

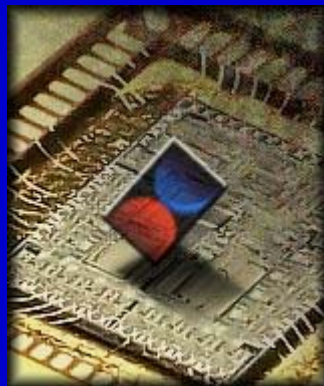


REPUBLIC OF TUNISIA

Information and Communications Technology
Contribution to Growth and Employment Generation

VOLUME I - POLICY NOTE

March 2002



Finance, Private Sector and
Infrastructure Group
Middle East and North
Africa Region
and
Global Information and
Communication
Technologies Department

World Bank

TABLE OF CONTENTS

Preface

Executive Summary

- I. Vision, Objectives and Targets
- II. ICT and growth: international experience and Tunisia's competitive position
- III. Strategy Overview and Priorities
- IV. Strategy components
- V. The economic impact of ICT development
- VI. Risks
- VII. Recommendations for an Action Plan

Vice President:	Jean-Louis Sarbib
Country Director:	Christian Delvoie
Sector Director/Manager:	Emmanuel Forestier/ Pierre Guislain
Team Leader:	Hamid Alavi

PREFACE

This policy note is the first of two volumes, drafted in conjunction with a more detailed technical report. It was prepared in response to a request by the Government of Tunisia for Bank assistance to formulate an ICT development strategy, in accordance with the targets set in the Government of Tunisia's 10th Development Plan. The policy note highlights current constraints to ICT sector development and proposes measures to eliminate them. It should be read in conjunction with the broader strategy report (Vol 2: Technical Report), which contains complementary data and technical information. The Government objectives were conveyed to the World Bank team in May 2001. The strategy is aimed at bolstering the country's emerging ICT sector and maximizing its ability to compete in local, regional, and global markets. In this context, the major objectives of the ICT strategy are to: (a) maximize the ICT contribution to growth and employment generation; (b) position Tunisia in the global ICT market; and (c) integrate ICT into the Tunisian economy. Indirect issues of the ICT impact on productivity and competitiveness are marginally treated in this note.

The report compares the state of ICT development in Tunisia that of other economies, taking into account Tunisia's relative strengths and weaknesses in developing a competitive and robust ICT industry. The report outlines the pillars of a strategy and specifies measures to be implemented by the Government, the private sector, and other stakeholders.

The analysis and recommendations in this note are based on the findings of a World Bank team that visited Tunisia in March 2001 and May 2001. It is the result of intensive consultations among the Bank team, the working groups coordinated by the Ministry of Communications Technology and including : the Ministry of International cooperation, the Ministry of Economic Development, Ministry of Higher Education, SEI, Tunisie Telecom, ATI, INT, ANCE, ANF, Technological Park of communications and ISET'Com. It also incorporates information that the Bank team obtained in discussion with some 40 companies in the Tunisian ICT sector. Structured discussions in the form of "brainstorming" sessions were held with selected Tunisian software and IT entrepreneurs to gain additional insights into the sector's competitive strengths, weaknesses, and opportunities. The Bank team, and the authors of the report, consisted of Hamid Alavi (team leader, MNSIF), Samia Melhem (CITPO), Carlo Maria Rossotto (CITPO), and Aristomene Varoudakis (DECPG). The team was assisted by a team of consultants composed of Mustapha Mezghani, Mari Rantanen, Kishore Rao, Risto Riihimaki, and Jari Pentti. Marianne Stigset (MNSIF), Anupama Dokeniya (CITPO), Mather Pfeifferberger (CITPO) and Rim Belhaj (Hubert H. Humphrey fellow) also contributed to this report. David Satola (LEGPS) reviewed the sections on legal and regulatory issues and contributed to the draft of proposed measures in the regulatory area. Peer reviewers for the report were Bjorn Wellenius (consultant) and Govindan Nair (CITPO). The strategy benefited from a survey of ICT enterprises and government agencies, completed in July 2001. The contribution of the Finnish Consultant Trust Fund to the preparation of this report is gratefully acknowledged.

EXECUTIVE SUMMARY

The Government of Tunisia's 10th Development Plan (2002-2006) sets ambitious targets for the country's ICT sector in terms of industry growth and job creation. According to these targets, the ICT industry is expected to increase significantly its share of revenues in GDP and its contribution to employment creation is expected to be large. This note proposes key elements of an ICT development strategy that could assist the Government in moving towards its targets. Specially assuming that the measures proposed by this strategy are fully respected (High case scenario) then the share of ICT in GDP could be expected to approach 8% in 2006 and one out of every four jobs could be generated in the ICT sector by end 2006.

The strategy analyzes the ICT sector as an industry composed of eight interdependent sub-segments (telecom hardware, computer hardware, telecommunications services, networking, software, ICT-enabled services, IT applications, and advanced media), each of which displays a different sensitivity to domestic and international demand. International and regional growth as well as best case policy examples are presented for each of the sub-segments. The strategy focuses on Tunisia's competitive position with respect to these international trends and global best practice. The strategy also considers the uncertainty in global ICT markets, and concludes that the crisis would not dramatically affect the prospects for ICT sector development in Tunisia, provided that the ongoing sector liberalization policy is accelerated. This implies that certain measures be undertaken quickly in order to : (a) develop a low-cost, high quality ICT infrastructure; (b) train more skilled human resources; (c) support the access to finance for ICT firms; and (d) increase the scale, scope, and synergies of ICT firms operating in different segments of the industry.

The strategy to achieve the Government targets, involves rapid telecommunications services growth in the first two years, relying on accelerated liberalization of the sector, which is expected to boost domestic demand for these services. The improvement of domestic ICT infrastructure, and the intra-industry demand that it generates, will be the basis for development of export-oriented ICT services. In particular, software and ICT-intensive services will accelerate sector growth in the second half of the period. This "high-case" growth scenario will bring ICT sector revenues and job creation in the range of the targets set by the Government. If, alternatively, a "base-case" scenario takes place, consisting in the preservation of the status quo in terms of sector policy, the ICT sector is expected to experience only limited growth, and at the end of the period (2006), the share in GDP of the sector will be only marginally higher than the present one.

To achieve the "high-case" growth path, seven priority measures must be implemented. These measures can be grouped in two categories. First, two priority measures focus on information infrastructure and involve the introduction of competition in all telecommunications market segments and strengthening the regulatory framework. To achieve the strong growth expected in the first two years, Tunisia will have to introduce effective competition in mobile and data communications, two areas where it has been delayed with respect to other countries of the region, but where recent progress is taking place. An adequate regulatory framework to support the development of telecommunications competition, also needs to be strengthened, particularly by: (a) reducing regulatory risk by strengthening the independence of INT and clarifying in attribution of institutional functions; (b) establishing a program of award of new licenses in different telecommunication services; (c) a better IPR enforcement; and (d) supporting rules for local digital content development. The second group of priority measures focuses on the business environment and involves development of technological incubators, increasing the availability of venture capital, and a marketing effort towards development of a brand name for Tunisia as a favorable business location (FBL) for ICT investments. An additional priority measure focuses on human resources and involves upgrading Tunisia's human capital skills. In addition to these priority measures, the strategy sets forth a number of supporting measures in the areas of finance, enterprise development, human resources, and e-business, each of which can stimulate growth and help achieve the Government's objectives.

Failure to implement the key measures and thereby remove existing constraints, particularly in telecommunications liberalization, would put the high-growth scenario at considerable risk. On the basis of current policies, the share of ICT revenues in GDP by end-2006 is not expected to surpass 4% of GDP, half of the expected growth in the high-case scenario, which presupposes that all suggested measures are implemented. In order to attract investors and outsourcing of services development, other countries from the MENA region are also transforming themselves into "Regional ICT Excellence Centers". Actually, Tunisia has a unique advantage but in order to keep it, the reform has to be accelerated. Recommendations for action are included.

I. Vision, Objectives and Targets

The Government of Tunisia has set an ambitious ICT development plan in terms of sector growth and job creation, for the period 2002-2006. The country's 10th Development Plan sets a target for the ICT sector to increase its share of revenues in GDP from 3.3% to about 8%. The sector's contribution to employment creation is also expected to be great. The report suggests that **the Government's goals are largely achievable, provided sector policy is deepened and targeted towards the rapid elimination of existing constraints (outlined in section II)**. The strategy is **growth-based**, aiming to bolster the country's emerging ICT sector; improve its ability to compete in local, regional, and global markets; and maximize the direct contribution of ICT to growth and employment generation. At the same time, the strategy lays the ground for further diffusion of the benefits of ICT development in the long term, through improved productivity and competitiveness.

The report analyzes the growth potential in eight interdependent segments of the ICT industry, shown in Table 1. It assesses global positioning of each of these segments and evaluates the macroeconomic impact of the proposed strategy. Implementation of the strategy is expected to lead to the high-case scenario shown below. By contrast, failing to remove existing constraints by implementing appropriate policy measures will seriously restrict the potential for ICT development, as shown in the base-case scenario.

The following table presents two growth scenarios in terms of shares of revenues and employment creation. Our estimation in job creation refers to direct employment generated within the ICT industry. The overall impact on job creation involves also the increase in jobs in ICT-using sector. For example, in the maximum growth scenario around 31,000 jobs will be in ICT sector.

