CHAPTER 1

SOFTWARE INDUSTRY IN EGYPT: OPPORTUNITIES AND CHALLENGES

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ABSTRACT

The role, status and future of software industry in Egypt, have been largely misunderstood by most of the western world. The ecnomic, political and strategic significance of Egypt make technological lacuna about it inexcusable. Egypt is the most populous country in the region as well as one of the most internationally oriented computing community in the Arab world, and its trained people are among its most important high-tech exports. Egyptian Government has been undertaking an ambitious steps towards economic reform and technology development. Actions have been taken to support software industry in Egypt. This paper highlights the software potential in Egypt, its role in providing high quality employment for young people, its innovative software packages and its ability to fulfill regional and offshore development and service contracts. Challenges facing the growh and globalization of Egyptian software Industry and the notion of the information society and information- friendly environment is also discussed.

1. INTRODUCTION

The worldwide computer industry has been characterzed since its inception by continuous innovation, improvement, and rapid change. These developments have resulted in the growing importance of software, the programs that run computers and allow them to communicate with each other through data networks. Developing and newly industrialized economies (NIEs) seeking a share of the burgeoning global information industry are promoting the development of their software industries through a variety of policy and institutional measures. At the same time, a growing number of U.S. and west European software and non- software firms are beginning to develop software overseas, often for foreign as well as domestic markets [1].

The software industry is becoming an arena of worldwide competition. Measured by revenues, by the number of firms engaged in software development, and by the variety of available software, industry performance over the last six years has been extraordinary. Although data are lacking and not very reliable, it is estimated that the world market for software is increaing by 30 to 40 percent annually and could reach US $ 500 billion in 1999 [1].

Five major forces are now promoting rapid changes in the worldwide software industry: (a) A severe software personnel constraint, with software and software related support activities now accouning for the overwhelming percentage of total system costs; (b) The global battle for operating system standards; (c) The move away from single vendor solutions as the typical way for organizations to meet their information systems needs toward customized, integrated, multi-vendor hardware and software solutions; (d) The increasing emphasis on software production and sales by hardware vendors, leading to increasing concentration within the industry of large and medium-sized firms; and at the same time (e) An expansion and fragmentation of the industry in growing number of independent software vendors.

This paper examines the global software market, particularly the major trends in the international software industry. The paper then reviews the software development process in Egypt and its labor, education, and training requirements. New technologies will affect the entire software production process and will require a reorientation in thinking about investment and technological options. New organizational and software management practices are also being introduced into software firms in an attempt to control costs throughout the software engineering process, and to improve the quality of the products and an organization's process of developing software. The major software engineering problems of the future will require organizational solutions that: integrate advanced software development tools based on object oriented technology and knowledge-based systems; provide flexible policies to ensure the best use, education and training on these tools and new methods; and manage large system development projects. Some areas of software production, especially for export markets, may be more cost effective than others. Ways in which Egypt can exploit some of these opportunities are addressed. Software firms in Egypt still have some way to go, and their role in the international software industry is likely to quite modest at best. Specific strategies for building a competitive software industry or enhancing the competitiveness of that industry are also addressed.

Egyptian software companies are gaining recognition throughout the Arab world as producer of high quality, leading edge products. Yet this recognition is still a far from what is deserved. Despite their proven excellence in software innovation and quality, on the whole Egyptian software companies are not entrenched in the world-wide arena. In fact, due to relatively small local Egyptian market, it is essential for Egyptian software companies to effectively reach export market, in order to achieve growth and acquire market share. While many of Egyptian smaller software companies are still focusing on local markets, export markets typically account for well over 60% of product sales among Egyptian larger and most successful software companies, like Delta.

While a world-wide presence is the ultimate goal, the US market represents the most immediate and logical opportunity. Barriers related to language, trade, and standards can be overcomed compared, for example, to Europe and Asia. Furthermore, this market not only repersents enormous revenue generating potential, it has a voice that is heard throughout the world. Products that are successful in the US typically have more chance to succeed elsewhere. Market acceptance of a product in the US means almost instant recognition worldwide. The strategic importance of the US market is fully understood in the Egyptian industry, but what is less obvious is how to succeed and continue to succeed in it. One major challenge is to have in place effective distribution channels.

Small and medium-sized Egyptian software companies need useful input to their marketing and distribution strategies, by identifying the trends affecting the distribution of software products in the United State and Worldwide, and assessing their impact on the use and effectiveness of distribution channels, developing strategies for success, and practical conclusions and recommendations. The results are based upon in-depth secondary research, interviews with representatives of software companies, channel organizations and industry associations in Egypt, US, and Europe as well as analysis by industry experts at Egyptian Software Association (ESA) & and Egyptian Society for Information System And Computer Technology (ESI-SACT).

2. PATH TO INTERTIONAL SOFTWARE DEVELOPMENT

Egypt is expected to take a clear path with regard to international Software development. This path has four distinct stages [2]. and each stage offers some interesting opportunities.

