the Western Asia region have been understandably limited. Indeed, very few countries in the region have managed to develop a clear and effective ICT policy or a related plan of action. Figures for basic ICT indicators, namely, density of fixed and mobile lines, PCs and Internet users and hosts, that measure the degree of ICT penetration in the region are well below corresponding world averages. Participants at the Conference afforded particular attention to the low penetration of Internet users and hosts in the region and noted the absence of available broadband facilities at an affordable cost. Moreover, the uneven distribution of ICT services and facilities between rural and urban societies, and the low utilization of the infrastructure by unprivileged segments of the society, namely, women and youth, in addition to rural and low-income communities, were also highlighted.

With regard to levels of ICT applications in the region, development and implementation has thus far been modest to weak. Many governmental organizations and public administration services suffer from heavy-handed bureaucracy and limited efficiency, in addition to a lack of transparency and accountability. This adds impetus to the need to modernize government and public administrations by means of applying e-government systems. It must be noted that e-business applications have not taken off as a result of their failure to support the needs of users by means of available technologies. Moreover, the revolution that has been sparked by e-learning in educational institutions in other regions, has made little impact in the ESCWA region.

Finally, participants debated the issue of Arabic content. Many believed that the limited availability of Arabic content and tools is one of the main reasons for the low rate of penetration of ICT infrastructure and applications in the region. Moreover, the Web share of Arabic content does not match the widespread use and importance of the Arabic language. This situation has also been compounded by the fact that lack of standards with regard to Arabic code and data exchange formats and reluctance on the part of many educated Arabs to communicate in Arabic for business and professional transactions, have also reduced demand for Arabic language content within the region.

In the context of the aforementioned concerns, ESCWA member countries and representatives of the UNESCO Cairo Office agreed on the points reviewed below.

B. REGIONAL VISION OF THE INFORMATION SOCIETY

For many developing countries, the untapped potential of ICT with regard to improving productivity and quality of life, is a serious issue. Failure to take advantage of this potential could mean that these countries will suffer. Therefore, ESCWA member countries must make extensive commitments and take

⁴⁴ The Beirut Declaration is also known as the Declaration of Principles.

significant policy measures to transform their societies into information societies. Moreover, this process of transformation must be sustainable and equitable. It must also aim to achieve the objectives laid out in the United Nations Millennium Development Goals with regard to reducing poverty and unemployment, raising levels of education, improving health services, enhancing empowerment and minimizing the loss of environmental resources. The rights of citizens and nations to communicate and access information, in addition to the recognition and application of IPRs and the principle of free flow of information, must be part and parcel of the fundamental human rights of all people. Finding ways to ensure that the information society serves the needs of developing countries more directly is also of profound importance. The objective of the regional vision embodied in the Declaration is to create an environment that enables countries to harness ICT to shape their futures, without risking the loss of cultural identity. Furthermore, this Declaration must provide ESCWA member countries with the means to transform the dangers and challenges of ICT and globalization into opportunities for development.

C. OBJECTIVES

The objectives of the Declaration are as follows:

- (a) To promote a common vision for the development of an information society, both at the national and regional levels;
- (b) To formulate innovative policies and ICT strategies that benefit socio-economic development, favour the reduction of poverty and promote growth and employment;
- (c) To attain the United Nations Millennium Development Goals by transforming the region into an information and knowledge society;
- (d) To formulate an agenda for action aimed at achieving specific objectives leading to the transition into an information society, emphasizing the needs of youth, women and underprivileged groups by selecting appropriate and affordable technologies for implementation, thus bridging the digital divide;
- (e) To promote a framework for national, regional and international partnerships with a view to coordinating efforts towards building the information society;
- (f) To adopt modalities for the implementation of policies/strategies with an emphasis on achieving tangible objectives.

D. PRINCIPLES FOR DEVELOPING AN INFORMATION SOCIETY

1. *National and regional formulation of ICT policy and an enabling legislative and regulatory environment*

- (a) *Formulating clear national and regional policies*

Strengthening policy-making capacity in the area of ICT to enhance national and regional ICT policy-making processes and institutions is of utmost importance. Moreover, the integration of related efforts and programmes into a national development strategy will enable ICT to advance development. In this regard, Governments, in cooperation with the private sector and civil society, are the primary actors in the pursuit of access for all to IT for development. Therefore, Governments must enunciate their own national vision, galvanize the necessary political will, devise national strategic frameworks, establish national priorities and create an environment that is conducive to the rapid diffusion, financing, development and use of IT.

(b) *Removing social and cultural barriers that impede transformation into the new information society*

The countries in the Western Asia region have diversified social and economic characteristics. Income levels vary across the region and illiteracy rates and poverty levels are high. Moreover, the participation of women and a more general lack of job opportunities in the regional labour market are further issues of concern. This can be attributed to continuous political instability.

(c) *Reforming legal, regulatory and policy matters*

The existence of a supportive and reliable legal framework is an important prerequisite with regard to enhancing trust in ICT and e-business. Moreover, it would serve to promote the development and dissemination of ICT and e-business. However, while there is a general consensus that the current legal infrastructure is generally applicable to electronic transactions, most national laws were developed in the absence of electronic systems. Therefore, reviews must be carried out with regard to the relevant legislation, with the aim of identifying and removing factors that prevent enterprises from using ICT, particularly in e-business. In fact, e-business raises a number of legal issues, questions and uncertainties concerning the validity, legal effect and enforceability of transactions conducted by electronic means. The existing requirements under national and international law for the use of written documents and manual signature in international trade transactions are considered major obstacles to the development of e-commerce at the global level. Other areas involving legal issues that are relevant to electronic transactions include: data protection, taxation, custom duties, security and authentication, IPRs, privacy, liability of Internet service providers, illegal and harmful content, Internet governance, e-payment systems, consumer protection, jurisdiction, applicable law and mechanisms for dispute resolution.

(d) *Adopting standards and norms*

Governments of the region must seriously consider adopting established ICT-related standards and norms, particularly those that are considered language-dependent. Norms and standards must meet user needs with regard to exchange of information and enable straightforward search and navigation and the widest possible access to systems.

2. *ICT infrastructure*

(a) *Enhancing and integrating ICT infrastructure to narrow the digital divide*

Despite the fact that technology is significantly improving and costs are decreasing, it is important to ensure that access to information is made available to all segments of the population. This is still not the case in many developing countries. Indeed, rural communities and the poor strata of the population still cannot afford information services. However, information and its ensuing knowledge, transmitted by means of a combination of new and more efficient technologies, common and shared access, open systems and universal service provision, must be considered vital and must be prioritized and delivered accordingly.

In addition, a regional ICT backbone must be created to facilitate exchange between countries and avoid the hub and spoke effect, whereby information leaves the region and returns after transiting through other regions. The development of the infrastructure necessary for connectivity requires complementarities between determined and relevant government policies and the participation of the private sector. In this regard, steps towards liberalization, privatization and competition, and the removal of excessive levels of tariffs are essential.

(b) *Developing appropriate ICT indicators*

ICT-specific indicators, which realistically reflect needs and performance of developing countries, must be devised. Such indicators must take into account the particular conditions of developing countries where several people often share access to the Internet and a whole community may share ICT equipment and infrastructure. Targets must also be set to benchmark penetration of ICT services within communities at urban and rural levels.

(c) *Ensuring governance of Internet and ICT resources*

The issue of Internet security is critical for the region. National and regional efforts must be coordinated, taking into consideration the importance of secure infrastructure and flow of data in concordance with international standards and guidelines.

(d) *Securing national domain names*

The responsibility for root directories and domain names must rest with a suitable international organization and must take multilingualism into consideration. TLDNs and IP address assignment must be the sovereign right of respective countries. Indeed, the sovereignty of each nation must be protected and respected. Internet governance must be multilateral, democratic and transparent and must take into account the needs of the public and private sectors, in addition to those of the civil society.

3. *ICT applications*

(a) *Implementing and standardizing e-government applications*

E-government empowers citizens by means of access to information, improves interactions with business and industry, and leads to better delivery of government services to citizens, in addition to more efficient management of government. The resulting benefits can include greater convenience, improved efficiency of the economic system, increased transparency and less corruption. This increases the opportunities for developing countries to attract foreign investments and financial assistance. Basic government services must be provided online by a target date. Modest achievements have already been made in countries of the region. However, many services still have limited interactivity owing to lack of awareness and limited training of the average citizen.

Therefore, introducing concepts such as e-democracy and e-governance in the decision-making process of local and national governments is essential. Moreover, procedures for auditing government applications and monitoring performance must be put in place. The development of secure and seamless access to e-government services depends on the deployment and effective use of electronic authentication means. Access to government services can be facilitated by providing multilingual content and making it available on various platforms. Initiatives regarding e-government must exist at regional, national and local levels. A great deal could be achieved in the region through the activities of the United Nations Online Network in Public Administration and Finance (UNPAN) and the task force created at ESCWA for UNPAN activities. It is hoped that global standards for e-government can be established by an appropriate international body to ensure accepted implementation practices by different governments.

(b) *Promoting e-learning programmes and projects*

ESCWA member countries must ensure that all schools, universities and other learning institutions have Internet and multimedia access for educational, training, learning new skills and research purposes. Moreover, attention must be afforded to the training of teachers to enable them to adapt to the new learning environment. In addition, legal, economic and social issues that are considered to be obstacles to the development of the e-learning process in the region must be identified. Learning networks offer potential educational opportunities to all segments of society and enable disadvantaged groups to practise learning anytime and anywhere. Within this context, there must also be a change in the general mindset towards management of education, design of curricula and self and distance learning.

(c) *Applying e-health*

Health-care applications with regard to networks could provide unique opportunities for patients and practitioners alike, particularly in developing countries. However, in this case, the infrastructure must be able to support such applications. Indeed, healthcare is becoming information intensive. Therefore, hospital management systems must be encouraged and the Internet must be increasingly used to obtain medical

information. Health information networks between points of care, namely, hospitals, laboratories and homes, electronic health cards and online health services have already been implemented or are being considered in many developed countries. ESCWA member countries must take advantage of the success achieved in this field.

(d) *Restructuring with regard to e-business*

The restructuring of business processes to make use of digital technologies is essential to the region, particularly for SMEs. Moreover, public policies must support this process. These policies must also aim to strengthen the entrepreneurial spirit of the business community. One suggestion is that developing countries could focus on ICT-based trade as a precursor to fully-fledged e-commerce. So far, the impact of e-commerce in many countries of the region has been limited, with very few organizations committed to the practice of trading over the Internet. Therefore, legislation must be reviewed with the aim of removing factors that prevent enterprises from conducting business over the Internet. Banking procedures and security issues associated with payments and transaction authentication are also responsible for the present reluctance to use e-business procedures.

(e) *Developing e-content applications and tools*

The ESCWA region is unique among other regions of the world in that its peoples share the same culture and language. Therefore, active steps towards encouraging the production of Arabic content must be taken. Such steps would involve the establishment of conditions for development of digital content and local multimedia industries, including provisions relating to IPRs, promotion of tools for the management of the Arabic language, including Arabic domain names, as a means of promoting multilingualism and investment in related projects.

(f) *Launching other applications*

Most economic and social sectors in countries of the region lack applications that aid management in the decision-making process and raise the internal efficiency of enterprises, which is a means of enhancing capabilities to produce better and more competitive products and services. Indeed, sectors such as agriculture, irrigation, industry, transportation, tourism and environment would greatly benefit from the application of effective tools and software, namely, the Geographic Information System (GIS), for the solution of relevant problems.

4. *ICT production and the service sector*

(a) *Developing ICT production capabilities*

The importance of the ICT sector has grown over time, particularly in the developed world. However, this has had little resonance in the region, which is lagging behind other regions in terms of ICT manufacturing capabilities, imports of embodied ICT and, more importantly, R&D, incubation schemes and investment in venture capital. The ICT sector accounts for an insignificant share of production sector GDP of the region. Therefore, it is essential for governments to encourage investment in the creation of regional ICT production facilities. Indeed, if the ICT production sector can achieve more rapid growth than other sectors of the economy, this could make an effective contribution to growth and productivity performance in the region.

(b) *Improving ICT services*

Growth in demand for applications could spark the creation of a favourable environment that would encourage the private sector to invest and meet the challenges related to moving towards the information society. Moreover, it is likely that demand for e-government, e-learning, e-health and e-business applications will induce the introduction and development of new services.

5. ICT capacity building

(a) *Developing human capacity through education and training*

The following endeavours are of the utmost importance in this regard: building and exploiting education processes; establishing new institutional forms, including incubation schemes and technology-based business start-up support programmes in addition to other enterprise promotion modalities; and creating training and technology assessment networks that specifically target educational systems. The possibility of establishing virtual schools for graduate studies and research that are shared by a number of universities in the region must be explored. In addition, the design, production and dissemination of ICT-based educational systems at all levels must be actively promoted, and countries must seriously strive to exploit, in a socially and economically sustainable and in a culturally enriching fashion, the benefits presented by ICT with regard to improving education and training.