The projected increase in the size of the ICT sector in the high-case scenario is certainly ambitious but not out of reach. ICT markets in the 20 largest developing countries grew, on average, by about 15.5 percent per year during 1992-97, surpassing ICT growth in high-income countries (OECD, 2000). At about 25 percent per year, projected growth in the high-case scenario would be at the high end of ICT market growth seen in other developing countries, outpacing ICT growth in Brazil and coming near the ICT boom in China (Figure 1). In the base-case scenario ICT markets in Tunisia would expand at the low end of growth seen elsewhere in emerging markets. In an intermediate case, where particularly the reform rhythm is moderated the growth rate of the sector will be between 5.5 and 6.5%.

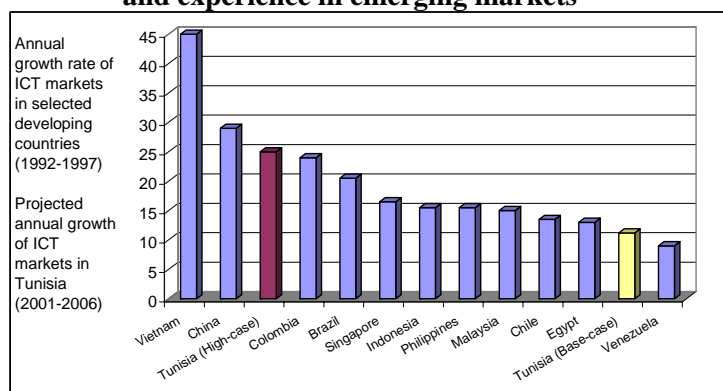
Table 1: Potential Growth of ICT Sector by Segment

	<i>2000</i>		<i>2006 BASE CASE</i>		<i>2006 HIGH CASE</i>	
	Revenues (\$M)	Total Workforce	Revenues (\$M)	Total Workforce	Revenues (\$M)	Total Workforce
Telecom Equipment	100	1500	160	2800	200	3500
Telecom Services	370	8000	670	12000	1300	15000
Networking Services	25	800	50	1500	100	2500
Computer Hardware	100	500	170	800	200	1000
Software and Software Services	50	500	130	2000	300	5000
IT-enabled Services	10	200	40	1000	240	2500
IT Applications	3	50	10	250	40	1000
Advanced Media Services	2	50	10	150	120	2000
TOTAL	660	11500	1250	20500	2500	31500
Revenues as % of baseline GDP	3.3%		4.1%		7.8%	
GDP level	20,100		30,650		31,900	
GDP gains (against baseline)			0.8%		4.5%	

Note: The nominal growth rate of baseline GDP is set at 9%. The baseline employment growth is set at 3%.

Reaching the ambitious path highlighted by the high-case scenario is a challenge that requires bold steps to remove bottlenecks to ICT sector development, along with considerable mobilization of resources across the country. But success would yield a substantial pay-off in terms of increased efficiency, faster overall economic growth, and employment generation across a wide array of sectors. By contrast, failure to implement a fast-track strategy would considerably limit the growth potential of the ICT sector. In the base-case scenario that reflects this risk, even though the ICT sector will keep growing at a faster pace than the rest of the economy, its size will increase only marginally and its contribution to growth and job creation will be limited.

Figure 1: Projected ICT sector growth in Tunisia and experience in emerging markets



Source: World Bank and OECD.

A strategy to maximize economic spillover benefits from ICT development needs to be cast in an appropriate time frame. International experience suggests that the effects of ICT sector development appear in successive rounds, as more transmission channels of the growth impulse to the rest of the economy are activated. Moreover, depending on the time horizon and on the ICT market segment considered, the **drivers of ICT development** may be different.

In the short term, the primary driver of ICT development is the domestic market, at least in the case of telecommunications and networking services. However, growth in the IT segments is likely to be driven by external demand over time based on the competitive advantages of Tunisia on the global and regional marketplaces. The report highlights strategic choices with the aim of taking full advantage of the **drivers** of ICT development by: (a) fostering the momentum of the domestic market in the telecommunications segment and creating the right infrastructure for ICT development; and (b) building on the competitive advantages of Tunisia in the global and regional ICT markets to boost growth of its ICT industry. In the high-case scenario depicted in Table 1 above, more than half of the projected 4.1 % points increase in the ICT sector's share of GDP would come from telecom and networking services. Because growth in these segments is driven by the local market, and the mobile network in Tunisia is smaller than its comparators, the overall downside risk from slower growth of the global ICT market is considerably reduced provided the right regulatory framework is put in place to foster local market growth.

The following is a proposed list of indicators, to monitor the progress of the sector over the next four years, towards a path consistent with the high-case scenario.

- ❖ Increase the number of Internet users from 4.1% to 20% by end-2006
- ❖ Increase the number of Internet accounts from 25 000 in 2002 to 300 000 by end-2006
- ❖ Increase PC penetration from 3% to 8% by end 2006
- ❖ Increase Mobile phone penetration from 4% in 2002 to 30% by end-2006

- ❖ Increase fixed line penetration from 11% in 2002 to 20% by end-2006
- ❖ Reductions in transaction costs in ICT-enabled sectors by end-2006
- ❖ Increase the number of Internet hosts (top-level domain names) from less than 100 in 2002 to 20,000 by end-2006. (source : Network wizards)

II. International Experience and Tunisia's Competitive Position

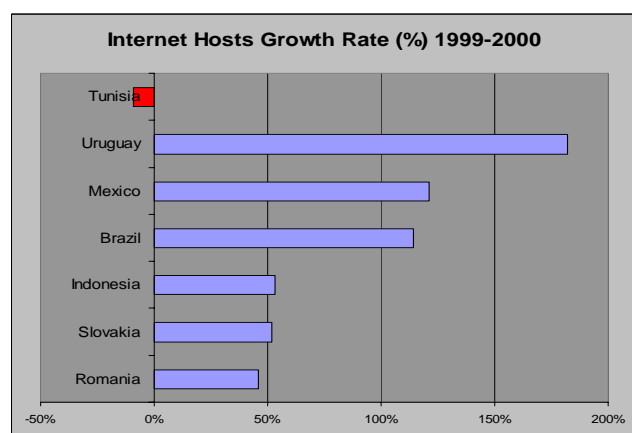
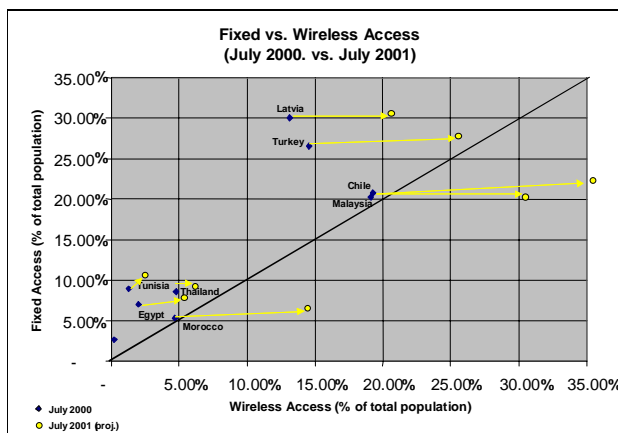
A. Tunisia's International Competitive Position.

ICT have been a leading source of growth in developed economies throughout the 1990s.¹ In the US, the share of "Information Technology Intensive Industries" grew from 6% in 1993 to 8% of GDP in 1999.² European Information Technology Observatory underlines that overall ICT market value in Europe between 1994 and 1999 grew more than 8% per year,³ by far outstripping the rate of growth of the European economy as a whole. Different segments of the ICT industry, in the second half of the 90s, have seen a sustained boom. In particular, revenues from mobile and Internet services have grown at a sustained rate, doubling their contribution to global ICT revenue composition. The recent financial crisis of some segments of the ICT industry seems to have only marginally affected revenue growth.

In emerging economies, ICT present the opportunity of jumping on a fast growth sector, as opposed to mature products and services, and bridging part of the technology gap with advanced economies. The success of ICT in developing countries such as Chile, India, Malaysia and Brazil can be traced, in part, to early adoption of comprehensive development strategies, emphasizing priority opportunities and actions, but ensuring that initiatives are market-led. Countries that established the right mix of pro-competitive policies have seen a sharp increase in ICT revenues as a percentage of GDP, for example Morocco (from 2.2% to 4% between 1998 and 2000) and Latvia (from 2% to 4.3% between 1996 and 2000).

In telecommunications, growth of revenue has been accompanied by a migration towards wireless communications, which, in countries with competitive markets (3 or 4 operators), have surpassed fixed telephony subscribers (Graph 1a). A second key global trend is Internet and data infrastructure liberalization. Free, unrestricted, entry in the ISP market, and solid competition at data network operator level, have boosted Internet host penetration, allowing several developing countries to reduce the gap with developed economies (Graph 1b). The strong development of wireless and Internet infrastructure in these countries allowed growth of downstream ICT applications and businesses, such as Electronic Delivery of Software (EDS, in India, Brazil, Israel), back-office data services (India, Malaysia, Indonesia), business-to-business e-commerce (Malaysia), advanced media services (Indonesia, Malaysia).

Graph 1a and 1b. Mobile and Internet strong growth in selected emerging economies.



¹ OECD, 2000.

² United States Department of Commerce, *The Emerging Digital Economy*, June 1999.

³ EITO's ICT definition also includes hardware, which grew more slowly (e.g. computer hardware annual growth was less than 6% in 1998-1999, while IT software and services grew more than 12%). This implies that pure annual growth rate of advanced services, which exclude hardware, should be estimated at 9-10% in 1994-1998.

- ❖ In the global economy, and especially in the fast-moving ICT industry, competitiveness is as crucial for countries as it is for companies.⁴ To take greatest advantage from access to both ICT factors and product markets globally, Tunisia must build its competitive strength vis-à-vis other regional and global players, becoming more competitive both in attracting investment from global capital markets and in supplying high-quality labor products and services to global ICT markets.

