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USAID / EGYPT / HDD

ICT PENETRATION AND SKILLS GAP ANALYSIS

BY:
MOUSTAFA EL-GABALY AND MEHDI MAJIDI

JULY 2003

IT CLUSTER

ICT PENETRATION AND SKILLS GAP ANALYSIS

SECTION I:
ICT SKILLS GAP IN ICT INDUSTRY REPORT

JULY 2003

ACKNOWLEDGMENT

This study is the synergistic result of the collaborative work and contribution of over 250 professionals. We would like to express our deepest gratitude and appreciation to everyone who participated in the study. Companies' executives allocated their companies' resources and time to share their knowledge and experiences with high level of transparency and cooperation. Industry experts provided continuous support to the team to analyze the dynamics of examined industries. The team exerted an outstanding effort to undertake the study and hopes that the result will prove useful to the community. The study team wishes to thank MCIT & USAID teams for their contribution in providing guidance and support to the study in its different phases.

Moustafa El-Gabaly, Director

IT Cluster, P*f*CE

E-mail: mgabali@internetegypt.com

Mehdi Majidi, Executive Director

IT-in-Education, P*f*CE

E-mail: Mehdi.Majidi@us.ibm.com

ACRONYMS

CRM	Customer Relationship Management
ERP	Enterprise Resource Management
F&B	Food and Beverage / Food Processing Industry
GDP	Gross Domestic Product
HCG	Harvard Computing Group
ICT	Information and Communications Technology
IT	Information Technology
KM	Knowledge Management
KRA	Key Result Area
MCIT	Ministry of Communications and Information Technology
OTS	Off The Shelf
P4	Purpose 4, P*f*CE project
P*f*CE	Partners for a Competitive Egypt
ROI	Return On Investment
SCM	Supply Chain Management
SGA	Skills Gap Analysis
LOE	Level of Effort
SMEs	Small and Medium Enterprises
SO17	USAID Strategic Objective # 17 (2000-2009 plan for Egypt)
SOW	Scope of Work
USAID	United States Agency for International Development

Sections

I. INTRODUCTION

Under its Strategic Objective 17 (SO17) the United States Agency for International Development (USAID) provided its contract to operate and implement *"Skills for Competitiveness Developed Initiative"*. The initiative that is being implemented by "Partners for a Competitive Egypt- P*f*CE" project was crafted to respond to the challenges of global competitiveness and workforce development. It aimed to build private sector coalitions, develop global thinking, and promote Egyptian leadership and innovative public/private sector partnerships.

A principal objective of P*f*CE project is to support the activities of the Ministry of Communications and Information Technology (MCIT) in implementing its National ICT Development Program as well as developing the IT Cluster in Egypt.

The ICT Penetration and Skills Gap Analysis (SGA) study was developed to respond to the immediate inquiries for information of MCIT and USAID on the needs for ICT skills covering the local, regional, and global markets. The outputs of the study will help alleviate the need for basic information on skills required by various planning activities undertaken by USAID and the MCIT. The results of the assessment and the related recommendations will add to the continuity of the ICT workforce development. The study will help in selecting the educational and training interventions supported by USAID and MCIT. It will provide the ICT stakeholders with the basis for continued ICT human resource and workforce development plans for maximum growth of the ICT sector. It will also serve as a basis for expanding the use and adoption of ICT practices and applications by Egyptian industries with the purpose of raising productivity and increasing Egyptian products competitiveness.

This report is one section of the ICT penetration and skills gap analysis report. It starts with an encompassing executive summary of the compiled executive summary of the three sections of 'ICT Penetration Gap', ICT Skills Gap', and 'the Study Institutionalization'. The repetition of the executive summary is intentional to serve our various readers.

II.EXECUTIVE SUMMARY (ICT Penetration & Skills Gap)

The ICT penetration and skills gap analysis study is composed of three separate but related sections. The first section—SGA in ICT Industry—provides a comprehensive analysis of ICT skills currently used in ICT companies and the existing gap these companies face to respond to their market needs. This section focuses on identifying the gap between the skills needed by the industry and those currently existing. The methodology adopted was based on identifying and selecting the main ICT cluster segments, identifying the need and types of educational institutions to be included in the study, and setting the criteria to select targeted sample organizations and countries benchmarked.

The second section—ICT penetration in Egyptian Industries—focuses on the demand side of the ICT industry. It analyses the level of ICT penetration and the ICT technologies required for enhancing their productivity and hence their competitiveness. On the other hand, the study will allow identifying the required skills needed for the ICT sector to help increasing the ICT penetration. This section examined pharmaceutical, ready-made garments, and food and beverage as potential industries for implementing ICT applications. It aims at providing an industry analysis and determining the level of ICT penetration gap within the industry's supply chain. It also provides benchmark data on the use of ICT in industrial development.

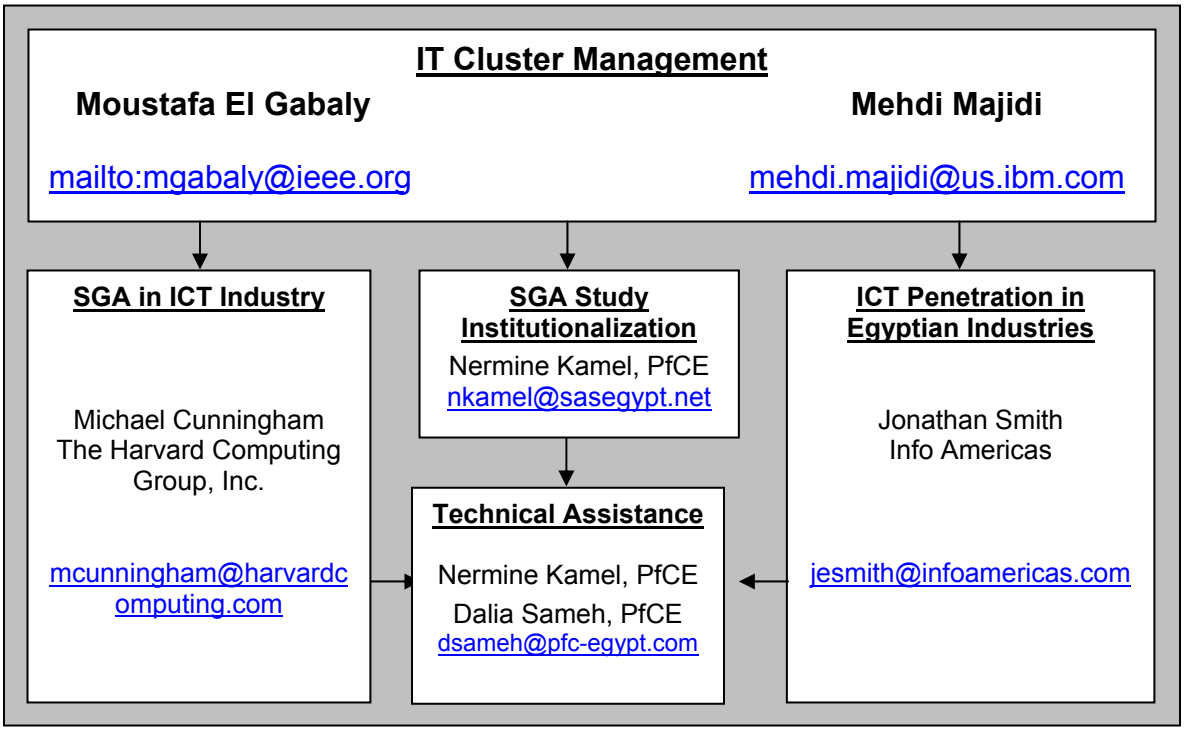
The third section—SGA Study Institutionalization—provides guidance and explanation on the way the study was conducted as well as suggestions and recommendations for repeating the study. The objective of this section is to ensure the continuity and usefulness of the study by defining the research process, methodology, and plan to repeat the study, as well as to share the lessons learned from the current experience with the implementers of the study.

The third section was developed by PfCE IT cluster team and the first two sections of the study were respectively conducted by Harvard Computing Group (HCG) and InfoAmericas companies in collaboration with PfCE IT Cluster management team who provided managerial and technical supervision in developing the related methodologies, selection criteria, and implementation. The final report on the findings and recommendations were conducted and completed by HCG and InfoAmericas.

A .Study Team

The following diagram illustrates the structure of the team that implemented the study.

ICT Penetration and Skills Gap Analysis Structure



Following summary of each section provides an encompassing overview of the entire study.

B. ICT Skills Gap in ICT Industry

Egypt's ICT sector exhibits skills gaps in two primary areas. First, there are gaps within individual ICT organizations. Second, there are gaps in the external consulting support that is required for the development and management of a healthy sector. For the most part, Egypt does not have severe skills gaps for technology-based skills, with the exception of significant gaps in advanced technologies such as Business-to-Business (B2B) and complex security and enterprise systems. In the telecom segment, wireless and mobile applications represent concerns. The advanced skills gaps are the result of "late adoption" of these technologies in the domestic and regional market, and are not a question of inherent ability in the workforce. These gaps will diminish as market demand increases in these areas and export activities increase.

The most significant gaps lie in business and personal communication skills and project management skills. It is difficult to hire employees with baseline skills such as Business Writing and Technical Writing in both Arabic and English. For export-oriented firms, foreign language skills in English and French are critical. In general, most organizations

feel that graduates from both the universities and the general education system are not equipped with the right skills.

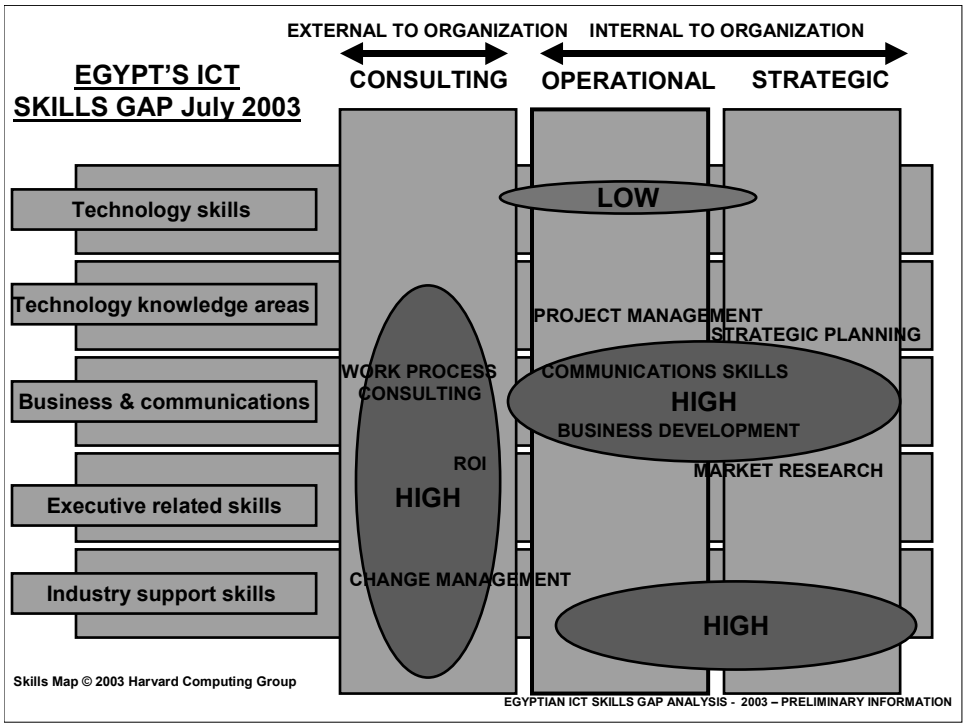


Figure 1 – Egypt's ICT Skills Gaps July 2003

Figure 1 shows the severity of Egypt's skills gaps in particular skill categories that are arranged from top to bottom on the left side of the figure. At the top, the figure also illustrates whether skills gaps are internal to the organization (such as an ICT firm), or external to individual firms but endemic to the industry. In addition to the oval representing a huge gap in the area of business and personal communication skills, required industry support skills are also missing in the marketplace. This gap in particular causes a considerable problem for the sale, support and expansion of many markets. Increasingly, firms are realizing that this gap is placing severe limitations on the expansion of their businesses, and they are starting to change hiring policies accordingly. By having the right consultants and staff in place, for example, organizations can better serve their clients with industry-specific knowledge and solutions. Many ICT firms are trying to source specialists with financial, healthcare, manufacturing and other relevant industry experience to complement their technology and software skills. Technology gaps are today frequently filled by multi-national vendors who provide the specialist skills and software to implement many of the leading-edge systems being deployed. Unfortunately, this practice does little to transfer experience and knowledge to the local firms, aside from those few that are large enough to handle these projects directly.

The status of the Egyptian ICT industry can be described as having an excellent telecom and Internet infrastructure today, particularly compared with pre-MCIT status in 1999. The Internet and telecom environment now provides a foundation upon which new business platforms can be developed, including call centers, data centers, B2B systems and Virtual

Private Networks using the Internet as a framework. However, the adoption of these new technologies creates challenges for the ICT sector in the future.

C. ICT Penetration Gap in Egyptian Industries

The study of the Gap Analysis of ICT Penetration in Egyptian Industries was carried out in three Egyptian industries: ready-made garments, pharmaceutical drug manufacturing and food and beverage industries, all three of which are strategically important Egyptian industries. Drug manufacturing is a strategic socio-economic sector for the country, producing 92% of the local market needs. Food and Beverage falls within the nation's agricultural sector, which occupies 29% of the nation's workforce and contributes to 16.4% of the nation's annual GDP. Ready-made garments industry, as part of the textiles industry, falls within a national economic sector that accounts for 30% of the nation's workforce and 49% of total Egyptian manufactured goods. All three industries are dynamic exporters.While the three industries analyzed are smaller than the macro-economic sectors in which they are situated, all three themselves, as well as the larger industry contexts in which they are situated, play a vital role in future employment generation, safety, and economic security of the country. All three industries have large, committed corporate players who operate globally through joint ventures, associations and partnerships, as well as on the national market, and a large number of SMEs (Small & Medium Enterprises) as dynamically within regional and international markets, albeit on smaller scales.

All three industries will be significantly impacted when the GATT conditions change in 2005. There is little reason to believe that after 2005 Egyptian manufacturing sectors will not experience shake downs, such as what occurred with the Mexican food and beverage SMEs when the NAFTA (North American Free Trade Agreement) went into effect: about 50% of the SMEs in that industry disappeared through their outright failure to compete, much of that failure was attributed to not leveraging ICT for business competitiveness.

The findings from the Gap Analysis of IC Penetration in Egyptian Industries show what the current ICT use and needs are in the production, management and growth operations of the three industries. The study also presents important comparative information about how ICT solutions have importantly bolstered the ability of those same industries in other countries similar to Egypt, to compete on international markets and to perform efficiently in their own national markets. The findings in the particular case of Mexico emphatically underscores what the negative impacts on industry can be when it did not leverage the advantages and benefits of ICT for global and national competitiveness and growth. Inversely, when ICT is used to such ends (as in the cases of Portugal, France, Argentina, Brazil, and Turkey), competitiveness can be raised and growth stimulated.

There is openness to learn from these examples, as nearly 100% of the companies in the three industries stated that ICT is "very important" to their business performance and growth. Nonetheless, only 46% of the companies have dedicated ICT budgets (67% of pharmaceuticals; 44% of food and beverage; 27% of ready-made garments). This large gap between how ICT is perceived to be important versus what companies are actually doing to strategically address ICT solutions is mainly due to three important factors:

1. General lack of management awareness concerning how leveraging ICT solutions impacts the bottom line.
2. General lack of management awareness concerning how leveraging ICT solutions impacts the bottom line.
3. Concentration of decisions concerning ICT in the hands of top management, who tend to not involve their ICT departments in the decision-making processes (30% of all companies analyzed do not even have IT departments).

The use of ICT in the three industries studied reflects the respective structures and characteristics of the industries' supply chains. In simple terms, the main differences of ICT use in the three industries are:

Food & Beverage

- The food and beverage industry is characterized by a heavy reliance on planning for crop planting and harvesting, quality farming and harvesting (even high-tech farming for hazard safety), and efficient inbound farm-to-plant logistics and efficient outbound logistics in general, but mainly concerning the demand for efficient outbound logistics for fresh products. The actual production operations in food and beverage are a mix of manual and automated, with a relatively low dependence on ICT solutions, given the relative low level of production line sophistication. This determines that much of the food and beverage ICT solutions are being leveraged on the farm, for safety and health controls, for crop quality and export market specs, for logistics and for complicated physical and information movement between (remote) farms and offices.
- Penetration of Internet, Intranet and Interactive Web-sites is low, particularly as compared to benchmark countries. Demand is highest for management and growth oriented ICT solutions.
- Food and beverage companies show a relatively healthy awareness of the importance of ICT for production management solutions, with 56% of the companies stating that over the coming twelve months they plan to migrate to more sophisticated ICT solutions for integrating production and management. At the same time, however, all but one of the 19 companies analyzed admit to having insufficient knowledge for deciding what ICT uses would be best for which solutions.

Pharmaceutical

- The pharmaceutical supply chain has heavy reliance on inbound logistics for imports of 85% of their active ingredients, which are transformed in the high-tech drug production lines. Drug sales are subjected to cyclical

demands from end consumers and intermediary buyers. Planning for sales and purchasing is thus a vital activity that kick-starts the supply chain operations, for which ICT applications are consequently found throughout much of the planning, sales and orders operations of the pharmaceuticals industry, linking broad production and management operations, including warehousing and distribution operations in addition to the aforementioned ones.

- Different from the private companies and multinationals, where ICT solutions are ubiquitous, the public firms are using ICT for production operations, but comparatively little in management and almost none for growth. None of the public firms are importantly enjoying the benefits of leveraging ICT for inter-/intra- communications and growth.

Ready Made Garments

- The ready-made garments industry supply chain is characterized by a complex production operation that depends on using cutting-edge textiles production machinery for meeting quality and quantity customer demands. That, plus the traditional reliance of the textiles industry on machinery, determines that ICT solutions in ready-made garments are mainly concentrated in the production areas.
- ICT solutions are relatively weak in management areas, particularly when it comes to ICT for communications systems and for global sales and markets sourcing. This is partially due to the inadequate penetration of basic infrastructure, particularly as concerns the stock of computers and use of corporate email.
- ICT solutions are sought for efficiency gains in production management, as well as for market development.

All three industries share the following trends:

- An increase in ICT expenditures and involvement of IT departments in decision making.
- A moderate improvement of basic ICT infrastructure.
- A slow tendency toward greater penetration and diffusion of ICT solutions.
- A growing interest in locally developed ICT solutions.
- An increase in the number of companies participating in sector market places and cluster initiatives.

The most important economic implications of these trends will be:

- Greater dissemination of ICT if supported by appropriate education and training.
- Greater dissemination of ICT if ICT suppliers and host industries collaborate in creating case studies, developing joint solutions, and propagating success stories.
- Higher adoption of ICT applications and infrastructures if industry and distribution clusters integrate further.
- Shared network initiatives if increased international competition prompts mergers and acquisitions in the industries.
- Short-term loss of jobs if labor saving technologies are adopted and as companies not adopting said technologies succumb to competition.
- Long-term job creation if the use of labor-saving technologies is more prevalent across the host industry, leading to general growth as a consequence of greater competitiveness.

Overall, although the industries perceive ICT as an instrument to increase efficiency and reduce costs, there is a ubiquitous lack of awareness as to what the optimum ICT systems and tools are for doing so. In each industry there is a clear demand for tailored ICT solutions, which many companies are commonly doing by adapting and customizing MSOffice applications. Most companies state that the ICT industry experts are too eager to push their solutions, and generally unacquainted with the particularities of their industry, thus not fully competent to advise them on best solutions.

The study's findings divulge that, to apply ICT strategically to improve business management activities, there is a serious two-way need for knowledge development: business2ICT and ICT2business. ICT use in industry depends on collective actions guided by strategic planning, drawn from a well-defined strategic market position. To this end the host industries, ICT industry, Government and NGOs/Associations, have roles to play to foster an environment that will foster the uptake of ICT. These roles can be summarized as follows:

HOST INDUSTRY	■ Create and provide aggregate industry information ■ Prepare for industry growth through use of ICT solutions
ICT INDUSTRY	■ Develop consultancy skills to create tailor made ICT solutions for host industries ■ Develop Business and Financial Cases for ICT use
GOVERNMENT	■ Encourage ICT uptake through use of e-Government ■ Facilitate and Promote Industry Growth through e-Marketplaces
NGO & ASSOCIATIONS	■ Raise Awareness ■ Promote ICT Education and Training

III. ICT SKILLS GAP IN ICT INDUSTRY

This section was conducted and completed by HCG

For additional information, please contact:
Michael Cunningham
The Harvard Computing Group, Inc.
Regency Park
238 Littleton Road
Westford, MA 01886 USA
+1 978-692-6766 x204
+1 978-692-1864 FAX
mcunningham@harvardcomputing.com

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Acknowledgements

Participating Organizations

The Partners for a Competitive Egypt (PfCE) team would like to acknowledge the tremendous collaborative effort that went into the design, delivery and support of this project. In particular the participating companies and educational organizations donated generous amounts of their time and energy being part of the study.

- Advanced Computer Technology (ACT)
- Ain Shams (Engineering)
- Ain Shams (Information Science)
- Alphamisr
- Arab Academy of Science and Technology
- Arab Cyber Education
- Arabize
- Asset
- AUC (Computer Science)
- AUTOMATION Consultants
- Bahgat Group
- CIRANET (RAYA GROUP)
- Compulink
- Cybercenter
- DMS
- EgyNet
- Fujitsu
- IBM
- ICTC Cairo
- Internet Egypt
- ISG
- ISIS
- ITWORX
- Khalifa Co.
- Ladis
- Masraya
- Microsoft
- Microtech
- MINATEL
- MobiNil
- Motorola
- National Systems & Communication Co.
- NCR
- NIIT
- Nile Telecom
- NileOnline
- NileSoft
- ORACLE
- Orascom
- Oratech
- PT (Pyramid Technology)
- Raya Software
- Sahara Group
- SEE (System Engineering)
- Sigma
- Solution Plus (Health Insights)
- SUN
- T3
- TE Data
- Telecom Egypt
- Telecom Equipment Manufacturing Corp
- Toshiba
- TRI TECH
- University of Cairo (Computer Science)
- University of Cairo (Engineering)
- Vodafone

Other Key Acknowledgements

Sincere thanks to:

- USAID and **Dr. Adel Gohar** for providing continued support and resources for this program.
- **Dr Gamal Aly** from MCIT, who from the beginning has been a key supporter of the program and who provided invaluable guidance during the development of the project methodology and company selection criteria.
- Representatives of the CIT Chamber, the Egyptian High Tech Industry Association (EHITA), and the Egyptian Software Association (ESA) for their continued support during this program.
- External country benchmarking interviewees for the dedication of their time and energy to the program.