(b) *Building institutions*

Institutional capacities to collect, organize, store and share information and knowledge are as critically important as human capacities. In fact, they are necessary complements to human capacities and must be developed to take full advantage of the benefits of the information society. The application of IT in public institutions, namely, schools, hospitals and clinics, libraries, government departments and agencies must be pursued. Particular attention must be directed to R&D activities through the establishment of centres of excellence for specific areas of technology. In addition, programmes that develop the capabilities of SMEs with regard to becoming globally competitive by means of ICT must be initiated.

E. ICT PRIORITIES FOR ACTION

ICT priorities for action pertain to the following areas:

(a) *Formulation of an ICT policy and the creation of an enabling environment.* Priorities must include the formulation of a practical policy by means of clear initiatives that take into consideration the removal of socio-economic barriers between privileged and unprivileged segments of societies;

(b) *ICT infrastructure.* Priorities must include narrowing the information and communication divide and providing services at an affordable cost to ensure the homogeneous availability of ICT for all;

(c) *E-government.* Priorities must include enabling reforms of public administrations to achieve transparency, accountability and good governance;

(d) *E-business.* Priorities must include enhancing intraregional trade and export transactions through electronic networks;

(e) *E-learning and e-education.* Priorities must include ensuring continuity and availability of information and knowledge for all, thereby enhancing employment opportunities for all;

(f) *E-content.* Priorities must include encouraging standards, presence and management of Arabic digital content with regard to electronic media and on the Internet;

(g) *ICT production and service sector.* Priorities must include promoting the creation of endogenous capabilities to meet regional demand in addition to possible export;

(h) *Capacity-building*. Priorities must include spreading awareness about ICT and the information society among all citizens, and at the same time, increasing investment in education and training with particular emphasis on quality higher education, graduate programmes and research that meets the priority needs of the region.

F. TOWARDS AN ICT STRATEGY

The development of an ICT strategy entails an understanding of what to promote, where to promote it, and how to tailor and implement activities to achieve maximum impact. This must capitalize on existing national, regional and global efforts. At the national level, virtually every country has recognized the importance of ICT with regard to development. Regional initiatives, such as those of the League of Arab States, UNDP's Programme on ICT for Development in the Arab Region (ICTDAR) and UNESCO Regional Programme promise significant results. Global initiatives such as the United Nations ICT Task Force, provide a clearing house for best practices with regard to ICT. Funding efforts must be targeted at the regional capital markets, with the objective that they would provide venture capital and investment funds for launching ICT companies and projects that have a regional dimension. Furthermore, the strategy must promote long-term government spending on R&D and higher education, with the aim of mastering and adapting specific ICT solutions. In addition, it must provide incentives and incorporate regulatory schemes that would enhance the capabilities of the private sector in terms of the development of human resources and the building of infrastructure and institutions. Taxation systems that provide abatements and incentives for start-up ICT companies must also be initiated.

ESCWA member countries must ensure that all needs of stakeholders are taken into consideration in the process of transformation into the information society. A valid ICT strategy must take into consideration the specific requirements of varied communities and must serve the objectives of the national economies of ESCWA member countries. Moreover, it must deploy quantitative and qualitative means, using indicators, target dates and other effective measures for monitoring performance. Regional strategies must encourage the creation of larger markets, thereby providing a viable and competitive environment for regional investment and cooperation.

IT is the critical determinant of the processes of globalization and interdependence. This is reflected in the emergence of a networked knowledge-based global economy. Therefore, it is essential to build partnerships among all stakeholders, developed and developing countries (particularly among developing countries) and the public and private sectors, in addition to civil society/NGOs. Indeed, efforts aimed at successfully integrating developing economies into the global economy, increasing employment, eradicating poverty and ensuring sustainable human development must take full account of the role of IT as the driving force of this new economy. International aid and partnerships are particularly important for the development of the vertical ICT sector. Such aid must be encouraged, provided there are few or no strings attached.

Organizational approaches that combine the skills and resources of both the public and private sectors, to bolster investment in the most effective manner, must be adopted. This must include the exemption from taxation on the import and export of ICT products and services. Moreover, considerations pertaining to the development of an institution capable of carrying out an investment promotion strategy, including the institutional framework of the agency, its internal structure and its capacity and marketing skills, must be taken into account. With regard to developing an investment promotion strategy, it is necessary to determine the short- and long-term objectives related to investment promotion activities and to find the appropriate balance between these activities. This process must take into account important factors that include the investment environment, the comparative advantages of the country and the region, and global developments, and must recognize that these factors change over time.

G. FOLLOW-UP

The Declaration, which was submitted to the Second Meeting of the WSIS Preparatory Committee (PrepCom2) as a regional contribution to the WSIS process, must also provide guidelines and directions for governments and the private sector as they endeavour to formulate policies and take necessary actions to ensure the proactive inclusion of the region in the information age.

PART THREE

VI. INFORMATION AND COMMUNICATIONS TECHNOLOGY PRIORITY ISSUES FOR ARAB COUNTRIES⁴⁵

A. INTRODUCTION: ICT AND DEVELOPMENT

Technological change is both a cause and a consequence of economic and social development.⁴⁶ However, despite the fact that the global technology revolution has had a limited impact on the Arab region, ESCWA member countries have played a very acceptable market role with regard to ICT tools and products. Moreover, the impact of all ICT acquisitions on development in the region is a difficult issue to quantify, and in general, has not been immediately noticeable.

Indeed, one point of view is that ICT has had a negative impact on the economies of the region. This can be attributed to a high level of spending, largely on imported infrastructure products, services and gadgets. In addition, ICT has equipped international firms that compete with local and regional industry with more efficient marketing weapons. These have enabled them to invade local markets more effectively.

Despite the fact that this argument may contain some truth, countries in the region must endeavour to benefit from globalization, the Internet and from other ICT tools and technologies. It can be argued then, that the selective adoption of ICT tools and products must be viewed as a loss-minimizing strategy.⁴⁷

Another factor that must be taken into consideration is that indicators that measure the impact of ICT on development are not exhaustive enough to be universally valid. Indeed, regional variations, including socio-economic and cultural differences render some factors less important than others. Moreover, in some cases, these can be irrelevant in one country, and of great importance in another.⁴⁸ Within this context, some factors, namely, the impact of quality and convenience are non-measurable.

In 2001, approximately \$2.1 billion worth of IT hardware, software and services were sold to Arab countries.⁴⁹ However, existing ICT-related industry in these countries, including the assembly of PCs, development of software, services for the ICT sector, cable, electronics, telecommunications and control equipment, is limited by a number of factors, including, lack of experience, know-how and suitable export strategies and capabilities.⁵⁰ In this regard, combined efforts between innovators and complementary technological bases, in addition to the coordinated regional acquisition of standardized technologies, could lead to the successful generation of new technology.

Several studies and workshops have addressed the relationship between ICT and development, including:

⁴⁵ This chapter is based on a report prepared by the author during a temporary assignment with ESCWA. Its content remains the responsibility of the author.

⁴⁶ ITU, *Telecommunication Policies for the Arab Region (The Arab Book)*, first draft. Available at: http://www.itu.int/ITU-D/treg/publications/Old_content/arabbook.htm.

⁴⁷ ESCWA, "Findings from the World Employment Report 2001: Life at Work in the Information Economy" (E/ESCWA/TECH/2002/W.G.1/19), a paper prepared for the Forum on Technology, Employment and Poverty Alleviation in the Arab Countries and the Consultative Committee on Scientific and Technological Development, in cooperation with International Labour Organization (ILO), Beirut, 16-18 July 2002.

⁴⁸ ESCWA, *New Technologies for Enhancing Competitiveness and Productivity in Selected Sectors* (E/ESCWA/TECH/2001/4).

⁴⁹ United Nations Development Programme, "Information and communication technologies for development in the Arab States: Overview, considerations and parallels with Asia", UNDP, Regional Bureau for Arab States (RBAS), June 2002.

⁵⁰ ESCWA "Information and communications technologies for development", an ESCWA presentation at the sectoral meeting between the United Nations and the League of Arab States, Cairo, 18-20 June 2002.

- (a) *New Technologies for Enhancing Competitiveness and Productivity in Selected Sectors* (E/ESCWA/TECH/2001/4);
- (b) *Information and Communication Technologies for Development in the Arab States: Overview, Considerations and Parallels with Asia*, UNDP;
- (c) “Information and communications technologies for development”, an ESCWA presentation;
- (d) “Development and international cooperation in the twenty-first century: The role of information technology in the context of a knowledge-based economy: Report of the Secretary-General”, United Nations, Economic and Social Council;
- (e) *Information and Communications Technology and Development*, ESCWA;
- (f) *Report of the Expert Panel on Information Technology and Development Priorities: Competing in a Knowledge-Based Global Economy* (E/ESCWA/TECH/2000/1);
- (g) *Changing Dynamics of the Global Computer Software and Services Industry: Implications for Developing Countries*, UNCTAD;
- (h) “E-Services: What? How? Challenges ahead” (E/ESCWA/TECH/2002/WG.1/12);
- (i) “Findings from the World Employment Report 2001: Life at Work in the Information Economy” (E/ESCWA/TECH/2002/W.G.1/19).

B. SOCIO-ECONOMIC DEVELOPMENT NEEDS IN THE REGION

ICT has the means to satisfy, to some extent, the socio-economic development needs of the region (see table 2). Despite the fact that this list of regional needs is not comprehensive and that these cannot be easily prioritized, it represents a valid set of regional concerns.

TABLE 2. THE NEEDS OF THE ESCWA REGION, BASED ON THE MEDIUM-TERM PLAN 2002-2005

Productive/integrated management of resources for sustainable development
Integrated/sustainable management of water and energy resources
Sound environmental policies
Competitiveness and harmonization of production sectors
Integration of social dimension in development
Integrated policies for social development
Region specific, culturally sensitive, operational social policies
Poverty and unemployment reduction, particularly with regard to youth and women
Women empowerment policies
Population/urban development
Positive social and cultural values
Economic analysis and forecasting for regional development
Capacity to coordinate economic policies
Quantitative assessment of economic and financial trends
Performance analysis of real sectors
Economic forecasting
Regional integration and adapting to globalization
Integration of regional markets
Facilitation of transboundary flows of goods, persons and capital
Increase share in international trade and the export performance
Encourage foreign and domestic investments
ICT for regional development

Harness ICT for development
Forge partnerships between various regional stakeholders
TABLE 2 (<i>continued</i>)
Comparable statistics for improved planning and policy decisions
Timely and comparable statistical economic and social information
Reliable, consistent information
Statistical capacity-building

Source: United Nations, "Proposed medium-term plan for the period 2002-2005, Programme 18, ESCWA", fifty-fifth session of the General Assembly (A/55/6 (Prog.18)).

C. STATUS OF ICT IN THE REGION: A BRIEF

The status of ICT, namely, infrastructure, relevant human resources, legislation and funding, has been the subject of a number of local and international studies. In this regard, the present section examines a number of reported indicators that are the most relevant to economic development and competitiveness. ICT infrastructure in the region has been measured by means of:

- (a) Telephone lines: fixed and mobile;
- (b) PCs;
- (c) Internet access;
- (d) ISPs;
- (e) TLDNs;

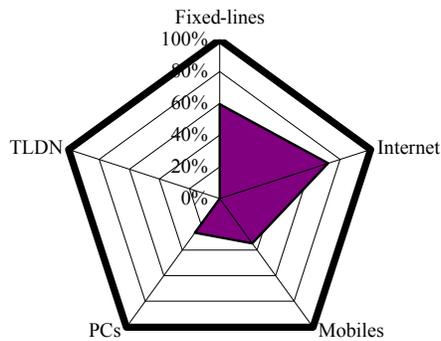
- (f) Local content;

- (g) Utilization of the Arabic language;
- (h) Satellite systems.⁵¹

Figure XXIII illustrates, in graphical radar format, the averages of ESCWA member countries in relation to corresponding world averages for ICT-relevant indicators. The perimeter of the pentagon represents the world average, while the shaded area reflects the ESCWA average.

**Figure XXIII. Combined infrastructure, ESCWA member countries
in relation to the world average, 2000-2002**

⁵¹ ESCWA, *Information and Communications Technology and Development*, Beirut, 2001.



Source: ESCWA, *New Technologies for Enhancing Competitiveness and Productivity in Selected Sectors* (E/ESCWA/TECH/2001/4).

The regional averages for certain indicators do not reflect the real scenario in various countries, as the following examples indicate:

(a) Lebanon accounted for approximately 40 per cent of Internet traffic in the Arab region and had approximately 20 ISPs in 2002.⁵² Moreover, during the same year, 20 per cent of population had mobile lines, with a high average use of 750 minutes per subscriber per month;

(b) In the United Arab Emirates, there were 40 fixed and 72 mobile lines per 100 people as of the end of 2001.⁵³

Table 3 illustrates the number of Internet users in various parts of the world. It reveals that existing ICT infrastructure in Arab countries does not correlate to an appropriate utilization rate for the Internet and other information-based activities.