2.1 Stage 1 : Export of Labour, i.e. Live in Contract Programmers

At first, teams of Egypt programmers will be knocking on doors, offering to develop software with teams located at the customer's local site. The primary advantage to this approach is low price. Even with the overhead of travel, lodging, and administrative expenses, the client often finds that he or she is paying only half the cost of a comparable American/European work force. In some cases, cost is not as important as availabilty. If the project involves an advanced technology (e.g. using Visual C_{++} for a client/ server application), it may be difficult for the client to find available talent in the normal labor pool.

There is also issue of stability. Offshore programmers are less likely to quit and take another job in the middle of a critical project. Most of the problems associated with the first stage of development within the software industry are obvious: The overhead expenses reduce the competitive advantage of lower salaries, without providing any benefit to the client or the software vendors. Visas and work permits can involve enormous red tape, and the delays may be unacceptable to a client with a tight deadline. Language problems, cultural differences, and the difficulty of trying to maintain a live-style comparable to the higher-paid U.S/ European colleagues with whom the foreign programmer is working. All these are obvious but predictable problems. Similarly, the client will often express strong hesitation about hiring a foreign programmer without an on-site interview. This poses a financial risk for either the Egyptian vendor or the client, depending on who pays the travel costs.

A more subtle problem involves the "brain drain" from Egypt. In the long run, perhaps the U.S./Europe should be rejoice in the fact that its software industry is becoming a "melting pot", just as its manufacturing industries did throughout the nineteenth century. But national planners in the Egypt and other developing countries are very concerned, they are losing their best and brightest mind, because many of the programmers who go to the U.S./Europe for software project never come home. (Ironically, Egyptian government seems actually encouraged this practice in other fields, because expatriate workers typically send home a steady stream of cash to their relatives. This was judged to be a more effective way of bringing hard currency into the country than such traditional mechanisms as building a factory).

2.2 Stage 2 : On- site Analysis, Offshore Code

The second stage involves having a small group of systems analysts who will work with the customer, on-site, to define the system requirements, which they then transmit back to programmer in the home country. Most of the first-stage offshore players are planning to move in this direction. Using a small number of onsite analysts saves considerable transportation and overhead costs. Having home-country software engineers implement the design also minimizes the brain-drain problem and allows the Egyptian firms to begin buiding its own infrastructure and long-term expertise in software technologies. The problem and the disadvantages of the second developmenttal stage are obvious: End users are reluclant to trust an offshore firm several thousand miles away with the development of a missioncrtical system. It's often not clear to the customer whether the software developers will understand the nuances of his or her requirements, nor is it clear how well developers can respond to ongoing changes in those requirement.

The second stage, however, isn't an all-nothing proposition: It work in some instances, not in other. It's particularly good for certain kinds of systems programming projects, where the interface and the end results are well understood and clearly defined.

2.3 Stage 3 : Offfshore Generic Software, i.e. Package Exports

The third stage in the growth of the offshore software industry is the development of generic software products such as word processing packages, spreadsheets, and database programs, generic applications that can be marketed both in the home country and in the rest of the world. This stage often begins with the Egyptian software developers producing software for their local markets. Stage 3 becomes more interesting when the software developer in Egypt decide to bring their software to the North American/European marketplace. Obviously, the same kind of problem can exist when dealing with any other market that already has an advanced, computer-literate user population. Even if the new software is bug-free, the developer's cultural assumptions and trappings may cause problems.

But the real problem involves marketing. The cost to bring even the smallest PC application into the American marketplace for example, can be daunting enough for the Egyptian start-up software company.

2.4 Stage 4 : Exploiting Home-Grown Expertise

The fourth and final stage in the development of a software industry involves the development of product that take full advantage of the native country's unique areas of applications expertise. There are many unique applications that originated in Egypt, all of them involve indigenous applications expertise that is completely independent of software technology per se, and all are being packaged as commercially salable product. Egypt has built some wonderful multimedia applications to catalog. manage, and display its vast treasure of historical artifacts [3]. These applications are likely to be far more sophisticated than anything Americans would build in the U.S.

Ironically, Eygpt has also built some of the world's most sophisticated financial applications for manging its vast array of loans and financial-aid packages from numerous countries, international agencies, and relief organizations. Other third-world countries might find such applications quite useful, and they certainly won't find anything like them in the cataloge of Borland, Apple, or Microsoft.

3. OPPORTUNITIES IN LONG-DISTANCE SERVICES

As service industries rely increasingly on IT, they tend to become more dependent on capital and human-capital inputs. This has led some analysts to suggest that developing countries like Egypt cannot compete internationally in services and that policies to liberalize trade in services would limited interest to them. This view is mistaken. Developing countries are already carying out areas of comparative advantage in IT- based services, a process that will continue to evolve. Moreover, liberalization is not only about expanding exports; even more important is its role in helping domestic producers gain access to more efficient and diversified services in world markets [4].