PfCE Team Members

Special thanks to:

- **Mehdi Majidi** and **Dr. Moustafa El-Gabaly**, who conceived and directed the project from inception to implementation; without their tenacity and determination, this project would not have been possible.
- **Larry Hearn** and **Andrew Lewis** from Pal-Tech for their continued support of this project through the SO17 USAID Workforce Development program.
- **Ms. Nermine Kamel** and **Ms. Dahlia Sameh** from the PfCE team in Cairo for their excellent administrative support; they kept the complex logistics of this project moving forward on schedule.

Executive Summary

Egypt's ICT sector exhibits skills gaps in two primary areas. First, there are gaps within individual ICT organizations. Second, there are gaps in the external consulting support that is required for the development and management of a healthy sector.

For the most part, Egypt does not have severe skills gaps for technology-based skills, with the exception of significant gaps in advanced technologies such as Business-to-Business (B2B) and complex security and enterprise systems. In the telecom segment, wireless and mobile applications represent concerns. The advanced skills gaps are the result of "late adoption" of these technologies in the domestic and regional market, and are not a question of inherent ability in the workforce. These gaps will diminish as market demand increases in these areas and export activities increase.

The most significant gaps lie in business and personal communication skills and project management skills. It is difficult to hire employees with baseline skills such as Business Writing and Technical Writing in both Arabic and English. For export-oriented firms, foreign language skills in English and French are critical. In general, most organizations feel that graduates from both the universities and the general education system are not equipped with the right skills.

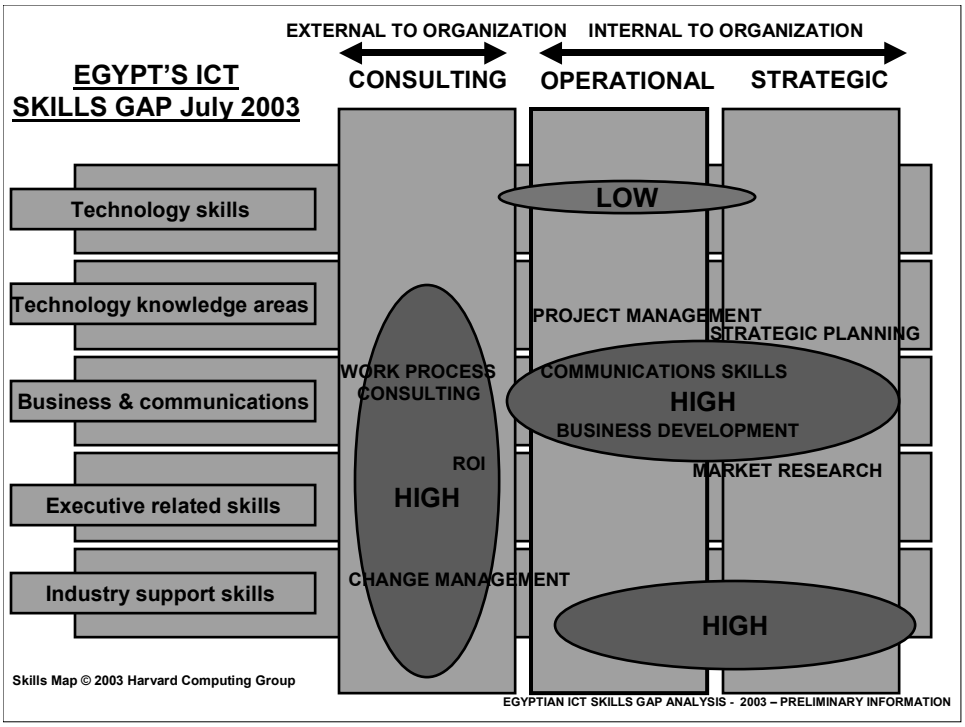

Figure 2 – Egypt's ICT Skills Gaps July 2003

Figure 1 shows the severity of Egypt's skills gaps in particular skill categories that are arranged from top to bottom on the left side of the figure. At the top, the figure also illustrates whether skills gaps are internal to the organization (such as an ICT firm), or external to individual firms but endemic to the industry.

In addition to the oval representing a huge gap in the area of business and personal communication skills, required industry support skills are also missing in the marketplace. This gap in particular causes a considerable problem for the sale, support and expansion of many markets. Increasingly, firms are realizing that this gap is placing severe limitations on the expansion of their businesses, and they are starting to change hiring policies accordingly. By having the right consultants and staff in place, for example, organizations can better serve their clients with industry-specific knowledge and solutions. Many ICT firms are trying to source specialists with financial, healthcare, manufacturing and other relevant industry experience to complement their technology and software skills. Technology gaps are today frequently filled by multi-national vendors who provide the specialist skills and software to implement many of the leading-edge systems being deployed. Unfortunately, this practice does little to transfer experience and knowledge to the local firms, aside from those few that are large enough to handle these projects directly.

The status of the Egyptian ICT industry can be described as having an excellent telecom and Internet infrastructure today, particularly compared with pre-MCIT status in 1999. The Internet and telecom environment now provides a foundation upon which new business platforms can be developed, including call centers, data centers, B2B systems and Virtual Private Networks using the Internet as a framework. However, the adoption of these new technologies creates challenges for the ICT sector in the future.

Project Methodology

Goals

The Skills Gap Analysis for the Egyptian ICT sector supports the development of a program to ensure that industry and market requirements become the driving forces for the development and delivery of training, education and consulting assistance for the industry. As supported by MCIT and USAID, the analysis and recommendations are intended to improve the competitiveness of the Egyptian ICT sector. The specific goals of the study are to provide:

1. Results that will guide and dictate the selection of education and training interventions supported by USAID and MCIT. Study results will provide USAID, MCIT, and other ICT stakeholders with the basis for continued ICT human resource and workforce development planning to ensure maximum growth of the ICT sector.
2. The basis for expanding the use and adoption of ICT applications and practices by non-ICT sectors, clusters, and businesses, for the purpose of enhancing Egyptian skills and competitiveness.
3. Benchmarking descriptions of four selected countries regarding the creation and optimization of their workforce development and education programs.
4. Information about short- and medium-term skills gaps in the ICT Sector in Egypt. Public education establishments, MCIT, private sector Workforce Development programs and other parties should be able to apply the results for near- and longer-term planning.

Overview

The first step in developing the methodology for this project involved identifying the segments of the ICT sector in which interviews would be conducted with individual companies. We also identified the need to interview educational institutions.

The next critical early phase involved identifying the right skills categories and job titles to use as the basis for the project. During December 2002, PfCE, MCIT, USAID and six industry firms in Egypt defined the details of the overall project and approved the skills clusters and segment selections. The program design and methodology was well-received by each of these groups, resulting in a consensus that the project was well-conceived and executable.

Next, the PfCE project team selected individual organizations to interview and developed the questionnaires to be used during the face-to-face interviews. The interviews were designed to include questions about skills classification, skill needs, and education and training needs.

Non-educational organizations were interviewed first, followed by education and training organizations. We felt it was important to capture as much of the Skills Gap information as possible before the education interviews in order to improve the quality of the research questions for the educational institutions.

Recommendations

The recommendations contained in the study comprise of 7 primary areas:

1) Technology Awareness

Providing effective technology awareness training represents one of the most important ways in which firms in general industry sectors can be exposed to relevant technologies. Showing companies how the use of technology can improve their business operations will help create demand for new technologies and services, thereby stimulating the entire ICT sector.

2) Sector-Based Business Process Improvement

Identifying industry sectors that are good candidates for Business Process Improvement is another key recommendation of this report. Doing so will not only increase domestic demand for ICT products and services, but it will increase the competitiveness of firms already exporting, or looking to export, to other markets.

3) The Consulting Gap

As discussed in the *Egypt Research Findings* section beginning on page 33, "The Consulting Gap" is having a profound impact on the development of the ICT sector and on technology use in Egypt in general. This gap represents a void between defining how technology can be used to help solve business problems and actually solving those problems. Because the gap is so large and needs to be narrowed so quickly, this report recommends relying on new private sector initiatives to get the job done.

Today, distrust between buyers and sellers of ICT systems is keeping many potential buyers out of the market. Building up one or a series of consulting firms with the ability to explain the nature of the "IT buying process" could help to create trust in the market and stimulate demand for new products and services.

The creation of an ICT Consulting Institute would be one means to improve dramatically the "consulting gap" in the marketplace. This concept would allow for either one firm or a collection of skills and practices under a "loose federation" of organizations. Regardless of the nature of the commercial arrangement, building this capability will fill many of the needs that are not serviced by the marketplace currently.

4) Skills Gap Action Plan

The Skills Gap Action plan would have two main components. First, a Skills Gap Analysis should be conducted at least annually to ensure that the ICT industry always has relevant skills gap data. Second, every Skills Gap Analysis should produce a specific set of short- and long-term objectives for use in closing skills gaps. Public universities might use this information to make appropriate curriculum changes; MCIT might fund programs to assist in demand generation in specific areas; private educational institutions might build or buy relevant courseware and skills transfer programs to deal with specific near-term skills gaps. The Action Plan must address closing of key technology gaps in both the telecom and IT segments of the industry. It must also specifically address non-technology skills gaps as they are far more severe than technology gaps in most cases.

5) Modernization and Privatization

Another area that could be a key area for improvement is the area of Modernization and Privatization programs in Egypt.. The current programs underway provide some good synergy with the skills gaps issues discussed in this report. In fact the "Consulting Gap" recommendations also will have an impact on the effectiveness of these programs, given that competent consulting resources are a key ingredient for success of these programs.

6) Education Recommendations

It is mandatory that government, industry and educational institutions work together to close ICT skills gaps. As noted in the *Skills Gap Best Practices* section of this report, with the exception of India, the countries that have been really effective in closing skills gaps have implemented programs that link education, industry and government. Of these links, the most important is the connection between industry and education.

7) Business Environment and Infrastructure

There are many factors outside the realm of this Skills Gap Analysis that adversely affects the ability of Egyptian organizations to operate in the domestic and international marketplaces. These factors are relevant for this report because they have a negative impact on exports and, in particular, on domestic business operations. For example, while it may be good news that ICT exports to the Middle East region have increased in the last three years, a large part of the reason has been the negative domestic business environment. Many interviewees would even describe the current domestic marketplace as hostile, due to unfair business practices and laws that are interpreted incorrectly. Action is needed to improve this situation, as the cause and effect of difficult business conditions will have a direct affect on the potential performance of the industry in the future.

Project Methodology

Overview and Goals

The Skills Gap Analysis for the Egyptian ICT sector supports the development of a program to ensure that industry and market requirements become the driving forces for the development and delivery of training, education and consulting assistance for the industry. As supported by MCIT and USAID, the analysis and recommendations are intended to improve the competitiveness of the Egyptian ICT sector. The specific goals of the study are to provide:

1. Results that will guide and dictate the selection of education and training interventions supported by USAID and MCIT. Study results will provide USAID, MCIT, and other ICT stakeholders with the basis for continued ICT human resource and workforce development planning to ensure maximum growth of the ICT sector.
2. The basis for expanding the use and adoption of ICT applications and practices by non-ICT sectors, clusters, and businesses, for the purpose of enhancing Egyptian skills and competitiveness.

3. Benchmarking descriptions of four selected countries regarding the creation and optimization of their workforce development and educations programs.
4. Information about short- and medium-term skills gap needs for the ICT Sector in Egypt. Public education establishments, MCIT, private sector Workforce Development programs and other parties should be able to apply the results for near- and longer-term planning.

Project Methodology

Overview

The first step in the methodology for this project involved identifying the segments of the ICT sector in which interviews would be conducted with individual companies. We also identified the need to interview educational institutions. *Selection of Cluster Segments in ICT Sector* on page 28 provides details of the way in which this work was completed.

The next critical early phase involved identifying the right skills categories and job titles to use as the basis for the project. During December 2002, PfCE worked with, MCIT, USAID and six industry firms in Egypt defined the details of the overall project and approved the skills clusters and segment selections. The program design and methodology was well-received by each of these groups, resulting in a consensus that the project was well-conceived and executable.

Next, the PfCE project team selected individual organizations to interview and developed the questionnaires to be used during the face-to-face interviews. *Selection of Target Organizations in Egypt* on page 29 offers additional details about this process. The interviews were designed to include questions about skills classification, skill needs, and education and training needs. Sample questionnaires are attached in Appendix A – Interview Instruments and Skills Categories on page 152.

Non-educational organizations were interviewed first, followed by education and training organizations. We felt it was important to capture as much of the Skills Gap information as possible before the education interviews in order to improve the quality of the research questions for the educational institutions.

Project Execution

Once the organizational interviews were completed we began the analysis portion of the project, which is shown in Figure 3. The analysis methodology involved applying a series of filters to the data gathered during the span of the project from December 2002 through July 2003. Filter One consisted of adopting and supplementing NWCET standards as described in
Industry Standard **Classifications** on page 29.

Filters Two and Three in Figure 3 consisted of identifying Technology Skills and Rating Education. Applying the first three filters resulted in an overall ranking of skills gaps in the Egyptian ICT sector.

Filter Four compared demand in the marketplace for skills and factors affecting firms hiring policies and desires. This was used to assist in corroborating skills gap needs against demand for open positions and "more desirable" hiring characteristics. We also reviewed the ability of educational organizations to change curricula, looked at their liaison strategies with industry, and evaluated how best this study could assist them in dealing with industry requirements in the short, medium and long term.

The final filter, number five in Figure 3, consists of applying best practices from the benchmark countries selected for the project. *Selection of Benchmark Countries* on page 31 details the selection and characteristics of the benchmark countries.

As shown on the right of Figure 3, the end result of the entire process is as set of recommendation and an action plan, which are detailed elsewhere in this document.

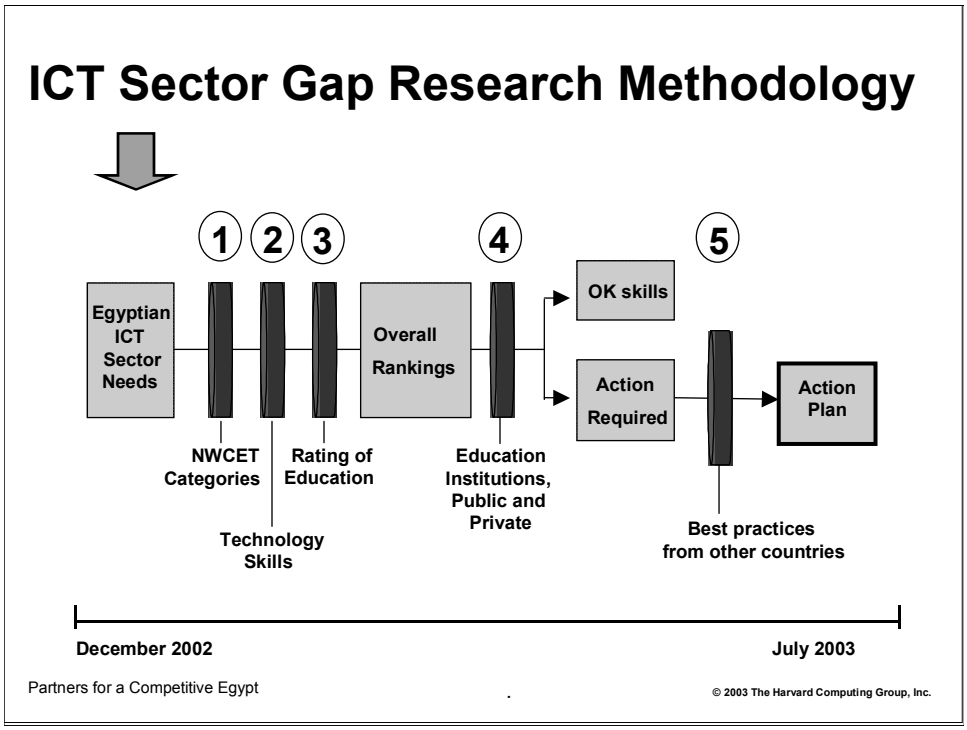

Figure 3 - Diagram illustrating project methodology and timeline

Selection of Cluster Segments in ICT Sector

The overall goal of the selection process was to ensure that we surveyed a comprehensive and relevant set of organizations. The process began with the selection of candidate segments of the Egyptian ICT Sector. An initial high-level list of candidate segments was defined before the project commenced. The PfCE team refined the segments and sub-categories in Egypt during December 2002.

The categories were selected based on the need to sample all areas of the ICT Sector, which necessitated including segments with a small number of active candidate organizations, such as Call Centers and Application Service Providers. Although a previous survey conducted by the Harvard Computing Group in 1998 found few Skills Gap differences

between smaller and larger firms, we included selected smaller firms to ensure that small but emerging workforce clusters and industry segments would be included in the study. These smaller clusters and firms may provide indicators for Workforce Development activities that would be otherwise missed.

The resulting segment and category list is shown below. Numbers in parentheses represent the number of organizations in each category that need to be interviewed to create an accurate and useful consensus on Skills Gaps. Please note that some organizations fall into more than one category.

- Software companies (11)
- Hardware companies (3)
- Service providers and consultants to the ICT (29)
- Arabization & Culturization (3)
- Customer support (Call centers) (3)
- Hardware support (6)
- Internet Service Providers (3)
- Application Service Providers (3)
- Customized Services (12)
- Telecommunications Companies (voice operators, mobile operators, and engineering project implementers) (5)
- Education and training establishments
- Public (4)
- Private (4)

Selection of Target Organizations in Egypt

Selection Criteria

The following selection criteria were used to select interview candidates from among the estimated 140+ organizations that make up the Egyptian ICT sector.

- US$0.5M or more in revenue for exporting firms
- US$0.2M or more for domestic revenue firms
- Intent to export to regional markets or international markets
- Currently exporting to regional markets or international markets

Education organizations are included from the following list. A selection of private and public institutions has been selected by experts in the PfCE team. This was based on their size of influence and output in undergraduate and post-graduate in the region, or their activities in specialized post-graduate or vendor specific training programs.

Selected Organizations

This section contains the names of the organizations that met the selection criteria and were interviewed for the study. Thanks to all them and their staff for donating so much of their time and effort to make this study possible.

- Advanced Computer Technology (ACT)
- Ain Shams (Engineering)
- Ain Shams (Information Science)
- Alphamisr
- Arab Academy of Science and Technology
- Arab Cyber Education
- Arabize
- Asset
- AUC (Computer Science)
- AUTOMATION Consultants
- Bahgat Group
- CIRANET (RAYA GROUP)
- Compulink
- Cybercenter
- DMS
- EgyNet
- Fujitsu
- IBM
- ICTC Cairo
- Internet Egypt
- ISG
- ISIS
- ITWORX
- Khalifa Co.
- Ladis
- Masraya
- Microsoft
- Microtech
- MINATEL
- MobiNil
- National Systems & Communication Co.
- NCR
- NIIT
- Nile Telecom
- NileOnline
- NileSoft
- ORACLE
- Orascom
- Oratech
- PT (Pyramid Technology)
- Raya Software
- Sahara Group
- SEE (System Engineering)
- Sigma
- Solution Plus (Health Insights)
- SUN
- T3
- TE Data
- Telecom Egypt
- Telecom Equipment Manufacturing Corp
- Toshiba
- TRI TECH
- University of Cairo (Computer Science)
- University of Cairo (Engineering)
- Vodafone

Industry Standard Classifications

Measurement of skills and their classification for the study is largely based on the National Workforce Center for Emerging Technologies (NWCET) standards. Some extensions have been added to track specific skills and job categories not covered by this standard. Charts containing the skills categories and job titles are included in Appendix A – Interview Instruments and Skills Categories on page 152.

Selection of Benchmark Countries

Selection Criteria

The selection of benchmark countries for this study was based on the following criteria:

- Geographic location
- Value added differentiation (selection of ICT sectors that create high levels of wealth)
- Ability to create and sustain momentum for expansion
- Export focus – Regional and Worldwide
- Intellectual capital and talent
- Language skills
- Infrastructure
- Likelihood to help project skills gap understanding

The PfCE project team selected four countries for benchmarking in co-operation with MCIT. The intent of the country-level benchmarking is to provide reference materials, examples and guidance to assist in the Workforce Development recommendations for this report. Areas to be covered in the benchmarking and review include:

- *Financial statistics and growth*
  - Size
  - Sector breakdown by revenue and cluster activity
  - Industry focus for ICT organizations
  - Impact of education and Workforce Development initiatives on financial growth
  - Historical patterns and their effect on Workforce development

- *Education (to support the industry)*
  - Workforce characteristics
  - Size and skills
  - Public institutions
  - Private sector training

- *Entrepreneurial factors impact on entire industry*
  - Availability of finance
  - Demand identification

- *Infrastructure (state of development, technology transfer programs, corporate support)*
  - Communications

- Availability of financial development funds and growth vehicles
- Import and Export characteristics
- Domestic demand for ICT Sector services
- Availability of research and development ICT Centers

- *Skills Gap and how impacted country level strategy*
  - Education programs
  - National initiatives
  - Regional initiatives
  - Cluster impact
  - Demand generation and sector development patterns
  - Comparison of Technology Skills Gap versus Business and Supporting Skills Gaps
- *Government support (programs and political initiatives)*
- *Promotion, marketing and finance*
- *Companies and expertise (interviews with firms in region)*
- *Incubators and private business development*

Selected Countries

The project team selected the following countries the reasons shown.

Country	Reason of Inclusion
India	Has become an ICT outsourcing powerhouse and is the reference point for many developing countries wishing to develop an export industry, but starting with limited infrastructure
Israel	Has developed and distributed high-quality products and intellectual property. Has a relatively small ICT workforce but generates extremely high revenue per employee in the ICT sector. Provides location similarity to Egypt though many other characteristics are substantially different.
Jordan	Small country with small ICT workforce, but is currently developing its ICT sector. Moving quickly so may be useful to learn from their recent actions. Have similar geographic and cultural characteristics, focused on high value export activities.
Philippines	Very large population, though vastly smaller than India. Extremely literate population with excellent English language skills. Not a powerhouse in ICT exports though government has placed significant emphasis on building a call center industry in recent years.

Table 1 - Selected benchmark countries

Egypt Research Findings

Overview

Egypt's ICT sector exhibits skills gaps in two primary areas. First, there are gaps within individual ICT organizations. Second, there are gaps in the external consulting support that is required for the development and management of a healthy sector.