TABLE 3. INTERNET USERS AS A PERCENTAGE OF POPULATION

Area	1998	2000
United States	26.3	54.3
Arab States	0.2	0.6
Eastern and Central Europe	0.8	3.9
Sub-Saharan Africa	0.1	0.4

Source: A. Dewachi, "Issues of concern to the Telecom sector in the ESCWA (Arab) region," a paper presented at the Arab and Africa Broadband and Internet Forum, Sharm El Sheikh, Egypt, May 2002 (in Arabic).

D. ADEQUATE ICT SOLUTIONS FOR ARAB COUNTRIES

The identification of adequate ICT solutions with regard to Arab countries was carried out by means of an ESCWA team effort, using a QFD methodology.⁵⁴

⁵² Paul Budde, *Telecommunications and Information Highways: Middle East* (Bucketty, New South Wales, Australia, Communication Pty Ltd, 2002).

⁵³ Ibid.

1. Characteristics of adequate ICT solutions

The team identified 29 characteristics of potentially useful ICT-based solutions that would be able to provide assistance with regard to satisfying the development needs of the region (see table 4). These were ranked in order of importance. (Table 13 explains the manner in which these results were obtained.)

TABLE 4. RANKED CHARACTERISTICS OF SUITABLE ICT SOLUTIONS

Characteristics	Rank
Allows higher information exchange rate	1
Increases real-time reliable access and management of information	2
Facilitates data networking for social development	3
Increases awareness and knowledge of ICT tools	4
Facilitates national/regional integration of statistical data	5
Increases transparency and availability of information	6
Offers opportunities for regional integration into the knowledge society	7
Allows affordable and user-friendly access	8

TABLE 4 (continued)

Characteristics	Rank
Supports monitoring of comparable economic indicators	9
Enhances measurements and analysis/forecasting tools for economic performance	10
Enhances economic performance	11
Facilitates dissemination of Arabic information	12
Facilitates partnerships among development stakeholders	13
Facilitates the adoption of standards	14
Supports quality and coverage of education	15
Encourages higher workforce utilization of youth and women	16
Facilitates awareness and enforcement of women empowerment policies	17
Offers new opportunities for industrialization	18
Supports initiatives to create productive employment	19
Offers investment opportunities	20
Supports management of resources	21
Enhances harmonization and standardization of trade procedures	22
Helps regulation and facilitation of capital flow	23
Increases export capabilities	24
Increases environmental monitoring capabilities	25
Facilitates accessibility and awareness of social and cultural values	26
Facilitates and simplifies procedures for regional travel	27
Enhances trust and lowers risk of foreign and domestic investments	28
Can be exported	29

Source: Compiled by ESCWA, from various sources.

⁵⁴ Quality Function Deployment Institute. Available at: <http://www.qfdi.org/>.

2. Assessment of suitable ICT solutions

The second stage of the process involved the identification of specific ICT solutions that exhibited the ranked characteristics that were adopted for the purposes of this exercise. Within this framework, the team composed a list of 22 ICT solutions, which were then evaluated in terms of satisfaction level with regard to the ranked and weighted characteristics. (A second correlation matrix was established, see table 14.) Based on the direct correlation matrix and the adopted weights of the characteristics, a ranked list for the proposed groups of ICT suitable solutions for the ESCWA region was generated (see table 5).

TABLE 5. RANKED ICT SOLUTIONS MOST SUITABLE FOR THE ESCWA REGION

Proposed ICT solutions	Rank
Arabized software development	1
Digitized language intensive industry and services	1
ICT-based education and training institutions	1
Digital publishing	1
ISP/hosting/data centres	2
Community telecentres	3
Digital public transactions processing	4
E-banking transactions	5

TABLE 5 (continued)

Proposed ICT solutions	Rank
Virtual shopping centres	5
B2B e-transactions	5
Broadband infrastructure	6
Smart public ID card	7
System design and integration	8
Computer peripherals manufacturing	9
Manufacturing of fibre-optics	9
Printed circuit boards (PCB) fabrication	9
Telecom equipment switches manufacturing	9
Telecom equipment units manufacturing	9
Telecom PABX manufacturing ^{a/}	9
Industrial process equipment design and assembly	9
Customized software subcontracting	10
Call/contact centres	11

Source: Compiled by ESCWA, from various sources.

^{a/} Private automatic branch exchange.

Each ICT solution model required a set of globally defined facilitators with corresponding proxy variables. Moreover, a selection matrix evaluated the fitness of Arab countries in relation to ranked ICT solutions within the context of the average of the region and benchmarked reference countries (see tables 15, 16 and 17).

It is important to note that the results of the aforementioned endeavours were based on subjective experiences and must be considered accordingly.

E. THE SUITABILITY OF SELECTED ICT SOLUTIONS FOR ARAB COUNTRIES

Based on the results of the previous section, and the recommendations of the team, three suitable ICT solution models will be analysed below.

1. *Regional model A: software development industry*

The ICT software and services industry is playing an ever more pivotal role in the wider computer industry. Indeed, the software industry worldwide is worth more than \$200 billion.⁵⁵ After the success of India, China and countries in South East Asia, Central Europe and Latin America, which all employ relatively low cost engineers, are trying to enter this market and attempting to differentiate their capabilities. For example, Chile is focusing on the Spanish language.⁵⁶ There are many reasons why this ICT sector is particularly attractive to developing countries. These are detailed as follows:

⁵⁵ UNCTAD, *Changing Dynamics of the Global Computer Software and Services Industry: Implications for Developing Countries*, Technology for Development Series, 2002.

⁵⁶ Monitor Analysis, "Software programming segment profile [for Lebanon] - Feasibility", a paper presented to the Ministry of Industry of Lebanon, Beirut, 11 September 2001.

- (a) It is a high growth sector with high industrial turnover, output and employment;
- (b) It has relatively few entry barriers and low financial and capital requirements;
- (c) It represents a golden opportunity for developing countries to participate in a high technology, knowledge-based industry;
- (d) It can play an important facilitating role for other parts of the economy;
- (e) It provides opportunities with regard to exports and ultimately foreign investments;
- (f) It has the potential to offer a wide range of employment opportunities, including a range of occupations from low skill, data entry jobs to high skill sophisticated programming work.⁵⁷

Software marketplace categories are as follows:

- (a) Software tools, including, databases and application development tools;
- (b) Packaged applications, including, accounting, healthcare and shipping;
- (c) Tailored applications, including, Government, manufacturing and e-commerce;
- (d) Multimedia and localization, including, Arabization, CDs, education and tourism.

Table 5 illustrates that the Arabization of software packages was considered to be of a much higher priority than the subcontracting of software for ICT solutions. Therefore, this model focuses on the localization and development of Arabized software.

In all categories, language is central to culture, and culture is central to the information society.⁵⁸ However, while new technologies are being created and disseminated all over the world on a daily basis, the real integration of such innovations into the life of the average Arabic-speaking citizen has not yet occurred. This means that the Arabic user is forced to choose between working in a foreign language and dealing with poor Arabic facilities. For example, the use of Arabic in ICT remains limited; in 2002 it did not exceed 0.1 per cent of total content, despite the fact that the Arabic speaking population amounted to 5 per cent of the total world population in that year.⁵⁹ This can be compared to the fact that while the Korean speaking population amounted to less than 1 per cent of the world total as of March 2001, 4.4 per cent of all content on the Web at that time was in the Korean language.⁶⁰

Within this context, therefore, the development of Arabic software must focus on the following areas:

- (a) Arabic educational content with regard to e-learning;
- (b) Arabic multimedia and web applications;
- (c) Arabic games;
- (d) Arabic financial software;

⁵⁷ UNCTAD, *Changing Dynamics of the Global Computer Software and Services Industry: Implications for Developing Countries*, Technology for Development Series, 2002.

⁵⁸ UNDP and Arab Fund for Economic and Social Development (AFESD), *Arab Human Development Report 2002: Creating Opportunities for Future Generations* (New York, UNDP, RBAS, 2002).

⁵⁹ ESCWA, "Information and communications technologies for development", a presentation at the sectoral meeting between the United Nations and the League of Arab States, Cairo, 18-20 June 2002.

⁶⁰ A. Dewachi, "Issues of concern to the Telecom sector in the ESCWA (Arab) region", a paper presented at the Arab and Africa Broadband and Internet Forum, Sharm El Sheikh, Egypt, 30-31 May 2002.

- (e) Arabic voice, language and character recognition software;
- (f) Arabic interface for existing international packages.

The Arabization of software, like many localization and development of technology activities, faces many problems. Some of these are technical in nature and are related to such areas as fonts, bi-directional and standards. Other problems are financial and stem from a lack of interest on the part of developers. Moreover, endeavours in this area cannot be based on adapting original English-based software to the Arabic language, as this does not take into account the linguistic properties of Arabic and the conventions of Arabic writing.⁶¹

Table 6 details ranked ICT solutions related to Arabization.

TABLE 6. RANKED ICT SOLUTIONS RELATED TO ARABIZATION

ICT solutions	Rank
Arabized software development	1
Digitized language intensive industry and service	1
ICT-based education and training institutions	1
Digital publishing	1

Source: Compiled by ESCWA, from various sources.

Table 7 highlights the items that have been proposed as supporting factors for this group of ICT solutions, with corresponding proxy variables.

TABLE 7. SUPPORTING FACTORS FOR ICT SOLUTIONS

Supporting factors	Proxy variables
Low cost of telecommunications (domestic)	Local rate (US\$ per three minutes)
Low cost of telecommunications (international)	Call cost from US (US\$ per minute)
Telecommunications infrastructure	Percentage of digitalized exchanges
Low cost of employment	Average industrial wage (US\$)
Availability of technically skilled labour	Proportion of natural science majors
Multilingual labour	Average score TOEFL ^{a/}
R&D capability and support	R&D expenditure as a percentage of GDP
University graduates	Gross enrolment ratio to tertiary education
Arabic literacy	Daily newspaper circulation per 1,000 people

Source: Compiled by ESCWA, from various sources.

^{a/} Test of English as a Foreign Language.

These solutions were evaluated for suitability in individual Arab countries, using Japan as the reference model country and were considered to be very suitable for Bahrain, Egypt, Jordan, Kuwait, the Syrian Arab Republic and Tunisia. Furthermore, according to the evaluations, these solutions were considered to be suitable for Algeria, Lebanon, Morocco, and the United Arab Emirates.

Prior to 11 September 2001, Arab countries had to develop their own models with regard to the development of software. These models operated on several levels and included on-the-job-training. Indeed, in the absence of strong university programmes and R&D, language and literature graduates had to be trained in computational linguistics, and engineers had to be retrained with regard to developing Arabic language

⁶¹ A. Chalabi, "Software development in Egypt: New technology and career trends", Sakhr Software, Cairo. Available at: <http://www.sakhrsoft.com>.

software.⁶² However, strong strategic interest in Arabic content in Europe and the United States is sparking serious efforts in this field. Moreover, the relevant proxy variables suggest the following regional observations (for country-specific standing see tables 15, 16 and 17):

- (a) Average industrial wage is competitively low;
- (b) Availability of skilled labour remains low;
- (c) R&D capability and support remain low;
- (d) University education enrolment remains low;
- (e) Arabic literacy and circulation remain low.

These observations highlight the fact that long overdue strategic, and economically and politically justified efforts must be exerted in this area of ICT. These must focus on achieving the following:

- (a) Showcasing Arabization and the development of Arabic content with regard to ICT as a feasible business case;
- (b) Introducing university courses and training in relevant areas;
- (c) Sponsoring the development efforts of local universities and research centres that address technical problems in this field.

2. Regional model B: e-services

E-services can play a major role in enhancing business opportunities, creating jobs and promoting the stability of the population in disadvantaged areas.⁶³ The understanding of developed countries with regard to e-services cannot be directly transposed to the Arab countries owing to social, economic, cultural and infrastructural differences and variations in the legal business environment and related practices. The following areas have been suggested as potentially appropriate applications for e-services in this region:

- (a) Online education (with Arabic content);
- (b) Advertising and marketing services;
- (c) Financial services and transactions;
- (d) Tourism;
- (e) Information teleprocessing;
- (f) Transport transactions;
- (g) Insurance claims and processing;
- (h) Customer support (Arabic markets);
- (i) Medical transcription;
- (j) Entertainment and information services;

⁶² Ibid.

⁶³ ESCWA, "E-Services: What? How? Challenges ahead" (E/ESCWA/TECH/2002/WG.1/12), a paper prepared for the Forum on Technology, Employment and Poverty Alleviation in the Arab Countries and the Consultative Committee on Scientific and Technological Development, in cooperation with ILO, Beirut, 16-18 July 2002.

(k) Business procurement from local and international sources.⁶⁴

There have been a number of recent studies on e-commerce,⁶⁵ which reveal that e-commerce has the potential to reduce physical trade obstacles and the ability to increase market access and support local producers and entrepreneurs. In addition, recent studies on ICT in education, as part of a long-term strategy for the alleviation of poverty, have recently been conducted.⁶⁶ Moreover, telecentres and other possible e-initiatives for development in the region have been studied.⁶⁷

Indeed, Governments are learning that transformations are not necessarily realized by moving services online. Rather they can be effected by redesigning the processes that increase the importance of the individual. This can be done by ensuring integration across agencies to simplify interaction, thus reducing costs and improving services.