There remains much scope for expansion in Egypt traditional service export areas (e.g., tourism). A new area of special promise is long- distance services. Data entry was one of the first service activities to be internationally outsourced. This type of activity requires only a low level of computer literacy and limited interaction between the customer and the supplier. The customer mails paper-based data forms or sends scanned images of data forms electronically to the foreign provider for processing. The supplier sends the computerized data back via telecommunication lines or by mailing magnetic tapes. Countries in the Caribbean have been quite active in exploring the market for offshore data entry.

Software programming is another activity that is increasingly traded across borders, with subsidiaries or partners overseas entrusted with developing software that is transmitted electronically back to the parent company. For example, many leading international computer and software companies have set up R & D and production operations in Bangalore, India. The Indian software industry, which is growing rapidly, generated revenues totaling more than $500 million in 1993-94, two-thirds of which came from exports. It it estimated that India has captured roughly 12 percent of the international market for customized software [4].

There are no precise estimates of the size of the market for long-distance services that can be captured by Egypt. The fact that a significant share of these transactions take place at the intrafirm level clouds the picture. However, rough estimates suggest that 15 percent of the employment in services in industrial countries may be internationally by developing countries. The potential impact of the globalization of services in terms of job displacement in industrial countries does not seem very large. But, from the perspective of developing countries, the potential impact in terms of higher exports over the long term is significant, possibly as large as their current total exports of commercial services. There are important niches in the market for long-distance services that can be successfully exploited by Egypt with a literate work force and a modern telecommunications system.

It is important to note that markets for these services are sensitive to technological change. Long-distance services in data entry, for example, are expected to continue to expand in the near future, reflecting the continuous fall in communcation costs. Progress in optical recognition technology and the development of online services for credit card and check clearing, however, can significantly affect the need for data entry in the future. These services may lose some of their dynamism as they are displaced by innovations in software and scanner technology in the industrial world. Nonetheless, the increasing number and diversity of information-intensive jobs, the technical feasibility of new long-distance services (e.g., in remote clerical support). and the dynamism of Foreign Direct Investment (FDI) flows and of the global demand for software suggest that the overall market for long-dictance services will continue expand [5].

While creating possibilities for new exports, the internationalization of services is important also for Egypt as importers of services, Long-distance access to the "floating pool" of nonproprietary knowledge, for example, is being revolutionized by computer-mediated networks, such as the Internet. Electronic bulletin boards are becoming more sophisticated and increasingly effective as instruments for the transference of knowledge and for technical assistance. They can now combine text, voice, images, and video and their use may significantly alter the prospects for human capital assumulation in Egypt and other developing countries in the next few years [5].

4. CAPTURING THE OPPORTUNITIES

To capture the opportunities offered by the internationatization of services, Egypt will need to adapt their regulatory environments and develop supportive physical and human infrstructure [4,5,6,7].

4.1 Liberalization and regulatory reform.

Liberalizing the import regime for services is central to achieving increased efficiency and competitiveness in the provision of services. It allows businesses to import services that are not produced domestically or that are not available at a price and quality required for competitiveness. Liberalization also fosters efficiency by increasing competitive pressures on domestic producers of services. Because of the nonstorability of many services, Foreign Direct Investment (FDI) is the major mode of international delivery of services. Lowering barriers to FDI, therefore, is crucial. Increasing recognition by Egypt of the need for such reform is reflected in the liberalization packages encompassing the services sector that many of them have unilaterally initiated in recent years. Yet most service activities continue to face a more restrictive regulatory regime than do goods.

Border policies account for only some of the impediments to internationalization. Services are regulation-prone, and the domestic regulatory environment can create additional barriers to international competition (state monoplies in service industries, legal barriers to entry in economic activities, price controls). Domestic deregulation is often a necessary complement to the opening up of the foreign trade and investment regime. Also, differences in regulatory environments for service industries across countries may restrict access on a de facto basis (for example, different standards for accreditation of professionals). Accordinggly, effective liberalization may also require harmonization of regulatory practices among major trading partners (e.g., as pursued in the context of the Single Market initiative in Europe).

Alongside unilateral liberalization of services, countries are pursuing liberalization though reciprocal negotiations. An important achieverment of the Uruguay Round is the adoption of the General Agreement on Tarde in Services (GATS), which extends multilateral rules and disciplines to services. Several recent regional integration arrangements have also included liberalization of services.

The GATS covers four modes of international delivery of services: cross-border supply (e.g., transborder data flows, transportaion services); commercial presence (e.g., provision of services abroad through FDI or representative offices and branches); consumption abroad (e.g., tourism); and movement of personnel (e.g., entry and temporary stay of foreign consultants). It broadly follows the GATT (General Agreement on Tariffs and Trade) tradition, emphasizing nondiscrimination [Most-Favored-Nation (MFN) and national treatment] and prohibiting policy instruments that resemble quantitative restrictions. It innovates, however, in covering transactions associated with commercial presence (that is, establishment trade) and introducing a concept of market access that encompasses nonborder restrictions (e.g., limitations on the type of legal organization under which foreign providers can operate are, in principle, prohibited).