The table below summarizes the main competitive advantages of Tunisia vis-à-vis international competitors.

Table 2 – Strengths, Weaknesses, Opportunities and Threats of Tunisia’s Competitive Position

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> ➤ Widespread export culture. Strong software cluster is developing ➤ Government commitment and advanced e-commerce legal framework ➤ Balanced urban/rural telecom network ➤ High quality technical universities ➤ Framework to promote venture capital already in place 	<ul style="list-style-type: none"> ➤ Small scale. Limited sectoral synergies ➤ Higher international communications and leased lines costs ➤ Low cellular and Internet penetration ➤ Actual bandwidth capacity could not follow the future increase of needs ➤ Limited private sector involvement in training and education ➤ Venture capital not available to ICT firms
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> ➤ Promising scope for domestic telecoms growth ➤ Large scope for development of mobile and data communications ➤ Cultural proximity to large markets ➤ Possibility to leverage Bank and EU technical assistance and IFC financing ➤ Capital can be easily attracted through better policies and business environment 	<ul style="list-style-type: none"> ➤ Competition from other countries with better skills, infrastructure and policies such as Morocco, UAE, and Israel ➤ promote a regulatory frame that attracts investors through an effective competition ➤ Downturn in global ICT market ➤ Maintain an adequate regulatory framework that supports an effective competition

Regulatory framework is being developed to sustain a more competitive market. E-commerce regulation is an area of excellence for Tunisia and will constitute a competitive advantage over countries that have not yet adopted regulations on digital signature and certification. However, telecommunications regulation only recently has progressed towards the establishment of regulations and institutions capable of promoting and sustaining a competitive market. Clear and consistent protection of intellectual property rights (IPR) in a manner consistent with international best practice (both the substantive rights being protected as well as the mechanisms for protection)

Information infrastructure: balanced basic network but weak Internet infrastructure. Compared with regional benchmarks, Tunisia’s fixed line penetration is above average, and the basic network is well balanced between main city and other parts of the territory. However, the mobile and Internet infrastructure is not yet well developed compared to progress on fixed line infrastructure. Tunisia mobile penetration (number of mobile subscribers per 100 inhabitants), is less than 2%, while it is over 14% on Morocco, 27% in Estonia, 47% in Israel. Similarly, Tunisia has 0.1 Internet Hosts per 10,000 inhabitants, while Egypt has 1.2, Lebanon has 14, Israel and Estonia have 280. International bandwidth capacity is also lower than regional benchmarks. For

⁴ Michael Porter, *The Competitive Advantage of Nations* (New York: The Free Press), June 1998.

example, the highest link-to-link international connection is Tunis-New York with 34 Mbps, while (to quote some regional competitors), the Rabat-Paris capacity is 68 Mbps and Haifa-New York is 58.5 Mbps⁵.

Concerning PC penetration, the Government has undertaken initiatives to expand access, such as subsidizing 6000 Publinets and 10,000 personal computers under the *PC Familial* program, as well as introducing computing in secondary schools. This particular development of the information infrastructure has the advantage that the domestic network allows the promotion of ICT-enabled services, i.e., call centers, outside the main cities, enhancing widespread job creation. However, bottlenecks in the Internet and data infrastructure are a constraint to the development of technology-intensive export services, which is a competitive disadvantage with respect to other developing countries that can rely on a low cost-high quality data and Internet infrastructure.

ICT skills: elite graduates -- but in short supply. Tunisia has a young population, mostly bilingual (Arabic and French) or tri-lingual (Italian, English or Spanish is often a third language). Education is given priority on the Government's agenda, with 30% of the annual budget allocated to the Education Ministry. Tunisia's primary/secondary education enrollment ratio of 91% is the highest in MENA, with even enrollment of girls and boys, unlike in many other MENA countries. Tunisia has a high tertiary education enrollment ratio, as 22% of Tunisia's population of young adults (19-24 year old) is currently enrolled in some superior or vocational training program. In the ICT sector, seven public institutes and 150 private schools were recently opened to teach office automation and management information systems. In the human resources area, Tunisia has certainly some of the best graduates in technical fields in the region, but there is an issue related to their number and their allocation to the ICT industry. Tunisia generates 12,500 jobs in the ICT sector, of which some 7,000 are employed by the public sector. In comparison to other MENA countries, Tunisia has a comparative advantage with regards to human resources, although issues of shortage and allocation problems persist. In attempting to remedy this, **the involvement of the private sector is key in order to enhance both the number of graduates and their skill sets.**

Entrepreneurship and export culture. Tunisia has a strong export culture in traditional sectors, such as textile. Entrepreneurship is part of the system of values of the Tunisian society, especially in Tunis and Sfax. These elements are important for successfully competing in global markets. In the area of innovation, the public sector and the public universities have taken a lead role in building high-technology incubators in the technological *Park*. However, there does not seem to be an extensive involvement of the ICT private sector, but rather a selection of companies which are mostly providing services to the public providers.

B. Tunisia's ICT Growth Opportunities

These assets such as its geographical proximity to Europe, a young and educated population, a balanced fixed line telecommunications infrastructure, an established "export culture" and a commitment to opening up markets to competition presents Tunisia with great opportunities for ICT development. The country could position itself in export markets, taking advantage of buoyant global demand for ICT services, by capitalizing on these assets and removing existing constraints. The areas that present the highest potential for Tunisia and where growth will be initially driven by foreign demand are: (a) value-added software services; (b) IT-enabled services; and (c) advanced media services. At a first stage, Tunisia could also position itself in telecommunications and networking services, although this will be primarily developed in the local market. In a second stage, expanding local demand for software and networking services could also become an important driver of ICT sector development.

Software and software services. Tunisia should aim to become a "hub" for investments and networking for high-value software development. The "**hub model**" is appropriate to Tunisia's conditions and assets due to its existing limited, but highly skilled pool of labor, its experience with

⁵ Telegeography, 2000

successful software start-ups, and the numerous incentives in favor of foreign investment present in Tunisia, which make the hub feasible and attractive for foreign investors.

By becoming a “hub”, the country would exploit its growth potential in the software sector most effectively by “**moving up**” the **software value chain**. In terms of software outsourcing, this means a move away from low-end coding, testing and maintenance operations to conceptualization, architecture, systems design, business process automation and systems integration work. These are higher-margin and more stable activities. Progress would be facilitated by a certain consolidation in the Tunisia ICT market to gain scale and size advantages when competing for international clients.

Tunisian firms should also engage in developing **customized software packages or solutions**, as well as focusing on the most promising **vertical markets**, where customization of existing packaged solution is needed and is very expensive due to a shortage of skilled experts. Globally, the trend is toward web-based, e-business software systems such as Customer Relationship Management (CRM), Application Service Provider (ASP), Enterprise Resource Planning (ERP) solutions for the financial, telecommunications, education and training, retail and manufacturing industries. Major development opportunities also lie in systems integration and convergence activities and software customization and localization.

IT-enabled Services. ICT-enabled activities are presently limited in Tunisia. The entire sector employs around 500 people, and is mostly export-based. However, there is room for growth. Global multinationals are constantly looking for cost-cutting methods by outsourcing customer service and data processing operations to lower-cost locations. Tunisia, in turn, presents a number of important assets required by certain types of ICT-enabled services, such as its geographical proximity to Europe and to other Arab nations (as well as being in the same time zone as them), a highly developed tourist sector that could be used as a marketing channel for the services, the availability of an educated and multilingual workforce.

Taking into account the strategic positioning and the assets of Tunisia, the areas where the advantages seem to be the greatest are the following:

- *Reservation centers*, due to the multi-lingual capacities of Tunisian skilled labor and the promising opportunities of this market segment internationally (there is however, strong competition);
- *Customer Support* (similar considerations).
- *Engineering and training*, especially for the francophone markets.
- *SIG/numérisation*, thanks to low cost manpower.

In addition, Tunisia needs to build strength in some ‘**vertical markets**’, to be recognized as a specialized provider of software services to a particular industry. Potential vertical sectors, where Tunisian ICT-enabled services can have an advantage in foreign markets, are automotive, travel and tourism, healthcare, textiles and clothing, communications, and finance and banking.

Advanced Media Services. Several factors point to the potential for development of the advanced media services market in Tunisia:

- Favorable human resource endowments
- Emerging domestic multi-media business
- The underdevelopment of hosting and web content creation activities in the MENA region
- The increasing tendency of European firms to outsource content development.

Technological advances, including convergence of broadcast media and the Internet are creating opportunities for Tunisia in areas such as:

- *Content development, e-learning* and related activities,
- *Animation,*
- *Streaming Media/Broadband,* offering significant scope for content development and multimedia. World Wide Web growth and convergence of broadcast and Internet create a major market for streaming audio, video, text, animation and other media content.

Telecommunications and Networking Services. Growth will primarily be driven in the short to medium term by significant pent-up internal demand, (corporate and household segments). Towards the end of the time horizon, **a potential for developing export-oriented activities might emerge,** especially in the provision of networking services to European markets, and development of services and applications in the wireless and data industry.

With stepped-up opening of the sector to competition, Tunisia can benefit from a number of opportunities:

- The extended fixed line telecommunications network offers the opportunity to **enhance revenues from the existing network,** while continuing the expansion of the existing network.
- There is a high potential to **develop internal demand for wireless and data services,** presently unexploited.
- Tunisia, with the privatization of Sotetel, was an early mover in developing private sector providers of networking solutions for the telecommunications infrastructure. The local networking industry is characterized by dynamic small firms, used to work in partnership and subcontracting with SOTETEL and international vendors (Alcatel, Nortel Siemens). Telecommunications infrastructure development can be an occasion, in the medium term, to develop a **high-quality export-oriented networking industry.**
- There is a possibility to exploit the market potential of niche telecommunications services for the European market, notably for **the development of services to support the wireless data industry,**⁶ with special attention to the European markets in such areas as solutions for wireless information services or wireless trading. Another example of the potential for wireless services development are wireless corporate network services, including wireless PABX and value-added services over mobile private networks, like the real-time client-supplier exchange of information.