Table 8 highlights specific ICT solutions pertaining to this area (also see tables 5 and 14). Those ranked 2 to 7, and 11 are suitable and required for the Arab countries. Those ranked 3, 4, 5 and 7 can be classified as development enablers and tools for all countries.

TABLE 8. RANKED SUITABLE ICT SOLUTIONS

ICT solutions	Rank
ISP, hosting and data centres	2
Community telecentres	3
Digital public transactions processing	4
E-banking transactions	5
Virtual shopping centres	5
B2B e-transactions	5
Smart public ID card	7
Call/contact centre	11

Source: Compiled by ESCWA, from various sources.

ICT solutions ranked 2 and 11 may be more suitable in certain countries of the region. Table 9 highlights items that have been proposed as supporting factors with regard to ISPs, hosting and data centres. They are presented with the corresponding proxy variables.

TABLE 9. SUPPORTING FACTORS FOR ICT SOLUTIONS: ISP/HOSTING/DATA CENTRES

Supporting factors	Proxy variables
Low cost of telecommunications (domestic)	Local rate (US\$ per three minutes)

⁶⁴ Ibid.; and ITU, *Telecommunication Policies for the Arab Region (The Arab Book)*, first draft. Available at: http://www.itu.int/ITU-D/treg/publications/Old_content/arabbook.htm.

⁶⁵ For recommendations that target Arab countries, see “E-Services: What? How? Challenges ahead” (E/ESCWA/TECH/2002/WG.1/12) and “Technology and innovation in the Arab world; status, trends and future needs” (E/ESCWA/TECH/2002/WG.1/28), papers prepared for the Forum on Technology, Employment and Poverty Alleviation in the Arab Countries and the Consultative Committee on Scientific and Technological Development, in cooperation with ILO, Beirut, 16-18 July 2002.

⁶⁶ ESCWA, “Integrating ICTs in education: A long-term strategy for poverty alleviation”, a paper prepared for the Forum on Technology, Employment and Poverty Alleviation in the Arab Countries and the Consultative Committee on Scientific and Technological Development, in cooperation with ILO, Beirut, 16-18 July 2002.

⁶⁷ M. Mrayati, “Impact of S and T system on electronics industries”, a paper presented at the Conference of Scientific Research and Technological Development in the Arab Countries, Sharja, United Arab Emirates, 2002 (in Arabic).

Telecommunications infrastructure	Main phone line per 100 people
Accessibility to Internet	User per 10,000 people
Domestic market size	Domestic population
Regional market size	Regional population
Availability of broadband infrastructure	Availability of ADSL ^{a/}
IT literacy	Number of PCs per 1,000 inhabitants

Source: Compiled by ESCWA, from various sources.

a/ Asymmetric digital subscriber line.

These solutions were evaluated for suitability in individual Arab countries, using Iceland as the reference model country and considered to be very suitable for Kuwait, Saudi Arabia and the United Arab Emirates. Furthermore, these solutions were evaluated and considered suitable for Bahrain and Qatar.

Table 10 contains items that have been proposed as supporting factors for the call/contact centre solution. They are presented with the corresponding proxy variables.

TABLE 10. SUPPORTING FACTORS FOR ICT SOLUTIONS FOR CALL/CONTACT CENTRES

Supporting factors	Proxy variables
Low cost of telecommunications (domestic)	Local rate (US\$ per three minutes)
Low cost of telecommunications (international)	Call cost from United States (US\$ per minute)
Telecommunications infrastructure	Main phone line per 100 people
Low employment cost	Average industrial wage (US\$)
Availability of skilled labour	Mean years of schooling (years)
Multilingual labour	Average TOEFL score
Domestic market size	Domestic population
Regional market size	Regional population

Source: Compiled by ESCWA, from various sources.

This solution was evaluated for suitability in individual Arab countries, using Ireland as the reference model country and it was considered to be very suitable for Algeria, Egypt, Jordan, Saudi Arabia and the Syrian Arab Republic. Furthermore this solution was evaluated and considered suitable for Bahrain, Kuwait, Lebanon, Morocco, Tunisia and the United Arab Emirates.

Based on the relevant proxy variables that were collected for the Arab countries, these are recommended to ensure the following:

- (a) The Arabization of ICT enablers and contents, including learning and commerce;
- (b) The establishment of telecenters to provide ICT access for the average person;
- (c) Updating the legislative environment with regard to supporting ICT industry growth;
- (d) The promotion of domestic demand for information and its application;
- (e) The expansion of the market share of international ICT demand;
- (f) The development of qualified human resources;
- (g) The regional coordination of standards and protocols.

3. Regional model C: electronics manufacturing and integration

The electronics industry is strategically important and constitutes a large sector of the world economy. Moreover, it is the foundation of the knowledge-based economy and society. It holds the promise of fast economic growth and has high value-added with a multiplier effect. In addition, the electronic industry is an area that maintains high employment levels and which incorporates a whole spectrum of skills. Moreover, it contributes to the competitiveness and productivity of other economic sectors. Indeed, ICT has become the

leading sector in the field of electronics, accounting for more than 70 per cent of all revenues in this area, which were estimated at \$290 billion in 2000.⁶⁸

The Arab electronics market, which is worth an estimated \$11 billion per year,⁶⁹ is small and service-oriented, and has virtually no export capability. Moreover, it comprises branches of multinational corporations with very little local assembly activities. The Arab electronics industry satisfied 17 per cent of the total electronic Arab market according to information published in 2001.⁷⁰ Tunisia has the highest value of electronics exports, which were worth an estimated \$55 million according to information published in 2000.⁷¹ It was followed by Morocco, which accounted for approximately \$50 million out of the total Arab electronics annual exports of \$150 million according to information published during the same period.⁷²

Furthermore, it is not productive to compare countries in the region with countries such as Japan and Singapore, which have considerable experience and expertise in this field, or with China, which has massive labour resources and materials. Therefore, and with the objective of building confidence, Arab countries must concentrate efforts on those niches that can capitalize on local resources. These include a multilingual workforce, petroleum-based materials, creative human resources, low cost labour, and a target market that is too small for more experienced countries.

In this regard, the electronics industry in the Arab world must be guided by the following considerations:

- (a) Size of the market;
- (b) Local R&D support capability with regard to sustainable growth;
- (c) Selective products that cannot be imported;

- (d) Strategic needs for basic national industries;

- (e) Strategic defence needs;
- (f) Strategic diversification of economies;
- (g) Creation of jobs;
- (h) Belonging to the knowledge society.⁷³

Recent studies have analysed the electronics industry in the Arab region.⁷⁴ Most of these studies concur on the following points:

- (a) The electronics industry in the Arab region cannot keep up with fast technical changes in the field owing to weaknesses related to infrastructure and R&D;

- (b) International companies dominate global markets. Ten organizations monopolized approximately 75 per cent of the market in 2000;

⁶⁸ Ibid.

⁶⁹ Ibid.

⁷⁰ A. Dewachi, "ICT industry in the Arab countries", 2001 (in Arabic).

⁷¹ Technical Centre for Electrical and Mechanical Industry, Tunisia, "Status of electronics industry in Tunis", Proceedings of the third Arab Conference on Electronics and ICT, Tunis, May 2000.

⁷² M. Hawari, "Status of the electronics industry in the Arab region and investment opportunities", Proceedings of the third Arab Conference on Electronics and ICT, Tunis, May 2000 (in Arabic).

⁷³ M. Mrayati, "Impact of S and T system on electronics industries", a paper presented at the Conference of Scientific Research and Technological Development in the Arab Countries, Sharja, United Arab Emirates, 2002 (in Arabic).

⁷⁴ Ibid.; and M. Hawari, "Status of the electronics industry in the Arab region and investment opportunities", Proceedings of the third Arab Conference on Electronics and ICT, Tunis, May 2000 (in Arabic).

(c) Arab countries have not benefited from the global trend of outsourcing and are therefore inefficient in the following areas: packaging, development, production cost, marketing and innovation.

Table 11 illustrates the specific ICT solutions pertaining to this area that are suitable and necessary for the region (also see table 5 and 14).

TABLE 11. SPECIFIC RANKED ICT SOLUTIONS IN THE ELECTRONICS INDUSTRY

ICT solutions	Rank
System design and integration	8
Computer peripherals manufacturing	9
Manufacturing of fibre-optics	9
Printed circuit boards (PCB) fabrication	9
Telecom equipment switches manufacturing	9
Telecom equipment units manufacturing	9
Telecom PABX manufacturing ^{a/}	9
Industrial process equipment design and assembly	9

Source: Compiled by ESCWA, from various sources.

^{a/} Private automatic branch exchange.

System design and integration includes software, interface, electronics, instrumentation, services, integration, and the design of total solutions that are critical to strategic industries in Arab countries, namely, oil processing, management of natural resources, water desalination, water and electricity distribution and management and agro-industry. In this regard, customization of user interface and specific applications is required, thereby making it a source of valid potential for the Arab countries. Arescon, a process automation competence centre that is located in Bahrain and associated with Asea Brown Boveri (ABB) remains the regional technology leader in this domain.

Table 12 highlights the items that have been proposed as supporting factors for these ICT solutions. They are presented with the corresponding proxy variables.

TABLE 12. SUPPORTING FACTORS WITH REGARD TO SYSTEM DESIGN AND INTEGRATION

Supporting factors	Proxy variables
Low cost of employment	Average industrial wage
Availability of technically skilled labour	Proportion of natural science majors
R&D capability and support	R&D expenditure on engineering and basic science
Domestic market size	Domestic population
Regional market size	Regional population
Plastic processing industry	Number of plastic processing firms
Casting/moulding	Number of moulding shops
Packaging/labelling	Number of paper/printing firms
Multilingual labour	Average TOEFL score
Telecom infrastructure	Main phone line per 100 people
Global network of emigrants	Number of emigrants
Professional population	Number of engineers/scientists

Source: Compiled by ESCWA, from various sources.

Indicators, including those defined by OECD, pertaining to the following factors are not available for the majority of the Arab countries: plastics processing industry; casting/moulding; packaging/labelling; global network of emigrants; and professional population. However, recent studies have shown that the design and manufacturing of electronics is more suited to Egypt, Morocco, Tunisia and Saudi Arabia, which already have comparative and competitive advantages in terms of the existing environment and resources. In any case, this industry requires more focused attention and monitoring. There are several critical factors for building a modern electronics industry. These are as follows:

- (a) Government policies and strategies that support sector growth;
- (b) Education and training programmes to strengthen human resources;
- (c) National industrial and quality assurance infrastructure to support enterprises;
- (d) Export marketing, distribution and sourcing networks to support an emerging electronics industry;
- (e) Foreign strategic alliances to achieve effective technology transfer and engender sufficient foreign development investments and research and technology partnerships (RTP);
- (f) Product rapid prototyping centres and incubators;
- (g) Linking public spending with the creation of local industry based on a clear public strategy;
- (h) Venture capital.⁷⁵

F. CONCLUSION

The pressures of catching up with the information age must not eclipse the fact that Arab countries must develop an innovative vision that corresponds to their circumstances.⁷⁶ Given that each country in the region is unique, solutions must be tailored to meet respective needs. Indeed, the wealth of Arab countries varies tremendously. Populations range from 400,000 to 60 million and country areas vary from 688 to over

⁷⁵ UNCTAD, *Partnerships and Networking in Science and Technology for Development*, Technology for Development Series, 2002.

⁷⁶ UNDP and AFESD, *Arab Human Development Report 2002: Creating Opportunities for Future Generations* (New York, UNDP, RBAS, 2002).

2.5 million square kilometres.⁷⁷ Moreover, levels of telecommunications rarely match levels of income. These clear differences create a very suitable environment to work on a productive complementary strategy among these countries.⁷⁸

The findings of the team exercise revealed that a number of prioritized initiatives must be launched, taking into account the following points:

(a) It is important to update true regional and national needs and development indicators continuously;

(b) It is essential to apply information-based systems with regard to deriving suitability of appropriate technologies;

(c) It is recommended to select representatives of actual stakeholders for the team to guarantee wider acceptance and validity of results;

(d) It is useful to benchmark international successful national and regional cases on the basis that no ideal state of technology readiness and utilization is defined;

(e) It is unfortunate that more relevant indicators or supporting items are not measured in the Arab countries.

Arab countries have already invested substantial resources in national restricted-access infrastructure, which in some cases is redundant. Moreover, this infrastructure is expensive to use and is limited by inconsistent policies and procedures.⁷⁹ In addition, the recent investments, made during the past decade, have not yet produced sufficient returns.⁸⁰ However, new technological breakthroughs, related to cheaper and better services, are becoming available, and these challenge the existing newly expanded structure.