Unconditional MFN is a basic obligation of signatories, but MFN exemptions are allowed. Market access and national treatment, in turn, are specific obligations under the GATS. They apply only to the service industries and activities specifically listed by the country in its schedule of commitments, at the level of each mode of supply and subject to the limitations made explicit in the offer. The GATS adopts a positive list approach with respect to sectoral coverage of service industries -- that is, only the industries scheduled in the offers of the negotiating parties are subject to GATS discipline. This practice is less transparent than the negative list approach adopted, for example, in the North American Free Trade Agreement (NAFTA), in which all service industries are covered unless specifically exempted.

The complexity of the agreement (with offers made by service activity and mode of supply) renders it difficult to make a comprehensive evaluation of the economic value of the offers and their liberalizing impact. In terms of industry coverage, developing countries covered a smaller subset of service activities in their offers than industrial countries. Tourism and travel-related services were the only activities in which a substantial number of developing countries made commitments. Commitments in the area of communication services -- an area of critical relevance for countries interested in pursuing outward-oriented strategies of development were quite limited. These commitments are mostly related to value-added telecom services (e.g., data processing, electronic data interchange) but cover less than 20 percent, on average, of the service activities negotiated under this category.

The liberalization of trade in services actually achieved under the Uruguay Round seems rather limited at present. However, while the immediate liberalization may be limited, the agreement paves the way for future multilateral liberalization. The framework agreed provides for continued negotiations to be completed over a two-year period, and nothing constrains members from undertaking further unilateral liberalization, provided it is consistent with the multilateral disciplines established by the GATS [8].

4.2 Other supportive policies.

The services revolution places a premium on the development of a competitive telecommunications system. Most developing countries, are hard pressed to meet the demand for even basic telecommunication services. and investment in networks for value- added services may be considered an unaffordable luxury. However, technology now allows a country to develop a dual structure for telecommunication services: a country can invest in low-cost, dedicated networks for business needs in parallel with expanding the basic infrastructure. The private sector can play a leading role in this process, as it has been applied recently in Egypt.

Providing access to modern, high-quality communication services is not enough. Countries can be at a competitive disadvantage in long-distance exports because of non-competitive pricing of telecommunication services. (This has been the case for Eygpt and Eastern Caribbean countries). The use of alternative means of telecommunications (e.g., low-cost satellite stations) may be inhibited by monopolistic practices of the basic telecmmunications providers. Establishing a competitive framework for the provision of telecommunication services is therefore necessary.

Another important constraint faced by developing countries concerns the quality and relevance of the training of their work forces. In-house training can partially mitigate the shortcomings of the formal educational system in preparing workers to use IT in service industries. The main challenge, however, is to make the general population receptive to technological change. As economies become more service-intensive, workers must be retrained more frequently, and their performance becomes more dependent on access to IT. Accordingly, the diffusion of computer literacy shoud receive special attention in education strategy which in already the case in Egypt.

In sum, most dynamic trade routes of the twenty-first century will be dominated by transactions in intangibles rather than goods. Service industries will be responsible for the "roads" of the global "infostructure" and they will be the main providers of the content to be traded via electronic means. The adoption of a liberal trade and investment regime is essntial for countries to maximize the benefits to be derived from the internationalization of services and to move toward the information age. This is particularly true for developing countries especially Egypt.

4.3 Information Technology : The cutting Edge of the Services Revolution

The convergence of computer and communication technologies is promoting the development of computer-mediated (or electronic) networks. These networks are formed by systems of computers and communication hardware, and software that allows users to communicate and transmit data and other types of information. As digital switches -- computers replace electromechanical switches, and integrated services digital networks (ISDNs) emerge, the technical feasibility of new value-added services expands rapidly. Falling prices for hardware and software generate a positive feedback effect as the demand for network services is affected not only by prices but also by the expected size of the network [9,10].

This expansion is expected to accelerate as the cost of communication bandwidth (the capacity to transmit more bits of information simultaneously) continues to fall. Moreover, the cost of communication is becoming independent of distance, and networks are becoming more international. Transnational corportions, for example, are actively building international dedicated networks to address their communication needs. Egypt is paying great attention for the expansion and enhancement of the communication infrastructure [9].

5. ROLE OF EDUCATATION AND LIFELOGN LEARNING

Education pays rewards to an individual for an educational investment include more employment options, higher income, and better future prospects. Education is the best route to improved status for work force worldwide. The need for continued education and training persists throughout a person's career. Export of low-skill jobs requires primary education of good quality, including language skills. India's large English-scientific and technical pool, give them the capability to team up with American firms to develop new products and processes for world-wide commercial applications. Export of high-skill jobs requires advanced and lifelong training. Information systems have supporting roles in education-efficient administration, low-cost delivery, and production of appropriate educational materials. Computer-based training is an effective tool for lifelong learning.