For the most part, Egypt does not have severe skills gaps for technology-based skills, with the exception of significant gaps in advanced technologies such as Business-to-Business (B2B) and complex security and enterprise systems. In the telecom segment, wireless and mobile applications represent concerns. The advanced skills gaps are the result of "late adoption" of these technologies in the domestic and regional market, and are not a question of inherent ability in the workforce. These gaps will diminish as market demand increases in these areas and export activities increase.

The most significant skills problems lie in business and personal communications and project management skills. It is difficult to hire employees with baseline skills such as Business Writing and Technical Writing in both Arabic and English. For export-oriented firms, foreign language skills in English and French are critical. In general, most organizations feel that graduates from both the universities and the general education system are not equipped with the right skills.

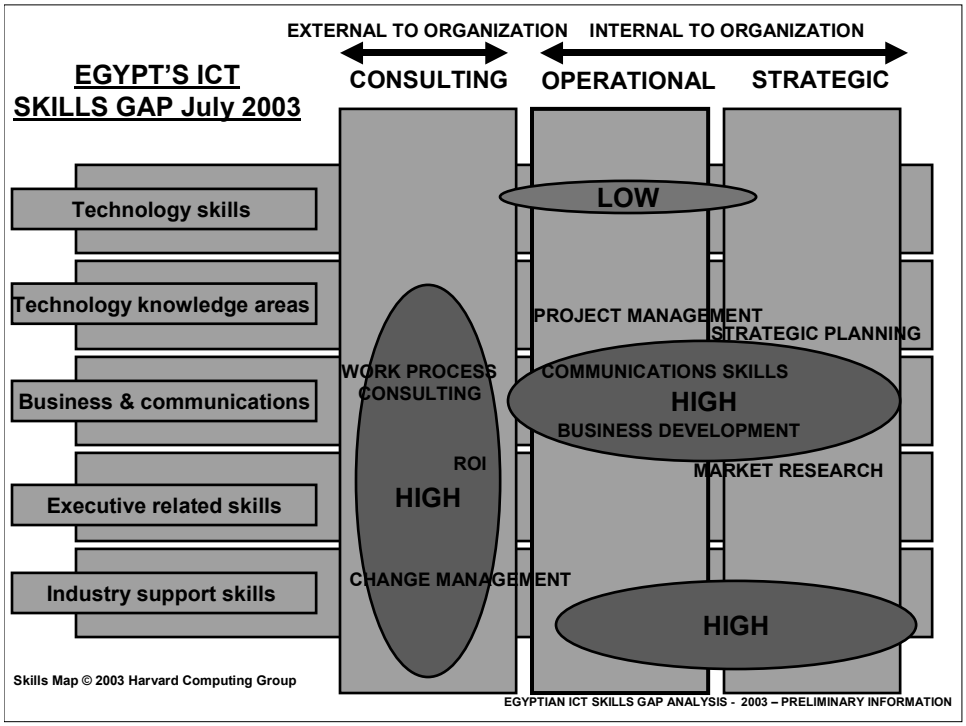

Figure 4 - Egypt's ICT Skills Gaps July 2003

Figure 4 shows the severity of Egypt's skills gap in particular skill categories that are arranged from top to bottom on the left side of the figure. At the top, the figure also

illustrates whether skills gaps are internal to the organization (such as an ICT firm), or external to individual firms but endemic to the industry.

In addition to the oval representing a huge gap in the area of business and personal communication skills, required industry support skills are also missing in the marketplace. This gap in particular causes a considerable problem for the sale, support and expansion of many markets. Increasingly, firms are realizing that this gap is placing severe limitations on the expansion of their businesses, and they are starting to change hiring policies accordingly. By having the right consultants and staff in place, for example, organizations can better serve their clients with industry-specific knowledge and solutions. Many ICT firms are trying to source specialists with financial, healthcare, manufacturing and other relevant industry experience to complement their technology and software skills. Technology gaps are today frequently filled by multi-national vendors who provide the specialist skills and software to implement many of the leading-edge systems being deployed. Unfortunately, this practice does little to transfer experience and knowledge to the local firms, aside from those few that are large enough to handle these projects directly.

The status of the Egyptian ICT industry can be described as having an excellent telecom and Internet infrastructure today, particularly compared with pre-MCIT status in 1999. The Internet and telecom environment now provides a foundation upon which new business platforms can be developed, including call centers, data centers, B2B systems and Virtual Private Networks using the Internet as a framework. However, the adoption of these new technologies creates challenges for the ICT sector in the future.

The Consulting Gap

Another major problem for skills gap affecting the entire industrial sector is the lack of effective consulting resources for both buyers and sellers. The gap in represented in Figure 4 above as the vertical oval in the column labeled “Consulting.”

Many segments of the industry are affected by this problem. In a poll on business issues affecting the development of the sector and the competitiveness of Egyptian industry in general, the following points were raised related to this problem:

- Number of firms complaining about poor procurement consulting
- Number of firms complaining about poor market research
- Strategic Market needs
- Business Process Improvement needs and resources

Job Cluster Findings

The charts in this section present skills gaps for groups of related job roles defined and organized into job clusters. The next section, *Skills Cluster Findings,* beginning on page 41, presents Skills Gaps information organized by grouping related skills into skills clusters. This section identifies Job Cluster and specific Job Roles that were found to be a Skills Gap among the participants.

In the charts below, skills gaps below 5% are not highlighted, those between 5-10% are gray, and those greater than 10% are shown in white text on a black background. Gaps greater than 10% can be considered more severe, and are noted accordingly.

JOB CLUSTER	***Severity (and percentage of gap)***			
DATABASE DEVELOPMENT AND ADMINISTRATION	***HIGH***	***MED***	***LOW***	***TOTAL***
Data Analyst	4.65	4.65	0.00	9.30
Database Administrator	6.98	6.98	0.00	13.95
Database Analyst	6.98	4.65	2.33	13.95
Database Developer	6.98	2.33	0.00	9.30
Data Architect	6.98	4.65	0.00	11.63
Data Modeler	6.98	9.30	0.00	16.28
Knowledge Architect	6.98	2.33	0.00	9.30

Database development has considerable gaps, but interestingly enough, most of the gaps are tied to limited higher quality resources in Oracle and Microsoft SQL server skills. As MCIT has invested considerable effort in creating large numbers of entry-level programmers with these skills, some continued emphasis is needed to fill these higher quality levels of certification and experience.

The largest gaps are in the modeling and architecture design areas that are generally not well served by entry level courses and require considerable experience to ensure that the right design and data is used for the subsequent programming effort. For the larger and more complex designs involved with many export-based projects, this need will continue to be high.

PROGRAMMING/SOFTWARE ENGINEERING	***HIGH***	***MED***	***LOW***	***TOTAL***
Software Engineer	4.65	2.33	0.00	6.98
Software Tester	9.30	6.98	0.00	16.28
Software Application Specialist	4.65	2.33	0.00	6.98
Software Development Engineer	2.33	0.00	0.00	2.33

Software testing is a recurring theme for many organizations looking to improve their operations. Implementation of effective testing programs and methods is crucial to improvement in this area. With organizations starting to take CMM certification seriously, finding good Software Testers will be critical to the success of these initiatives. Many of the local industry developers have learned about the importance of this area "the hard way," and now see that quality improvement is not just important to create the right image for their organization, but also that this will be key to creating a differentiated "brand" for the Egyptian hi-tech industry.

DIGITAL MEDIA	***HIGH***	***MED***	***LOW***	***TOTAL***
Animator	0.00	2.33	0.00	2.33
2D/3D Artists	2.33	0.00	0.00	2.33
Virtual Reality Specialist	2.33	2.33	0.00	4.65

DIGITAL MEDIA	*HIGH*	*MED*	*LOW*	*TOTAL*
Multimedia Author	0.00	2.33	0.00	2.33
Media Specialist	0.00	2.33	4.65	6.98
Media Instructional Designer	2.33	2.33	0.00	4.65

Digital Media skills are still in short supply in the local market, with the exception of firms that are producing game and "game-like" educational software products. The level of sophistication of these systems and the price that the local market will pay restricts the demand for talent in this area, although that that demand is likely to increase based on three factors:

- An increase in the amount of on-line training courses requiring more sophisticated digital media content,
- E-commerce sites needing a makeover to attract and retain customers,
- Export oriented firms marketing electronic courseware and titles that will demand high quality content combined with excellent "look and feel."

TECHNICAL SUPPORT	*HIGH*	*MED*	*LOW*	*TOTAL*
Supervisor for Help Desk center	2.33	0.00	0.00	2.33
Technical Support Representative	9.30	4.65	2.33	16.28
Technical Support Manager	0.00	0.00	0.00	0.00
Customer Support Representative	6.98	4.65	2.33	13.95
Help Desk Technician	9.30	0.00	0.00	9.30
Sales Support Technician	0.00	0.00	0.00	0.00
Quality and Service	2.33	0.00	0.00	2.33
Maintenance Technician	4.65	0.00	0.00	4.65

For the most part, organizations participating in the study did not have huge needs for additional Technical Support talent. Organizations citing the greatest demand in this area were ones that have had higher levels of interaction with customer-facing activities, such as Call Centers, Telecom and Application Providers. Creating professional technical support groups is becoming a feature of emerging businesses in Egypt, so the demand for professionals who understand the special requirements of customer communication and problem resolution is likely to increase over time.

ENTERPRISE SYSTEMS ANALYSIS & INTEGRATION	*HIGH*	*MED*	*LOW*	*TOTAL*
Systems Analyst	13.95	9.30	0.00	23.26
Systems Integrator	18.60	11.63	0.00	30.23
E-commerce specialist	16.28	6.98	2.33	25.58
Data systems manager	0.00	2.33	0.00	2.33
Infrastructure analyst	0.00	0.00	0.00	0.00
Chief Information Officer	4.65	4.65	0.00	9.30

One of the largest groups of firms in Egypt resides in the Professional Services category and provides customized applications. Telecommunication firms also have operations

supporting this area, but for the most part have contracted out the development of their call center and customer support activities to IT firms in this category. The e-commerce and systems integration skills, which include such things as XML and transaction based e-commerce development, show very strong demand. The fact that these all scored around 25 per cent is a clear indicator of shortages in these areas. Many firms expect demand in these areas to increase during the course of the next 12 months, hence the high combined ratings of these roles.

Important note: Even though the scores for Infrastructure Analyst and Data Systems Manager show an absence of skills gaps, the reason is probably because the demand for these skills has not yet become apparent to ICT company managers. As Enterprise Systems Analysis and Integration become more important, these roles are likely to show significant skills gaps in the future.

TECHNICAL WRITING	*HIGH*	*MED*	*LOW*	*TOTAL*
Technical Writer	25.58	4.65	6.98	37.21
Document Specialist	2.33	0.00	2.33	4.65
Electronic Publication Specialist	0.00	2.33	4.65	6.98
Technical Publication Manager	2.33	0.00	0.00	2.33

At a whopping 37%, the shortage of good quality Technical Writers is severe for many Egyptian firms. Only the firms that write for a living, e.g., translation and Arabization firms, appeared to have sufficient staff. The current education system does not produce the right sort of candidates for this function, and the specialization of Technical Writing is not viewed as a lucrative career path. Options such as programming or other technical disciplines have greater attraction to the workforce. Creating a professional association for Technical Communications would be a good way to begin the process of improving the role and image of writing specialists. An opportunity probably exists for enterprising firms to sell outsourced technical writing services to companies who can't or don't want to hire their own staff in this specialized but necessary part of the industry.

NETWORK DESIGN AND ADMINISTRATION	*HIGH*	*MED*	*LOW*	*TOTAL*
Network Technician	0.00	2.33	2.33	4.65
Network Engineer	0.00	2.33	2.33	4.65
Network Operations Analyst	4.65	4.65	2.33	11.63
Network Architect	4.65	4.65	2.33	11.63
Data Communications Analyst	2.33	0.00	0.00	2.33

In the main, Network Design and Administration appears to be well covered by existing skills and programs. Larger and more complex systems require the Analysis and Architecture skills that are in more limited supply, as indicated by the participants' responses. However, these shortages don't appear to be affecting system design or deployment, because multi-nationals are filling the breach by importing talent to deal with the analysis and architecture of specific systems. In the long run, increased capabilities in

local firms will allow them to participate in the larger, more complex system deployments that are currently the bailiwick of the multi-nationals.

BUSINESS AND PROJECT MANAGEMENT	*HIGH*	*MED*	*LOW*	*TOTAL*
Account Management	2.33	0.00	0.00	2.33
Banking specific Industry manager	2.33	0.00	0.00	2.33
Business Contract Management/Procurement	2.33	0.00	0.00	2.33
Business development manager	4.65	0.00	0.00	4.65
Business Intelligence Consultant	0.00	2.33	0.00	2.33
Business process Analyst	6.98	0.00	0.00	6.98
Business Process Consultant	25.58	6.98	6.98	39.53
Business requirement consultant	2.33	0.00	0.00	2.33
Contract Management	11.63	6.98	0.00	18.60
Data warehousing consultant	0.00	2.33	0.00	2.33
Financial Management	2.33	0.00	0.00	2.33
General Manager	0.00	0.00	0.00	0.00
Industry Specific Consultant	0.00	2.33	0.00	2.33
International Business Development	0.00	0.00	0.00	0.00
Localization Engineer	4.65	0.00	0.00	4.65
Market research analyst	20.93	0.00	0.00	20.93
Marketing communications	11.63	9.30	2.33	23.26
Marketing Executive	2.33	0.00	0.00	2.33
Marketing Manager	27.91	6.98	0.00	34.88
Organizational consultant	0.00	2.33	0.00	2.33
PR Manager	2.33	0.00	0.00	2.33
Product Manager	30.23	0.00	0.00	30.23
Project Manager	27.91	18.60	2.33	48.84
Proposal development	13.95	11.63	2.33	27.91
Sales Engineer	11.63	0.00	0.00	11.63
Sales executive	30.23	11.63	2.33	44.19
Sales Manager	27.91	2.33	0.00	30.23
Strategic Planning Manager (Telco)	6.98	0.00	0.00	6.98

Business and Project management roles in general show the highest number and severity of skills gaps for Egyptian organizations. Whether it is a special need for Strategic Planning skills in telecommunications, or effective proposal development, the ingredients for industrial development are clear. In general the skills gaps can be categorized into five areas:

- Sales and Sales management
- Marketing and Market Research related activities
- Product Management
- Project Management
- Business Consulting roles

As can be seen in the more detailed analysis of missing skills in the *Skills Cluster Findings* section beginning on page 41, these five sets of skills are fundamental building blocks for the growth of an organization. The existence of a strong Product Management function, for example, ripples across an organization and affects many aspects of the ways in which it brings products and services to market. While most organizations recognize the need for this type of improvement to occur, developing and transferring these skills is not such an easy task. To institutionalize these skills and methodologies, they have to be embraced by the operation as part of a systematic change management program. Filling these gaps may have to be dealt with through corporate development programs that will be specific to each individual company or their specific market focus.

In general, these roles and skills will have to be developed with a combination of education and experience to ensure that effective consulting, sales, project management and business consulting is "burned into" the behavior of not just the individuals but also the teams that surround them. Many Egyptian firms readily admit that marketing and consultative selling are just not a core proficiency of their operations today. Most understand the need to change this, but without local resources, and a better appreciation of the value of these skills, it will not be an easy task. Some lessons learned from other countries will be a useful benchmark in the development of recommendations to resolve, these most crucial of skill gaps.

Many of the job titles in this category that show minimal or no skills gap actually have quite significant gaps. In many cases the low gap percentages reflect interviewees belief that they cannot afford to hire someone fulltime into these roles, rather than meaning that the role is unimportant. For example, many firms indicated a desire to hire sales executives with International Business Development skills as part of future hiring plans but it is not something all can afford today.

WEB DEVELOPMENT AND ADMINISTRATION	***HIGH***	***MED***	***LOW***	***TOTAL***
Web Page Developer	0.00	4.65	4.65	9.30
Web Site Developer	0.00	6.98	0.00	6.98
Webmaster	4.65	0.00	0.00	4.65
Web administrator	2.33	0.00	0.00	2.33
Web Designer	0.00	2.33	0.00	2.33

Interestingly enough, web development did not make it as high as many other skills gaps. We believe the major reason for this is the limited amount of complex web site development work that is currently available in the local and regional markets. As the majority of offshore work now is based on some form of web interface or portal interface, the demand here is higher. This is a skill gap area that we expect will increase as the volume and complexity of the web development work increases.

HARDWARE OPERATIONS AND MANAGEMENT	*HIGH*	*MED*	*LOW*	*TOTAL*
Datacenter Manager	2.33	0.00	2.33	4.65
Electronic design engineer	0.00	0.00	0.00	0.00
EE Manufacturing engineer	0.00	0.00	0.00	0.00
Operations Manager (datacenter)	2.33	2.33	0.00	4.65
Industrial designer	2.33	0.00	0.00	2.33
Manufacturing engineer	0.00	0.00	0.00	0.00
CRM system development and integration manager	0.00	2.33	0.00	2.33
SLA development engineer	2.33	0.00	0.00	2.33

Hardware and Operations Management was a new segment added to the Job Functions and the chart above does not reflect significant skills gaps for any of the job roles. However, this is more likely a reflection of the early development of this functional area than an actual lack of skills gaps. New types of companies, such as ASPs (Application Service Providers) will spur demand for these roles and skills gaps will become apparent quite quickly. Several firms expected this part of the ICT sector to increase considerably in 2003-04 period, as more operations become comfortable with outsourcing complete applications, and as B2B networks start to develop. In addition, development of call centers and data centers will increase demand for these roles dramatically during the 2003-04 period.

CUSTOMER APPLICATION TELEPHONE SUPPORT	*HIGH*	*MED*	*LOW*	*TOTAL*
C.A. Telephone Mgr	0.00	2.33	0.00	2.33
C. A. support specialist	0.00	2.33	0.00	2.33
Customer Hotline Mgr	0.00	2.33	0.00	2.33
Customer Hotline Rep	0.00	2.33	0.00	2.33
Customer support co-coordinator	0.00	2.33	0.00	2.33

Customer support and telephony support is another area that is growing in Egypt, particularly with Call Center activities being developed for internal and external sales and support activities. At the present time, the skills gap for this area appears to be limited, with an abundant labor pool and many of the roles being entry level in nature.

Skills Cluster Findings

The previous section, *Job Cluster Findings,* beginning on page 34, presented skills gaps for related roles as organized by Job Clusters. This section groups related skills together into Skills Clusters. This grouping allowed us to capture the detailed requirements of individual organizations, and at the same time, reflect the needs of the overall market.

Skills Clusters include:

- Programming Languages
- Database Platforms
- Business and Project Management
- Platforms
- Connectivity and Integration
- Interface and Media Design
- Certification
- Application Categories
- Business Specific Skills
- Technical Writing
- Data Center Operations

These clusters have provided a wide berth to cover the individual skills noted and needed by the various groups included in the study.

In the charts below, skills gaps below 5% are not highlighted; those between 5-10% are gray, and those greater than 10% are shown in white text on a black background. Gaps greater than 10% can be considered more severe, and are noted accordingly.

PROGRAMMING LANGUAGES	*HIGH*	*MED*	*LOW*	*TOTAL*
Java	11.63	2.33	2.33	16.28
C and C ++	6.98	2.33	0.00	9.30
C#	0.00	2.33	0.00	2.33
Cobol	0.00	2.33	0.00	2.33
Fortran	0.00	2.33	0.00	2.33
Portable Operating systems	4.65	2.33	0.00	6.98
Pocket PC	2.33	0.00	0.00	2.33
Palm OS	0.00	0.00	0.00	0.00
Microcode and Machine code	4.65	2.33	0.00	6.98
Medical System export interfaces	6.98	2.33	2.33	11.63

The strength of the technical workforce shows through with a limited set of Gaps in basic programming areas. Java scored the highest in skills gap, indicative of the rising need for skills in this area, and the later adoption in the local and regional marketplace of java as a platform for e-business based applications. In addition, some specialized areas such as Portable Operating Systems are now showing themselves to be required.

DATABASE PLATFORMS	*HIGH*	*MED*	*LOW*	*TOTAL*
Access	0.00	2.33	0.00	2.33
DB2	2.33	2.33	0.00	4.65
Informix	0.00	2.33	0.00	2.33
Microsoft SQL server	2.33	2.33	2.33	6.98
Oracle	4.65	6.98	0.00	11.63
Performance training (Oracle)	0.00	4.65	0.00	4.65
Sybase	0.00	4.65	0.00	4.65
VLDB (skills and capabilities)	0.00	2.33	0.00	2.33
Data modeling	4.65	0.00	0.00	4.65
Siebel Systems	2.33	0.00	0.00	2.33
Migration skills	2.33	0.00	0.00	2.33

As with basic programming skills, database platforms are fairly well covered. Only Microsoft SQL Server and Oracle were high on the list of gaps, primarily for higher qualified applicants with these skills. Based on the fact that a considerable effort has been made by MCIT to sponsor training in both these platforms, it is obvious that higher levels of certification are required for the firms reporting these gaps.

BUSINESS AND PROJECT MANAGEMENT	*HIGH*	*MED*	*LOW*	*TOTAL*
Business Process Analysis*	0.00	0.00	0.00	0.00
Business Analysis	9.30	0.00	0.00	9.30
Business Process Modeling	16.28	9.30	2.33	27.91
Geographic Information Systems*	0.00	0.00	0.00	0.00
Industry specific skills*	0.00	0.00	0.00	0.00
Methodology to improve products	0.00	2.33	0.00	2.33
Product Management	11.63	4.65	0.00	16.28
Product specific knowledge	2.33	0.00	0.00	2.33
Project Management	25.58	2.33	0.00	27.91
QA engineering	13.95	13.95	0.00	27.91
QA Test Methodology to improve products	4.65	0.00	0.00	4.65
QA testing	16.28	2.33	0.00	18.60
QOS (Procedures and policies implementation)	0.00	2.33	0.00	2.33
Quality Management	2.33	0.00	0.00	2.33
Software engineering project mgmt*	0.00	0.00	0.00	0.00
Software Level Agreements (SLA's)	2.33	0.00	0.00	2.33
Software Lifecycle Management	11.63	2.33	0.00	13.95
Telephony (TAPI, IVR)	0.00	0.00	0.00	0.00
Test Delivery Criteria Development	2.33	0.00	0.00	2.33
Test verification skills	2.33	0.00	0.00	2.33
UML	2.33	4.65	2.33	9.30

* Skills that have been noted here but not as skills gaps (with a specific score), were identified as areas that organizations would like to have access to consulting resources with these skills on an as needed basis.