Technology trends concerning ICT infrastructure have seen a surge in the popularity of fibre optics with regard to such areas as medicine, learning, commerce and Government.⁸¹ Moreover, efforts must be exerted in order to benefit from strategies pertaining to improved utilization of existing copper networks by means of capacity effective transmission techniques (various versions of DSL).⁸² In addition, the present range of wireless communications, which covers all services, is affordable, reliable and practical in most applications.⁸³

ICT infrastructure-related technical characteristics were ranked in the top 10 per cent of the adequate characteristics pertaining to ICT solutions for the ESCWA region (see table 13).

⁷⁷ ITU, *Telecommunication Policies for the Arab Region (The Arab Book)*, first draft. Available at: http://www.itu.int/ITU-D/treg/publications/Old_content/arabbook.htm.

⁷⁸ A. Dewachi, "ICT industry in the Arab countries", 2001 (in Arabic).

⁷⁹ UNDP, "Information and communication technologies for development in the Arab States: Overview, considerations, and parallels with Asia", UNDP, RBAS, June 2002.

⁸⁰ ITU, *Telecommunication Policies for the Arab Region (The Arab Book)*, first draft. Available at: http://www.itu.int/ITU-D/treg/publications/Old_content/arabbook.htm.

⁸¹ Paul Budde, "Industry analysis – Infrastructure issues," *Telecommunications and Information Highways: Middle East* (Bucketty, New South Wales, Australia, Communication Pty Ltd., 2002).

⁸² A. El-Sherbini and O.A. Mohsen (National Communication Institute of Egypt), "New trends in fixed networks: Egypt case study", ITU/Arab Centre of Excellence (CoE) Regional Workshop on Trends on Communications, Damascus, 15-17 July 2002.

⁸³ Brad Schrick, "Wireless Broadband in a Box", *IEEE Spectrum*, June 2002. Available at: <http://www.spectrum.ieee.org/WEBONLY/publicfeature/jun02/wire.html>; A. Abuqayyas (CoE), "Trends on Mobile Satellite Communications", ITU/CoE Regional Workshop on Trends on Communications, Damascus, 15-17 July 2002; and M. Wreikat (Telecommunications Regulatory Commission of Jordan), "Technology Trends in Communications", ITU/CoE Regional Workshop on Trends on Communications, Damascus, 15-17 July 2002.

The prioritized ICT areas most suitable for the region include:

- (a) Upgrading and utilization of ICT infrastructure efficiency;
- (b) Development of Arabization and Arabic ICT contents;
- (c) Localization of e-services;
- (d) Design, manufacturing and integration of electronics system.

Moreover, the ICT infrastructure relevant proxy variables suggest the following regional observations (for country specific standing see tables 15, 16 and 17):

- (a) The cost of local telecommunications in the region is very acceptable;
- (b) The cost of international telecommunications in the region is high;
- (c) The penetration of telecommunications main phone lines is low;
- (d) Accessibility to Internet is very low;
- (e) Availability of broadband (ADSL) is improving and acceptable;
- (f) IT literacy and PC penetration is very low.

Within the context of the above, Arab countries are recommended:

- (a) To selectively upgrade existing infrastructure taking into consideration demands, technology trends and amortization of past investments;
- (b) To interconnect Arab countries directly instead of going through Europe or the United States;
- (c) To develop regional hosting and data centres;
- (d) To support the creation of telecentres;
- (e) To make efficient use of intelligence pertaining to ICT technology trends;
- (f) To work towards a standardized and coordinated network pertaining to the acquisition, development and operation of infrastructure.

ICT, which provides information with regard to support activities and decision-making related to economic and social development, can play a major role in achieving the above-mentioned recommendations. In addition, ICT has the potential to be a thriving industrial sector, capable of contributing to sustainable and widespread employment. Indeed, it is important to bear in mind that while many people have discussed the digital divide and the depressing status of ICT in the region, misleading ICT statistics can lead to misperceptions. In fact, true indicators concerning the impact of ICT on development are not universal and in some cases, cannot be measured, particularly those that are related to quality and convenience enhancement applications. Useful and productive ICT utilization is a challenging issue for all. However, even the most pessimistic assessment of the impact on development of ICT will view the selective deployment of these technologies as a loss minimizing strategy. ICT can only contribute to development. It is not in itself, the answer to all needs and problems.

The information contained in this chapter must be interpreted only as a guide for future investigation, not as a basis for investments and/or the creation of policies.⁸⁴

⁸⁴ Additional references for this chapter include: “Challenges of globalization, innovation, and competitiveness for developing countries” (E/ESCWA/TECH/2002/WG.1/37), a paper prepared for the Forum on Technology, Employment and Poverty Alleviation in the Arab Countries and the Consultative Committee on Scientific and Technological Development, in cooperation with ILO, Beirut, 16-18 July 2002; and X. Voisin (Alcatel), “Unified network infrastructure; Overview presentation”, ITU/CoE Regional Workshop on Trends on Communications, Damascus, 15-17 July 2002.

TABLE 13. ADEQUATE CHARACTERISTICS OF ICT SOLUTIONS FOR THE ESCWA REGION*

ICT solutions correlation matrix	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ranked characteristics	Higher information exchange rate	Increases real and management of information	Facilitates data networking for social development	Increases awareness and knowledge of ICT tools	Facilitates national integration of statistical data	Increases transparency and availability of information	Offers opportunities for regional integration into the knowledge society	Attractive & user friendly	Supports monitoring of comparable economic indicators	Enhances measurements and economic performance analysis	Enhances economic performance	Facilitates dissemination of public information	Facilitates partnerships among development stakeholders	Facilitates standards adoption	Supports quality and coverage of education	Higher workforce utilization of youth and women	Facilitates awareness and enforcement of women empowerment policies	Offers new opportunities for industrialization	Supports initiatives to create productive employment	Offers investments opportunities	Supports Resources Management	Enhances harmonization and standardization of trade procedures	Helps regulation and facilitation of capital flow	Increases export capabilities	Increases environmental monitoring capabilities
ESCWA region needs																									
Productive/integrated resources management for sustainable development																									
Integrated/Sustainable management of water and energy resources	M	S	S	M	S	M			M	M	S		M	M	M						S				S
Sound environmental policies		S	S	M	S	S			M	M		M	M	S	M						S	M			S
Competitiveness and Harmonization of Production sectors	M	S	S	S	S	M	S	M	M	S	S	M	M	S	M	M	M								
Integration of social dimension in development	M	S	M	M	M	S	M	S			M	S	M	M	M	S	S	S	S	M	M	M	S	S	M
Integrated policies for social development																									
Region specific, culturally sensitive, operational social policies	M	M	M	M		M	M	M	M			S	M		M		S				M				
Poverty and unemployment reduction especially for youth/women	M		S	S			S	S			S	S	S		S	S	S	S	S	S				M	S
Women empowerment policies	S		S	S		S	S	S			M	S	S		S	S	S	S	S	M	M				
Population/Urban development			S	M		M	S	M	M			S	S	M	S	S	S	S	S	M					M
Positive social and cultural values	M		S	M		S	S	M				S	M		S	S	S								
Economic analysis and forecasting for regional development																									
Capacity to coordinate economic policies	S	S	M	S	S	S	M		S	S	M		M	M								M	M		
Quantitative assessment of economic and financial trends	S	S		S	S	S	M	M	S	S		M		M	M						M				M
Performance analysis of real sectors	S	S	M	S	S	S	M	M	S	S	S			M											
Economic forecasting	S	S	S	S	S	S	M	M	S	S	S	M									M				M
Regional integration and adapting to globalization																									
Integration of regional markets	S	M	M	S	S		S	M	M	M		S	S	S		M		M		M	M	S	S	S	M
Facilitate transboundary flows of goods, persons, and capital	S	S			S		S	M	M			M	S	M	S					M		S	S	S	S
Increase share in international trade and the export performance	S	S	M	M	S	M	S	S	M	M	S		S	S	M	M			S	S	S	S	S	S	S
Encourage foreign and domestic investments	S	S	M	M	M	S	S	M	S	S	S		S	S	S	S	M	S	S	S	S	M	S	S	M
ICT for regional development																									
Harness ICT for development	M	M	S	S	S		S	S		S	S	M	S	M	S	S	S	S	S	S	M			M	M
Forging partnerships between various regional stakeholders	S	M	S	S	M	M	S	S	M	M	M	S	S	M	M	M	M	S	M	S		S	S	M	
Comparable statistics for improved planning and policy decisions																									
Timely and comparable statistical economic and social information	S	S	S	M	S	S		S	S	S	M			S											M
Reliable, consistent Information	S	S	S	M	S	S			S	S				M											M
Statistical capacity building	S	S	S	M	S	S		M	S	S			M		M		M				M				M
Normalized total percentage	75	73	70	70	68	64	57	57	55	55	55	50	50	41	41	41	36	36	34	32	32	32	30	30	

Source: Compiled by ESCWA, from various sources.

* This is based on information from the Quality Function Deployment Institute. S (strong), M (medium), and blank (weak) are a direct correlation between each derived technical characteristic and the regional needs. Adopting a numerical scale (S=6, M=3, blank=0), the corresponding percentage weights were computed and the 29 characteristics were ranked in order of importance.

TABLE 14. ASSESSMENT OF SUITABLE ICT SOLUTIONS FOR ESCWA MEMBER COUNTRIES *

ICT ranked characteristics/ solutions	Ranked characteristics																																
	Higher information exchange rate	Increases real-time reliable access and management of information	Facilitates data networking for social development	Increases awareness and knowledge of ICT tools	Facilitates national/regional integration of statistical data	Increases transparency and availability of information	Offers opportunities for regional integration into the knowledge society	Affordable and user friendly	Supports monitoring of comparable economic indicators	Enhances measurements and analysis/forecasting tools for economic performance	Enhances economic performance	Facilitates dissemination of Arabic information	Facilitates partnerships among development stakeholders	Facilitates standards adoption	Supports quality and coverage of education	Higher workforce utilization of youth and women	Facilitates awareness and enforcement of women empowerment policies	Offers new opportunities for industrialization	Supports initiatives to create productive employment	Offers investments opportunities	Supports resources management	Enhances harmonization and standardization of trade procedures	Helps regulation and facilitation of capital flow	Increases export capabilities	Increases environmental monitoring capabilities	Facilitates accessibility and awareness of social and cultural values	Facilitates and simplifies procedures for regional travel	Enhances trust and lower risk of foreign and domestic investments	Can be exported	No. of strong correlations	No. of medium correlations	unweighted score S=3 M=2	weighted score (weights 0-10)
Normalized percent weights	75	73	70	70	70	68	64	57	57	57	55	55	55	50	50	41	41	41	36	36	34	32	32	32	30	30	27	23	18				
Ranked ICT proposed solutions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29				
Arabized software development	6	6	6	3	3	6	6	6	3	3	6	6	6	6	6	6	3	6	6	6		3	6	6	6	3	3	6	18	8	70		
Digitized language intensive industry and services	6	6	6	3	3	6	6	6	3	3	6	6	6	6	6	6	3	6	6	6		3	6	6	6	3	3	6	18	8	70		
ICT based education and training institutions	6	6	6	3	3	6	6	6	3	3	6	6	6	6	6	6	3	6	6	6		3	6	6	6	3	3	6	18	8	70		
Digital publishing	6	6	6	3	3	6	6	6	3	3	6	6	6	6	6	6	3	6	6	6		3	6	6	6	3	3	6	18	8	70		
ISP/hosting/data centres	6	6	6	6	6	6	6	3			3	6	3		3	3		3	6	6		3	3		3	3	3	3	10	11	52		
Community telecentres	6	6	6	6	6	6	6	6			3	6	3		3	3		3	6	6			3		3	3		11	7	47			
Digital public transactions processing	3	6	6	3	6	6	6	3	6	3	3	3	3	3	3	3			3	3		6	6		3	6	6	10	12	54			
E-banking transactions	6	6		6		3	6	3		3	6	3	6	3	6	6		3	6	6		3	6	6			3		11	8	49		
Virtual shopping centres	6	6		6		3	6	3		3	6	3	6	3	6	6		3	6	6		3	6	6			3		11	8	49		
B2B e-transactions	6	6		6		3	6	3		3	6	3	6	3	6	6		3	6	6		3	6	6			3		11	8	49		

TABLE 14 (continued)

ICT ranked characteristics/ solutions	Ranked characteristics	Higher information exchange rate	Increases real-time reliable access and management of information	Facilitates data networking for social development	Increases awareness and knowledge of ICT tools	Facilitates national/regional integration of statistical data	Increases transparency and availability of information	Offers opportunities for regional integration into the knowledge society	Affordable and user friendly	Supports monitoring of comparable economic indicators	Enhances measurements and analysis/forecasting tools for economic performance	Enhances economic performance	Facilitates dissemination of Arabic information	Facilitates partnerships among development stakeholders	Facilitates standards adoption	Supports quality and coverage of education	Higher workforce utilization of youth and women	Facilitates awareness and enforcement of women empowerment policies	Offers new opportunities for industrialization	Supports initiatives to create productive employment	Offers investments opportunities	Supports resources management	Enhances harmonization and standardization of trade procedures	Helps regulation and facilitation of capital flow	Increases export capabilities	Increases environmental monitoring capabilities	Facilitates accessibility and awareness of social and cultural values	Facilitates and simplifies procedures for regional travel	Enhances trust and lower risk of foreign and domestic investments	Can be exported	No. of strong correlations	No. of medium correlations	unweighted score S=3 M=2	weighted score (weights 0-10)	
Broadband infrastructure		6	6	6	6	3	6	6			6	6	3		6							3	3	6		6	3				11	5	43		
Smart public ID card		3	6	6	3	6	6	6	3	3	3	3	3	3	3	3				3	3			6			6	6		8	12	48			
System design and integration		3	6		6			6			3	6		3	3	3	6		6	6	6	6			6	3			3	6	11	7	47		
Computer peripherals manufacturing		6		3	6			6				6		6	3		6		6	6	6	3			6			6	6	12	3	42			
Manufacturing of fibre-optics		6		3	6			6				6		6	3		6		6	6	6	3			6			6	6	12	3	42			
Printed circuit boards (PCB) fabrication		6		3	6			6				6		6	3		6		6	6	6	3			6			6	6	12	3	42			
Telecom equipment switches manufacturing		6		3	6			6				6		6	3		6		6	6	6	3			6			6	6	12	3	42			
Telecom equipment units manufacturing		6		3	6			6				6		6	3		6		6	6	6	3			6			6	6	12	3	42			
Telecom PABX manufacturing		6		3	6			6				6		6	3		6		6	6	6	3			6			6	6	12	3	42			
Industrial process equipment design and assembly		6		3	6			6				6		6	3		6		6	6	6	3			6			6	6	12	3	42			
Customized software subcontracting					6			6	3			6	3	3	3		6		6	6	6				6			6	6	10	4	38			
Call/contact centres		3						3	6			6		3			6	3		6	6		3		6		3	3	3	6	8	34			

Source: Compiled by ESCWA, from various sources.