⁶ According to Nokia, 10% of mobile communications revenues comes from data services.

III. Strategy Overview and Priorities

A. Preconditions

A range of pre-conditions to create a competitive, information-based economy are required for Tunisia to realize the full benefit of an ICT revolution. First, Tunisia needs a flexible economy to successfully cope with the need for constant change and restructuring. A quick redeployment of resources is facilitated by an adequate competition policy, an efficient financial system (including the availability of venture capital) and flexible labor markets. This, in addition to the following factors related to ICT enabling environment, constitute what we call “preconditions” for the implementation of the ICT strategy. These aspects include: (a) information infrastructure; (b) the institutional, legal, and regulatory framework governing ICT; (c) skilled human resources; and (d) availability of appropriate financing for start-up and expansion of ICT enterprises. The key to leaping forward in ICT development is to strengthen Tunisia’s assets and remove bottlenecks in these four areas identified as the main enablers of ICT growth.

(a) Developing an efficient information infrastructure. High-quality, low-cost competitive telecommunications and Internet infrastructure is a prerequisite for developing information intensive services, such as call-centers, electronic delivery of software, e-commerce, and other Internet services and applications. Government control and limited liberalization have for a long time constrained the development of an information infrastructure. Over these past years, however, some improvements have occurred, including partial competition at the ISP level and progress in establishing a pro-competitive regulatory framework in the sector. In addition, the Government increased the number of Publinets, developed technology parks, and introduced incubators in technical universities. Notwithstanding these efforts, the present information infrastructure would not sustain the accelerated growth that the strategy forecasts in the high-case scenario. Notwithstanding recent efforts, it is clear that to realize the ambitious targets set by the Government, **bandwidth capacity must increase.**

(b) Establishing pro-competitive regulations and building institutional capacity. To encourage private sector involvement in ICT, the regulatory framework must be further elaborated with a view to develop competitive markets. Although Tunisia’s new Telecommunications Code establishes the possibility of competition, the introduction of effective competitors has been slow thus far. A proactive policy for introduction of competitors in telecommunications needs to be strengthened. This requires regulatory reform to allow competing telecommunications operators, non-discriminatory choices of technical standards, transparent, open and competitive bids for selecting international operators and equipment providers, and enforcement of competition principles. To cope with these issues, three agencies (INT, ANCE & ANF) were recently created and are in the process of hiring professionals and establishing personnel rules. **Continued commitment toward development of adequate regulatory and institutional counterparts** is key to sustaining development of competition and involvement of the private sector.

(c) Developing skilled human resources. The key element for capitalizing the potential offered by the explosion of new knowledge and accelerating technical change is a skilled labor force. Ensuring that education expenditures are allocated efficiently and that the workforce has knowledge and skills needed to participate in the knowledge-based economy are Government priorities. Countries that have established the right conditions in terms of skilled labor development and an efficient labor market have substantially increased the number of jobs in the ICT sector.

Current examples include Hungary, Malaysia, and India (International Labor Organization, 2001).⁷ Tunisia decided to make the development of the country's educational system a priority, focusing on secondary and university education. In many cases, however, university graduates do not find an appropriate placement in the job market, resulting in unemployment or underemployment. To explore the full potential of the ICT sector for job creation, Tunisia recently created a *Parc Technologique des Communications* (Communications Technology Park), which offers facilities such as broadband Internet access and research, development and technology transfer (RDT) to ICT firms. This initiative includes training and incubation programs and partnerships with local universities. This is a first step, which should be developed and complemented by wider reforms, including the introduction of flexibility in the job market and programs to train workers in IT and communications. Sustained private sector involvement is also needed in the educational and training area.

(d) Developing adequate channels of funding for the ICT industry. Efficient capital markets and flexible financing are essential for the growth and development of ICT start ups. High-tech investment requires a higher share of equity financing than other more traditional investments. This places Tunisia at a competitive disadvantage vis-à-vis some of the competitors, as its capital markets are less developed and biased towards loans to large firms. For example, stock market capitalization in Tunisia was only 2% of GDP in 1999, compared to 10% in Egypt. Despite numerous Government initiatives to encourage financing of ICT firms, a lack of expertise in evaluating ICT project risks (rather than a shortage of liquidity) limits bank financing of these investments. The same is true for venture capital companies. There are 25 venture capital companies or *Sociétés d'Investissement à Capital à Risque* (SICARs), but they rarely invest in ICT firms (TUNIVEST being an exception). SICARs would therefore need to enhance their capacity to evaluate ICT projects. Other measures that could increase possibilities for ICT financing are: (a) the development of an IPO (Initial Public Offering) market (such as NASDAQ or *Nouveau Marché*); and (b) incentives for institutional investors to invest in ICT projects. The International Finance Corporation (IFC) can play a major role in the development of adequate capital markets for technology ventures.

B. Broad-based, Diversified, but Focused Strategy

The rapid growth and dynamism of the global ICT industry and the resulting opportunities created for countries to position themselves in the global marketplace has two broad implications for a Tunisian ICT development strategy. First, the strategy must be **broad-based, or diversified**, initiating actions to respond to a broad range of ICT market opportunities, both internal and external, and across the entire ICT sector. International experience has shown the risk of relying narrowly on any one segment of the ICT services market.⁸ Exporting services from different segments, will also make the development of Tunisia ICT sector less sensitive to a crises in international demand. Accordingly, Tunisia needs to focus on developing all segments of the ICT sector in order to achieve its growth objective. The second implication, however, is that the strategy needs to respond to **market niches and activities** where Tunisia has the greatest comparative and competitive advantages, especially considering the Government's intent to meet its ambitious targets by end-2006. This allows initiatives to focus on areas of greatest opportunity based on Tunisia's assets and global demand patterns, in order to maximize growth and

⁷ The ILO *World Employment Report 2001* indicates that the ICT sector currently employs 4.3% of the labor force in Hungary, a percentage that has been increasing steadily over the last 10 years, and that exceeds the EU average of 3%. Similarly, Malaysia and India boosted their employment in the ICT sector, thanks to the development of export-oriented, highly-specialized ICT firms.

⁸ Examples include India, which until recently has been highly dependent on low-end software outsourcing, and Singapore and Korea, which have concentrated on hardware activities to the virtual exclusion of software and services (World Bank, 2001).

employment generation potential. From the global positioning analysis of Tunisia, it emerges that the areas that present the highest potential are: (a) telecommunications and networking services; (b) software and value-added software services; (c) IT-enabled services; and (d) advanced media services. In addition, development of IT applications (e-commerce and e-government) also has growth potential, especially toward the end of the four-year period. A series of measures are presented in the strategy to facilitate growth in the above areas.

C. Priority Measures

The measures that constitute Tunisia's ICT strategy aim to create an enabling environment for ICT development according to the pre-conditions discussed earlier. These measures have different priority and different impacts on sector performance. The main measures are summarized in Table 2 below, indicating the implementation timetable and priority of action. Out of the 14 measures proposed in the five strategic axes, the core of the strategy can be condensed into six measures that assume priority and are associated with the highest growth generation and job creation impact. However, to reach the high-case ICT-growth scenario, it is assumed that all measures are implemented (and that favorable conditions on international ICT markets are maintained as well).

The key measures include establishment of a liberalization timetable for telecommunications, and **introduction of competition in all market segments** (see Measure 1 in the following section). The introduction of competition in telecommunications infrastructure and services would enable the establishment of an adequate broadband infrastructure to support all the other ICT market segments. In voice telecommunications, competition would drive telecommunications revenues to higher levels. A necessary element in establishing competitive markets is the **strengthening of the regulatory framework**, especially in telecommunications, to face the challenges of an open, competitive market. Since about 50% of the growth over the five-year term is likely to be telecommunications-related, these measures are key.

Other measures include the **development of a brand name for Tunisia as a "Favorable Business Location"**, and **upgrading human resources in software and ICT-enabled services**. The development of a brand name for the country is key to attracting FDI, and will facilitate networking efforts of Tunisian ICT firms. It will also allow Tunisia to consolidate consensus on the benefits of the new strategy and communicate them to domestic stakeholders and international investors. Human capital reforms are also considered crucial, due to the expected ICT expansion in Tunisia and the larger role the private sector will play. A **program of incubators for ICT firms and start-ups** is also necessary for the achievement of the ICT strategy goals, and its implementation should start no later than the second half of 2002. It should involve what the incubator literature calls the "triple helix" : private sector, government, policy makers and academia. Finally, among the proposed measures to enhance financial flows to the ICT sector, **the proposed reform of the venture capital business environment is considered a key priority**, because technology firms often fail to meet the financing criteria for traditional bank credit.

Once this group of measures have started to show results, complementary measures can be implemented to consolidate and diffuse growth. These additional measures could enhance the networking efforts of ICT firms by facilitating their access to equity funding and to training in ICT among Tunisian enterprises. Towards the middle of the time horizon, efforts could be placed on the demand side of the industry, through development of sector portals and enhancement of the role of the Government (e-government and outsourcing of the Government's IT functions). At this point, the efforts of private and public sector stakeholders should be concentrated to promote the diffusion of e-commerce and advanced applications in the industrial and social tissue of Tunisia (improve payment systems, promote diffusion of ICT among enterprises).