Business and project management skills scored very high, illustrating gaps that are limiting the growth of the sector. Product Management, the effective selection, definition, packaging and implementation of new products and services, scored as a big gap in those firms that need such a function. Product Management needs are separate from Project Management, where technology and business management of new, existing and custom projects requires considerable upgrading of both skills and staff numbers. Quality Assurance is another skill area, once neglected, that is now high on the list of "things to improve." A major theme for most participants was seeing the value of programs such as CMM and other methods that would systematically improve the quality management and measurement inside their firms.

Access to proven Software Development Methodologies that will allow firms to improve the way they operate, and can be certified will ultimately improve the confidence of buyers of their products and services. This will apply to both a more sophisticated local market, as well as regional and international buyers of Egyptian ICT output.

PLATFORMS	*HIGH*	*MED*	*LOW*	*TOTAL*
Websphere	2.33	4.65	0.00	6.98
Microsoft .net	11.63	2.33	0.00	13.95
Mainframe OS	2.33	0.00	4.65	6.98
UNIX	0.00	9.30	2.33	11.63
LINUX	6.98	4.65	6.98	18.60
Oracle	2.33	0.00	0.00	2.33
SSL Web standards	0.00	0.00	0.00	0.00
BEA	0.00	0.00	0.00	0.00

In platform skills Microsoft and UNIX related skills topped the list. LINUX appears to be a skill area that could be in high demand for 2004. Even though the demand for these services is not huge today, this need appeared to be tied to increased need for JAVA programming skills and a desire to create server applications with lower cost infrastructure than those supported by the multi-national software vendors.

CONNECTIVITY AND INTEGRATION	*HIGH*	*MED*	*LOW*	*TOTAL*
ATM	2.33	0.00	0.00	2.33
XML	20.93	2.33	4.65	27.91
EDI (AS400/MF)	0.00	2.33	0.00	2.33
CORBA (oracle)	2.33	0.00	0.00	2.33
EDI	2.33	2.33	0.00	4.65
EAI	0.00	2.33	0.00	2.33
MQ series	2.33	2.33	0.00	4.65
Workflow and workprocess tools	0.00	0.00	0.00	0.00
W3 standards	2.33	0.00	0.00	2.33

CONNECTIVITY AND INTEGRATION	*HIGH*	*MED*	*LOW*	*TOTAL*
Network Performance Analysis	0.00	0.00	0.00	0.00
System Analysis Skills	4.65	0.00	0.00	4.65
System Integration Skills	4.65	0.00	0.00	4.65
Technical solution requirements	4.65	0.00	0.00	4.65
Requirement analysis for performance	4.65	0.00	0.00	4.65

While some specific skill sets had a low level of gap reported, some of this is due to the limited demand in the marketplace to exercise these skills. With more demand, the requirement for some of these areas would likely improve. However, there is no question that XML knowledge and its application represent a huge skills gap in the connectivity and integration of systems. When the market starts to implement more complex B2B solutions and supply chain systems, most of which will be based on XML, demand will grow even more.

INTERFACE AND MEDIA DESIGN	*HIGH*	*MED*	*LOW*	*TOTAL*
Graphical User Interface	4.65	6.98	2.33	13.95
Multi-media graphics	0.00	2.33	2.33	4.65
Film and TV production	2.33	2.33	2.33	6.98
Usability design	0.00	6.98	0.00	6.98
Courseware development	2.33	0.00	2.33	4.65
On-line help tools/shells	4.65	0.00	0.00	4.65

Usability design is generally not high on the list of needs for many firms, which may be a function of the immaturity of the market. Graphical User Interface and Usability design are rising as needs for organizations that understand that the success or failure of a system can often depend on whether the users will adopt it or not. For this reason, usability and system interface design has become an important element in overall system design and success. Bringing this to the fore will surely improve the quality of ICT product in general in Egypt. As e-learning and on-line systems come to market, an increased awareness of the sophistication required to build effective self-service tools will emerge. This demand should be increased by new courseware being imported into the country by specialized training and education firms in 2003-04.

CERTIFICATION	*HIGH*	*MED*	*LOW*	*TOTAL*
CMM	11.63	4.65	0.00	16.28
General management	4.65	0.00	0.00	4.65
TickIT	4.65	0.00	0.00	4.65
Vendor specific	0.00	2.33	0.00	2.33
CompTIA	0.00	2.33	0.00	2.33
Legislation of products and IP	0.00	2.33	0.00	2.33
Oracle	0.00	2.33	0.00	2.33
Microsoft	0.00	2.33	0.00	2.33

CERTIFICATION	*HIGH*	*MED*	*LOW*	*TOTAL*
COPC (variant of ISO for call centers)	0.00	0.00	0.00	0.00
Call center certification	0.00	0.00	0.00	0.00
CISCO Network Certification	4.65	0.00	0.00	4.65
CISCO Network Security	2.33	0.00	0.00	2.33

Low scores in the Certification cluster either result from high levels of existing certifications or a perception that it is not that important. For the domestic market, some firms did not believe certification was that critical. Their feeling is that if the market is not willing to pay for it, why should they go through the process? This perception is somewhat dangerous, as anything that improves business operations and the quality of products and services should be considered a worthwhile investment. However, when it came to CMM, the firms that are exporting to regional markets thought it was desirable, and those exporting to the USA and Europe believed it was going to be mandatory to even get on the same playing field with other exporting countries.

APPLICATION CATEGORIES	*HIGH*	*MED*	*LOW*	*TOTAL*
Banking/Finance	0.00	0.00	0.00	0.00
Business Intelligence	0.00	4.65	0.00	4.65
Collaboration Systems	2.33	0.00	0.00	2.33
Contact Management	0.00	2.33	0.00	2.33
CRM technology management	6.98	0.00	0.00	6.98
CTI	0.00	2.33	0.00	2.33
Customer Relationship Mgmt	2.33	2.33	2.33	6.98
e-Commerce concepts	0.00	0.00	0.00	0.00
e-Commerce security	0.00	0.00	0.00	0.00
e-learning	2.33	0.00	0.00	2.33
Enterprise Resource Planning	13.95	2.33	0.00	16.28
Financials	2.33	2.33	0.00	4.65
Geographic Information Systems	0.00	0.00	0.00	0.00
HR (Human Resource applications)	2.33	0.00	0.00	2.33
Healthcare	2.33	0.00	0.00	2.33
Hospitality (Hotel and Tourism)	2.33	0.00	0.00	2.33
IVR (Interactive Voice Recognition)	0.00	0.00	0.00	0.00
IP (Internet Protocol applications)	2.33	0.00	0.00	2.33
Knowledge Management	4.65	4.65	0.00	9.30
Money Management applications	0.00	2.33	0.00	2.33
PBX (integration)	2.33	0.00	0.00	2.33
Portals	13.95	2.33	2.33	18.60
Security	18.60	6.98	0.00	25.58
Telephony	6.98	2.33	0.00	9.30
Wireless	6.98	2.33	0.00	9.30

The increase in interest in application specific platforms is a very positive sign. Skills gaps are starting to occur in such areas as Portals, Security and ERP. Security was rated very high as a skills gap, and because of the limited deployment of products and services in this area, could be a difficult one to close. Enterprise Resource Planning remains a high potential application for Egypt's industry to improve production management and planning, ensuring competitiveness using ICT as an instrument; it will require considerable effort to develop suitable skills for ERP.

BUSINESS and INDUSTRY SPECIFIC SKILLS	*HIGH*	*MED*	*LOW*	*TOTAL*
Business Analysis Skills	2.33	0.00	0.00	2.33
Business and Strategic Planning	2.33	2.33	0.00	4.65
Business Continuity	2.33	0.00	0.00	2.33
Business Knowledge	2.33	0.00	0.00	2.33
Business Management skills	0.00	0.00	0.00	0.00
Business Planning	20.93	2.33	2.33	25.58
Business Process Modeling	9.30	0.00	0.00	9.30
Business writing (Arabic)	23.26	11.63	0.00	34.88
Balanced scorecard	0.00	2.33	0.00	2.33
Business Writing (English)	34.88	9.30	0.00	44.19
Change Management skills	4.65	0.00	0.00	4.65
Competitive Analysis	2.33	0.00	0.00	2.33
Contract and business mgmt skills	0.00	0.00	0.00	0.00
Contract Management	2.33	0.00	0.00	2.33
Computer skills (basic)	0.00	0.00	2.33	2.33
Consultative Selling	2.33	0.00	2.33	4.65
Cultural skills (sensitivity)	2.33	0.00	0.00	2.33
Customer Account Management (post sales)	2.33	0.00	0.00	2.33
Customer orientation and management skills	2.33	2.33	0.00	4.65
Customer Communication skills	34.88	4.65	0.00	39.53
Direct Marketing	2.33	0.00	0.00	2.33
Demonstration development	2.33	0.00	0.00	2.33
English language skills	4.65	0.00	0.00	4.65
Estimating for projects	2.33	0.00	0.00	2.33
Ethical standards	2.33	0.00	0.00	2.33
Evaluation planning and market development	0.00	0.00	4.65	4.65
Exposure to International markets Europe	2.33	0.00	0.00	2.33
Exposure to International markets Gulf	2.33	0.00	0.00	2.33
Exposure to International markets US	2.33	0.00	0.00	2.33
Facilitation skills	9.30	2.33	2.33	13.95
Financial Analysis	0.00	0.00	0.00	0.00

Customer communications skills, business writing (in both English and Arabic), and business planning all scored extraordinarily high in this segment of the survey. With some scores higher than 40%, these skills gaps must be considered remarkable and should be dealt with through a variety of means, including customized and remedial programs.

It is important to note that many of the skills in this cluster can be taught at the college or university level, however, truly effective training for skills such as writing, presentation and communications must begin much sooner. The ICT industry must work with the primary and secondary education system in Egypt so that high school graduates already have been taught basic writing, presentation and communication skills. The Ministry of Education in Jordan is beginning to work more closely with the Ministry of Information and Communications Technology for just this reason.

BUSINESS and INDUSTRY SPECIFIC SKILLS	*HIGH*	*MED*	*LOW*	*TOTAL*
Finance skills for analysis	4.65	0.00	0.00	4.65
French language business skills	2.33	0.00	0.00	2.33
General business awareness	0.00	2.33	0.00	2.33
General knowledge for Data communication employers(	2.33	0.00	0.00	2.33
IT and computer skills	0.00	2.33	0.00	2.33
Inventory control	2.33	0.00	0.00	2.33
ICT skills in Marketing (basic skills plus ICT knowledge)	2.33	0.00	0.00	2.33
Internet awareness	2.33	0.00	0.00	2.33
Individual skills (general knowledge)	2.33	0.00	0.00	2.33
Industry Knowledge	4.65	0.00	0.00	4.65
International business development	2.33	4.65	0.00	6.98
International business skills (export)	6.98	2.33	0.00	9.30
Knowledge Transfer Skills (industry specific)	2.33	0.00	0.00	2.33
Language skills (English)	4.65	0.00	0.00	4.65
Language skills (French)	2.33	2.33	0.00	4.65
Leadership skills	4.65	0.00	0.00	4.65
Legal data communication skills	2.33	0.00	0.00	2.33
Local Business Development	2.33	0.00	0.00	2.33
Localization skills	4.65	0.00	0.00	4.65
Management Development (Career Path)	2.33	0.00	0.00	2.33
Management skills	2.33	0.00	0.00	2.33
Matchmaking for Partnering options	4.65	0.00	0.00	4.65
Managing innovation	0.00	0.00	0.00	0.00
Market Intelligence	2.33	0.00	0.00	2.33
Market research	0.00	0.00	0.00	0.00

BUSINESS and INDUSTRY SPECIFIC SKILLS	*HIGH*	*MED*	*LOW*	*TOTAL*
Market research and planning	13.95	6.98	0.00	20.93
Marketing strategy	0.00	0.00	0.00	0.00
Negotiation skills	4.65	2.33	0.00	6.98
Policy and procedure development	0.00	0.00	0.00	0.00

Market research and planning also came out as a very high score, indicative of a huge desire to improve the way that products are defined and brought to market. Most of the ICT sector is very skeptical of the ability of local research firms to provide the right type of research for their organizations, and therefore do not use them extensively. Market Research skills also represent a considerable component of the "Consulting Gap" discussed at length in this report.

BUSINESS and INDUSTRY SPECIFIC SKILLS	*HIGH*	*MED*	*LOW*	*TOTAL*
Partnership Management	0.00	0.00	0.00	0.00
People Management Skills	0.00	0.00	2.33	2.33
Presentation skills	9.30	6.98	2.33	18.60
Pricing And Packaging	4.65	0.00	0.00	4.65
Prioritization Management	2.33	0.00	0.00	2.33
Problem solving skills	4.65	0.00	2.33	6.98
Product Selling Skills (for technology)	0.00	2.33	0.00	2.33
Proposal Development	20.93	4.65	0.00	25.58
Project Management skills	2.33	0.00	0.00	2.33
Proposal Management	2.33	0.00	0.00	2.33
Reading and interpretation skills	2.33	0.00	0.00	2.33
Report Management Methodology	0.00	2.33	0.00	2.33
Report writing	0.00	2.33	0.00	2.33
Risk Management	2.33	0.00	0.00	2.33
ROI analysis	2.33	0.00	0.00	2.33
Sales skills	18.60	2.33	0.00	20.93
Sales Management	0.00	4.65	0.00	4.65
Supplier Relations Management	0.00	0.00	0.00	0.00
Service Level Agreement (development)	0.00	0.00	2.33	2.33
Supply Chain Management	2.33	0.00	0.00	2.33
Solution selling (department level)	2.33	0.00	4.65	6.98
Solution selling skills (strategic)	9.30	0.00	4.65	13.95
Standardized business procedures skills	2.33	0.00	0.00	2.33
Teambuilding skills	4.65	4.65	0.00	9.30
Team Communication Skills	2.33	0.00	0.00	2.33
Team dynamics	0.00	0.00	0.00	0.00
Time management	2.33	4.65	0.00	6.98

Proposal Development, Presentation Skills, Sales Skills and Solution Selling all scored high or very high in the study. All of these skills are crucial to a company's ability to influence prospective client's during the decision making process and to win new business. Solution selling, in particular, is key to improving any company's penetration of a targeted industry sector. By using a "consultative" selling approach, sales professionals learn about and understand their prospect's issues BEFORE proposing solutions to them. This approach will be particularly important to the implementation of new and more complex systems, where a custom approach will be needed to ensure successful deployment.

TECHNICAL WRITING	*HIGH*	*MED*	*LOW*	*TOTAL*
Technical Doc Management	2.33	0.00	0.00	2.33
Technical Writing	25.58	6.98	0.00	32.56
Typing skills	0.00	2.33	0.00	2.33
Typing speed	2.33	0.00	0.00	2.33
Tele Services skills	2.33	0.00	0.00	2.33

Technical writing is the intersection of technology and the users of the system. Closing skills gap in this category will improve the user acceptance along with the overall quality of implementation. The gap is currently so high that developing a specialized intervention program is likely to be necessary in the near term. In addition, there could be a good business opportunity for outsourcing technical writing services to firms that cannot afford to hire their own professionals directly.

DATACENTER OPERATIONS	*HIGH*	*MED*	*LOW*	*TOTAL*
Datacenter security	2.33	4.65	0.00	6.98
Redundancy planning	2.33	2.33	2.33	6.98
Disaster planning	2.33	4.65	0.00	6.98
Operations Management Systems	2.33	0.00	0.00	2.33
Operations Monitoring tools	0.00	0.00	4.65	4.65
Capacity planning	0.00	2.33	0.00	2.33
Network optimization	2.33	0.00	2.33	4.65
Performance management	0.00	0.00	2.33	2.33

Data center operations did not really show any considerable skills deficiency. However, this is more likely a reflection of the newness of this functional area than an actual lack of skills gaps. New types of companies, such as ASPs (Application Service Providers) will spur demand for these roles and skills gaps will become apparent quite quickly. Some firms are now starting to identify disaster planning, redundancy and security as important items.

Education

Findings from Company Interviews

Education output and satisfaction was measured from each organization interviewed during the study. This was measured by the "hire-ability" of individuals that firms were looking to add to their workforce. While education was one factor in "hire-ability" of staff, others included personality factors, industry qualifications, certification and experience.

Consolidating information from dozens of company interviews suggests the following conclusions:

1. Most firms are now as, if not more, interested in evaluating personality and attitudinal factors when making hiring decisions.
2. Older, more experienced talent in the marketplace may still not be as hirable if they display "old world" attitudes towards management and information sharing. Teamwork, collaboration and flexibility are much more important to firms in this sector.
3. There was a split opinion from many firms on the output from the education system. Some firms felt that the graduates from public institutions were adequate for technical roles, but mainly not acceptable for other roles (e.g., Marketing, Sales). In general, most felt that business, communication, writing and presentation skills were far below an acceptable "work assignment" level for Bachelors degree graduates entering the workplace. (AUC graduates were considered somewhat of an exception to this rule.)
4. More than 50% of the firms indicated they do not plan to hire graduates from any institutions in the next 6-12 months. However, this is more of a reflection of overall market conditions and current needs for more experienced or certified talent.
5. The most frequent needs among organizations with hiring plans include: sales and marketing executives, technicians and programmers with certification in relevant platforms (IBM, Microsoft, Cisco, Oracle), and project managers with industry experience.
6. Many firms now believe that it is better to cross train industry specialists in IT skills rather than trying to provide the education in the reverse direction. This represents a fundamental shift in thinking for many IT firms. They now understand that considerable benefit is gained by having industry specialists on their staff, emphasizing the need to build systems that a particular sector business needs, rather than what an IT firm can build.
7. The lack of connectivity between industry and education providers is a major source of frustration for industry and education leaders alike. However, there are few programs that provide industrial or work experience as part of the curriculum today, which further exacerbates the problem.
8. In general, training programs are not tied to industry demand. This is causing much frustration for both groups: education organizations get poor feedback from their alumni because they can't get the jobs they want, and companies feel that their skills gap issues are not being dealt with effectively.
9. Many educators believe that the government should be more flexible in permitting curriculum changes and the establishment of relevant programs for public and private educational establishments.
10. The compensation levels are so low for faculty in most public universities; it makes it very difficult for faculty to dedicate enough time and energy in courseware development. They have to invest their time in creating supplemental income from consulting and other activities. This creates not only a potential conflict of interest,

but ensures that the quality, relevance and timeliness of courseware is less than adequate in a continually changing industry.

Interviews with Educational Organizations

Eight organizations including public and private sector universities and private sector training and education firms were interviewed as part of this study. In addition to briefing the organizations on the purpose and output of the study, multi-hour interviews and discussions covered discussion of faculties, ratios of professors to students, graduates and specific discussions on the issues of:

- Specialization relevant to ICT industry development
- Connections and programs to industry
- How courses are modified and changed to meet industry demand
- Their needs in terms of input from industry and government to improve their responsiveness to market conditions
- Their input on other factors that could improve the Skills Gap issue for Egypt

Interview results and recommendations from education institutions are summarized in the tables below.

Specialization Relevant to ICT Industry Development

Specialization	Relevance
One university produces nearly all of its own programs and products for its "internal companies." These include CDs for education, major projects for government and clients (mainly overseas), and even includes printing their own prospectus materials. They separate their production from their educational environment, but the experience that they gain from operating a "consulting business" inside their operation, makes their education programs much more effective.	Understand exactly the industrial needs when creating courseware for e-learning, video and game software development efforts.
Includes a 360 degree evaluation system as a result of their ISO 9000 certification for teaching classes.	Students get to evaluate their professors in an open policy mechanism. (Similar to leading practices in multi-national organizations, very business like. Focuses on quality issues for future business students. As this was a requirement for ISO9000 approval, the college keeps its courseware up to date through a standardized process.

Specialization	Relevance
A 6-week internship program in industry. In the past this has been optional for students, but will be mandatory in coming years, to ensure industry experience is part of their program.	Makes industry experience a part of the program, key to exposing students to how the industry works before they enter the workforce.
Offering consulting services to related organizations. Professors supplement their income with consulting income. Offering training for software areas and consulting for microelectronics.	Hands-on experience by faculty in industry specific activities.
Looking to do more work in the procurement assistance area, but not yet in IT	Desire to offer more services in the ICT sector for consulting fees.
Automation center	Industrial center within the university that is focused on business automation programs, particularly manufacturing systems.

These programs represented some of the better practices and activities inside the universities and colleges, however, in general many students leave university with a primarily theoretical view of the ICT business area. One way of improving these programs would be through better connections to industry.

Industry Connections Programs

Connection or Program	Relevance
Co-operative programs with other leading universities. One college visited had just completed a deal with Brunel University (Uxbridge, UK) to offer their IT programs here. Students will be able to get a BsC from a well recognized international school by attending here.	Excellent method to provide leading edge courseware in local environment.
On-line education. Some of the courseware from these partnerships is be placed on-line in regional colleges	This has the added benefit of making extended education and curriculum to an existing student audience with relevant and high quality content.
Research Centers. One college has developed a research center with a Board of Directors mainly comprising of local industry leaders. Their companies set problems for the center to solve and the center provides the research and combined intellectual power to work on the issues. It has been a great success for all involved.	Research center that solves real world problems creates tremendous value for both the college and for industry using them. This type of connection is what has made the top-notch schools even better.

Connection or Program	Relevance
One university has a Board of Advisors comprised of industry figures in the ICT area to ensure that that they get feedback on curriculum each year. This input is then used to modify their coursework accordingly. They feel comfortable with this input to their operation and it appears to be working well for them. This university is always willing to change course content to reflect industry needs, but wants to do it a programmatic way.	An excellent means to keep in contact with what is going on in the outside world. However more frequent contact with this group will provide better feedback for the participants.

Course Modification to Meet Industry Demand

When it came to reviewing how courses were modified and changed to meet industry demand the input and means became considerably softer in nature. The establishments that had stronger ties to industry were fairly confident that their courseware changes were likely to meet with industry needs. However, the more distant the connection with industry, the more desperate institutions became to acquire relevant course information. In one case, plagiarizing the curriculum from a respected ICT school was the primary means of getting input to change courseware for future years. Like many in this industry sector, it appears that the universities are also deprived of the relevant research required for them to keep pace with industry change.