* The following table is based on information from the Quality Function Deployment Institute. S (strong), M (medium), and blank (weak) are a direct correlation between each derived technical characteristic and the regional needs. Adopting a numerical scale (S=6, M=3, blank=0), the corresponding percentage weights were computed and the 29 characteristics were ranked in order of importance.

TABLE 15. SELECTION OF SUITABLE SOLUTIONS FOR THE ARAB COUNTRIES

Contact/call centers		Average	Ireland	Bah	Egy	Irq	Jor	Kuw	Leb	Oma	Qat	PAL	SA	Syr	UAE	Yem	Tun	Alg	Dji	Sud	Som	Com	Lib	Mor	Mau	
Supporting items	Proxy variables																									
1	Low telecommunications cost (domestic)	Local rate (USD per 3 min.)	0	-	-	-	n.a.	-	-	-	-	-	-	-	-	-	-	-	-	-	n.a.	-	-	-	-	
2	Low telecommunications cost (international)	call cost from US (USD per min.)	0	+	-	-	-	-	-	-	-	n.a.	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	Telecommunications infrastructure	main phone line per 100 people	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.a.	-	-	-	-	
4	Low employment cost	average industrial wage (USD)	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.a.	n.a.	n.a.	n.a.	-	n.a.	
5	Availability of skilled labor	mean years of schooling (Years)	0	+	-	-	n.a.	-	-	-	-	n.a.	-	-	-	-	-	-	-	-	-	n.a.	n.a.	-	-	
6	Multilingual labor	Average score of TOEFL	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n.a.	-	-	-	-	-	
7	Domestic market size	domestic population	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	Regional market size	regional population	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL				2	1	5		3	1	1	-7	-1		3	3	1	-1	1	3					-3	1	
Contact/call center		Average	Ireland	BAH	EGY	IRQ	JOR	KUW	LEB	OMA	QAT	PAL	KSA	SYR	UAE	YEM	TUN	ALG	DJI	SUD	SOM	COM	LIB	MOR	MAU	
Supporting items	Proxy variables																									
1	Low telecommunications cost (domestic)	Local rate (US\$ per 3 min.)	0.05	0.17	0.06	0.03		0.03	0	0.07	0.08	0	0.05	0.02	0.01	0	0.02	0.03	0.02	0.2	0.02		0.16	0.03	0.08	0.09
2	Low telecommunications cost (international)	Call cost from US (US\$ per min.)	0.95	0.14	0.72	0.41	0.98	0.61	0.52	0.61	1.11	1		0.51	0.98	0.41	1.01	0.54	0.54	1.01	0.98	1.69	3.68	1.01	0.59	1.04
3	Telecommunications infrastructure	Main phone line per 100 inhabitants	10.72	47.77	24.87	7.51	3.01	8.72	24.02	20.09	8.96	26.19	7.76	12.95	9.93	33.19	2.21	10.89	6.04	1.54	1.42		1.22	10.05	3.92	0.72
4	Low employment cost	Average industrial wage (USD)	4940.88	21000	9680	2443	378	3316	8763	6237	5558	7587	3008	7863	1134	8139	707	5322	4474					5183	4203	
5	Availability of skilled labour	Mean years of schooling (years)	2.99	8.8	4.3	3		5	5.5	4.4	0.9	5.8		3.9	4.2	5.6	0.9	2.1	2.8	0.4	0.8	0.3		3.5	3	0.4
6	Multilingual labor	Average score of TOEFL	194.10	*	201	212	213	203	169	213	190	174	200	173	207	172	185	200	212		203	203		179	189	184
7	Domestic market size	Domestic population	12.89	3.84	0.64	67.8	22.9	4.91	1.91	3.49	2.53	0.56	3.1	20.3	16.1	2.6	18.3	9.45	30.3	0.63	31	8.7	0.7	5.2	29.8	2.66
8	Regional market size	Regional population	284.00	379.6	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284
Recommendations				S	VS		VS	S	S				VS	VS	S		S	VS						S		

Source: Compiled by ESCWA, from various sources.

Note: VS = very suitable; S = suitable.

* It is important to note that the proxy variables that were adopted were measured in various Arab countries and were compared to the group average. Equal weights were assumed for all variables, which correspond to an algebraic +1 for better than, -1 for worse than, 0 for equal to the average. All countries that scored the same as, or better than, the reference country were evaluated as very suitable. Scores just below that of the reference country were evaluated as suitable. Reference countries for annex tables 4, 5 and 6 are respectively Ireland, Iceland and Japan.

TABLE 16. SELECTION OF SUITABLE ICT SOLUTIONS FOR THE ARAB COUNTRIES FOR ISP HOSTING/DATA CENTRES

Internet Service Providers (ISP)/Hosts/Data centre		Average	Iceland	Bah	Egy	Irq	Jor	Kuw	Leb	Oma	Qat	Pal	SA	Syr	UAE	Yem	Tun	Alg	Dji	Sud	Som	Coe	Lib	Mor	Mau	
Supporting items	Proxy variables																									
1	Low telecommunications cost (domestic)	Local rate (US\$ per 3 min.)	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2	Telecommunications infrastructure	Main phone line per 100 people	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	Accessibility to internet	User per 10,000 people	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4	Domestic market size	Domestic population	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5	Regional market size	Regional population	0	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6	Availability of broadband infrastructure	Availability of ADSL ^a	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	IT literacy	Number of PCs per 1000 people	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TOTAL				3	2	0		-2	4	0	-6	2		4	-2	4	-2	-2	-2	-6	-2		-6		-4	-6

Raw Data Comparison

Internet Service Providers (ISP)/Hosts/Data centre		Average	Iceland	Bah	Egy	Irq	Jor	Kuw	Leb	Oma	Qat	Pal	SA	Syr	UAE	Yem	Tun	Alg	Dji	Sud	Som	Coe	Lib	Mor	Mau	
Supporting items	Proxy variables																									
1	Low telecommunications cost (domestic)	Local rate (USD per 3 min.) ¹	0.05	0.11	0.06	0.03		0.03	0	0.07	0.08	0	0.05	0.02	0.01	0	0.02	0.03	0.02	0.2	0.02		0.16	0.03	0.08	0.09
2	Telecommunications infrastructure	main phone line per 100 inhabitants ²	10.09	67.74	24.87	7.51	3.01	8.72	24.02	20.09	8.96	26.29	7.18	12.95	9.93	33.19	1.67	8.99	5.2	1.4	0.87	0.16	0.96	10.05	5.26	0.64
3	Accessibility to internet	user per 10,000 inhabitants ³	497.86	6794.43	1988.6	92.85		409.1	1014.7	858	457.4	655.7	181.2	134.4	36.12	3392.3	8.89	412.3	19.27	51.32	17.61		34.39	35.84	131.4	25.48
4	Domestic market size	domestic population ⁴	12.89	0.29	0.64	67.8	22.9	4.91	1.91	3.49	2.53	0.56	3.1	20.3	16.1	2.6	18.3	9.45	30.3	0.63	31	8.7	0.7	5.2	29.8	2.66
5	Regional market size	regional population ⁵	284.00	379.6	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284	284
6	Availability of broadband infrastructure	availability of ADSL ⁶	A	A	A	A	N	A	A	N	N	A	A	N	A	N	A	N	N	N	N	N	N	N	N	N
7	IT literacy	number of PCs per 100 inhabitants ⁷	4.93	41.48	14.18	1.55		3.28	13.19	5.62	3.24	16.39		6.27	1.63	15.83	0.19	2.37	0.71	1.09	0.36		0.55		1.31	0.98
Recommendations					S				VS				VS		VS											

Source: Compiled by ESCWA, from various sources.

Note: VS = very suitable; S = suitable.

a/ Asymmetric digital line subscriber.

TABLE 17. SELECTION OF SUITABLE ICT SOLUTIONS FOR ARABIZATION AND ARABIC ICT CONTENT DEVELOPMENT

Arabized software development		Average	Japan	Bah	Egy	Irq	Jor	Kuw	Leb	Oma	Qat	Pal	SA	Syr	UAE	Yem	Tun	Alg	Dji	Suf	Som	Com	Lib	Mor	Mau
Supporting items	Proxy variables																								
1	Low telecommunications cost (domestic)	domestic telephone rate	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Low telecommunications cost (international)	call cost from US	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Telecommunications infrastructure	percentage of digitalized exchanges	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Low employment cost	average industrial wage	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Availability of technically skilled labour	proportion of natural science major	0	+	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Availability of multilingual labour	average score of TOEFL	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	R&D capability and support	R&D expenditure as % of GDP	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	University graduates	gross enrolment ratio to tertiary edu.	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Arabic literacy	number of publications	0	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL			3	3	3		7	4	1	-5			-1	3	1	-1	3	1						1	

Raw Data Comparison

Arabized software development		Average	Japan	Bah	Egy	Irq	Jor	Kuw	Leb	Oma	Qat	Pal	SA	Syr	UAE	Yem	Tun	Alg	Dji	Suf	Som	Com	Lib	Mor	Mau	
Supporting items	Proxy variables																									
1	Low telecommunications cost (domestic)	Local rate (US\$ per 3 min.)	0.05	0.09	0.06	0.03		0.03	0	0.07	0.08	0	0.05	0.02	0.01	0	0.02	0.03	0.02	0.2	0.02		0.16	0.03	0.08	0.09
2	Low telecommunications cost (international)	call cost from US (US\$ per min.)	0.95	0.12	0.72	0.41	0.98	0.61	0.52	0.61	1.11	1		0.51	0.98	0.41	1.01	0.54	0.54	1.01	0.98	1.69	3.68	1.01	0.59	1.04
3	Telecommunications infrastructure	percentage of digitalized exchanges	90.56	100	100	86		99.9	97	100	100	100	93	99	100	100	100	70		95		10.7	70	100	100	
4	Low employment cost	average industrial wage (US\$)	4940.88	34000	9680	2443	378	3316	8763	6237	5558	7587	3008	7863	1134	8139	707	5322	4474				5183	4203		
5	Availability of technically skilled labour	proportion of natural science major	23.47	23	25	15		27	23	17	31		10	18	31	27	6	27	50					29	16	
6	Multilingual labor	Average score of TOEFL	194.10	183	201	212	213	203	169	213	190	174	200	173	207	172	185	200	212		203	203		179	189	184
7	R&D capability and support	R&D expenditure as percentage of GDP	0.15	2.9	0.07	0.36	0.04	0.3	0.24	0.06	0.08	0.08		0.15	0.15	0.03	0.21	0.14	0.08				0.05	0.22	0.31	
8	University graduates	gross enrolment ratio to tertiary edu.	13.14	40.5	17.7	20.2		21.7	19.3	27	8	26.6		16.3	15.7	11.9	4.2	13.7	12	0.3	3		0.6	16.6	11.1	3.8
9	Arabic literacy	daily newspaper circulation per 10009	71.69	576	126	43	26	47	387	110	29	146		58	19	136	15	45	51		24		13	15	0.5	
Recommendations					VS	VS		VS	VS	S					VS	S		VS	S					S		

Source: Compiled by ESCWA, from various sources.

Note: VS = very suitable; S = suitable.