Table 3: Key Measures and Support Measures for Tunisia's ICT Strategy

2002		2003		2004	2005- 06	
Award a 2 nd GSM license	Award licenses of Data transmission	Award 3 international Licenses	Award local and Ld licenses	Full liberalization		Award a third GSM license (in 2007)
Award a 2 nd GSM license	Award licenses of Data transmission		Award of retail operator licenses		Full liberalization	Award a third GSM license (in 2007)
Strengthen Regulatory Framework						
Develop Brand of Tunisia as Favorable Business Location for ICT						
Assist start ups in research for funds, preparation of business plan, national and international networking						
technological Incubators						
Change regulation on venture capital						
Create ICT Fund						
Facilitate « exit options » for technology SMEs investors						
Upgrade Tunisia Human Capital in ICT						
Outsource IT Procurement in Tunisian Public Administration						
Develop "e-government Program"						
Develop Sector Portals						
Develop e-payment solutions for e-commerce						
Make the private firms active elements in e-commerce						
	Key measures					
	Support measures					
	Intermediate liberalization Scenario GDP growth from 6 to 6.8 % in 2006					
	Accelerate liberalization scenario GDP growth of 8 % in 2006					

The liberalization program included in table3 assumes that Tunisia moves aggressively towards all open competition in all segments. That's the choice that will generate the highest turnover growth and is a key assumption of the high case scenario. However, if the tunisian authorities must proceed to a much moderate approach, including competition in data and mobile in 2002 and wire-spread retail competition this choice if followed it's estimated that the turnover objective should be lowered by around 1.2% on GDP.

IV. Strategy Components

This section describes the main components of the strategy. The larger strategy report provides detailed description of the different measures. Priority measures are presented first.

A. Priority Measures

Measure #1. Introduce competition in all telecommunications market segments

This measure has two objectives:

- ❖ Expand revenues from the telecommunications sector by contributing to about 50% of the growth necessary to reach to the Government revenue growth objective;
- ❖ Develop a low-cost, high-quality liberalized information infrastructure through a fully competitive, private sector-driven market development.

The introduction of competition (including infrastructure liberalization) is expected to generate the following benefits:

- ❖ Presence of operators specialized in data services, which can better target corporate demand;
- ❖ Private sector investment in upgrading the existing communications infrastructure;
- ❖ No harm to *Tunisie Telecom*'s profitability, since most of its revenues come from voice services and Tunisie Telecom will enjoy high interconnection revenues from competing operators

In terms of **growth of ICT revenues**, competition in cellular and international voice services is expected to double the size of the telecommunications sector in about two years (from 2% to 4% of GDP) and is the single most robust contribution to the achievement of the 8% GDP growth goal of the Government. This would be a result of progressive liberalization of voice telephony services, and must be accompanied by infrastructure liberalization. A possible liberalization timetable which would foster sector revenues to the levels sought by the Government could be the following:

- ❖ Award a second GSM license and start up of services in 2002;
- ❖ Award data licenses (services and networks) by end-2002;
- ❖ Award three international licenses (voice and data) by beginning-2003;
- ❖ Award local and long distance licenses in 2003 (voice and data);
- ❖ Full liberalization (no restriction on number of providers) as of January 1, 2004;
- ❖ Award a third GSM license in 2005;

Looking specifically at the **data segment**, crucial for overall ICT development, private firms should have four roles:

- ❖ Network operator, providing physical connections, basic telephony, and transmission;
- ❖ Access provider, transporting the Internet and data traffic;
- ❖ Service operator, offering basic services and providing value-added services;
- ❖ Content provider, offering user-demanded content.

Competition should be introduced at all levels. Throughout the world, private sector operators are prominent in telecommunications data operations within an overall regime of competition. For example, Egypt and Lebanon have multiple private data network operators and service providers. Morocco has already awarded three VSAT licenses (not limited to data services) to private

providers and is currently in the process of awarding two new licenses for fixed line operators, initially to provide data services.

Measure #2. Complete the effort to strengthen the regulatory framework in order to secure effective competition

Tunisia has completed steps to create an adequate policy and regulatory framework for ICT development, particularly with the preparation of new laws in the area of telecommunications, e-commerce, and IPR. It is important now that the present focus is maintained and deepened. This measure should accompany the establishment of effective competition, especially in the years 2002-2003. The following are areas in need of reform.

- ❖ Enhance regulatory independence and clarity in attribution of institutional functions. The Telecommunications Code has created two regulatory bodies: the *Instance Nationale des Télécommunications* (INT) and the *Agence Nationale des Fréquences* (ANF).⁹ While ANF is a department of the Ministry of Communications Technologies, INT is set by law as an independent agency. However, there is some concern that INT's core competencies are too narrow, and its independence from the Government (and the state-owned incumbent) is therefore not completely assured. Core competencies could include: (a) licensing (tendering, forms of licenses, license control); (b) general powers of investigation; (c) power to draft regulations; (d) dispute resolution; (e) enforcement powers (power to compel production of documents, search of premises, issuing injunctions, levying fines, awarding damages). In addition, the stages of the licensing process (preparation of license forms, license tender process, selection and evaluation criteria, evaluation and recommendation, and license modification) could be transferred from the Ministry to INT. As licensing is not transparent, for example, it is questionable whether the current provisions of the Telecommunications Code are compatible with the WTO requirements regarding public availability of licensing criteria. In this sense, the reforms contemplated in this Measure would be aimed at implementing Tunisia's WTO Commitments.
- ❖ Reduce "regulatory risk" in telecommunications. The Telecommunications Code establishes the principle of competition in all telecommunications market segments. However, there is no certainty about when new licenses for different telecommunications services will be awarded. More broadly stated, a precondition for sector development is that there be certainty on the degree and pace of liberalization. A Sector Policy Paper, including a timetable for liberalization, would signal to investors the sustained commitment of the Government towards introduction of competition. Introduction of competition in data networks and international communications and the enlargement of competition in data services would seem to be key to the achievement of the Government's growth rate targets as set out in its medium term strategy.
- ❖ Better IPR enforcement. Many enterprises that were surveyed lamented the fact that, notwithstanding the presence of a legal framework for IPR protection, IPR rules are not enforced, and this is harming their potential performance. The Intellectual Property Law was approved in 1994 and covers both software and Web sites, as well as multimedia content in general. Nonetheless, to be a credible tool for encouraging IT investment, clear, consistent application of this law, especially with respect to pirated software and CD-ROMs, is required.

⁹ However, the Law is silent about appointment and removal criteria and procedures for both regulatory bodies, financing (with respect to INT) and budgetary independence, or their structure, composition, and institutional governance.

- ❖ Restriction on the development and hosting of web sites and on the development of digital content in Tunisia. Presently, over two-thirds of all Tunisian enterprises which have a Web site host their site outside Tunisia, due to regulatory restrictions. For example, web content is now subject to the press law, which does not take into account the greater dynamism of the web compared to other media such as television and the printed press. These restrictions need to be eased. The short-term objective of this policy shift should be to induce Tunisian enterprises to choose local hosting, while the long-term objective would be to create an image of Tunisia as a favorable business environment for hosting and digital content creation.

Measure #3. Facilitate the procedures for acquiring software and IT services and externalize the development of software and ICT services

This measure includes three components :

1- Outsourcing : The acquisition of goods and services in the context of a sector as rapidly evolving as that of the ICT sector cannot follow standard procedures, which can require between 2 to 3 months at best, to over two years. Therefore, it is important to:

- ❖ Differentiate between the markets for services and the markets for goods, with different requirements. Software should be considered part of investments, rather than services.
- ❖ Differentiate between services with a high value added, which includes ICT services, and services with low value added, such as maintenance and cleaning. Services with a high value added have greater markets, and should therefore see their limits increased.

By externalizing development of software and ICT services along the lines of best practice abroad and in other sectors, Tunisia would increase its chances of success. This could be done by:

- ❖ Externalizing labor intensive tasks of repetitive nature and with little value added.
- ❖ Externalizing equipment and network maintenance.

Acquire packaged applications or sub-contract development of applications to private sector.

2- Development of vertical applications such as eprocurement or e-filing in local language

3- Import substitution : Even if it is difficult to avoid totally the import of softwares, it is possible to make of the Tunisian market a supplier of computer products such as embedded systems, language recognition, SMS, WAP and GSM applications, if sufficient private resources are mobilized for that objective.

Measure #4. Technical Support Programs: Develop a brand name for Tunisia as a Favorable Business Location (FBL) for firms in the ICT sector (eTunisia)

After liberalization of the telecommunications infrastructure and adequate regulation are in place, Tunisia could concentrate its efforts on Technical Support Programs. The advantages to locating business activities in Tunisia are currently not well known to global ICT executives. Few people outside Tunisia know, for example, about the presence of a well-functioning cyber park or that Tunisia is the most advanced country of the region in terms of e-commerce legislation. Presently European and American business and technology executives do not associate Tunisia with “high technology” and FBL. An effective marketing campaign is indispensable for a successful ICT strategy. This is shown in the cases of Ireland, Wales, Utah and Lombardy. These places have communicated to the international community their efforts to establish a FBL for ICT. Tunisia’s 4

millions a year tourist industry could be an effective vehicle to “spread the word” back home if these are impressed by ICT’s ubiquity existence functionality in Tunisia.

Tunisia also needs to develop a brand name (“*eTunisia*”), and communicate its status as a FBL. This involves:

- Recruiting an international marketing firm, specialized in “Country Marketing Consulting”;
- Advertising in leading business journals and on European television.
- Developing a Web portal “*eTunisia*”, where the advantages of Tunisia as a FBL may be illustrated and advertised in conjunction with its tourist appeal.
- Sponsoring Tunisian ICT firms to participate in industry and technology events.