Course Modification Strategy and Plans	Results
For those organizations with strong industry connections courses are modified in line with industry needs on a regular basis.	The changes are submitted to the government for approval, and changes are made on annual basis.
Would like to participate in Technology Park activities and other industry related activities that would help them be as a responsive as possible to industry needs.	This was a desired direction that one university requested, however there does not appear to be a vehicle in place for them to make this happen.
One university is trying to modify the curriculum to make it easier for a student to change if they have selected the wrong track or department. However, they still require highest performance for the EE track, and weed out students that way.	Tracking of students is based on the "most difficult course route" not necessarily the ideal career or industry path.
While several universities would like to provide credit bearing courses, they do not have the facilities, staff or flexibility to offer them.	No easy way to allow students to change their major while at the university.

Course Modification Strategy and Plans	Results
Despite the fact that the curriculum indicates commonality at the country level, individual universities change the things they want to change. So the corresponding course content is actually very different from school to school. This differentiation is important to the leading schools.	Differentiation between courses and courseware has become important to the faculties. This can create unhealthy competition between similar faculties in the same system.
One university is looking for a way to move the system to make it easier for students to move into other fields once started. Do not plan to move to credit system, but plan to move towards a major/minor program.	Could be a method to revise courseware and student growth path by adding some flexibility to the system without having to move entirely to a credit-based system.

Improving Education's Responsiveness to Market Conditions

Listed below are some of the ideas generated by interviewees at educational institutions on ways that their responsiveness could be improved through government or industry based programs and activities.

1. Programs such as the Skills Gap Analysis appear to be an excellent method to potentially get info on future needs.
2. More Research Centers where industry participates with education.
3. Their own consulting units provide input to the curriculum based on real world needs.
4. More real market research would be welcomed by all.
5. Increasing pay scales of the university professors would attract the right type of talent. Currently very difficult to hire even the best students (500Le month for TA versus 6,000 Le for leading industry job).
6. Emphasis on the value of continuing education. Not considered really valuable by the society but is critical for this market sector.
7. Needs to be a way for the universities to improve standards and operations. In particular:
    a. Accreditation (such as ABET)
    b. Quality Assurance standards for courses and faculty management
    c. Greater investment to make it easier for courses to be brought to market and changed more easily.
    d. Quality systems to measure current staff performance and ability to upgrade accordingly.
8. No planning in the industry regarding the direction of education. Needs to be improved
9. Mismatch of skills has to be dealt with in a better way. Training programs should be better customized to meet industry demand.
10. Vendor specific training e.g. Cisco training – could enhance the courseware at university level considerably. (This has already been implemented at some establishments.)

11. Increased resources and improved links to industry and resources specifically for: Networking Labs, AI Labs, Speech, Games and Linux

These comments and suggestions were given in a great spirit of co-operation and desire to improve the way that the university system supports the ICT Sector. Many of them are incorporated in the recommendations as a result.

Other Issues that Could Help Improve Skills Gaps

These recommendations also came from the education groups:

1. Changing the culture of the management and decision-making processes in Egypt. Currently slow, indecisive, does not reward risk, teamwork adverse and does not create or engender entrepreneurs.
2. Let the government get themselves out of the way of high quality education. Many organizations feel trapped by the processes that they have to go through to make changes in the system, and feel that the bureaucracy fulfils it's own needs without paying attention to what industry or their students need to become more employable.
3. A serious planning effort should be applied to industry for direction and execution, so that education programs can build around it.
4. Technology awareness for CEOs is a key factor that affects skills gaps.
5. Very few jobs open in the current economic climate, and education establishments are not sure what they will be, therefore there is a need for more detailed market research and monitoring.
6. One university cited that 50% of students are unemployed in the market after graduation…the lack of market demand is very difficult to explain to students who have worked hard for 4 years.
7. Implementation of recommendations is the key. Many things are just never implemented and go round in circles between government and education
8. Operating characteristics of the country make it very hard to create accountability for professors in the education system. One dean cited having very little control over the activities of the faculty, and he cannot easily take action to correct basic issues such as quality control, timeliness etc. This creates an environment that accepts less than excellence as the norm. Hard to overcome this issue, when the professors are being paid very little. There is a need to upgrade quality starting with the paycheck of professors.
9. Top Management needs to become engaged in the decision process for education.
10. Library systems and automation consulting should be deployed and supported.

Statistics

From Egypt's university graduates of 163,000[i] around 2,500 of those are graduating with technical degrees that would be most relevant to the ICT sector. Many of the public university students are graduating from Cairo University, Ain Champs, Assuit University and some smaller bodies. In general the private universities such as American University in

[i] CAPMAS. The Statistical Year Book, June 2000.

Cairo and Arab Academy have curriculums linked to industry requirements including factors such as:

- Board of Advisors that include industrialists
- Research centers providing services to local industry
- Internship programs to provide students with work experience as part of their educational experience

Skills Gap Best Practices

Among the four countries researched for this report, there are no clear examples of best practices across the board. There is not, for example, one country that has done so many things right (or wrong) that they provide an obvious example for Egypt to follow.
Consequently, the recommendations in this report are based on looking at individual actions from other countries that provide point examples from which Egypt can learn. The country summaries that follow highlight some of what has worked or not worked in the four benchmark countries.

In addition, none of the countries surveyed has undertaken a systematic approach to identifying and closing skills gap issues. The recommendations in this report provide a programmatic approach for Egypt to follow in identifying and closing skills gaps as part of an integrated action plan.

India

Summary

Supporting details for the comments in this section can be found in the report on India beginning on page 80.

Development of ICT skills in the Indian workforce was not the result of a centralized program or a predetermined strategy. Instead, the rise of the Indian ICT export industry and the concomitant development of ICT-skilled workers resulted from the confluence of a number of otherwise unrelated factors.

- A decades-long emphasis on engineering in the education system
- Widespread availability of training in COBOL and other mainframe and legacy skills
- Strong English skills in IT-trained workers
- A large number of expatriates who were successful and well-placed, especially in the United States and the UK
- Entrepreneurs with vision that others would be willing to outsource to India
- The onset of the Y2K crisis
- Persistent global increases in demand for IT workers through 2000-2001, and to a lesser extent, through today

Though the Indian government was not involved at the start of the Indian IT export revolution, it is actively involved in examining and helping to close skills gaps today. Examples include:

- In 1998, the Indian government created the National Task Force on IT and Software Development with the specific goal of making India one of the largest producers and exporters of software by the year 2008.
- The Steering Committee on Secondary, Higher and Technical Education contributed significantly to the Education section of the current five-year plan in India.
- In January 2000, the Indian government created the Task Force on Human Resource Development in Information Technology.

Development of the services sector in India has lagged considerably behind the software sector. It is only recently that Indian companies have begun to sell consulting services, along with other more sophisticated and higher-value services, rather than just serving as "body shops" for programmers.

Development of the telecommunications sector has been very slow in India and the country still faces enormous gaps in provision of basic telephony services to its population. The technology sector has benefited by a concentration of service upgrades in selected locations, often referred to as technology parks or software parks.

Lessons Learned

Government must work cooperatively with the IT industry and both public and private educational institutions. In many respects, the rise of the Indian software export industry was a fluke – a very successful fluke – but a fluke nonetheless. Lack of government participation from the earliest stages is not a model that any other country should follow.

A country with a weak telecommunications infrastructure, which is still the case in India today, can succeed in developing both domestic and export markets in ICT. Trying to raise the level of infrastructure services to an acceptable level across an entire country as large as India, however, will take far too long. The key is to focus the development of high bandwidth telecommunications services and reliable electrical power in specific locations like technology parks.

Building a market in higher-value ICT consulting services requires either or both of two things:

1. A well-established ICT industry that provides the foundation for moving to "the next step" of selling consulting services.
2. A critical mass of consultants and service providers with experience in other markets who can supply the expertise needed to build a services sector. Note that the experienced consultants may be expatriates who return home or talent imported from other countries.

In India's case, it is primarily repatriation of skilled consultants that is allowing them to succeed in delivering ICT consulting services.

Israel

Summary

Supporting details for the comments in this section of the document can be found in the report on Israel beginning on page 98.

Israel presents a special case in that the establishment of the country as recently as 1948 provided an opportunity to create a highly literate and technology-oriented workforce. In addition, many people with advanced degrees immigrated to Israel in the ensuing decades, raising the education and skill levels beyond what would have occurred through normal population growth.

Consequently, the government of Israel has deliberately placed strong emphasis on R&D and technology development as a means for national growth. As part of this strategy,

- Computer use and technology training is mandatory in the schools.
- The government sponsors retraining programs to bring more people into the ICT workforce.
- The government sponsors programs to rapidly assimilate educated immigrants into Israeli culture, society and the workforce.
- The Ministry of Industry and Trade created a program to develop technology skills and ensure continuous skills development.

Lessons Learned

Israel provides the perfect counter example to India in terms of government involvement in identifying and closing skills gaps. Even before the high-tech boom of the 1990s, the Israeli government was already working with industry and educational institutions to raise the technology skills and education level of the country's workforce.

Israel is the only one of the four benchmark countries in this report that is a net exporter of telecommunications equipment. This has resulted from heavy emphasis on R&D and military communications in the last 50 years and is unlikely to be duplicated to a significant degree in any other country.

Jordan

Summary

Supporting details for the comments in this section of the document can be found in the report on Jordan beginning on page 112.

Jordan has been moderately successful in advancing the state of its ICT sector and the technology skills of its workforce. A significant positive factor is the extremely high emphasis placed on ICT development by HM King Abdullah. However, by most reports, public and private colleges need to work even more closely with industry in order to produce more employable graduates.

Int@j, the trade association created in 2000 during the first REACH initiative, appears to be an effective advocate for industry and an effective liaison with government. They have produced the only national-level skills gap study of any of the countries surveyed for this report.

Two other initiatives are worth mentioning:

- The Jordanian government has worked aggressively to establish industry-sponsored training institutes in conjunction with overseas vendors (primarily US technology companies). Intel, Cisco Sun and Microsoft all run training programs in Jordan.
- NetCorps Jordan trains young people with the skills to be interns in community IT centers, schools and businesses around the country. The goal is to provide the interns with both technology and business training so they can spread their knowledge throughout the community.

Telephone services in Jordan are probably at a median level when compared to other countries in the region. However, Jordan has chosen to invest heavily in one specific area – a broadband national network – in order to many other countries' capabilities. The Connecting Jordanians initiative will link schools and Community IT Centers at 100 Mbps, while connecting universities at gigabit per second speeds.

Lessons Learned

Direct intervention by the head of state in a country can only help the cause of an industry. However, it requires close cooperation between education and industry to train workers with the right skills and provide them with satisfying jobs and careers. Pronouncements from the top cannot produce results by themselves. It is still early to tell whether government, industry and education can work together in Jordan to close the crucial skills gap identified in the int@j report.

An innovative project like Connecting Jordanians could provide an effective tool to radically improve the technology skills of the Jordanian population and dramatically increase the competitiveness of its ICT graduates and workforce. The network is scheduled for completion in 2005 and it will take several years to measure its long-term effectiveness, but it seems quite likely that Jordan will enhance its competitiveness in global ICT markets if this project meets its goals.

Philippines

Summary

Supporting details for the comments in this section of the document can be found in the report on the Philippines beginning on page 134.

The Philippines has a long history of successful manufacturing and agricultural exports, based largely on its natural resources and abundant low-cost labor. In the 1980s and more particularly in the 1990s, the country began to focus its literate, English-speaking workforce on the technology sector. More recently the government has focused considerable effort on the call center industry, placing a higher priority on that segment rather than trying to duplicate India's success at software exports.

The Philippine government has recognized that the technology skills of its workforce are crucial to the success of the call center industry, in particular, and the ICT sector in general. Consequently, the following organizations all focus on skills gap issues to some degree:

- The Commission on Higher Education (CHED) has overall responsibility for public and private higher education. Though not focused exclusively on ICT training, CHED has developed several ICT-oriented programs.
- The Technical Education and Skills Development Authority (TESDA) was formed almost 10 years ago through the merger of several skills development organizations in various government departments. TESDA monitors skills gaps, sets policies, formulates its own programs as well as working with both Philippine and foreign organizations to raise technology skill levels in the country.
- The Foundation for Information Technology Education and Development (FIT-ED) is a non-governmental organization established to raise IT awareness and prepare Philippine society to actively participate in the information age.
- The Information Technology and E-Commerce Council (ITECC) is the highest policy making organization in the Philippines that focuses on information technology. ITECC is chaired by the President of the Republic of the Philippines and consists of five committees, one of which focuses on human resource development.

Lessons Learned

Much of the success of the call center industry in the Philippines derives directly from government and policy initiatives in education and training, along with traditionally strong English-language skills in the Philippine workforce. The working relationship between industry and education seems particularly strong in the Philippines.

In addition, the President of the Republic is the chair of the The Information Technology and E-Commerce Council, demonstrating direct involvement of the President in the development of the ICT sector.

Recommendations

The recommendations in this report cover a broad spectrum of topics but still have one unifying theme – they are all designed to help close ICT Skills Gaps in order to help the Egyptian ICT sector to be more successful. Success can be achieved in both the domestic and export markets, and indeed, success in one is closely intertwined with the other.
These recommendations are also designed to help other industries improve their supply chain operations and overall productivity through increased use of ICT. There is a strong symbiotic relationship between general industrial growth and the health of the ICT sector. Unfortunately, due to the limited penetration of ICT inside Egyptian industry in general, (see Industry Report from PfCE August 2003), the benefits of operational improvement form using ICT and business process improvement has not yet impacted the economy. This may be one the best opportunities for improvement in multiple industry sectors and the ICT sector as a whole.

At the heart of all of the recommendations in this report is the need for a coordinated set of actions among three parties – government, education and industry. While there are isolated instances of countries that have achieved ICT export success without close coordination among all three parties, it is essential for these groups to work together in Egypt.

The recommendations are broken into seven groups, with the recommendation for which party should take the next potential action.

1. Technology Awareness

Building effective Technology Awareness for organizations represents one of the most important areas where firms in general industry sectors can be exposed to relevant technologies and how it can benefit their operations. Creating effective Technology Awareness programs will help the industry in 5 ways:

- Educating key buyers about how technology and Business Process Improvement can improve their business operations and export opportunities
- Provides a consultative vehicle for ICT firms to assist in the education of their potential client base as a result of these programs
- Clearly show how Internet based technologies (voice and data) can improve a business operations
- Brings both the buyer and the seller to a common framework of understanding when beginning discussions together. (Starts the RFI/RFP process)
- Permits executive management, internal IT staff and line mangers to a common framework of what ICT can do to help improve the business operation.

Action Plan

	Program item	Content	Responsible party
1	Creation of industry specific technology awareness seminars	Seminars to include industry specific topics such as Portals, Supply Chain Management, Customer Relationship Management, Knowledge Management, B2B activities for relevant industry	Promoted by MCIT and other industry associations. Provided by private sector.
2	Industry Technology Guides	Booklets and web based guides to help industry to improve their operations in a step-by-step method incorporating Best Practices from relevant industry sector. Applicable to resources and support available in local market.	Promoted by MCIT and other industry associations. Provided by private sector.

3	Outsourcing guide and seminar	Guide and seminar to illustrate the benefits and requirements of an organization to effectively outsource a business function. Could cover current topics of interest such as Call Centers, ASP, Hosting and IT outsourcing. Will show to deal with Service Level Agreements and be a "buyer's guide" to these services.	Promoted by MCIT and other industry associations. Provided by private sector.
4	Case Studies	Compendium of case studies where industry has improved business operations through the intelligent use of ICT in their operations	Promoted by MCIT and other trade bodies. Studies will be provided by the private sector.
5	Self paced Technology Awareness programs	Selection and licensing of e-learning programs that cover key technology areas for managers and relevant staff. Self paced and able to be run on-demand inside the operation. (Could be CD based, or web seminars.)	Promoted by MCIT and ICT industry associations. Studies will be provided by the private sector.

Each of these programs could be developed and delivered on a continuous basis to illustrate how industry can become more competitive, and in particular increasing exports. The course content would need to carefully reflect a balance between industry, business and technology needs, and encourage (where relevant) exploitation of technology in Egypt.

As a side benefit, these programs would also be relevant to assist in the penetration of other markets, whether regional in the Middle East and North Africa, or in the USA/Europe areas.

2. Sector Based Business Process Improvement

Identification of industry sectors that are good candidates for Business Process Improvement is another key recommendation of this report. This would provide a good focus for not only increasing domestic demand for ICT products and services, but will increase the competitiveness of firms already exporting, or looking to export to other markets. A program could look like this:

	Program item	Action details	Responsible party
1	Select industry sectors	Identify industry candidates that will support Government economic strategic goals of "export driven growth".	Promoted by MCIT and other industry associations. Provided by private sector.

2	Identify target opportunities inside industry sectors	Research to clearly identify best candidate applications and business process improvement programs that will provide results for sector in question. e.g. Supply Chain Improvements, Technology opportunities, Business process improvements, telephony infrastructure and CRM.	Promoted by MCIT and other industry associations. Provided by private sector.
3	Develop Sector Improvement plan	Identify "early adopters" who are keen to change and participate in the Process Improvement program. Develop a program for relevant supporting parties.	Promoted by MCIT and other industry associations, NGOs. Provided by private sector.

3. The Consulting Gap

As discussed at the beginning of the findings "The Consulting Gap" is having a profound impact on the development of the sector and technology use in general in Egypt. Because this gap represents a void between defining what needs to be done, and getting it done, action is recommended to have the private sector primarily solve the issue.

By building up one, or a series of firms with this capability to provide the lacking skills in the marketplace will not only eliminate huge gaps currently present, but could act as a catalyst for demand where in many cases reluctant buyers abound. The distrust between the buyers and sellers of systems in the domestic market is a key reason for consultants that understand the nature of the "IT buying process".

	Program item	Action details	Responsible party
1	Procurement Consulting	Procurement consulting groups provide assistance to buyers in the development of requirements, business process change, technology definitions and even advising them through the buying process.	Private Sector
2	Market education	Providing Technology Awareness programs and assistance to educate market sectors on relevant Technologies and how they can improve operations in a sector.	Private Sector
3	ROI education and TCO	Providing guidance to organizations buying and selling technologies about the benefits of Return On Investment and understanding Total Cost of Ownership. These mechanisms are a way of ensuring that technology is being selected to support business goals, and measure the results after it has been implemented.	Private Sector

	Program item	Action details	Responsible party
4	Technology awareness	Individual Technology Awareness programs would be designed to meet specific company needs. These could be run on a regular schedule.	Private Sector
5	Business process consulting	Source to assist organizations document and improve their business processes. This could be business process improvement or definition of improve Business and Work practices as a result of industry and technology knowledge.	Private Sector
6	Change management	For organizations that are looking at mergers and acquisitions, new market entry, or reorganization of existing operations, (e.g. modernization and privatization), Change Management consulting can help them through this process. Requires organization and methods proven in other markets, but relevant to domestic and regional cultural conditions.	Private Sector
7	Outsourcing	Providing outsourcing of the above services to vendors, suppliers and buyers would assist in developing partnerships that will help them "fill gaps" needed for their short and long term specialized needs.	Private Sector
8	Market Research and Strategic Planning	Market Research and Strategic Planning for the ICT sector is an important business function not available locally to many of the firms operating in Egypt. Provision of these services at the right quality level could be a considerable boost in the creation of competitive products and services for the market.	Private Sector
9	Segment specific knowledge	Particular skills in an individual segment, for example Telephony. Could provide benchmarking, business process consulting and technology consulting to help with upgrade of industry segment to next level	Private Sector

Functions that could be filled by an ICT Consulting Institute

The creation of an ICT Consulting Institute would be one means to improve dramatically the "consulting gap" in the marketplace. This concept would allow for either one firm or a collection of skills and practices under a "loose federation" of organizations. Regardless of the nature of the commercial arrangement, building this capability will fill many of the needs that are not serviced by the marketplace currently.

3. Skills Gap Action plan

The Skills Gap Action plan would have 2 main components. The first would be the continued use of the Skills Gap Analysis program to ensure that relevant information is

gathered in a timely manner to address the Skills Gap needs at a particular point in time. The second would be to create some form of output from this study to allow relevant organizations use this input to best effect. This might be building courseware to address short terms needs, Public Universities using this to assist in the creation of the appropriate curriculum changes, or MCIT directly programs to assist in demand generation in relevant spaces.

	Program item	Action details	Responsible party
1	Annual or semi-annual Skills Gap Analysis study	Regular requests of industry regarding the Skills Gap requirements for the Egyptian ICT Sector. This will provide timely and relevant input for other programs in industry, government and education.	Promoted by MCIT and other industry associations. Provided by private sector.
2	Skills Gap Plan follow up	Provision of Skills Gap Study output for industry, government and education to affect short and long term programs related to current and future Skills Gaps needs. e.g. Business Skills, Telephony, Wireless, ERP, CRM etc.	Promoted by MCIT and other industry associations. Provided by private sector.
3	Skill Gap Calendar	Web site where follow up programs are being offered by industry and government to show how Skills Gaps are being addressed and by whom and when.	Promoted by MCIT and other industry associations. Provided by private sector and MCIT.

4. Modernization and Privatization

Another area that could be a key area for improvement is the area of Modernization and Privatization programs in Egypt. Looking for good candidates for Business Process Improvement and upgrading of their skills within the organization. The current programs underway provide some good synergy with the skills gaps issues discussed in this report. In fact the "Consulting Gap" recommendations also will have an impact on the effectiveness of these programs, given that competent consulting resources are a key ingredient for success of these programs. Recommendations include:

	Program item	Action details	Responsible party
1	Select industry candidates	Identify industry candidates that will support Government economic strategic goals of "export driven growth", and are a good match for current Modernization programs.	Promoted by MCIT and other industry associations. Provided by private sector.
2	Identify target opportunities	Research to clearly identify best candidate applications and business process improvement programs that will provide results for modernization groups in question. e.g. Supply Chain Improvements, Customer Relationship management, Business process improvements, IP infrastructure, Wireless, PDAs	Promoted by MCIT and other industry associations. Provided by private sector.

3	Develop Sector Improvement plan	Identify "modernization candidates" who are keen to change and participate in the Process Improvement program. Develop a program for relevant supporting parties.	Promoted by MCIT and other industry associations, NGOs. Provided by private sector.