VII. THE SOFTWARE INDUSTRY IN LEBANON: A ROADMAP FOR THE FUTURE⁸⁵

The software industry has long been hailed as focal point of hope for Lebanon, in that it has the potential to stand as a pillar of the Lebanese economy alongside tourism and banking. The emergence of this industry would not only boost the exports of the country, it would also employ and encourage talented nationals living abroad to return to Lebanon. However, collaborative and systematic action has not been taken in this area. Therefore, the industry has never realized its potential or had the ability to become a symbol for a new, modern knowledge-based Lebanese economy.

However, Lebanon is making another attempt to exert efforts to this end. Local software companies, united under the banner of the recently established ALSI, in cooperation with the main stakeholders of the industry, are spearheading efforts to design a long-term strategy that aims to transform the almost non-existent software industry into a substantial contributor to GDP.

The present chapter outlines an approach for the development of such a strategy, taking into account the specific cultural, economic and political circumstances of Lebanon. However, it does not provide answers. Rather, it examines which questions must be asked with regard to formulating this strategy.

The starting point of the proposal that is reviewed below is the belief that all those who aim to devise a strategy for the software industry in Lebanon must answer the following three fundamental questions:

- (a) Where is the software industry today?
- (b) Where does the software industry want to be tomorrow?
- (c) How should the software industry get there?

These questions are reviewed in detail below and must be considered within the context of recent events, namely, those of 11 September 2001, which rendered planning for the future more difficult. Since that day, the world has become more uncertain. Indeed, strategies must now account for unpredictable circumstances. With regard to strategic planning, the fundamental question that is now asked is: How can one define a strategy when the present is unknown and the future is highly unpredictable? This question is highly relevant to the software industry in Lebanon.

There are no easy answers to any of these questions. Therefore, they must be approached from a different angle and considered within the context of the following advice: "Strategy is basically to decide what one should not do".⁸⁶

A. WHERE IS THE SOFTWARE INDUSTRY TODAY?

Bearing in mind the aforementioned advice, it is perhaps better to ask: Where isn't the industry today? Answers to this question tend to include long lists of complaints concerning the current state of the industry, which can be broken down into the following points:

(a) The political situation in the ESCWA region has always been a burden with regard to business. For decades, the rest of the world has regarded this region as unstable. Therefore any strategy must account for the impact such an environment has on the demand and supply side of the software industry in Lebanon. One answer to the question of 'where isn't the industry today' is that the industry is not where it should be owing to the fact that companies do not operate in a predictable and stable environment.

⁸⁵ The opinions expressed in this paper reflect the personal views of the author, which have been gathered through meetings with the main players of the industry. None of the points made are based on any systematic study. Rather, they are a list of perceptions and reflections.

⁸⁶ Hiro Takeuchi of Hitotsubashi University of Japan, strategy professor.

(b) An often-expressed view is that Lebanon suffers from an image problem in terms of delivering reliable services and products, and in terms of ethical business behaviour. Some Lebanese software companies would appear to have developed a bad track record with their clients. Customers have complained, repeatedly, about the low quality of products, unsatisfying after-sales service, or simply about companies not delivering what has been promised. All of these factors contribute to an image problem that encompasses the entire industry, regardless of major differences in the quality of products and services among companies. Given the very difficult political, economic and social environment in which Lebanese companies have had to operate, the outside world tends to regard the behaviour of some Lebanese businessmen as unethical, irrespective of whether this is true or not. While this tends to be a problem of perception and culture, the failure in the past, with regard to coming up with outstanding products on a regular basis, is more a question of capabilities and performance. Both areas, whether they are true weaknesses or just perceived as such, must be discussed and addressed when developing a strategy for the industry.

(c) Local markets are still immature. This renders the operations of local software companies in their domestic market very difficult. Local clients lack an understanding of the value of software in terms of its cost of production and the value it adds to their businesses. So just as the industry is not ready to deliver, client companies are not ready to consume. Furthermore, when companies do buy software, they tend to favour imported software products or brands over locally developed products, even though prices are often higher.

(d) The lack of information concerning the software industry in Lebanon, with regard to its size, scope and reach, poses a significant problem. Therefore, the first step towards answering the above-mentioned question must be to get a better understanding of the landscape of the industry. However, even this may be more difficult than it seems, given the reluctance of Lebanese companies to report true figures to the outside world. Nevertheless, this has to be done, regardless of the difficulties.

(e) The software industry is not starting from zero. An estimated 50 to 70 companies were making a living from the development of software in 2002 and some of these produce top-notch products that can compete with the rest of the world. These success stories are encouraging and reveal that there is great potential with regard to the development of software in Lebanon.

In conclusion, the responses to the question ‘Where isn’t the industry today?’ reveal that the sector is not operating in a predictable and stable environment; its products often lack the means to achieve excellence; some of the key players in the industry are not perceived as reliable business partners; and its domestic consumer market is not yet mature. However, with access to better information, the true landscape of the industry could be assessed more accurately. Finally, the existence of success stories offers hope and highlights the fact that with regard to the future, the industry can build on the foundations it has already established.

B. WHERE DOES THE SOFTWARE INDUSTRY WANT TO BE TOMORROW?

Again, bearing in mind the aforementioned advice, it is perhaps better to ask: Where doesn’t the industry want to be tomorrow? The responses to this question are reviewed below.

(a) It is evident that Chief Executive Officers (CEOs) of domestic software companies do not want the industry to be in its current form. While the development of software exists in Lebanon, it is not an industry in any true sense and Lebanon is far from being considered a centre of excellence in this regard. Rather, the sector can be said to occupy an unhealthy middle level, which is a strategic position that is not sustainable in the long run. This present state, with little or almost no industry growth cannot last. Moreover, companies are at a crossroads and will either opt to exit the industry, or will make one last serious attempt to create an entity that will grow considerably over time.

(b) The most important resource with regard to producing software is brainpower. Indeed, the fact that many people are of the opinion that Lebanon is well endowed with highly educated and talented people is cited as one of the reasons why the software industry is able to thrive. However, the future does not look

promising. A large number of Lebanese university graduates intend to pursue careers abroad on the basis that there are few opportunities in Lebanon. Needless to say, the software industry cannot envisage a future without young, talented people, and therefore, the greatest task for the leaders of the country is to shape an exciting future for them. In this regard, opportunities created in the Lebanese software industry could play an important role in transforming Lebanon's brain drain into a brain gain.

(c) Young people in Lebanon aspire to be employers, rather than employees. They can be characterized as free thinking, risk-taking entrepreneurs rather than disciplined corporate team players. While young people can be described as creative and full of ideas in terms of business, there is room for improvement with regard to delivery. Again, this situation is reflected in the lack of quality and excellence of software products and services produced in Lebanon. Therefore, an industry strategy must include ways of capitalizing on the creativity of its people with the objective of developing innovative products. At the same time, the strategy must promote the production of high quality goods and the provision of good customer service. In short, it must find ways of satisfying the desire of the client for perfection and excellence.

(d) Strategy making often tends to be dominated by short-term thinking. This makes it difficult to devise a vision for the future. Indeed, actions taken by CEOs and Government leaders tend to be influenced rather more by daily events than by long-term goals. This can be attributed to cultural factors. However, with regard to the software industry in Lebanon, this can also be the result of cash flow problems and concern with the daily survival of a struggling industry. Software companies work in a cut-throat competitive environment, often offering their services below production cost, which squeezes margins for software products and services. While clients may benefit from this, the industry does not. This is based on the fact that this does not allow for long-term investments in capabilities related to the production of better products. Therefore, the main players in the industry must be open to adopting a longer-term approach.

In conclusion, the responses to the question 'Where doesn't the industry want to be tomorrow?' incorporate the idea that the industry does not want to remain, as is its present status, strategically ill positioned and suffering from a continuous brain drain. Furthermore, it does not want to build on its weaknesses but rather on the strengths of its human resources. Finally, while difficult market conditions present a serious challenge, the industry must adopt a longer-term approach with regard to devising strategies.

C. HOW SHOULD THE SOFTWARE INDUSTRY GET THERE?

Again, it is perhaps better to ask: How shouldn't the industry get there? What must it avoid doing? In a country where financial resources are scarce, every costly step must be carefully evaluated before it can be taken. Within the context of this particular environment, it is not an option to do things that do not directly help the software industry to achieve its vision. The following precautions can be taken to avoid ineffective actions.

(a) Actions must not be taken before a vision and strategy pertaining to the software industry has been developed. Given the current situation, in which short-term thinking is predominant, a new approach must therefore be devised. Each action must contribute to a long-term strategic goal, and the course of action must not be changed unless there are good reasons to do so. Short-term concerns must be put into perspective and solutions to those concerns must be in line with the long-term strategy. The software industry has neither the resources nor the time to undertake measures that have not been identified as top priorities. Furthermore, it is imperative that once a strategy has been designed it is strictly followed. Losing focus could ultimately threaten the intended impact of the strategy as a whole.

(b) Fragmentation must be avoided at all costs. Lebanon must devise one strategy for one sector: the software industry. The Government, experts, other private sector institutions and donors must support such a strategy, as long as the key players of the industry support it. Parallel efforts must only be made that complement one another. Failure to ensure this will result in wastage of precious resources on duplication. Again, unfocused actions in this regard, could do more harm than good to the industry.

(c) Lebanon has a long history of taking initiatives and later abandoning them. This must be avoided. The realization of the desired results of an initiative can only be achieved by ensuring that the initiators personally make sure that the strategy is implemented, instead of relying on others to do so. With regard to the software industry, the private sector must establish a dedicated delivery organization that is fully responsible for implementing the strategy.

In conclusion, the responses to the question ‘How shouldn’t the industry get there?’ include the recommendations that the industry must avoid acting prior to having designed a long-term vision and strategy. Furthermore, the industry must avoid fragmentation and those concerned must bear personal responsibility for the implementation of strategies.

D. CONCLUSION

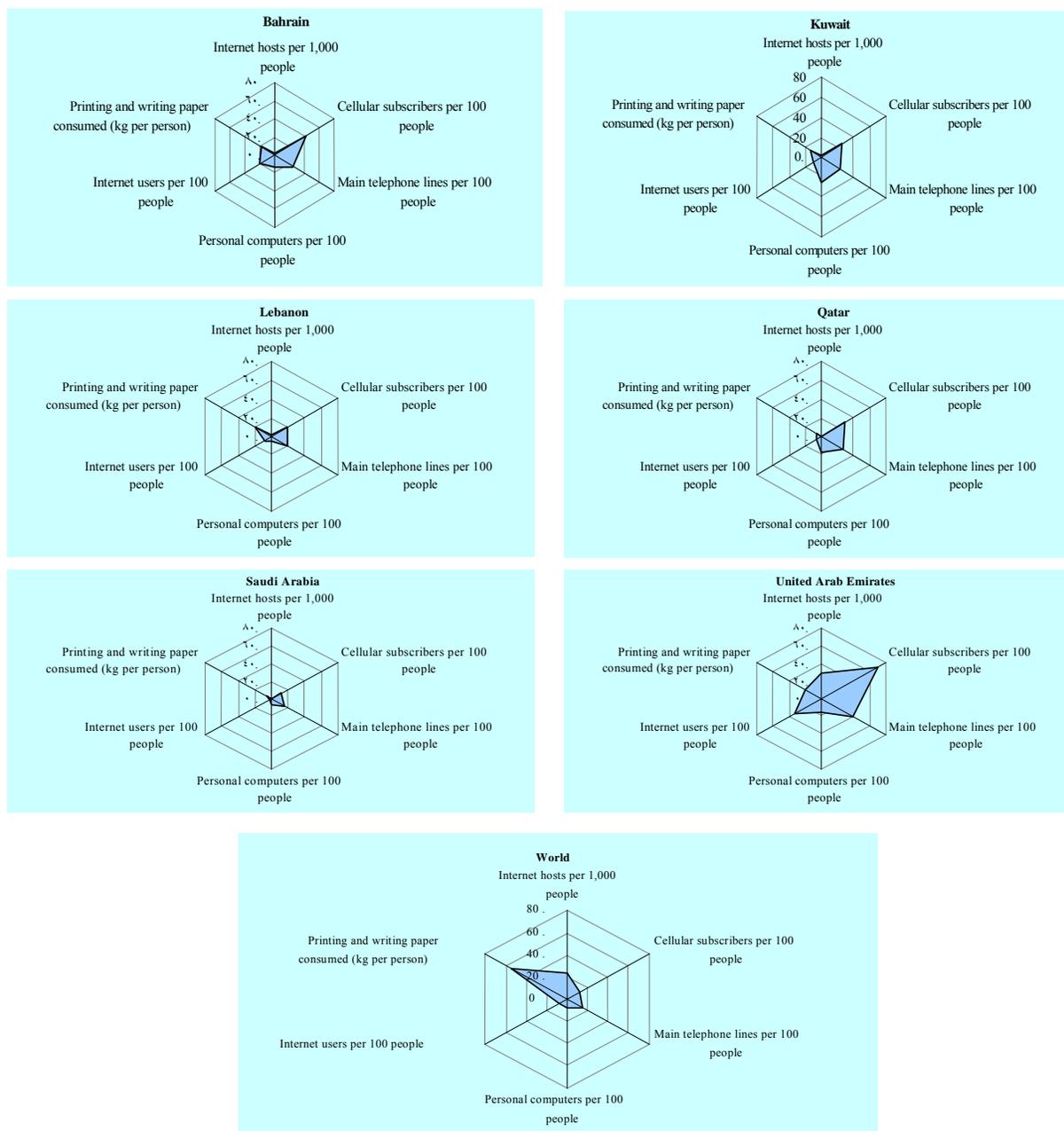
If all the relevant people involved in the task of boosting the software industry in Lebanon ask themselves these three questions, the possibility of success is one step closer. However, the lack of data and transparency in this area renders it impossible to answer these questions completely. By attempting to provide answers, the main stakeholders in the industry could at least become aware of what might and what might not be possible.