Education correlates with employment, income, and opportunity. In industrial countries, the well-educated are more likely to be employed. In the US in 1989, unemployment was 9.1% for persons with high school or less education and 2.2% for those with college degrees. In Japan, these figures were 7% and 2.3%. The well-educated earn more, and the gap is widening. In the US in 1980 the earnings gap was 30%; in 1988 it was 86%. The well-educated land jobs that provide them with more training; the uneducated are locked out of opportunities to improve their skills [11].

Distance education in Africa has been used to pursue entirely conventional educational ends. Its main advantages: economy, flexibility, and suitability for widely scattered student bodies [12]. Egypt is paving the way towards long distance education as an effective means of providing quality education.

The Globe program is a good example of distance education. It is a world wide science and education program coordinating the work of students, teachers, and scienists to study and understand the global environment. Globe is an international partnership involving countries around the world to: increase environmental awareness, contribute to scientific understanding of the Earth, and help students everywhere reach higher standards in science and mathematics [13].

6. NEEDS AND MEANS TO IMPLEMENT A MAJOR ADJUSTMENT AGENDA

It is easy to get excited about the opportunities, but the information revolution dictates new needs for Egypt that must be addressed, whether exciting or not. Fortunately the information revolution also provides the means to address this urgent agenda of adjustments.

Egypt and other developing countries will pay a high cost if lag behind. Without fast and successful adjustment, a software industry in Egypt can be hampered in many ways: Local software production may be less competitive in international markets against better quality, lower-priced, and more flexible products, especially one's that come from India, Malaysia, Philippines, Chian, Colombia, Korea and Singapore. Productive software firms might lose market share due simply to inability to connect to international trading networks and to participate on equal terms in markets. Research and development might stagnate without convenient access to international science networks.

There is a real and present danger of deepening inequity of access to information both within and among countries. The information revolution confronts countries with a major new equity issue, not of wealth but of information. If the adjustment agenda does not lead a country toward widespread access to information services, those without access will face a double hardship, lacking both information and economic opportunity.

6.1 Strategic consensus among partners.

Government, the private sector, local communities, non-governmental organizations, and international organizations such as the World Bank Group all have a role play in creating information economies in Egypt. The broader and more effective the partnerships among these agents, the faster the adjustment will accur. The most important role of partnerships is to create consensus on strategic priorities and commitment by the various stakeholders to a national strategy to create or enhance information infrastructure in Egypt. A national strategy must include identification of the sectoral reform policies and strategic investments needed to deploy the infrastructure as well as priorities for implementation. Reaching strategic consensus is a difficult but very important initial step toward an information economy.

Government action and reform can build competition. Private sector competition fueling growth of telecommunications and information industries could not have taken place in advanced countries without complementary government action and reform. Nor could have development of national infrastructures, without public investment in certain critical areas (such as R & D) or changes in laws and regulations.

Asian informatics strategies have public and private support. Taiwan identified production of PC clones as a strategic industry. Japan's Sigma project to expand software tool usage and common development platforms is a public/private partnership. Singapore's trade system initiative into an informatics strategy [14, 15].

6.2 Creation of an information- friendly environment

Characterized by coherent telecommunications reform and information policies; laws protecting investment, intellectual property, and individual privacy; open and well-regulated information and communication markets; education policies that favor a skilled labor force; and effective regulatory and standard-setting institutions. Such an environment supports availability, diversity, and low cost of information services and products. Clearly, the task of creating such environment falls to not but all of the partners for development [16].

6.3 A national information infrastructure

Consists of both the telecommunications networks and the strategic information systems necessary for widespread access to communicatiôns and information services. Deployment of this infratructure is a task of ten years or more and billions of dollars in Egypt and most developing countries. It is possible only through the efficient functioning of national and international markets for financing, engineeing, and management services. An information one friendly environment is a precondition for investments. While the role of the private sector is paramount, the government and often international organizations such as the World Bank Group also play key roles as legislators, regulators, advisors and guarantors.

There is a correlation between telecommunications investment and economic growth. A study by Hardy of 60 nations from 1960 to 1973 showed a causal relationship in both directions. Of course telecommunications investment increases as an economy grows, but there is also a small but significant contribution of telecommunications to economic growth. A causal relationship did not hold for radios. It was therefore postulated that the organizational impact of telecommunications contributed to economic growth. The study also found that the economic impact was greatest in countries with low teledensity (telephone lines per 100 persons) [17].