5. Education Recommendations

As noted in the best practices segment the countries that have been really effective in closing skills gaps systematically have implemented programs that link education, industry and government. Of these links, the most important is the connection between industry and education. The following table outlines an action plan that should assist in improving the environment for ICT sector development:

	Program item	Action details	Responsible party
1	Establish an Education ICT Skills Committee	Taking the output of Recommendation #4 and create a committee that will transfer the knowledge gained from the Skills Gap Analysis and use this as input to curriculum development for the relevant body.	MCIT, Educational organizations and industry associations (or representatives from industry)
2	Establish Educational Best Practices Forum (BPF) for educational establishments to leverage the best in local and international areas	Best practices could include, ISO 9000 for education, review processes for students and faculty, courseware development strategies, partnership programs, management and research activities.	Educational organizations
3	Private consulting and training firms help close skills gaps	Firms with access to special knowledge and skills that can help close the skills gaps issues will have the opportunity to offer these courses to the participants in the marketplace.	Private Sector
4	ICT Research Center	Potential establishment of an ICT Research Center that several educational organizations could participate in the development and running of on day-to-day basis. This could provide specialized or original research and problem solving for ICT or other industry sector firms.	MCIT and Education organizations.
5	e-Learning and self-paced programs	The addition of relevant e-learning programs to university and other vocational courseware will increase the number of students that can be reached with timely materials.	MCIT, Educational organizations, private sector.

	Program item	Action details	Responsible party
6	Regular review of university curriculum for ICT market needs	The university system produces the bulk of the graduates for the industry, but is drastically under funded to produce the quality of product they would like to build, a regular review should be undertaken to upgrade the quality of programs and their relevance to ICT industry needs and resources required to sustain this in the long term. This would constitute an overall improvement plan for all the education establishments, including salary and compensation review for faculty to become competitive with industry levels.	MCIT, Ministry of Education, Educational organizations, private sector (input only)
7	Add "experience" time and effort into each students courseware	Internship programs, work time experience needs to be added into almost all programs in the current university curriculums	Educational organizations
8	Improvement of university standards and courses	By using a combination of means such as: a) Accreditation (such as ABET) b) Quality Assurance standards for courses and faculty management c) Greater investment to make it easier for courses to be brought to market and changed more easily. d) Quality systems to measure current staff performance and ability to upgrade accordingly.	Educational organizations
9	Add flexibility into the educational system	Create a positive initiative to help universities deal with creation of more flexible courseware and career paths. Not only will this benefit students by giving them alternatives during their undergraduate years, but will also benefit industry if changes can be more flexibly included to meet industry and market demands.	Educational organizations

6. Business Environment and Infrastructure

There are still many factors adversely affecting the ability of organizations to operate in the marketplace, both domestically and in the international field. Some of these issues have little to do with the Skills Gap Analysis study, but are relevant because of the negative impact on exports and in particular domestic business operations. One factor in the increase of exports to the Middle East region in the last 3 years, has been the negative domestic business environment. Many of the interviewees would even describe the current domestic marketplace as hostile, due to unfair business practices and laws that are interpreted incorrectly.

For improvement in the business environment the following recommendations are:

	Program item	Action details	Responsible party
1	Certification program to ensure that suppliers have a well qualified basis for competition.	The development of a certification program to ensure that firms meet both technology standards (such as CMM) and ethical standards in terms of business practices. This could be an excellent means to ensure that higher quality firms are differentiated from others in the market, in the long run assisting both buyers and suppliers to the Sector.	Promoted by MCIT, and other industry associations. Could be developed through Private sector, or with MCIT assistance.
2	Changes in Law 89 and procurement practices	Many firms are unhappy with the way that government procurements are handled and how Law 89 is interpreted by enforcement bodies. Many feel that price pressure is also unfairly created by "inside government consultants" who are in many cases not qualified to manage the complexity of the procurement systems in question. There is a desire for changes to the laws, and a transparent procurement process for all government bids.	Government legislation and procurement practices.
3	Taxation laws	Tax laws are seen as unfair, prohibitive in tariffs in some cases illegal in their administrative means. Firms want to avoid the hassle of having to "negotiate" with Tax officials if they are abiding by the laws that are passed.	Government legislation and practices.
4	Internal competition on bids from government agencies	Many firms believe that due to the development of internal "consulting operations" within government departments that unfair competition is affecting the price and potential for work that should be destined for the commercial ICT sector in Egypt.	Government legislation and procurement practices.

	Program item	Action details	Responsible party
5	Lack of qualified consulting resources	The "consulting gap" has a big impact on the efficiency of the marketplace. As clients cannot find an adequate number of qualified Procurement consultants (to run and develop RFPs) things start going right from the buying side of the cycle.	See recommendations for "Consulting Gap"
6	Corporation Tax too high	Corporation Tax is high, and making companies that pay it unable to reinvest in their operations because the levels are too high. Lower taxes are likely to be more collectable.	Government legislation
7	Availability and use of foreign currency	Use of foreign funds earned overseas requires a very rapid exchange of those funds without regard to any company specific need for those funds in the short or long term. Most firms would like to see a lower percentage of transfer, and an extended period before conversion of funds to Egyptian Pounds.	Government legislation
8	Branding ICT for Egypt	Egypt has a very low profile in the International marketplace for technology based skills. This needs to be part of a skills upgrade and adoption program in the marketplace.	MCIT and Industry Associations
9	Labor Laws and copyright laws	Labor laws do not protect the important IP of employers. Most feel the current copyright and contract laws are not enforceable. This creates a very negative environment for investors, who see that the investment for their IP is not protected by law.	Government legislation
12	Tax benefits for firms using ICT in their operations	Firms that are using ICT and investing could have a considerable tax benefit for making this investment. This will encourage firms to be more aggressive in their strategy to use ICT inside their organization.	MCIT and other government agencies
13	Appropriate Real Estate availability	Finding the right sort of real estate at the right price is a key element to seed the concept of "clustering firms to leverage expertise". The current site of the Smart Village is too expensive for many firms that participated in the survey.	MCIT and relevant government agencies

	Program item	Action details	Responsible party
14	Code of ethics for industry needs to be developed	A set of industry standards for buyers and sellers in the ICT sector. This would include rules for arbitration in contract dispute and formal means of communication and problem solving.	MCIT and Industry Associations. Private Sector drafts them.
15	TRA	The Telecommunication Regulatory Authority, while ostensibly an independent body, still is viewed as somewhat biased towards decisions that favor Telecom Egypt, the organization that grew from the Government's telephone monopoly. Competitors in new segments such as mobile and payphone believe that revenue shares and new rules favor Telecom Egypt affecting profitability and competitiveness in this sector.	MCIT and TRA
16	Venture and private capital	While this continued to be a significant complaint among many firms, for overseas private capital to invest in Egyptian firms, many things need to change in the environment to secure their investments. These are complex issues and beyond the scope of this Skills Gap study, but nevertheless have an impact on the growth of ICT in the industry.	MCIT to influence changes to affect potential flow of private capital

State of the Worldwide IT Industry

In order to identify recommendations that will focus Egypt in the ICT market, a basic understanding of the major consumers as well the Egypt's competitors for market share must be understood. In this section of the document, the buyers and sellers in the worldwide IT industry will be examined at a high-level. This section will be followed by a more detailed analysis of four countries that have targeted ICT exports as a market opportunity. The target countries are: India, Israel, Jordan and the Philippines.

Market Considerations

There are several factors that uniquely characterize the ICT market: evolution, volatility, competitiveness, and enabling technology. These factors must be considered as one examines the dynamics of the worldwide market.

Evolution

The underlying hardware and software that support the ICT industry has demonstrated unprecedented evolution. Moore's law observed in 1965 and still true today, indicated that processing power would double every 18 months. Bandwidth, as another example, has quadrupled every one and a half years.

On the software side, evolution is more difficult to measure, but by way of example, the Internet is the fastest growing service the world has ever experienced. As another example, twenty years ago companies were investing in software systems that they expected would last them a minimum of 10 years, today companies hope they will not be outmoded in 3 – 5 years.

As a result of this fast paced evolution, companies in this sector must work hard to keep up with pace of change or their products and services quickly become obsolete.

Volatility

Another unique aspect of the ICT market is its extreme volatility. Market conditions, partnerships and alliances, and global economic conditions are all changing quickly and frequently. In part, this is driven by the fast-paced evolution of the hardware and software; however, it is also the result of the relative ease with which ICT components may be interchanged and the ease with which companies can change their products or services to match competitive offerings.

The highly volatile nature of the market requires companies to create strategic plans that are well targeted but do not force them into a position where they can not quickly adjust to the changing conditions around them. The market also requires companies to continually monitor their target market and their competition to ensure they are maintaining their competitive position.

Competitiveness

Global software markets are extremely competitive. Spurred, in large part, by widely publicized successes in India, Ireland and Israel, every country wants its slice of the pie. The lure of a clean, non-polluting, highly skilled industry that generates income is too strong to resist. Furthermore, there is a minimal capital investment to start a software company so it is easy for companies to enter the market.

The important factor in highly competitive market is for a company to clearly differentiate themselves among the masses of companies that all appear to be offering the same services. For success, a company must find a way to raise themselves above the din and the company must gain the reputation for providing top quality products and services, on time, every time.

Enabling Technology

While ICT represents recognized industries, unlike nearly all other industries, ICT also represents horizontal, enabling technologies. As Tessler et. al. suggest, the ability to use ICT, or more specifically software, is no longer a specialized skill. Instead, it has become a "core competency and general-purpose technology", even in developing nations. Software competency is required in nearly every industry and is vital to the success of e-government programs that promise to make local and national governments more open, transparent and accessible. ICT is the linchpin to building a knowledge economy, which is an essential goal for many developing nations. (Tessler, 2003)

Market Size

Global ICT Spending

According to the *Digital Planet 2002: The Global Information Economy,* global ICT spending grew from $1.3 trillion in 1993 to over $2.4 trillion in 2001, however, the economic downturn of the past few years has been devastating for many ICT companies. In 2001, ICT spending as a percentage of Gross Domestic Product (GDP) had the smallest increase since 1995, at just one-tenth of one percent. In some countries, including the United States and Israel, ICT spending as a percentage of GDP dropped between 2000 and 2001. (WITSA 2002). The market in 2002 was not any more promising as it remained basically stagnant for another the year.

Fortunately, in 2003, things have begun to improve. In late 2002, The European Information Technology Observatory estimated that the ICT market would grow at 6.2% in 2003. While this prediction is down from their previous estimate of 9.8% for the year, it still reflects a significant improvement over the previous two years and is consistent with estimates from other leading research firms like Gartner, Inc. (Pringle 2002).

It comes as no surprise that North America and Western Europe continue to lead the way in ICT spending. Figure 5 shows the percentage of global ICT spending conducted in each region during 2001.

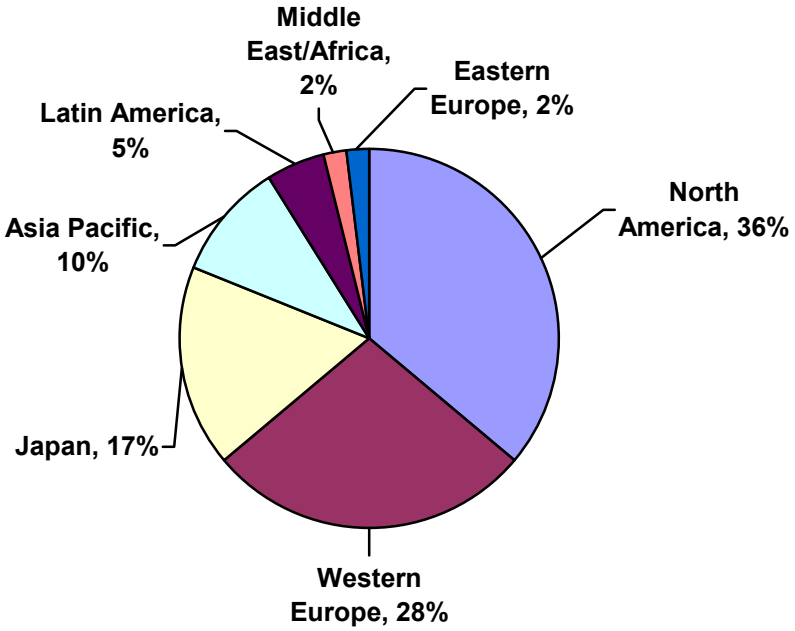

Figure 5 - Worldwide ICT spending by region (WITSA 2002)

According to an EITO Update, the leaders in the Western European, Middle Eastern, and African ICT markets in 2001 were:

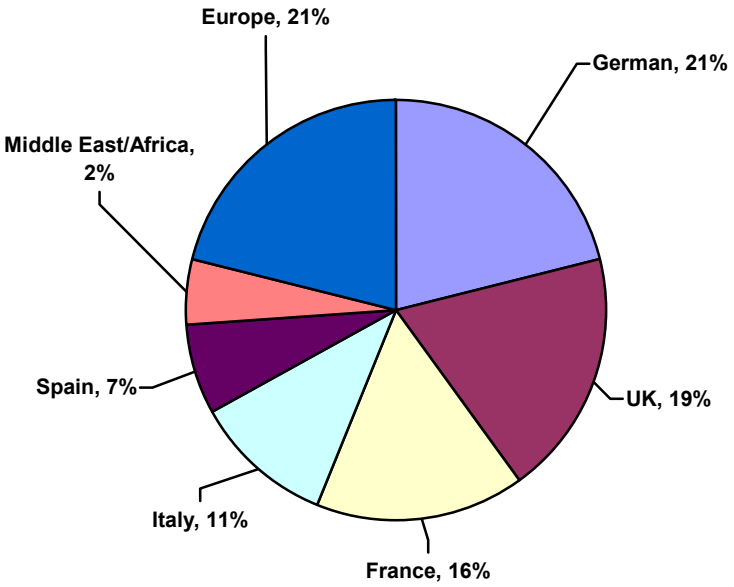

Figure 6 - ICT spending in Europe, Middle East, and Africa (WITSA 2002)

The nations with the fastest growing ICT markets in 2001 are shown in Figure 7.

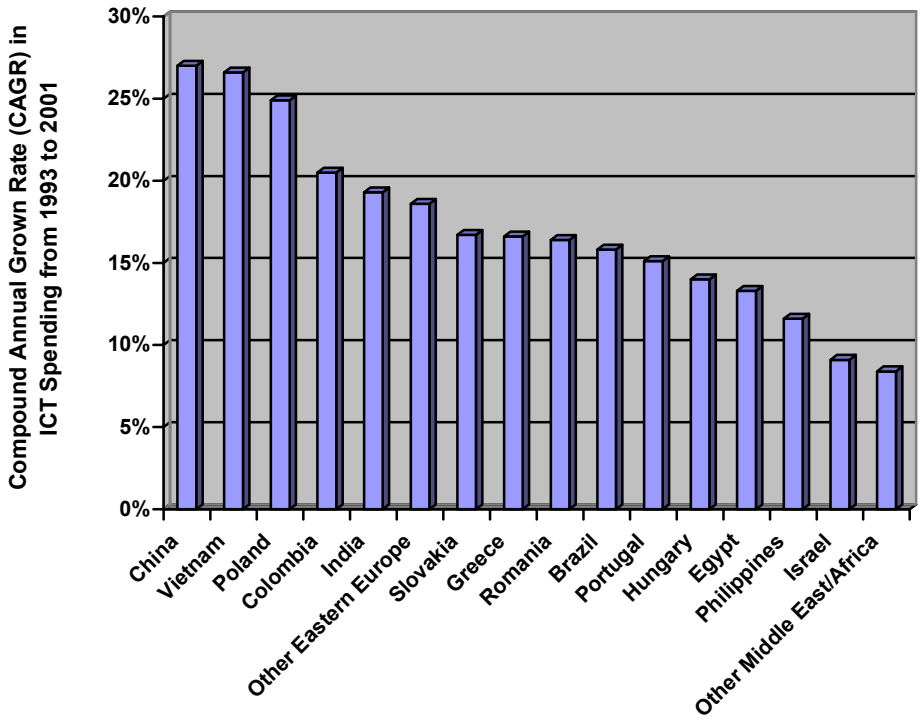

Figure 7 - Rate of increase in ICT spending by country (WITSA 2002)

The data presented above becomes more interesting when it is dissected to a more detailed level. More detailed observations indicated:

- United States was the leading spender on ICT, followed by Japan and then Germany;

- China was the fastest growing ICT spending nation (Miller 2002);
- Eastern Europe, led by Poland, experienced faster growth in ICT spending then North America, Latin America, Middle/East and Africa combined (Miller 2002);
- India spends .4% in the world ICT market, Other Middle East/African Countries are at .5%, Israel has .3% and Egypt is at .1%.

Global ICT Spending Projections

Gartner projects spending in the ICT sector will be 2.818 trillion by 2006. *(Hong 2003)* Figure 8 below shows Gartner Dataquest's worldwide ICT spending figures through 2006 with a breakdown by spending sector.

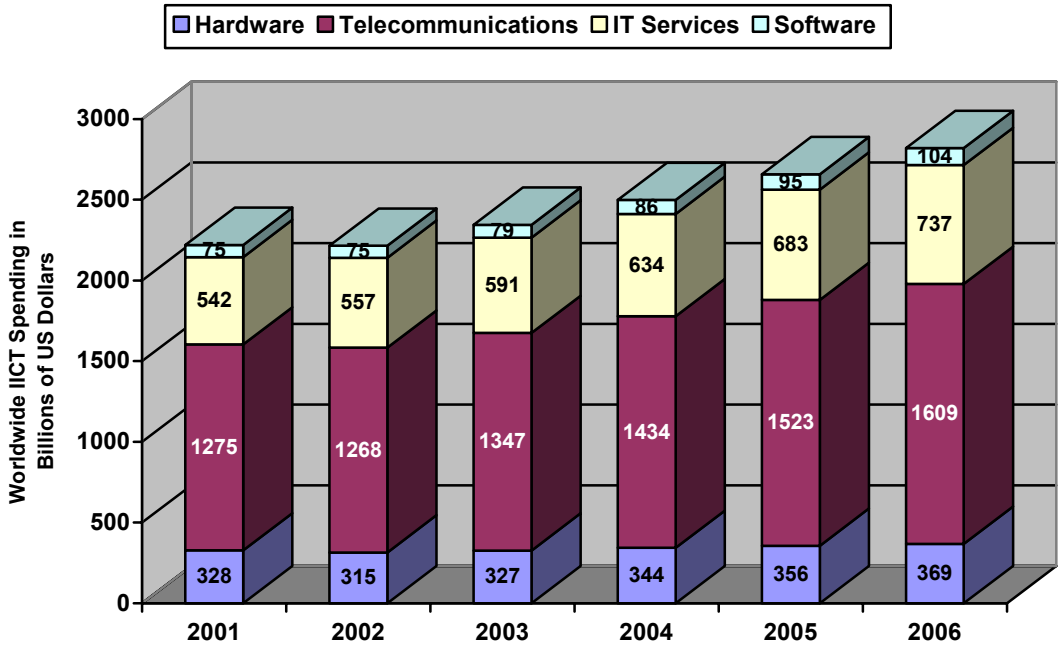

Figure 8 - Worldwide ICT Spending Estimates ("IT Spending" 2003 and Hong 2003)

Within the ICT sectors, telecommunications will continue to be largest technology sector; however, its percentage of the total ICT industry will remain stable. Over time, the hardware sector will actually represent less of the total ICT industry. It is the Software and IT Service sectors that will show the most significant growth, at a Compound Annual Growth Rates, from 2001-2006, of 6.9% and 6.3%, respectively, compared with 2.4% in the hardware and 4.8% in the telecom sectors. (Hong 2003).

As we have identified in the Global ICT Spending section, Eastern Europe and Asia/Pacific (specifically China) have experienced the fastest growth in ICT spending. Future spending estimates from Gartner and other sources predict that these areas will continue to experience the fastest growth in ICT spending for the foreseeable future.
The following table reflects Gartner's projections for ICT spending growth in various regions through 2006.

Region	2002 Spending (US $ Billions)	2006 Spending (US $ Billions)	Annual Growth (%)	CAGR (%) 2001-2006
United States	823.7	1040.7	6.1	4.6
Canada	50.9	69.1	7.7	6.3
Latin America	127.7	174.9	8.0	6.0
Western Europe	571.8	694.7	4.7	3.8
Central/Eastern Europe	76.4	105.7	6.6	9.3
Japan	237.2	287.4	6.2	3.5
Asia/Pacific	249.4	339.2	6.8	6.6
Rest of World	77.8	106.7	7.0	8.3

Table 2 – Growth in ICT Spending by Region through 2006 (Hong 2003)

IT Outsourcing

The Offshore Outsourcing market is on the move, and if that is not obvious already, then all you need to do is ask an analyst:

- Gartner predicts the offshore-outsourcing market will be nearly US $2 billion in 2004. (St. John 2003)
- Forrester Research estimates more than 3 million IT-related jobs will go offshore in the next 15 years. (Glascock 2003)
- Dataquest indicates that 26% of companies currently using offshore services expect to double their offshore spending within the next year. (Glascock 2003)
- Yankee Group predicts that through 2006, worldwide spending on IT outsourcing will grow 10 to 12% and business process outsourcing will grow 12 to 20%. (Kaplan 2003)
- IDC estimates application-infrastructure provider outsourcing and managed-services markets will have a five-year growth of about 17.6% through 2007. (Kaplan 2003).

In a 14-year study conducted by Gartner Group they analyzed 1,055 outsourcing contracts. As a result, they found the average IT outsourcing contract is worth US $47 million and has a term of six years. Furthermore, large outsourcing deals, worth $1 billion or more, comprised 9% of the total number of contracts, but represented 66% of the total value. The Financial Services and Telecommunications industries boasted had the most large outsourcing deals. ("IT Outsourcing" 2003)

Based upon Gartner's research, the following diagram illustrates the top five vertical industries in terms of average annual contract value[ii]:

[ii] The Percentages for top five vertical industries for IT outsourcing contracts excludes a US $40 billion master contract between General Motors and EDS in 1996 in the automotive industry.

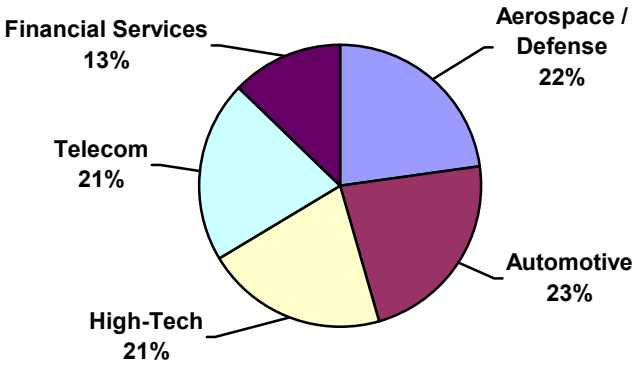

Figure 9 – Top Five Vertical Industries for IT Outsourcing Contracts ("IT Outsourcing" 2003)

Software Applications

Large scale, enterprise wide, software applications like Enterprise Resource Planning (ERP), Contact Relationship Management (CRM) and Supply Chain Management (SCM) systems have moved in and out of the spot light over time. One thing for sure is that implementing and maintaining these high-profile systems are costly and time-consuming endeavors and the opportunities for complications or all out failure are limitless. That said, these systems, like the products of the industrial revolution that came before them, are the foundation for successful corporations around the globe.