Measure #5. Technical Support Programs. Initiate a Government Program to fund at least 10 Technological Incubators in Tunisia

The Government should initiate a program **to fund at least 10 technological incubators** in Tunisia. Some incubators are being operational in Tunisia, and others are expected to be created within university establishments (e.g., an incubator of the *Ecole Nationale des Ingénieurs de Sfax*). Incubators are a key determinant for the potential generation of new enterprises. For this reason, it is important that the emergence of incubators in the country be developed around a well structured program, with adequate financing channels and an emphasis on generating entrepreneurial ventures. Incubated firms should be managed by specialized professionals, with skills which cannot be found in the academic world or in the Administration. In other words, incubators need to be run as private profit-seeking enterprises.

Since the risks involved in this activity are high, several governments (Ireland, Israel, Wales, Dubai) have provided financial incentives to privately-owned and managed incubators. These financial incentives are structured within the framework of contractual relationships. Volume 2 of this report outlines a possible structure for the program of technological incubators in Tunisia. The technological incubator should be an autonomous private sector corporation. Each incubator would host 15-20 start-up companies at the same time for a period up to two years, providing a funding contribution of up to 60% of the total project cost. The Government of Tunisia would fund part (up to 60%) of start-up costs and it would be reimbursed for its effort through a contribution to the royalties on sales. The incubator would have a capital stake in the incubated companies and would receive an administrative fee from the Government. Academic or educational institutes involved would also have a stake in new inventions while employing some of their graduate students in business and marketing. This program of incubators would benefit start-ups, especially in the software, IT services, and advanced media areas, but has the potential of having an impact beyond ICT.

This measure should be complemented by the creation of a lean and efficient mechanism to help start-ups and SMEs grow and establish themselves on local and international markets. The Government should outsource to a private company, through open tender, the functions of assistance to private ICT companies, such as:

- Helping start-ups to prepare business plans;
- Advising start-ups on different funding sources and facilitating contacts with financiers;
- Informing ICT firms about Government incentives and technical support tools;
- Facilitating networking among Tunisian and international ICT firms and trade associations;
- Assisting Tunisian firms to find partners to participate in R&D programs funded by the EU or to participate in the incubator program mentioned above;

- Facilitating the creation of consortia between Tunisian firms to enable their participation in national and international tenders.
- Organizing an annual ICT Fair in Tunisia and marketing it in cooperation with the Ministry of Tourism in their calendar of events and festivities.

Measure #6. Further development of venture capital financing

A number of actions need to be undertaken to raise the awareness of the Tunisian financial sector about the challenges and inherent opportunities in the ICT sectors. These include:

- ❖ Tax incentives for investors (including institutional investors) in venture capital companies, focused on ICT investments.
- ❖ Enhancing capacity of venture capital firms to evaluate ICT projects.
- ❖ Identifying and increasing the domestic pool of funds for venture capital investment. In the US, apart from high net worth individuals and angel investors, pension funds, insurance funds, mutual funds, and other similar funds provide a significant source of financing. The share of corporate funding is also increasing and it was as high as 25.9% in 1998 as compared to 2% in 1995.
- ❖ With increasing global integration and mobility of capital, it is important that Tunisian SICARs (Société d'Investissement à Capital Risque) as well as venture-financed enterprises to have opportunities for investment abroad. This would not only enhance their ability to generate better returns but also add to their experience and expertise to function successfully in a global environment. Tunisian enterprises should thus become global and create their own success stories. Therefore, automatic, transparent, and flexible norms need to be created for such investments by domestic firms and enterprises.

A model used in the US that has contributed significantly to the development of start-up companies (in the ICT and other sectors) is the Small Business Investment Company (SBIC) Program. Tunisia could draw on this experience to realign its existing program (FOPRODI, etc.) to better service the ICT sector .

Measure #7. Increase the human resources endowment of Tunisia to better serve the needs of market segments where Tunisia should develop a competitive advantage

This measure pertains to three key sectors where Tunisia might develop a competitive advantage in the next four years: (a) software; (b) ICT-enabled services; and (c) advanced media services.

(a) Software

In order to accomplish the objective of 20,000 new ICT jobs created by end-2006, Tunisia needs to increase the number of computer science specialists, and encourage their knowledge and expertise toward the needs of the software segment. Through increased public-private partnership in education, Tunisia should increase the number of **computer engineers** by 1000 in the 2002-2006 period. In addition the number of **computer sciences specialist** should be increased by 3000 over the 2002-2006 period (hardware, software, computer languages, operating systems, databases, web applications, artificial intelligence, etc.). Tunisia should also increase its number of **computer and networking hardware technicians and IT specialists** (Bac+2 or ISET graduates) by 2000 at a suggested rate of 500 graduates per year. This increase in the number of professionals of the software industry would be achieved through increased student intake at existing ICT institutes and training companies, provision of training and accreditation on tools and languages indispensable to a competent work force in IT applications.

The suggested program is consistent with the Ministry of Higher Education's focus on ICT training and their goal to produce a total of 50,000 ICT experts by 2010. To implement such a program, the following actions are recommended:

- Better coordination and joint task forces between the Ministry of Higher Education and Ministry of Communication on all issues related to ICT education and vocational training
- Awareness programs at the secondary school level to orient students towards ICT studies;
- Teach teachers computer usage and content creation skills for development or publishing of educational material in local languages on the Internet;
- Familiarize students with computers at the secondary school level;
- Retrain teachers in secondary schools to allow them to grasp and teach computer concepts;
- Promote distance education (DE) programs, and equip rural schools with technology and teacher skills to exploit DE opportunities;
- Attract doctorate-level young professors to an exchange program with reputable education partners outside the country;
- Encourage young girls from the secondary school level to adopt an ICT study track;
- Use of PubliNets for the above programs when capacity, space, and computers are an issue.
- Encourage language training (French , English and Arabic)

(b) ICT-enabled services

Tunisia should **target higher-end operations in the ICT-enabled segment**, such as integrated call centers/customer support (voice- and data-based), insurance claims processing, etc. Toward that end, it is suggested that each year some 2000 young unemployed graduates from the Fond 21/21 be selected and trained by the private sector as customer service agents for more sophisticated operations where Tunisia's competitive advantage is high, such as database management, data warehousing, and imaging-related activities. The larger strategy report recommends that unemployed educated young women with language skills from the Fond 21/21 pool be targeted for tourism reservations and customer services or running customer services for new GSM operators. Should the effort be managed successfully and Tunisia effectively sold its competitive advantage in the globalized customer service industry, 1600 of these young potential workers from the Fond 21/21 could be absorbed each year over the 2002-2006 period, thereby creating 9000 new jobs will be created by end-2006.

(c) Advanced Media Services

To develop skills in this area, the following actions are recommended:

- Integrate digital content creation in university curricula. The skill sets required include creation of information architecture (requiring a liberal arts background and emphasizing critical thinking, research, and creativity); visual and interactive design (graphic design, animation, layout, etc.); writing (mass communications, creative and technical writing); and technical production skills. A good example of this is the Multimedia University in Malaysia.
- Create several multimedia universities or institutes with state-of-the-art studio and production equipment and a high caliber faculty in cooperation with other similar academies (US, Malaysia, Italy, etc.); preferably one in each of the newly created technology parks.
- Encourage vertical specialization ex: documentation production, animation, sound and special effects.
- Integrate digital content creation in existing current university curricula. The skill sets required include creation of information architecture (a liberal arts or language background); visual and interactive design (graphic design, animation, layout, etc.); writing (mass communications,

creative and technical writing); and technical production skills. This would imply training of young Tunisians, preferably from the Fond 21/21 unemployed pool with a background in art or in writing; at the rate of 100 for each category per year from 2000 to 2004.

B. Support Measures

In addition to the priority measures indicated above, the following measures would have a positive impact and would assist in integrating the development of the ICT sector.

Measure #8. Increase the range of “exit options” for technology investments

A key element of the business environment that should be included in the Tunisian ICT strategy is to encourage the development of the Tunisian stock market. Moreover, Tunisia could consider the creation of a *Nouveau Marché* (linked to European markets) with lower listing standards, targeted to high-technology SMEs. This would have two implications: (a) it would provide an exit mechanism for SICARs (venture capital companies) investing in ICT projects, thereby increasing SICAR funding of ICT start-ups; and (b) it would facilitate the development of stock options that would enhance incentives for the recruitment of highly qualified staff.

Measure #9. Develop e-government

A certain number of priority projects should be defined, on the basis of the importance of their services to the citizens and the private sector, in addition to their impact on the advanced media sector (Web design and programming). Online services could allow:

- ❖ Fiscal and social declarations,
- ❖ Immatriculations of enterprises,
- ❖ Civil status registering,
- ❖ Biddings,
- ❖ Citizen data Vehicle or land registration.

The private sector should be involved with the planning and realization of the projects. This will allow Tunisian enterprises to offer their expertise to the Government, and prepare to compete on international markets. Government should also reduce size of its RFPs (2M DT) in order to allow private ICTs participate in bidding for e-government projects. An awareness campaign to promote of the e-government amongst the citizens, as well as civil servants will be key success factor for the project. An efficient and competent human resource network, capable of managing the project should also have priority.

Measure #10. Make the private firms active elements in e-commerce

- ❖ Promote awareness amongst private enterprises of the benefits of the immaterial and the importance of information systems,
- ❖ Encourage enterprises to accurately estimate the requirements for assistance and implementation when acquiring software,
- ❖ Encourage the development of ASPs (Application Server Providers), allowing SMEs to rent software applications against a fee, rather than invest in software products.

Measure #11. Develop and introduce sectoral portals (tourism, textile, etc.)