Rural telephone switches are being produced by and for India. In 1980, India had fewer than 2,500,00 telephones. almost all of them in a handful of urban centers. The country had only 12,000 public telephones for 700,000,000 people, and 97% of India's 600,000 villages had no telephones at all. India was using its priceless foreign exchange to buy the West's abandoned technology and install obsolete equipment. The technological disparity was getting bigger, not smaller. By 1987, a three-year effort by many of India's great young engineers had produced a series of telephone switches, manufactured in India to international standards, and adapted to village use. The 128-line rural exchange was housed in a metal container, cost about $8.000, required no air conditioning, could be installed in a protected space in the village, and would switch phone calls more or less indefintely in heat, dust, and monsoons [18].

The costs of telecommunications are falling, according to desk research and case studies from 26 developing countries that explores options for commercial supply of rural telecommunications. Capital costs per line for the most appropriate technology remains high but are falling: $1000 near urban areas and $2000-3000 in rural areas. This kind of service can be commercially feasible with annual revenues per line around $400 (urban) or $800-1200 (rural). The proposed strategy for serving villages and rural population centers, which is derived from a broad consensus of world experience, is to provide lines to : (1) institutions and businesses whose estimated call revenues exceed incremental cost of supply and (2) public pay-phones [19].

The emergence of the global information infrastructure presents an extraordinary opportunity for Egypt and other developing countries, sometimes called telecom lite. The new infrastructure is characterized by a variety of low-cost options for local connections, competing global operators for long-distance services, digital transmission, and low-cost, reliable, simple network access with increasingly sophisticated terminals. The model for the telecommunications infrastructure allows developing countries to leapfrog the industrial world's enormous investment in wired local loops, the most expensive part. Egypt can provide better service at a much lower cost per subsriber. With radio and satellite options for the local loop, widespread deployment of telecommunications becomes affordable, and Egypt can have the technical support to coexist with commerce in the information age [20].

The growth in telecom lines in developing countries in shown in figure 1, and in figure 2 the average annual telecom investment in developing countries is shown [9]. Telecommunications investment in less developed countries has been and will be massive. Regional codes are as follows: NIS Newly Industrialized States of former Soviet Union, ECA Eastern Europe and Central Asia, LAC Latin America and Caribbean, AFR Sub-Saharan Africa, MENA Middle East and North Africa, SAS South Asia, EAP East Asia and Pacific. Data for charts from [9, 10].

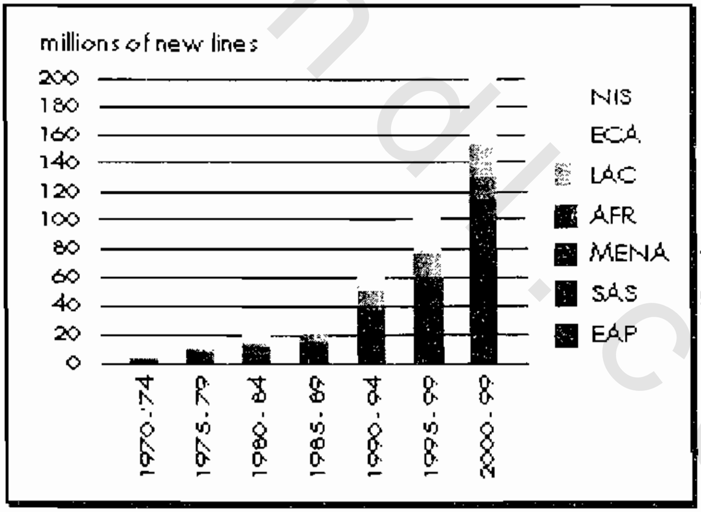

Figure 1: Growth in Telecom Lines in Developing Countries

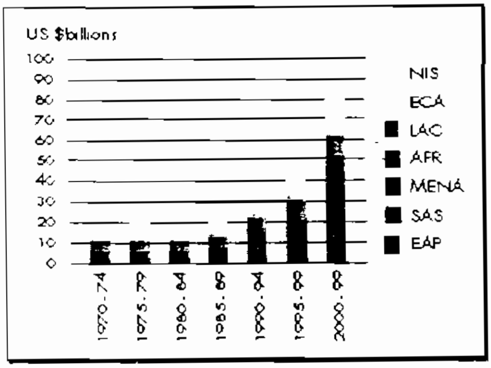

Figure 2: Average Annual Telecom Investment in Developing Countries

6.4 Strategic information systems for Egypt

Should include sector-wide information systems for education, health public sector management, and transportation. Electronic payments, education and science networks, trade facilitation, disaster prevention and management, and national statistics might also be defined as strategic systems.

An information system provides a societal capability based on the use of information that encompasses its full context of people, institutions, policies, processes, incentives, data. information technology, and infrastructure. A strategic information system provides a fundamental capability of such importance that it can enhance the scope and efficiency of an entire sector and economy.

6.5 Meeting new demands for education and training

Demand for specialized information professionals, computer, computer literacy throughout the workforce, and lifelong training are challenges for most countries in the face of rapidly changing technology and shifts in job mixes. Meeting the demand will require the efforts of universities, private companies, training institutions, computer societies, and accreditation councils.