Finally, the process of answering the questions is of great importance in itself. However, this exercise can only be successful if it engages all stakeholders in the design and the implementation of a strategy. Everybody who has a stake in this industry must realize that defining and implementing a strategy is for the common benefit of all the people in Lebanon and can only be realized if all parties involved put short-term personal interest aside and join the effort. If this happens, it may be possible to answer all the aforementioned questions and turn a much talked-about idea into reality.

Annex I

INFORMATION AND COMMUNICATIONS TECHNOLOGY INDICATORS IN SELECTED ESCWA MEMBER COUNTRIES

ANNEX TABLE 1. ICT INDICATORS IN SELECTED ESCWA MEMBER COUNTRIES
AS COMPARED TO WORLD VALUES
(Percentage)



Source: ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

ANNEX TABLE 2. ACCESS TO ADVANCED MODES OF COMMUNICATION

Country	Internet users (per 1,000 people)	Number of top level domain names (per 10,000 people)	Personal computers (per 100 people)	Cellular subscribers (per 100 people)
	2001	2001	2001	2001
GCC ESCWA member countries				
Bahrain	198.87	24.37	14.18	42.49
Kuwait	101.47	17.44	25.14	24.82
Oman	45.75	17.83	3.24	12.37
Qatar	65.57	2.08	16.39	29.31
Saudi Arabia	13.44	5.12	6.27	11.33
United Arab Emirates	339.24	288.53	15.83	71.97
GCC average	63.32	38.20	8.88	20.09
ESCWA members excluding GCC countries				
Egypt	9.30	0.28	1.55	4.33
Iraq	-	-	-	-
Jordan	40.91	4.22	3.28	14.39
Lebanon	85.80	19.97	5.62	21.25
Syrian Arab Republic	3.61	0.01	1.63	1.20
Yemen	18.12	-	-	9.06
Non-GCC average	0.89	0.04	0.19	0.80
Arab and African countries				
Algeria	11.62	1.12	1.58	2.53
Djibouti	1.93	0.21	0.71	0.32
Eritrea	5.13	0.00	1.09	0.47
Libyan Arab Jamahiriya	2.62	0.03	0.18	0.00
Mauritania	3.58	0.13	0.00	0.90
Morocco	2.55	0.41	0.98	0.27
Somalia	13.15	0.81	1.31	15.68
Sudan	-	-	-	-
Tunisia	1.76	0.00	0.36	0.33
Regional aggregates and other countries				
World	82.08	232.66	8.42	12.14
ESCWA member countries	22.23	8.91	3.11	7.72
Arab countries	16.12	5.83	2.16	6.45
Chile	200	79.2	8.39	34.02
Republic of Korea	510.7	92.14	25.14	60.84
Israel	230.5	220.77	24.59	80.82

Source: ITU, *World Telecommunication Indicators Database*, sixth edition (Geneva, ITU, 2002).

Note: A hyphen (-) indicates that the amount is not applicable.

ANNEX TABLE 3. ACCESS TO CONVENTIONAL MODES OF COMMUNICATION

Country	Printing and writing paper consumption ^{a/} (kg per person)	Main telephone lines ^{b/} (per 100 people)	Number of TVs (per 100 people)	Radios (per 100 people)
	1997	2001	1997	1997
GCC ESCWA member countries				
Bahrain	17	24.6	47.2	58
Kuwait	14.3	23.97	50.5	67.8
Oman	2.1	8.97	69.4	60.7
Qatar	4.6	27.45	40.4	45.0
Saudi Arabia	6.1	14.48	26.2	32.1
United Arab Emirates	18.7	39.69	13.4	35.5
GCC average	7.6	17.99	31.1	37.9
ESCWA members, excluding GCC countries				
Egypt	3.2	10.30	11.9	31.7
Iraq	0.3	0.00	8.3	22.9
Jordan	5.9	12.74	8.2	27.1
Lebanon	18.3	19.49	37.5	90.7
Syrian Arab Republic	1.0	10.88	7.0	27.8
Yemen	0.6	7.76	2.9	6.4
Non-GCC average	2.6	2.21	10.0	27.7
Arab and African countries				
Algeria	3.2	9.52	10.5	24.2
Djibouti	0.5	6.04	4.5	8.4
Eritrea	0.03	1.54	0.04	10.0
Libyan Arab Jamahiriya	0.3	0.84	14.0	25.9
Mauritania	0.2	10.93	2.5	14.6
Morocco	2.3	0.72	11.5	24.7
Somalia	0.02	3.92	1.5	5.3
Sudan	0.1	0.00	8.6	27.2
Tunisia	6.1	1.42	10.0	22.4
Regional aggregates and other countries				
World	21.2	16.19	24.0	41.8
ESCWA member countries	3.5	11.26	13.7	29.5
Arab countries	2.8	8.31	11.9	26.5
Least developed countries	0.4	-	2.3	14.2
Developing countries	6.0	-	15.7	24.5
Chile	13.8	23.9	21.5	35.4
Republic of Korea	56.5	47.6	34.8	103.9
Israel	49.5	47.63	28.8	52.4

Source: UNESCO, *Statistical Yearbook '99* (Paris and United States, UNESCO and Bernan Press, 1999).

a/ Includes newspapers, other print forms and consumption of writing paper.

b/ ITU, *World Telecommunication Database*, sixth edition (Geneva, ITU, 2002).

Annex II

ESCWA INITIATIVE FOR TECHNOLOGY PARKS, INCUBATORS AND HIGH-TECHNOLOGY CLUSTERS

The initiative reviewed below aims to identify and implement schemes that can be adapted to ESCWA member countries. This initiative incorporates the relevant studies, training, and technology transfer, and creates appropriate institutions for related capacity-building and networking.

Indeed, ESCWA economies must become more diversified. They must become more productive, competitive and environmentally friendly. While technology and research parks, technology incubators and high-technology clusters are not the only options in this regard, they do constitute effective means for achieving many worthwhile objectives.

The experiences of countries that have both developed and developing economies highlight this. In these countries, efforts have been exerted with regard to the creation of new employment opportunities that aim to meet the challenges of growing populations and the demand of new global, local and regional changes. Indeed, similar results can be attained by ESCWA member countries. However, such initiatives must not be viewed as an end in themselves; rather they must be viewed as a link between industry and R&D institutions.

Within this framework, ESCWA has been called upon to coordinate efforts with other United Nations agencies and entities, and with concerned international and regional organizations to formulate and assist in the implementation of relevant initiatives, taking into account, at the very outset, the special needs and priorities of ESCWA member countries.

The objective of these initiatives must be the creation of technology parks, incubators and high technology clusters by means of the following:

- (a) Raising awareness of the possibilities offered by these new institutional forms;
- (b) Providing assistance with regard to building experienced national teams of motivated individuals;
- (c) Contributing substantively to the formulation of governmental and business-sector technology policies and strategies;
- (d) Providing advice with regard to the creation of infrastructure capabilities and legislative instruments that render ESCWA member countries and their business communities attractive to high-tech entrepreneurs and international technology-based partnerships.

The notes on technology park initiatives, which are included in the following box comprise: (a) a basis for the formulation of detailed project proposals related to fund-raising; and (b) a starting point for future regional and international cooperation and coordination.

In both areas, ESCWA must aim:

- (a) To collect and learn from valuable experiences related to formulating optimal modalities, methodologies and criteria with regard to the selection and implementation of suitable forms of technological capacity-building initiatives that are of particular relevance for ESCWA and other Arab countries;
- (b) To act as a catalyst and coordinator of efforts within and among ESCWA member countries, with a view to formulating and implementing initiatives in the above-mentioned domains and to publicize them as rapidly as possible, using ICT.

Box. ESCWA initiative for the creation of technology parks in its member countries

In the 1980s and 1990s, several resolutions of the Economic and Social Council and General Assembly called for focused efforts with regard to the dissemination of new technologies, the facilitation of technology transfer and the improvement of scientific and technological capacity, with an emphasis on needs related to sustainable development in the developing countries and the enhancement of the competitiveness and productivity of their economies.

The fact that previous ESCWA work programmes in this area focused on studies and the organization of expert group meetings was justified by the need to create awareness of, and build consensus on, essential strategic and policy issues considered lacking, or at least underdeveloped, in many ESCWA institutions.

These issues have been adequately addressed in the past. Therefore, based on information from the field and the recommendations of a number of expert group meetings, ESCWA must undertake operational activities that aim to foster technology, research, development and demonstration networks and activities. The objective of such activities must be to link the capacity of production and services to enhanced technology inputs. In this regard, participants in at least three previous expert group meetings in the area of technology strongly supported a more active role for ESCWA with regard to networking in the capacity-building of technology. Moreover, ESCWA meetings of eminent persons on priority areas of the work programmes of the Commission during the past few years have also emphasized these points.

Technology parks play an important role in technological capacity-building by uniting, in the same physical location, such facilities as R&D, manufacturing, high-level training, technology and business incubation, financing institutions, standardization and calibration laboratories, testing and analytical facilities and industrial services and facilities.

ESCWA has already been approached to provide inputs on the design of technology parks and technology/business incubators for institutions in Jordan, Kuwait, Lebanon, Palestine and the Syrian Arab Republic.

The fact that institutions in a number of ESCWA member countries, namely, Bahrain, Egypt, Oman and the United Arab Emirates, are in the process of setting up facilities for parks, contemplating their establishment or seeking advice on such measures, is further evidence of the need for ESCWA to play a well-defined role in this regard.

It is within this context that an ESCWA initiative that aims to foster the creation of technology parks, essentially as instruments for networking at the disciplinary, sectoral and functional levels, would constitute a logical and necessary step at the present time. The future role of ESCWA includes the following tasks:

- (a) The preparation of documents on the role of technology parks and other capacity-building schemes, including their constitution, organizational structures and resource requirements, with case studies from developed and developing countries, including nascent examples from some ESCWA member countries;
- (b) The elaboration of frameworks for establishing technology parks and other capacity-building schemes with at least three proposed models, which would accommodate variations in the nature and diversity of prevailing economic conditions and the degree of sophistication of national S&T and innovation systems;
- (c) Monitoring activities aimed at the creation of technology parks and their subsequent operation in ESCWA member countries, with the aim of facilitating exchange of know-how and expertise;
- (d) ESCWA will become a hub for a network of technology parks and other capacity-building schemes in its member countries.

The Expert Group Meeting on Coordination of Technology Policies to Increase Productivity and Competitiveness within the Global Context: Capacity-building Initiatives for the Twenty-first Century (Beirut, 1-3 November 2000) recommended that ESCWA undertake the study and formulation of models for use in the creation, monitoring and management of technology parks and incubators, taking into account the variety of economic systems in force in ESCWA member countries and the need for an effective

amalgamation of legislative, regulatory and managerial arrangements pertaining to these initiatives under prevailing conditions.

Furthermore, the Meeting recommended that the formulation of the above-mentioned frameworks be undertaken as a component of an integrated initiative that ESCWA was requested to launch. The initiative was to take advantage of the regional status of ESCWA and its extensive knowledge of, and information concerning, various aspects of socio-economic development in its member countries.

In addition, ESCWA was requested to seek existing and potential avenues of cooperation and coordination with other concerned United Nations agencies and entities, in addition to international, regional organizations regarding efforts to disseminate and customize these models for optimal application in other Arab countries.

Moreover, within the context of the need for adapting frameworks for technology initiatives more precisely to national socio-economic conditions in each member country, ESCWA was also recommended to identify national institutions with which it would be possible to cooperate in order to customize frameworks for specific national needs and aspirations.

It was also recommended that ESCWA cooperate with relevant national and regional bodies with a view to elaborating models for initiatives particularly aimed at the promotion of small and medium businesses and the role of women in technology development. It was suggested that feedback on priorities was however, to be actively sought by means of a market survey. Moreover, the choice between dedicated and specialized, technology parks/incubators was to be made with a view to the characteristics of the area in question and the special attributes it might impart to the park/incubation scheme.

Experts taking part in the Meeting further expressed the hope that such efforts would result in the creation of a network of institutions that would be involved in the establishment, monitoring and management of technology park and incubation initiatives.