In late 2000, early 2001, the Japanese Ministry of Economy, Trade and Industry conducted a study that shows the penetration of ERP, CRM and SCM in Japan, the United States, Europe and the newly industrializing economies (NIEs) of Asia. The study surveyed a total of 800 companies in these regions. The European countries in the survey included: U.K., Germany, Holland, France, Belgium, Switzerland, Italy and Sweden. The NIEs countries included: Hong Kong, Singapore, South Korea and Taiwan. The following table shows the survey results:

Application	Region	% Already Installed	% Considering	% Not Considering
ERP	Japan	21.0	24.0	55.0
	US	37.0	15.0	48.0
	Europe	41.0	23.0	36.0
	Asian NIEs	53.5	16.5	30.0
CRM	Japan	30.5	23.5	46.0
	US	57.5	16.0	26.5
	Europe	48.5	34.0	17.5
	Asian NIEs	43.5	27.5	29.0
SCM	Japan	29.0	28.0	43.0
	US	32.0	10.5	57.5
	Europe	61.5	13.0	25.5
	Asian NIEs	37.0	15.0	48.0

Table 3 – Penetration of ERP, CRM & SCM Systems (JETRO 2003)

What Table 3, above, illustrates, is that the:

- Japanese market represents promising opportunities for ERP, CRM and SCM implementations.
- CRM, which has already been well adopted in the United States, will continue to be popular in Europe and the newly industrializing economies in Asia.
- Supply Chain Management (SCM), which as been well adopted in Europe, shows little opportunity in the United States; however, these numbers may not be entirely representative as it is possible that components of Supply Chain Management systems may already be integrated as part of the larger ERP system in the US.

Telecommunications

The following table shows key Telecom data from selected countries as published by the International Telecommunications Union and other sources. Unless noted otherwise, data are from 2000. Note that GDP numbers for Egypt and Jordan may not be consistent with other figures in this report but represent the GDP in local currency from ITU, divided by the conversion rate to US dollars for the year 2000, also supplied by ITU. We chose to use ITU's financial data exclusively in this chart to provide a more accurate comparison to other countries that are included here.

Cells bordered by a dashed line ( ) represent HCG estimates when data is not available or appears inaccurate.

	Units	Algeria	Bahrain	Egypt	Jordan	Lebanon	Morocco	Saudi Arabia	UAE
Population	10x3	30,836	635	62,475	5,039	3,286	28,705	21,607	2,938
Gross Domestic Product (GDP)	10x6	54,195	7,887	97,608	8,328	16,488	33,309	188,469	
Telephone Lines	10x3	1,761	171	5,484	614	576	1,425	2,965	1,020,097
Telephone Lines / 100 people		5.80	26.94	8.64	12.18	17.53	4.96	13.72	34.72
Telecom Workforce		17,900	2,089	54,922	6,430	6,000	14,511	22,973	8,329
Faults per 100 lines per year		12.0	15.0	2.0	18.2		24.8	2.0	0.2
Estimated number of PCs		200,000	95,000	800,000	150,000	175,000	350,000	1,300,000	400,000
Number of PCs / 100 people		0.6	15.0	1.3	3.0	5.3	1.2	6.0	13.6
Estimated Internet Hosts		434	1,121	2,240	907	4,800	1,858	3,745	43,000
Estimated Internet Users		150,000	40,000	450,000	127,317	300,000	200,000	460,000	765,000

Table 4 - Market data for selection countries in MENA region (ITU 2002)

Business Process Outsourcing

Business Process Outsourcing (BPO) is when a company elects to have basic business functions like accounting, transaction processing, human resource management, payroll, customer support, sales, marketing and others performed by a third party in order to reduce costs. By using a third party, a company saves money because the provider recognizes costs savings by performing the same function for a number of customers. A commonly recognized example is payroll processing.

Today, through the use of information technology, more and more business functions may be provided by a third party. As a result of the close link with IT systems, many

companies/countries are referring to these functions as IT-Enabled Services and lumping the revenue into their ICT buckets.

Many countries are viewing BPO and IT-Enabled Services as their key to break into the lucrative ICT sector. In order to compete in this sector, it is important to recognize, that companies/countries do not need a surplus of IT technologists, instead they must have a top-notch infrastructure and "computer savvy" knowledge experts who can perform the desired business functions.

While the 'part of the ICT sector' / 'not part of the ICT sector' argument continues, opportunities continue to exist in this sector. Gartner estimates that offshore portion of business process outsourcing represents about 1.5% of the total market and will grow from last year's 1.3 billion to 1.8 billion by the end of 2003. India dominates this sector with 66% of offshore BPO and 20% revenue growth. ("Offshore" 2003)

While most BPO revenue is coming from large companies with more than $500 million in revenue, mid-market companies are now being targeted. Financial Service companies have been early adopters of BPO and human resource BPO represents about 40% of the total market. ("Business" 2003)

A *Wall Street Journal* article in May 2003 estimates that 15% of all financial services jobs in developed countries will move to lower cost regions in the next five years, resulting in more than US $ 100 billion in savings to the companies doing the outsourcing. The financial services job loss in Europe could be as high as 730,000 jobs during the same period. (Gentle 2003)

Country Benchmark Summary

Egypt Statistics

The following chart illustrates various segments of the ICT market in Egypt and the relationship between domestic and export activities.

Segment	Export Revenue ME/N. Africa	Export Revenue Rest Of World	Revenue per Employee	Total Revenue (le)
ASP	**NA**	**NA**	**166,000**	**60,000,000**
Call Center	573,000	393,000	75,000	50,000,000
Hardware and support*	600,000	300,000	589,000*	1,100,000,000
ISP	45,000,000	3,000,000	NA	405,000,000
Arabization + cul.	NA	18,000,000	283,000	40,000,000
Customized services	59,000,000	13,000,000	313,675	599,370,000
Software manufacturer	84,900,000	38,000,000	297,495	554,000,000
Sub total	190,073,000	72,693,000	227,034	2,763,370,000
Telecom	2,400,000,000	1,200,000,000		14,980,000,000
Total	**2,590,073,000**	**1,272,693,000**		**17,748,370,000**

*Includes multi-nationals and software/services revenue (excluded from rev/employee calculation)

The above chart indicates the market size based on revenue research conducted as part of this study. The numbers have been adjusted based on the total estimate of vendors and service providers in each segment. All revenue numbers are in Egyptian pounds (US dollar estimates were converted at 6le = $1USD). These estimates exclude Hardware manufacturing (e.g. electronics and domestic appliances), and domestic PC manufacturing. Highlights of this market position include:

- Revenue per employee in the range of $37K
- Almost $3 billion sector. Most of it Telecom and domestic IT sales.
- $460 million IT sector
- $44 million in IT exports

Improvements in the regional IT exports are generally very encouraging, now reaching $33M. However, the darker side of the picture is that many organizations are focusing on regional and international markets because of the doldrums and problems in the domestic economy. These are discussed in more detail in the recommendations section.
The revenue per employee is particularly interesting, as this is considerably higher than India (at $25K). With the export revenue number spread over a relatively small number of companies, most of the higher value can be attributed to either product or customized services firms performance.

Overview

Product/Services Placement Chart

The data for each of the four countries in this study includes a chart like the one in Figure 8 that HCG designed to show the most prevalent types of ICT activities in each benchmarking countries. The horizontal axis depicts, from right to left:

- Hardware products
- Software products
- Non-tangible services deliverables such as consulting, research and development or network design.

The vertical axis ranges from low-value, commodity products on the bottom to high-value, innovative products/services at the top.
With this chart we have tried to show not only the key activities in each country today, but by means of arrowheads on the drawing, we've indicated the direction in which we believe each country is moving their ICT production.

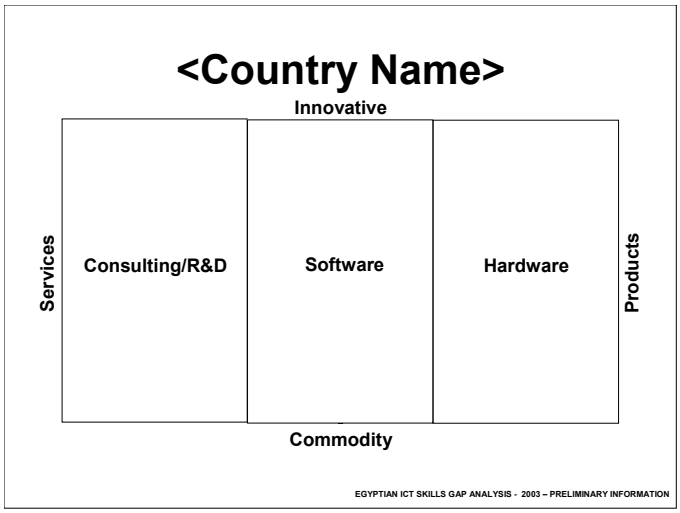

Figure 10 – Sample chart showing relative ICT strengths in export markets

We have also summarized key skills-gap related data about each country in *Table 15 – Key Data for Countries in this Report* on page 151.

India

Financial Statistics and Growth

Demographics

Having surpassed the one billion mark in population, Indians represent one-sixth of the world's population. Nearly three quarters of that population lives in rural areas, however, the urban population is growing.

India is an extremely large and diverse country with between 14 and 17 officially recognized languages, spoken in hundreds of dialects. Hindi is considered the mother tongue and is the official language of the Union and many states; it is spoken by nearly 40% of the population.

As a by-product of Britain's colonial rule, English is identified as an associate language in India. English is the standard for most national, political, and commercial communication, especially in the ICT industry. While less than 5% of the total population in India speaks English, there are still millions of English speakers.

Improving the literacy rate has been documented as a significant government focus over the years. Since 1998 the literacy rate has improved from 52% to 58% and the literacy rate for the male population has increased from 64 to 68%.

Historical Patterns and their Effect on Workforce Development

In the early 1950s, just as India gained its independence from England, the first prime minister recognized the need for a highly skilled population. As a result, a higher education resolution was passed to create an open higher educational system throughout the country.

Following this, the world class Indian Institutes of Technology, Management and Medicine were founded.

While the India Institutes were able to produce many skilled workers, in the 1970s they were unable to find jobs at home, so they started leaving the country, first to the United Kingdom and later to the United States. As a result, approximately three to four thousand workers left India per year from 1970 to 2000. Currently, there are about 30,000 technologists, 36,000 medical and 34- 35,000 MBAs in the United States from India. Many of the technologists ended up in Silicon Valley where they eventually became executives and entrepreneurs. Starting in the late 1970s, Tata and several other Indian companies began to capitalize on the exceptionally low wage rates and reasonably strong coding skills of Indian software engineers by selling their services as offshore developers for US and UK firms.

Then the Year 2000 (Y2K) crisis arrived. US and European companies and governments had millions of lines of code written in the COBOL programming language, which relatively few western schools were still teaching. Few companies or government agencies had a sufficient number of COBOL programmers to address all of the Y2K problems. Fortunately for India, they still had 3rd tier colleges that were producing an ample supply of graduates with the ability to write code in the out-dated COBOL language. Furthermore, the Indian expatriates who had become executives in the US and UK recognized the value of this pool of resources and encouraged corporations and government agencies to outsource their Y2K remedial work to Indian companies.

Initially, US and UK companies tried to outsource the work directly to Indian development companies. However, they quickly realized that the Indian firms were not supported by sufficient infrastructure (telecommunications, electrical power, etc.) to allow them to work effectively from 10,000 miles away. Furthermore, cultural differences made communications even more difficult. As a result, in the late 1990s, US and UK began importing Indian engineers by the hundreds of thousands to solve Y2K problems.

As Y2K came to a close in 1999-2000, the concept of using Indian software engineers was well entrenched. The outsourcing movement gained even more momentum, as the following developments occurred:

- India invested heavily to improve their telecommunications infrastructure.
- Software Technology Parks were built and the private sector invested in generators and power-regulating equipment to overcome severe problems with India's electrical infrastructure.
- The economic boom continued to drive demand for engineers, even as Y2K remedial efforts were winding down.
- The high demand for engineers in the US sent salaries sky-rocketing, so outsourcing to India or other countries offered a cost effective solution.

- US and UK companies had become comfortable working with Indian engineers and were pleased with the quality of Indian work. They were willing to continue to work with organizations in India.
- India continued to produce high-quality engineers from their technical institutes.

Recognizing the IT industry's significant impact on the Indian economy and quality of life, the Indian government has continued to institute policies that promote the growth of ICT outsourcing sector.

Today, Indian IT companies employ approximately 520,000 people, making India the second largest employer of IT workers behind the United States. (Singh 2002a) Their workforce continues to move higher up the value chain by taking on the roles of project and product managers, performing research and development, consulting, and providing high-value IT enabled services. India is able to easily transition into these roles because it has been producing highly skilled engineers and managers from their Institutes for nearly 50 years. In addition to the world-class Indian Institutes, the private sector in India has responded to demand for ICT workers by opening private training institutes.

According to the National Association of Software and Service Companies (NASSCOM), "The statistics show today, one in four global IT customers are turning to Indian companies for their software requirements." (NASSCOM 2002a) The value proposition for utilizing India's IT resources is their:

- Stable economy and infrastructure
- Large reservoir of highly educated and skilled workers who speak English
- Government initiatives and support directed at making India an IT hub

To summarize, the keys to the successful evolution of the Indian IT market, were:

1. Highly educated, English speaking workforce that has been producing exceptional engineers for nearly 50 years.
2. A vast body of work delivered in the US and UK, which established the reputation and credibility of Indian workers, and encouraged US companies to consider outsourcing higher value work to India.
3. The existence of 3rd tier schools that were still producing many programmers using older languages like COBOL when the Y2K crunch arrived.
4. Many Indian expatriates in the United States and United Kingdom who had become executives and entrepreneurs and were the driving force for utilizing Indian workers. This had a very positive impact on market development in the target export countries.

Industry Focus for ICT Organizations

Indian companies began to develop application software across a broad number of segments concentrating on banking, financial services and insurance, along with manufacturing and telecom equipment.

The following table identifies the industry focus for Software Services and IT Enabled Services:

Vertical	Percentage
Banking, Financial Services & Insurance	35%
Manufacturing	12%
Telecom Equipment	12%
Retail	4%
Healthcare	3%
Telecom Service Providers	3%
Utilities	2%
Government	1%
Transportation	1%
Others	27%

Table 5 – India: Industry Focus for Software and IT Enabled Services (NASSCOM 2002c)

Figure 11 indicates that India has traditionally provided relatively low-value software products, along with a limited amount of commodity hardware and consulting services. In recent years, especially as Indian wages have increased and the country has lost much of its once-considerable price advantage, the ICT industry has made a deliberate decision to move up the value scale. They are now concentrating on delivering not only higher value software, but are expending considerable effort to offer a broader range of consulting services, call center, business process outsourcing and project management services as indicated by the upward-pointing arrows in the diagram.

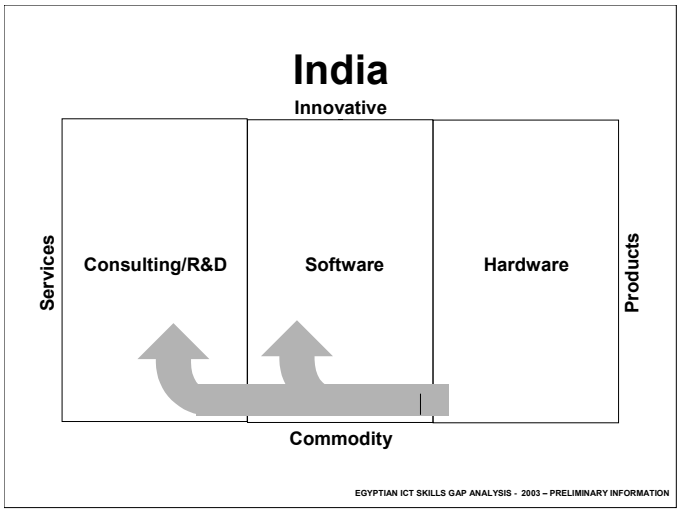

Figure 11 - India: Relative ICT strengths in export markets

Labor Organizations

Two IT Professionals' forums have been created in Bangalore and Hyderabad for software professionals and computer specialists. The groups hope to provide a collective voice to defend their interests including working time, ethics, career development and skills certification. The forums have been launched with the assistance of Union Network International, a global trade union federation based in Switzerland.

Future Mainframe Opportunities

Research firm the Meta Group recently suggested that "the combination of a disproportionately aging staff, continued attrition, and few new staff entering the field, points to a significant human capital crisis in mainframe-centric data centers during the next 5-plus years." (French 2003) Meta also reported that when they surveyed more 300 companies with mainframe staffs, more than 90% said they do not have a strategy for dealing with the diminishing pool of mainframe workers. (King 2002)

The reliability of mainframes and their use for many new applications, including acting as web servers and even virtual Linux servers assure the continued existence of mainframes in the future. As a result, it is likely that demand for mainframe talent from India will continue.

IT Industry Goals

According to a 2002 McKinsey-NASSCOM study, the goal for India's IT industry is to become a US$ 77 billion entity by 2008. Of that total, an estimated US$ 57 billion will be derived from IT Services and IT-Enabled Services. Accomplishing this long-term target will require a compound annual growth rate of 34% between 2002 and 2008. ("Indian IT" 2003)

Current estimates are that India services only .5% of the global ITES market. Achieving the 2008 goals means that India could service 2 – 3% of the market and that the resulting export revenue would account for more than 30% of all foreign exchange inflows (currently 8%).

In order to achieve the 2008 goals, the McKinsey-NASSCOM study predicts India will require 1.1 million IT professionals in the basic IT Services sector and an equal number to support IT Enabled-Services.

Workforce Characteristics

According to a NASSCOM Human Resource Development survey there were 340,000 software professionals employed in 2000. In 2001-2, the IT Industry generated 29,000 new jobs and indirect employment of over 250,000 people. A study by Arora, Arunachalam & Others revealed that 80% of software professionals have engineering degrees and 12% have diplomas / certificates from private training institutions. ("IT Manpower" 2003)

IT industry revenue per IT professional is about $25,000 compared with $14,000 in the late 1990s. (Singh 2002b) Wages in the software industry have been rising consistently at over 20% a year since the early 1990s. Despite the gains, however, wages in India were 16% below those in the United States in 1999.

Size and skills

Prior to independence, higher education was limited and growth was slow. Today there are over 244 universities with 11,594 affiliated colleges in India. Approximately one half of these universities teach English. Approximately 330,000 teachers graduate a total of 2,200,000 students with Bachelors degrees each year. Of that total, management institutes

produce about 40,000 management graduates annually. The student teacher ratio in higher education is 1:21. The following table shows the increase in educational institutions and enrollment over time.

Although education is characterized by significant public investment, the investment is still considered to be sub-optimum. In the first five-year plan higher education accounted for 9% of Gross National Product (GNP), with actual expenditures of RS 140 million. In the 8th 5yr plan, the percentage of GNP decreased to 8%; however, actual expenditures were RS 15,000 million, an increase of more than 100 times from the first five-year plan.

TABLE 2.5.1
Number of Institutions of Higher Education, Enrolment and Faculty

Year	Number of colleges	Number of universities*	Students (In 000)	Teachers (In 000)
1950-51	750	30	2,63,000	24,000
1990-91	7,346	177	49,25,000	2,72,000
1996-97	9,703	214	67,55,000	3,21,000
1998-99	11,089	238	74,17,000	3,42,000

Note : * includes institutions that are deemed to be Universities, but excludes other institutions.
Source : UGC Annual Report 1996-97 & 1998-99 and Selected Educational Statistics, Ministry of HRD

Table 6 - India: Number of Institutions of Higher Education, Enrollment and Faculty

There are 160 universities and 776 colleges that provide computer education at the degree level. Approximately 140,000 engineering students graduate from government and private-run colleges annually, with roughly 100,000 of those students specializing in Information Technology. The teacher to student ratio varies from 1:39 to 1:52 for IT courses because it is difficult to attract and retain good faculty in the field. ("IT Manpower" 2003)

In addition to the colleges and universities, at the height of the boom, there were an estimated 70,000 private training institutes for computer education. Combined with colleges and universities, these institutions produced about 1,000,000 trained professionals each year. (Aggarwal 2003a) With the recent economic downturn, however, many of these private training operations are closing, so the number of trained professionals is decreasing.

The premier institutions of higher education in India are the Indian Institutes of Technology (IITs), Indian Institutes of Science (IISc) and Indian Institutes of Management (IIMs). The entrance exams to the Indian Institutes of Technology exclude over 99% of the students per year helping to ensure the institutes produces the best graduates.

India's colleges are established by the state governments and private agencies. In addition, some universities establish colleges. Self-financing for private colleges is a new idea and it is just starting to take hold; most colleges get support from the state governments for their maintenance.

Education

History of Education

After Independence in 1947, India inherited a small higher education system with intra/inter-regional imbalances. It only had 20 universities and 500 colleges. Recognizing the need for a higher educated workforce the government made efforts to build a network of universities and affiliated colleges to provide extend education throughout the country.

In 1986, believing that "education is a unique investment in the present and future" the Government did a comprehensive review of the nation's education policy. The review urged that higher education had to become more dynamic than ever before and proposed that the universities and colleges needed all-round improvement. It also called for launching the Open University system to democratize education and take up education challenges at the grass-root levels for the rural areas. Since this time the government's Five Year Plans have included specific objectives related to upgrading and improving the educational system.

Public Institutions

Most higher education in India is in the form of public institutions. Education in India is the joint responsibility of the Union Government and the States. The coordination of state and Union is brought about through the Central Advisory Board on Education (CABE). The Union has the responsibility to maintain quality and standards, study and monitor education requirements of the country as a whole in regard to manpower development, cater to research and advanced study needs, look after international aspects, ensure cultural and human resource development, and promote excellence.

In addition to the CABE, there are several other organizations that help to support public education in India, some of the organizations include:

- All India Council on Technical Education (AICTE) - plans and coordinates technical education in India. It supports engineering colleges and the management of education institutions and polytechnics engaged in training technicians. The council reviews and renews the curriculum, modernizes labs and organizes programs through twenty-eight centers in the country. (http://www.nonprofitpages.com/aicte/)
- National Council for Teacher Education (NCTE) - ensures planned and coordinated development of teacher education and the determination and maintenance of its standards. (http://www.ncte-in.org/index.asp)
- University Grants Commission (UGC) – allocates and disburses grants by the central government to the universities.
- Distance Education Council – established under the IGNOU Act, it provides development funds to open universities and distance education institutions from Central Government funds.
- National Centre for Software Technology (NCST) - under the Department of Information Technology, Ministry of Communications & Information Technology.