The private sector, through industry associations should complement the efforts of the Government through the establishment of sectoral portals will provide the sectors involved with greater

international exposure, increase awareness amongst Tunisian enterprises of the importance of IT and facilitate the introduction of B2B, as well as B2C e-commerce.

Measure #12. Electronic payment

The development of e-commerce (B2C) will require introducing new methods of payment, to complete the e-dinar, such as:

- ❖ Authorizing electronic transfers by electronic signature,
- ❖ Introducing payments by national bank cards, for the development of national sites,
- ❖ Distribute international payment cards

The Tunisian postal service has an important role to play in the development of e-commerce, including: acting as a certifier, promote electronic payment (e-dinar) and provide logistics and delivering of packages.

V. Economic Impact of ICT Development

In the high-growth scenario, the **initial** growth impulse of ICT development will be felt on the **demand side** of the economy, through increased expenditure on telecommunications and IT services—partly driven by domestic, and partly by foreign demand. Progressively, the impact will be transmitted to the **supply side**, through cost and productivity improvements in a wide array of **ICT-using** sectors. Industries making intensive use of ICT services will benefit more. Eventually, increased investment in ICT technology across economic sectors will increase the effectiveness of production and marketing—thus fostering productivity growth.

Growth will be fuelled by increased ICT expenditures

In the short run, the impact of ICT development will be driven primarily by buoyant expenditure on fixed and mobile telephony services, as a result of lower user prices and to significant pent-up demand—especially for mobile services. The main supporting factors will be greater competition in telecommunications services, data transmission, and advanced media, which will expand the array of services provided to users in both the telecommunications and IT segments.

On impact, the share of the ICT sector **value added** in GDP could rise to about 4.9% by end-2006, up from 2.1% in 2000. Despite the boost to household income and business revenues from expanding activity in the ICT sector, the impact on GDP would be somewhat muted because other expenditures would be to some extent displaced by stronger spending on ICT services. Thus, on impact, the increase in the level of GDP would be of about 2 percent. However, overall economic activity would gain additional momentum thanks to greater ICT sector investment for the purpose of raising production capacity. ICT investment will feed back into increased demand for the output of other sectors, thus generating demand **spillovers** for the rest of the economy as well. On balance, total investment expenditure could rise by an estimated US\$400 million by end-2006, increasing the investment share in GDP by about 1.2%. With an estimated investment multiplier of about two, the level of GDP could increase, in total, by 4.4% by end-2006, **lifting the annual growth rate from 2001 on by 0.9%**. By contrast, in the low-case scenario, the increase in the annual growth rate would be about 0.2%.

Part of the benefits will stem from faster export growth, because foreign demand will be the main driver of software and IT-enabled services development. ICT development would boost Tunisian non-energy exports by an estimated US\$500 million by end-2006, so that about 13% of the increase in non-energy exports from 2000 to 2006 would be accounted for by growth in IT exports.¹⁰

Declining production costs will also spur non-inflationary growth

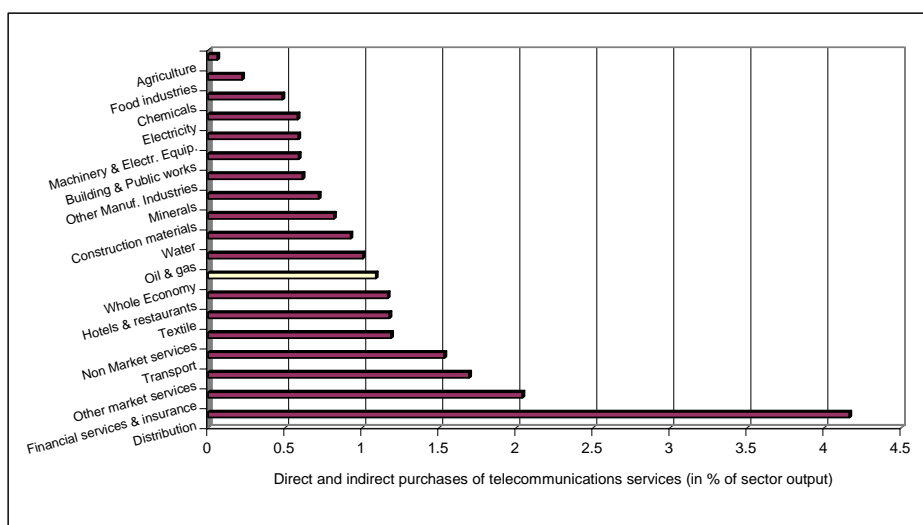
Beyond the demand-driven impact on GDP, ICT development will also generate supply-side benefits by reducing transaction and production costs of ICT-using sectors. In the projection period through end-2006 declining telecommunications costs, reflecting greater competition, hold the biggest potential for a sustained reduction in domestic production costs. International evidence suggests that greater market openness improves efficiency in telecommunications (Varoudakis and Rossotto, 2001), thus creating room for lowering the cost of telecommunication services to users

¹⁰ This calculation is based on the medium-term growth scenario for Tunisia, in the IMF Staff Report for the 2000 Article IV Consultation.

by as much as 50%. As telecommunications services represent 1.2% of total output (sales), producer prices for the whole economy could be reduced, on impact, by about 0.6%. However, business costs could be further cut in the medium term—by an estimated 1 to 1.2% on the whole—along with more intensive use of telecommunications services by businesses.

Industries that use telecommunications services more intensively would see their costs trimmed more sharply (Figure 3). The services sector, and in particular distribution, would benefit more with costs in retail and wholesale trade reduced on impact by as much as 2%. If healthy competition in distribution were to keep margins from rising, the reduction in costs would leave substantial room for lowering consumer prices, hence further raising the welfare gains from ICT growth. Overall, the stronger impact of lower telecommunications costs on the prices of key services will help tame consumer price inflation, because inflation in services is higher and stiffer than inflation in industrial goods and primary products.

Figure 3: Services would benefit more from lower telecommunications costs



Source: World Bank staff calculations, based on data from INS, Tunis.

Among services, finance, insurance, transport, and other market services (business services; real estate; repairs; health services; education) would benefit, above market average, with their costs cut between 0.8 and 1%. Hotels and restaurants and non-market services (general administration, security, etc.) would benefit about as much as the economy on average. Manufacturing, mining, and the primary sector would benefit less as they are less intensive users of telecommunications services. However, the textile industry is a notable exception, because the overall intensity of telecommunications services in production exceeds the average for the economy as a whole. Lower costs of telecommunications services will foster competitiveness in textiles and clothing—an industry strongly export oriented that faces increasing competitive pressure in international markets. Lower cost of services in distribution, finance, and communications would greatly contribute to reducing transactions costs across the board. Lower business costs and better competitiveness will spur supply-side, non-inflationary growth—although an accurate assessment of the growth impact would require a fully-fledged model.

Reductions in transaction costs will contribute to faster productivity growth in the long run

Looking further ahead, greater competition in telecommunications will reduce access cost to the Internet, encourage the expansion of backbone infrastructure, and support Internet penetration in Tunisia. With the spread of the Internet and IT applications such as e-commerce, there is ample

scope for further reductions of transaction and production costs, as demonstrated by the recent experience of Tunisie TradeNet, that has substantially reduced trade-related transactions costs. Better Internet connectivity and ICT applications will help businesses improve supply chain and inventory management, upgrade quality control, and adopt more efficient marketing techniques. Though in some sectors—such as textiles, finance and tourism—cost savings could occur earlier, overall cost reductions will become more widespread beyond 2006, in a third round of ICT incidence on growth.

ICT applications also facilitate international technology transfers, hence **speeding up** best-practice technology assimilation, and boosting the rate of **total factor productivity (TFP) growth**. Thus, while the growth impact of the initial rounds of ICT spillovers would progressively die out beyond 2006—because these effects boost the level of GDP in a one-off manner—more rapid TFP growth is likely to become the main driver of growth thereafter. In the high-growth scenario, the annual **growth rate** could increase by about 1% in the long run, closing much of the gap with the fast-growing global ICT market integrators.

A high leverage on employment creation

Although in the short term some labor shedding is likely to occur in the telecommunications segment as a result of public enterprise reform and greater market openness to competition, there is a large potential for offsetting job creation from the emergence of new operators and services. Experience in other developing countries is that aggregate employment in telecommunications companies grows following sector reform, while new employment is created by sub-contractors, suppliers, retailers, and others.

More importantly, faster GDP growth stemming from the economy-wide spillovers of ICT development could accelerate the pace of employment creation. With an estimated average elasticity of employment to GDP growth of 0.6, in the high-case scenario the 4.4% increase in the level of GDP would increase employment in 2006 by about 2.6%. By contrast, in the low-case scenario, employment would increase by only 0.7%. Thus, in the high-case scenario, about 85,000 additional jobs would be created through 2006 in the economy as a whole—including the 20,000 new jobs that are projected in the ICT sector. The unemployment rate in 2006 would decline by about 2.6 percentage points.

ICT sector development would thus **leverage** employment creation for the economy as a whole. While only about 4.3% of the *new* jobs generated from 2001 to 2006 would be in the ICT sector, 11.6 per cent of new jobs would be created thanks to faster GDP growth driven by ICT sector development. Therefore, in the high-case scenario, about **1 out of every 6 new jobs up to 2006 would stem from ICT-driven growth**.

Cost savings and faster productivity growth hold the potential to further foster employment growth, as they improve firm competitiveness and profitability, thus stimulating investment and job creation. But labor market flexibility is key to securing long-term employment dividends from ICT development. Job creation may be less responsive to ICT development if faster productivity growth is offset by steeply rising labor costs. Increased flexibility in human resource use will help firms take advantage of new business opportunities and facilitate reorganization of production.