Effectiveness of telecommunications technologies for secondary and post-secondary education has been fairly well documented. Research on the costs and benefits is much more limited. Hewlett Packard provides interactive voice and data communications in more than 100 classrooms worldwide, and estimates that its system delivers training at one-half the cost of traditional classes [17].

Some 10.000 schools in the US have a networked computer Lab. Increasingly, they are linked nationally and internationally. National Geographic and other have used networks to conduct experiments and aggregate data [21].

A World Bank report on the East Asian miracle discusses education: "Investments in both physical capital [for education] and schooling contribute significantly to economic growth. An increase of 10% in the primary or secondary school enrollment rate would raise the per capita income growth by 0.3%. Primary education is by far the largest single contributor to the HPAEs' [High Performance Asian Economies] predicted growth rates. Between 58% (Japan) and 87% (Thailand) of predicted growth is due to primary school enrollment. Physical investment comes second (between 35% and 49%), followed by secondary school enrollment. Far and away the major difference in predicted growth rates between HPAEs and Sub-Saharan Africa derives from variations in primary school enrollment rates. Education is the main theme of the story of the difference in growth between Sub-Saharan Africa and the East Asia high performers [22].

6.6 Developing of sectoral information networks

Social networks based on electronic communications are needed to enable alliances that connect institutions in agriculture, education, health, banking, industry, and other sectors. Once operational, these networks multiply opportunities for technical cooperation, research, coordination, information sharing, and private transactions.

Electronic customs clearance, transpotation arrangements, and other electronic commerce capabilities have reduced import and export transaction costs substantially for many countries. More than 60 commercial, educational, non-profit, and government entities in the U.S. have joined CommerceNet, formed in April 1994 to facilitate the use of an Internet-based infrastructure for electronic commerce to allow efficient interactions among customers, suppliers, and development partners to speed time to market and reduce the costs of doing business.

Toolnet is a network for small scale development projects that fosters exchange of information, experiences, expertise, and solutions to technical problems. It provides multifunctional electronic mail to link field workers, local organizations, technological institutions, international development organizations, and individuals to each other and to national and international networks. It is sponsored by TOOL, a non-profit organization in the Netherlands directed toward technology tranfer to and among developing countries. Toolnet Access Points are operating or planned in about 25 countries worldwide [21].

The Minitel network in France connects nearly 30 million private and business subscribers in France through 6 milion small terminals operating through the normal telephone network. It carries about 15.000 differnet services, which have created around 75.000 net jobs. It has indirectly helped to create 300,000 new jobs boosting efficiency and competitiveness.

6.7 Creation of consortia for advice, investment, and research

Social networks and consortia have systematically addressed market failures and externalities in the supply and diffusion of information technology through financing of prototypes and large investment projects. advising on intangible investments related to physical investments. and sharing of best practices among enterprises. These are enabling conditions for program impact and wide diffusion of information technology and its benefits.

Science networks are supplanting journals. A daily wire service is operational for preprints and live reports by researchers in more than 10 disciplines in science and mathematics. About 20.000 e-mails flow daily to more than 60 countries with abstracts of new preprints and research reports. Thousands of full papers are downloaded daily [23].

Printed scientific information has been doubling every 12 years. Journal subscrption prices doubled in 8 years. A 1994 directory lists 440 electronic journals and research newsletters. up from 110 in 1991. Proponents and some agreements are emerging on electronic low-cost dissemination of scholarly work, but not yet agreement on refereeing. scholarly priority, journal of record, and other issues traditionally resolved by print journals. Scholarly journals could become an anachronism. In this change is an opportunity for Egypt and other developing countries: Participation in international research will depend on ideas. results, and evaluations by peers, not on location.

7. INFORMATION SOCIETY CHALLENGES

7.1 Constraints and hazards that must be recognized

The information revolution fuels change of remarkable pace and scope, but also of remarkable unevenness. Failures and horror stories litter the history of the information industry. Even the success stories, when scrutinized, reveal formidable social and technical complexities. The power of information technology, which has so much potential for social good, can also be harnessed for selfish, dangerous, or even destructive ends.

7.2 Social and technical complexity

Developing and deploying information systems and telecommunications capabilities is socially and technically complex. even in the face of technoligical advances and obvious potential benefits. Countries need to marshal substantial resources, often from abroad, to accomplish this task. They need to establish effective incentives and management schemes to facilitate adoption and effective use of new systems.

The transferring of investment and operation responsibility for the telecommunications infrastructure from the public to the private sector is an urgent and particularly complex task. It involves sacrificing local short-term revenues and control to gain the investment volume and service improvements that a competitive private sector can supply.

From 1989 to 1994, the Ministry of Finance of Kenya built a public financial accounting and budgeting system. Creation of this system ran into difficulty in recruiting technical staff- a problem typical of developing countries. A training program was developed to train computer programmers, develop, their organizational skills, and instill in them the importance of accountability. As team-work is uncommon in Sub-Saharan Africa, the training emphasized the critical role of teams in developing and maintaining complex systems. The six-month programs produced 20 programmers at a cost of appoximately US $3,000 per person. Turnover rates, however, stood at about 50% [24]. Japan is just beginning to go online and few companies have taken the information technology route. It is estimated that just 8.6% of all personal computers in Japan are hooked into a network of some kind, compared with 52% in the US. This may be partly due to different attitudes on information sharing. The US is far more comfortable with putting information out- giving access to anonymous people and being non- hierarchical. That's not customary in Japan. To address this problem, Nippon Telegraph & Telephone and researchers at Stanford University's US- Japan Technology Management Center co-sponsored Japan Window, an electronic information service offering Internet users access to information on Japanese technology, science, business, industry, government and culture and allowing Japan to learn about the Internet by developing software products [25].

7.3 Waste and misallocation of scarce resources

In the absence of appropriate policy incentives, adequate quality stanards, and competitive discipline, a society could allocate scarce development resources to information infrastructure investments that create waste or perversely increase social inequality. Such is the case when telecommunications services are available only to the urban rich, when incentives favor use of technology more for recreational than productive purposes, and when an excessive share of investments are directed toward military purposes.

Wasteful information infratructure investments also can occur because of inadequate definition of the expected benefits and inadequate measurement of the actual results. Benefits in terms of societal capabilities and institutional objectives can be and should be defined for projects, but it is very complex to measure the results objectively, and it is tempting to hide behind alleged intangible benefits.

Bank projects show mixed experience with information in Africa. Government agencies are the dominant users of information technology (information technology) in Africa. As in the industrial countries, the returns of the use of information technology are mixed. Analysis of 76 World Bank projects in Africa including Egypt shows that government and aid agencies alike need to make more intensive efforts in the design of projects with information technology components. Specific examples of information technology use in Egypt show the core constraining factors to lie in limited human and organizational capacities [26].

7.4 Cultural preservation versus social disruption

An information society Should both benefit from and contribute to worldwide cultural assets. A balance should be maintained between import of artistic, recreational, and educational products and local generation and consumption of culture-enhancing products. Without that balance, the information revolution could weaken the cultural ties that bind communities and nations. The information revolution greatly facilitates production, publishing, and international dissemination of cultural products by individuals, citizen groups, and communities.

Enhanced access to telecommunications and broadcasting creates opportunities for those who would enhance culture, society, and human life, as well as for those who would diminish or destroy them. Social control through information censorship is unworkable, yet information technology creates threats to individual privacy. Advocates of a benevolent and fair society must accept new responsibilities for influencing access to communications.

7.5 Social and employment inequities

Information technology has an increasing capacity to capture the knowledge and expertise required for many human tasks and to repeat those tasks with an unprecedented degree of speed and precision. This capacity constitutes a singularly powerful force for transformation of the employment landscape for both high-skilled and low-skilled jobs.

Many low-skilled jobs will be lost. Others will migrate to the lowest bidder Countries can compete for the migrating jobs, but they must mainly count on massive retraining to raise the skill level of the workforce as a whole. High-skilled jobs will increase their wage differential, but the information revolution will reduce the number of jobs in this category as human skills are increasingly automated. Furthermore, a shrinking pool of highly effective suppliers who best master technology and knowledge for competitive advantage will perform many of the remaining jobs.

An extreme problem of managing change affects individuals, firms, professions, and countries. Even in the best of circumstances, the transition will put some industries and countries at a severe disavantage. This transformation of employment reinforces the urgency and strategic importance of education and the need for lifelong learning at all levels.

Both theory and evidence suggest that in the long run new technology should create more jobs than it destroys. But the long run can take a long time. Unfortunately there may be prolonged lags between job losses and the creation of new jobs. And the new jobs may anyway be inappropriate for the displaced workers. Governments can help by making workers more adaptable through improvements in education and training and by removing obstacles to free markets in labour and in goods and services.

8 . CONCLUSION

The Software industry of Egypt may have a chance of becoming the Second Garments Industry, both in terms of the social change that it can bring and also the economic boost that it can give to our economy. The industry has the highest possible ROI. The growth of training centers also points to the fact that there is a healthy demand from the people as well as the industry. We should and we can sell our Software worldwide, but there is a long way ahead.

We need to educate more people and support lifelong learning. Make governments more efficient, accountable, and transparent. Increase effectiveness of economic reforms. Monitor and protect the environment. Reduce information and income inequalities. Overcome natural disadvantages. Diversify into information-intensive industries. Promote small and medium enterprises. Participate in global trade and competition.

Also, an information-friendly environment must be created. An information infrastructure must be deployed. New demands for education and training must be met. Sectoral information networks must be developed. Consortia for advice, investment, and research must be created.

Constraints and hazards of information society must be recognized. Social and technical complexity. Waste and misallocation of scarce resources. Cultural preservation and social disruption. Social and employment inequities.

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