VI. Risks

The path of growth suggested by this strategy provides for a strong expansion of domestic revenues from telecommunications services in the first two years and for an increasing growth of exports, especially in ICT-enabled services and software. In this respect, the strategy is well diversified across different classes of ICT services, and between domestic and international demand.

Notwithstanding this balance, the success of the strategy is exposed to four main risks:

- ❖ Success in introducing effective competition in telecommunications;
- ❖ Capability to implement adequate regulatory reform to allow sector growth and private sector involvement, especially in telecommunications;
- ❖ Adverse conditions in international ICT markets;
- ❖ Threat from regional and global competitors.

Success in introducing effective competition in telecommunications

This strategy is explicitly based on telecommunications growth as a precondition for rapid expansion of ICT revenues and as a basis for reducing the cost and enhancing the quality of the information infrastructure, a key input for the other ICT services.

There is some risk that, notwithstanding Government intention to open up its telecommunications market to competition, liberalization steps may fall short of the implementation timetable. Such concerns could be reinforced by delays in implementation of WTO commitments observed in the past, and in the award of the second GSM license in particular.

Delays in the introduction of effective competition in telecommunications would hold back sector growth. In fact, if telecommunications grows at the historic rate of growth of the 1990s, it is estimated that its revenues as a percentage of GDP will be only slightly higher than today, and this means a loss of about 2-2.5 percentage points with respect to the 8% growth objective set by Government. Additional negative impact on the rest of the ICT sector will be felt, since the expansion of telecommunications networks is an excellent opportunity for firms in the networking and software cluster to sell their services and increase the size of their operations, either directly or as sub-contractors of foreign suppliers. Additional negative effects will be in the development of the information infrastructure.

This risk is mitigated by the fact that competition is a major theme in the agenda for reform of telecommunications. At least for the GSM tender, there is expectation that competition will be introduced at the beginning of 2002. For the other licenses, there is more uncertainty. A risk mitigation tactic could be to publish a liberalization timetable for telecommunications and introduce more licenses early in the period, to display commitment to competition.

Capacity to implement adequate regulatory reform resulting in sector growth and private sector involvement, especially in telecommunications

Tunisia has certainly made some progress in the establishment of an adequate regulatory framework for ICT, with some areas of excellence and advance with respect to the rest of the region, such as e-commerce regulation. However, the Telecommunications Code has several areas

in which it could be improved. In addition, Tunisia is embarking on an ambitious reform of its regulatory framework with the establishment of different regulatory agencies. As shown in many emerging and developed markets, the transition towards independent regulation is often not smooth, due to institutional capacity constraints and political as well as industry pressures. Lack of capability to establish an adequate regulatory framework would have an adverse effect in terms of the capability to attract reputable international investors and might stifle competition. This risk is mitigated by the fact that Tunisia has already established a credible and successful agency, *Agence de Certification*, and is well advanced with the establishment of the two other agencies (*Agence de Fréquences* and *Institute Nationale des Telecommunications*). Attention should be paid to independence, technical and economic capacities, and adequate funding of INT. Some areas of regulation will also need attention in the coming years, such as interconnection, licensing, application of competition law to the Telecommunications sector, and IPR enforcement.

Adverse conditions in international ICT markets

Over the past 18 months, the outlook for growth in global ICT markets has been worsening rapidly. Global ICT growth prospects have been overcast by a sharp downturn in ICT capital spending in the US, triggered by declining corporate profitability in the face of an excessive build-up of capacity since the mid-1990s. And as the import content of US capital spending has increased dramatically in the late 1990s, the ripples from this downturn are being felt around the globe—especially in East Asian economies with tech-heavy exports. Thus, while until a year ago, the growth of the ICT sector was leading GDP growth in many countries, now it is bringing it down rapidly. What are the risks of the ICT downturn—often described as “e-crash”—for the Tunisian ICT sector development strategy, and what are the policy options to minimize these risks?

In the high-growth scenario, more than half of the projected 5 percentage points increase in the ICT sector's share in GDP would come from buoyant growth in telecom and networking services. As this growth will be driven by the domestic market, the overall downside risk from slower growth of the global ICT market is considerably reduced. Sizeable pent-up demand—as reflected in the small size of the mobile network in Tunisia, which falls short of comparators—would secure steady growth in the medium term. However, a pro-competitive regulatory framework is a key prerequisite to foster business growth in the domestic telecommunications market.

ICT-enabled services represent another 20% of the projected increase in the ICT sector's share in GDP. This segment could be relatively unscathed from the IT downturn, as it allows companies to trim down costs—which is key in the current context where corporations actively look for ways to boost profitability. The strategy report therefore attaches a rather low risk to the medium-term growth outlook of that segment, which should provide support to the Tunisian strategy. Growth of the software segment—which would be mainly export-oriented in the first stage of ICT development—faces more downside risks. With lower IT investment, software spending—which has held up well up until now—could be affected as well in the near term. But software exports account for only about 20% of the increase in the ICT share in GDP, so that the thrust of the projected growth is unlikely to be jeopardized.

On the upside, the downturn in IT spending (in particular, software) is likely to be short-lived, with a recovery projected in the second half of 2002, as growth resumes. And, importantly, the strategy is based on a medium-term scenario, with the current slump very much likely to be over by 2005. In addition, part of the growth dividend for Tunisia would come from the supply side, thanks to declining production costs from the usage of ICT services. These benefits will be “home-driven”, as they stem from reduced telecommunications and networking costs following liberalization.

Again, provided the right regulatory framework is put in place, the downside risks would be relatively limited.

Threat from regional and global competitors

Many countries are currently trying to position themselves as providers of ICT services to advanced markets (for example India, Brazil, Malaysia, Morocco, Israel, Dubai, most of Eastern Europe). A risk is whether Tunisia will acquire market shares in an increasingly competitive market.

There are several areas where Tunisia is at a competitive disadvantage. Examples:

- ❖ The cost of leased lines in Tunisia is higher than in Eastern European competitors;
- ❖ Israel has already over 20 well-run and successful incubators;
- ❖ India is a recognized leader in export of software and back-office services;
- ❖ Morocco has already started attracting significant investments in the call center business.

In many cases, **'first-mover'** advantage in technology positioning is crucial, and Tunisian firms will face tough competition. For this reason, it is not suggested to base its growth strategy on exports only. However, as exports will play a significant role, it should be underlined that: (a) even a gain of a small percentage share on an advanced ICT market would have an enormous impact on the Tunisian economy; (b) there are market segments, such as advanced media services, where few developing countries have any positioning yet; (c) Tunisian firms are well placed to develop partnership agreements with firms in South European markets (Italy, Portugal, Spain) that are enjoying a particularly high ICT growth rate, notwithstanding the recent global downturn.

In this light, the capabilities to develop quickly the image of Tunisia as a favorable business location for ICT investment and assist local firms in their networking efforts to establish business relationships with European consortia are key to the success of the strategy.

In view of the volatility of global ICT markets, and the downside risks associated with the near-term growth outlook, it is particularly important that a **balanced strategy** be pursued. Addressing these risks calls for further strengthening the domestic drivers of ICT development: e-government and ICT investment by domestic businesses. Injecting more competition in telecommunications and networking services holds the key to bolstering domestic demand.

VII. Recommendations for an Action Plan

The implementation of any strategy for ICT sector development poses serious challenges to Government authorities, both in developing and in developed markets. These challenges arise from the very nature of information and communications technologies embracing different sectors of economic activity and from the policies that affect areas as different as human resources, telecommunications policy, and financial markets.

In addition, a second challenge is the presence of many vested interests that are affected by the reform. “Pressure groups” with different interests typically include: different Government departments that advocate responsibility and oversight on the sector, national and international investors with different interests, trade unions, banks, and financial institutions. An example of how co-ordination is key for the success of the ICT strategy is the “e-Dinar” initiative. While *la Poste* has developed a payment system for e-commerce, the banks have expressed interest in developing a different platform. These differences have the potential to slow down progress, if they are not properly managed.

In many respect, the relative efficiency of the Government of Tunisia with respect to other countries in the region is to be considered an advantage. Nonetheless, it is strongly suggested that a specific effort be placed on the implementation of the strategy with specific attention to the following two implementation priorities:

- ❖ Coordination between different bodies of the Government;
- ❖ Involvement and occasional leadership of the private sector.

It is suggested that an Action Plan be finalized as soon as possible, with the establishment of a Commission for the development of ICT in Tunisia. The Commission could be led by the Ministry of Communications Technologies and report directly to the Prime Minister. The Commission would have several Action Groups in charge of the implementation of each of the priority measures of the strategy. Private sector actors representing local ICT enterprises would participate and in some cases lead the Action Groups.

Prime Minister of Tunisia		
ICT Commission. Leadership: Ministry of Communications Technologies (MCT)		
Action Group	Leadership	Members
<i>1. Introduction of Effective Competition in Telecommunications</i>	MCT	Ministry for Economic Development (MED), Instance Nationale des Telecommunications (INT)
<i>2. ICT Regulatory Framework</i>	INT	MED
<i>3. “e-Tunisia” Country Marketing</i>	Ministry of Commerce (MC)	MCT, MED, UTICA, ICT firms
<i>4. Technological Incubators</i>	MC, MCT	UTICA, MED, ICT firms
<i>5. Human Resources Upgrade</i>	Ministry of Higher Education (MHE)	MCT, Universities, ICT firms
<i>6. Venture Capital Reform</i>	Ministry of Finance (MF)	MCT, MC, la Poste, Private Banks, UTICA, ICT firms
<i>7. Support Measures</i>	MED, MCT	UTICA, la Poste, Tunisie Telecom, ICT firms