Through its many centers throughout the country and affiliations with many organizations, it is committed to India's role as a leader in software technology by: providing support for the IT industry, conducting Research and Development and providing high quality education and training of professionals for the IT industry in India.

- National Informatics Centre (NIC) – headquartered in New Delhi with state units in all 29 state capitals and 6 union territory headquarters. In addition, they have established 17 National Information Technology Promotional Units. NIC is known all over the country for providing one of the best platforms for getting trained in the field of Information Technology.
- Centre for the Development of Advanced Computing (C-DAC) – established in 1988 as a Scientific Society of the Department of Information Technology in the Ministry of Communications and Information Technology. Primarily an R & D institution involved in the design, development and deployment of advanced Information Technology solutions (high performance computing & communications, networking, turnkey solutions for power, telecom, health, financial markets, etc., third party products, geomatics, eGovernance). C-DAC's Advanced Computing Training School (ACTS) is dedicated to creating high quality manpower for C-DAC in particular and the industry in general. Courses are offered through a network of 100+ Authorized Training Centers, plus their own centers in Pune, Delhi, Hyderabad and Bangalore. Over 30,000 students per year take such courses the following areas:
  - Diploma in Advanced Computing
  - Diploma in Embedded Systems Design Course
  - Diploma in Geoinformatics Course
  - Diploma in Information Technology
  - Advanced Diploma in Information Technology
  - Diploma in VLSI Design
  - Co Curricular Diploma in Advanced Computing
  - Diploma in Advanced Computer Arts
  - Multimedia & Computer Arts Certificate

Private Sector Education

Colleges and Universities

The majority of Indian colleges are private, however, there were no private universities until 1992. In that year, the Private University Act (PUA) was passed to foster the creation of private universities.

Since 1992, at least one private university has been opened. North South University (NSU), in Bangladesh, established by the NSU Foundation with support from a group of philanthropists, industrialists, bureaucrats and academics. The government of Bangladesh approved the establishment of North South University in 1992. Begum Khaleda Zia, Honorable Prime Minister of Bangladesh, formally inaugurated the university in February

1993. The President of People's Republic of Bangladesh serves as the Chancellor and the university is managed by several statutory bodies as required under the provisions of the Private Universities Act 1992.

NSU follows the American education system, including semesters and credit hours; furthermore, it parallels North America's academic calendar. Its curriculum has been reviewed by relevant departments of the University of Illinois, Urbana-Campaign, and the University of California at Berkeley in USA.

Private Training Organizations

Thousands of private training organizations have been created in India to meet the constant demand for more ICT workers. One example of an extremely successful training organization is NIIT, which pioneered private IT training in India in 1981. Today, NIIT generates more than half its revenues from international operations in 38 countries.

Business Partnerships

Many believe that it is the IT Market that drives the private sector to maintain a skilled workforce and keep the skill gaps closed. While government creates policy and supports the public institutions, it is the private sector that is identifying the market demands and creating the partnerships and programs to prepare their staff. International corporations have developed training programs under public/private partnership agreements in order to respond to skill shortages. The programs are taught in educational institutions and not-for-profit training centers.

The following are some examples of partnerships in India and the skill gaps they are trying to address.

- NIIT Limited and IBM India Limited created an alliance to expand the pool of technical manpower skilled with IBM software. ("NIIT" 2002) Training will include Data Management (DB2, Business Intelligence in Data Warehousing and OLAP), Transformation and Integration (Visual Age for Java and WebSphere Application Server). Initially training will be offered at its Centers for Advanced Technology Studies (CATS) in major Indian cities. According to Mr. Abraham Thomas, managing Director, IBM India Limited, "we are focusing on skills that will meet the emerging e-business requirements." According to Mr. P. Rajendran, Chief Operating Officer, NIIT LTD., "This strategic partnership will create a specialized pool of IT Professionals with advanced skills. The Software Professionals will play a major role in creating the e-business infrastructure in India and abroad and bridge the skills gap in the advanced software technologies."
- NIIT and Oracle are partnering to provide a specialized pool of IT professionals to bridge the skills gap in Oracle technologies. NIIT's faculty has been trained and certified by Oracle. NIIT will also offer testing and certification facilities at special prices to trained students.
- Infosys and IBM created a pact to organize a series of educational seminars for employees on leading and emerging technologies such as IBM solutions for web services, application servers, frameworks for application development and other

topics like legacy integration. Seminars will allow Infosys employees to refine their skills and receive IBM certifications.

- The Digital Partnership "is an international public-private-partnership set up by the Prince of Wales International Business Leaders Forum and co-funded by the World Bank and by national and international business communities, government and public authorities in the countries it will operate in." (Selinger 2003) It establishes 'e-learning centers' to deliver ICT skills training in disadvantaged communities. The Internet, software and course content support schools, teacher training centers and social projects. Pilots programs are planned for South Africa, Brazil, India and Russia, involving partnerships with Cisco and Oracle.

Infrastructure

People interviewed for this project agreed that ICT skills gaps are not the biggest issue concerning India's ICT industry. Many pointed to infrastructure problems as bigger deterrents to the future success of the industry. While they acknowledge improvements in recent years, especially in telecommunications, a considerable amount of work still needs to be done throughout the country.

Availability and reliability of electrical power are also serious problems. It is not uncommon to have as much as two hours of blackouts per day. Many companies have their own internal generators or have offices in Software Technology Parks that provide uninterrupted power.

The poor condition of the country's roads and highways also affect commerce in the ITC sector. These physical barriers limit the ability of people to easily move to, or commute from, the locations of the best quality training and jobs. As a result some communities remain isolated from opportunities even while significant progress is being made in other regions of the country.

Country-level Skills Gap Strategy

Education Programs

The government of India has not undertaken a systematic analysis and targeting of skills gap in the ICT sector. Instead, India has been driven by the market and has been very successful at matching in-country skills with needs in the global market.

For the future, India has set aggressive goals for the expansion of the ICT sector and is looking for ways to achieve those goals, both by continuing to grow their existing segments and by moving higher up the value chain. To that end, they have identified areas where more education is needed, including, but not limited to soft skills, software engineering processes, mainframe skills, and IT enabled management. The following sections define the education requirements in each of these areas.

Soft Skills

The article "Wanted: Software Professionals with Soft Skills" suggests that "soft skills are a quintessential qualification for professionals aspiring to move up the value chain." (Sarkar 2002) Soft skills are those professional etiquette and interpersonal skills that allow

employees to be easily accepted within a group, to work as a team, to communicate clearly, and present information professionally. It also includes potentially sensitive topics as cross cultural understanding, personal appearance and hygiene.

Industry in India has traditionally hired and trained only on the basis of technical skills. This has led to a huge gap in soft skills development, not just in the areas mentioned above but also for project managers and project leaders.

Corporations in India spend more the RS 600 million a year in direct training costs. A recent study suggests that more than 40% of this amount was spent on building soft skills. (Sarker 2002)

Software Engineering Processes

Dr. E J Sarma, CEO of Hurmist believes an important gap in skill levels occurs when new staff is hired to start a project. While their basic technical skills might be excellent, these new employees lack the software engineering processes that ensure quality, productive, predictable work. Sarma advocates a mandatory common basic training (CBT) process that covers the personal software process and advanced language skills that must be completed before people are assigned to a job. Sarma points out some of the common skill deficiencies include (Sarma 2002):

- methods are largely private and people may not know what is proper
- engineers are not trained to follow planning and measurement disciplines
- even when common practices are defined, they are not consistently followed
- current environments do not require the use of best-known software engineering methods.

Mainframe Skills

As we indicated in the *Future Mainframe Opportunities* section on page 84, there will be continuing demand for mainframe development. The required training is not trivial. According to VL Mehta, director-IT, Mukand Engineers, one of the few existing IBM training partners in the country, "a candidate would take at least three months even to get the hang of basics and about two to three years for a professional to become comfortable [with mainframe technologies]."

Interestingly, most mainframe training centers closed down as the Y2K rush subsided. Interskill Interactive's mainframe training library, however, still consists of 150-plus courses and over 1,400 hours of instruction.

Required mainframe skills include CICS, DB2, Systems Software, Application Software, IMS, Operating System management, COBOL, MQ Series and Websphere. (Dev 2002)

Information Technology Enabled Management

The National Productivity Council in New Delhi has a mission for the "Development, Dissemination and Application of knowledge and experience in productivity, for promoting consciousness and improvement in productivity, with the objective of strengthening the performance and competitiveness of the national economy as well as of improving the working conditions and quality of working life."

They have developed a program on "Information Technology Enabled Management" for executives to improve their understanding of information systems including their role in effective design, development and implementation. The program was developed in recognition of the fact that it is difficult, if not impossible, to manage an organization without at least a basic understanding of IT fundamentals. The objectives of the program are:

- Understanding role changes resulting from a changed business environment and technology developments
- Awareness of IT tools and techniques for improving productivity
- Appreciation of the potential of technology to enhance effectiveness
- Insight into issues relating to implementation of technology solutions.
- Overview of the IT infrastructure planning, procurement, installation and maintenance processes.

National Initiatives

National Task Force on IT and Software Development

In 1998 the Prime Minister's office set up a National Task Force on IT and Software Development in order to make India an Information Technology superpower and one of the largest generators and exporters of software in the world within ten years. The Task Force was under the Chairmanship of the Deputy Chairman of Planning Commission, Shri Jaswant Singh. Their mandate was to formulate a draft of a National Informatics Policy. ("National Taskforce" 2003)

The result of the Task Force's efforts was the creation of a three-part Action Plan for the IT industry. Part one of the plans focused on Software and Services, part two on Hardware, and part three the Long-Term National IT policy. Many of the recommendations presented by the Task Force have been adopted by the Indian government and included as part of their 10th five-year plan for the country.

The list below includes a key subset of the recommendations from the Long-Term National IT policy plan that relate directly to managing skill gaps:

- The government will fund a number of study projects to understand the problems precipitated and solutions required under conditions of high growth rate. For example, the fast growth rate is causing a large number of project managers to become entrepreneurs, thus creating a gap between the demand and the supply of project managers. Special funds will be enabled for increasing the supply of project management skills.

- The government will give special incentives for increasing the language advantage in exports by promoting sections of IT manpower to cultivate other languages like European languages, Russian, Japanese and Chinese. This will be done to further encourage the strategic advantage for increasing software export.
- The government will encourage the migration of mathematical talents into mathematically oriented software development through scholarships and subsidized retraining programs.
- The government will extend the facilities and supportive policies given to local R&D to global R&D units.
- Establish "IT Enabled Services Habitat Parks" in various cities to provide quality infrastructure for hi-tech.
- Introduce courses on IT Enables Services as vocational courses.
- 1-3% of the budget of every ministry/department shall be earmarked for applying IT in the department/sector, including purchasing IT software, but also training and IT services.
- Provide suitable floor space in Government buildings that are not utilized during non-office hours to education institutions for IT training purposes, in return for a proportionate number of agreed nominations of government employees for IT training.

One component of the National Task Force on IT and Software Development's IT Action Plan is to drive toward 'IT for all by 2008' through the 'Operation Knowledge' campaign. The aim of the "Operation Knowledge" campaign is to universalize computer literacy and spread the use of computers and IT in education. The objectives of the campaign include:

- improving access to computers and the Internet,
- encouraging IT education and student output,
- utilizing distance education to distribute education to areas underdeveloped in IT,
- establishing groups to ensure courses and educators are up-to-date on the latest technologies.

Steering Committee on Secondary, Higher & Technical Education

The Steering Committee on Secondary, Higher and Technical Education was constituted by the Planning Commission to deliberate upon the future policies and plans on various sub-sectors of education. As a result they provided a report that helped in finalizing the Tenth Five-Year Plan for Education.

The Issues of Concern section of the report appears to be very pertinent to the skill gap question. The report highlights the following problems that weaken the education system's overall efficiency.

- Lack of enough training programs in the area of information technology and other emerging areas resulting in a shortage of talented and high caliber faculty in these areas.

- Inability to make available funds/resources to all the technical institutes.
- Compartmentalized functioning of IITs, Regional Engineering Colleges and other engineering institutes.
- Lack of sufficient arrangements to sustain the progress and the tempo created with assistance from the World Bank for the polytechnics.
- Efforts to transfer the technology particularly in rural areas have not been as successful as expected.

Task Force on Human Resource Development (HRD) in Information Technology

In January 2000, the government of India formed a task force on Human Resource Development in Information Technology. Their main objective was the preparation of a long-term strategy for human resource development in IT, including:

- plans to optimally use the existing educational infrastructure,
- recommendations to achieve mutually beneficial cooperation between education institutions and IT,
- suggestions for measures to create enduring good quality IT education and its availability in poor and rural areas,
- suggestions for ways to use IT to improve the teaching of non-IT subjects.

The task force recommends that there is a need for continuous monitoring of the job markets in IT and various alternative scenarios need to be developed, in addition to coordinated research and studies related to IT manpower.

The task force identified many important human resource recommendations that will enable the country to achieve its IT goals. The following is a sample set of those recommendations that are related to closing skill gaps in IT.

- Within 3 years, all engineering students in the country will graduate with IT knowledge to be able to serve in the IT Enabled Services sector, in addition to directly serving in the IT industry.
- IT HRD Entrepreneurship Training Programs will be organized by the IT HRD sector in collaboration with IIMs and other leading management institutions.
- Increasing attention should be paid to education in basic principles of computer science.
- Reward packages for IT professionals (particularly teachers) should be upgraded so there is less temptation or need to emigrate.
- The proposed Institute of Computer Professionals of India (ICPI) will function as a voluntary association with various accreditation institutions as its members. It will receive initial financial support from industry and government and be regulated by NASSCOM.
- Employers' organizations like NASSCOM and others may be invited to set standards for evaluating the output of HRD institutions.

- Virtual institutions will create special HRD programs to help educate women in the field of IT-Enabled Services.

In addition to the recommendations listed above, the task force also proposed a number of financial incentives to encourage organizations to participate in programs that will close the gaps.

- Banks and financial institutions will be allowed to float education bonds to raise capital for investment in IT Education and Training. The investment will be treated like infrastructure bonds, available at low interest rates.
- Special financial packages, including venture capital, will be offered to young entrepreneurs, including NRIs, to set up IT education facilities.
- Universities, colleges and vocational schools (polytechnics) will be given autonomy to jointly offer education and training programs with the IT industry, such that contribution of the academic institution in terms of infrastructure will be treated as equity to the company.
- All companies (IT and other sectors) will be encouraged to set aside 6% of their value added revenue (sum of salaries, perquisites and net profit) in offering IT as well as IT-enabled education.
- IT HRD companies may use satellite and able TV based networking for broadcasting educational and training programs and services without any licensing.
- All investments in IT HRD companies/institutions, including investments made by companies on IT education and training of their employees, and donated computer systems to recognized IT HRD institutions, will be eligible as deductible expenses to the extent of 133%.
- Royalty payments received on account of IT education and training services will be covered under Section 10 of Income Tax act.
- 100% depreciation in a year will be allowed to any company, and budgetary provision will be made to enable government organizations, to donate computer systems two years after procurement to recognized IT HRD institutes.

Five-Year Plans

In their Five-Year Plans, the Indian government outlines the goals and objectives for the next five years for everything from Information Technology, Higher Education, Human Resource Development, and Information Broadcasting to Governance and Implementation and everything in between. The current plan is the 10th Five-year plan and represents years 2002-7.

According to the 10th Five-year plan, "The Government's hitherto hands-off policy with regard to the IT sector would continue in the Tenth Plan. It will confine itself to being a facilitator and a catalyst for accelerated growth of the section. It plans to take major initiatives in the area of e-governance with a view to ensuring balanced and orderly growth." That said, many of the objectives in the Five-Year Plan are related to the ICT sector and most are taken, almost directly it appears for the IT Action Plan prepared by the

National Task Force on IT and Software Development and the Task Force on HRD in IT report.

The following is a sample set of some of the 10th five-year plan initiatives:

- Technical and management education – focus on intake, quality, and research, faculty development, optimal utilization of resources, development of IT education, modernization of the curriculum, international benchmarking, developing capacity in new and emerging technology areas.
- Support the improvement in the quality of the teaching staff, including teaching assistants, training, cross-migration of staff from other disciplines, encouraging dual degrees, and perks to attract quality faculty.
- Upgrade quality of technical education in the Indian institutes of Technology and the Regional Engineering Colleges and other engineering colleges and Polytechnics by providing funds for new courses modernizing the syllabi and the development of teaching-learning materials.
- Set up an IT Enabled Services training infrastructure and involvement of Industrial Training Institutes (ITIs) and Polytechnics for Call Centre management and degree level courses for IT Enabled Services industry.
- Promote postgraduate education and research.
- Facilitate the educational system's interface with the IT industry.
- The National Technical Manpower Information System (NTMIS) shall be strengthened and expanded into other areas of technical education, namely, Management, Pharmacy, Hotel Management & Catering, and Applied Arts. This will assist Central and State Governments and the AICTE to monitor mismatch between supply and demand of technical manpower and facilitate more effective planning and development of technical education in the country.
- For development of new and emerging technology areas like bio-technology, nano-technology, bioinformatics, advance new material technology, funds are proposed to create a full fledged department of bio-technology at IITs, Regional Engineering Colleges and Indian Institute of Science, undergraduate, post-graduate and doctoral programs. This will provide a competitive edge to the country in the long term development of biotechnology potential.
- Develop the Technical Education Sector in the Northeastern States and Jammu & Kashmir. Funds are proposed in the Tenth Plan for Technical Institutes in these two regions. The proposed scheme will support facilities of technical education by modernizing laboratories, libraries and providing digital resources.

Regional Initiatives

State governments in India create their own plans and policies for the development of their regions. In fact, the National Task Force on IT recommended that each department/agency in the central government and the state governments shall be required to prepare a five-year IT plan.

Generally all of the states have the following high-level educational focus as directed by the central government:

- Wired schools are being promoted
- Computer literacy is a focus
- New schools and universities are being opened
- Computer education is becoming compulsory at various class levels.
- The number of available seats at technical institutions and in training programs is being increased.

In addition, the individual states are setting up their own Indian Institutes of Information Technology, partnering with multi-national corporations to provide additional training, upgrading their training facilities to support the IT Enabled Services sector, creating software technology and hardware parks.

The following are some specific examples of regional IT initiatives that impact skill gaps.

Kerala

Kerela's State Institute of Educational Technology (SIET) Project is responsible for the planning, research, production and evaluation of education software. It has plans to develop an Education Communication Floor equipped with all available audio-visual devices and demonstrations of education gadgets. This lab will provide teachers and students with hands-on experiences on computer multimedia.

Delhi

Delhi's Taskforce for Formulating Information Technology Policy identified that Delhi has the potential for providing IT Enabled Services at economical costs and is a destination for software and hardware companies. ("Delhi" 2003)

Madhya Pradesh

The vision statement in Madhya Pradesh's report from The State Task Force on Information Technology indicates there should be no islands of elitism or conclaves of wisdom. Every citizen must feel comfortable in accessing and imparting information through the facility of technology. ("Final Report" 2003)

Madhya Pradesh's goal is to contribute at least 5 to 10% of the IT output of India by the year 2008 and to create employment opportunities for 1 million people in IT-related activities.

To accomplish this goal the state must attract investors. They will accomplish this by providing cost effective infrastructure in addition to transparent and responsive governance. In addition they must provide information access to all citizens and achieve IT literacy in all high schools and colleges by the year 2003 and all schools by 2008. Similar to the National IT Task Force's recommendations, Madhya Pradesh proposes permitting the use of computers after office hours by employees in IT courses and providing suitable floor

space in Government buildings that are not utilized during non-office hours, to education institutions for IT training purposes.

Madhya Pradesh also established the Agency for Promotion of Information Technology (MAP_IT). (Madhya 2003) MAP_IT acts as a technical consultant to the government, formulates guidelines, conceptualizes the broad system configurations and develops the road map for IT related/e-governance projects initiated in the state. MAP_IT is involved in all major IT initiatives taken by the government. Among other things MAP_IT will work to:

- Attract IT investment.
- Prescribe guidelines for accreditation of IT institutions in the state.
- Coordinate with state government in the retraining of government employees.
- Sponsor scholarships for higher education in IT within the state.
- Conduct/sponsor state level IT talent competitions and award merit scholarships to students.

Punjab

Punjab is a relatively advanced state that saw an opportunity to develop a robust IT industry; however, despite substantial efforts it has been ineffective. Some of the efforts they attempted included policy changes to promote the industry, direct financial incentives, and the allocation of land for a software technology park that was set up.

Despite having adequate human capital and telecommunications infrastructure, the industry is still small and some firms have left. Speculation for the reasons that the industry did not flourish include:

- Global economic slowdown.
- Lack of international airport and other amenities.
- Severe power problems.
- Policies that cause infrastructure bottlenecks.
- Policy environment was still more focused on their traditionally strong sector, agriculture.
- Firms didn't make a big enough investment to gain critical mass.
- Technical and management education lags behind several other states. Most graduates go beyond the state's boundaries for jobs.

Punjab's current draft governmental IT policy makes IT Enabled Services a priority, however, they have created this policy without making an assessment of such factors as manpower availability, telecommunications infrastructure, policy initiatives, power infrastructure, city preparation and entrepreneurial history. (Singh 2002a) It remains to be seen whether IT Enabled Services will succeed in this state.

Technology Skills Gap versus Business and Supporting Skills Gaps

The ICT sector in India developed primarily because the country was in the unique position of filling the technology skill gaps that existed in other countries. As ICT companies in India continue to provide more, higher value services, their technology skills will continue to be challenged but the focus will move more to business and supporting skills including project management, product management, facilitation, team building, support, and the like.

As a result of India's long history working in the US and UK, they have been able to learn and develop the professional and interpersonal skills necessary to work effectively with these countries. Having already moved through this learning curve they have a competitive advantage over other markets. Furthermore, they are prepared to effectively educate a whole new group of professionals as they gain more opportunities in this sector.

Interviews Conducted for this Report

Dr. Alok Aggarwal, Co-Founder and Chairman, Evalueserve.com, Gurgaon, India and Chappaqua, NY USA
Mr. Richard Devane, Director, Icommit, Washington, DC USA
Dr. Anil K. Jampala, Vice President, Hyderabad Software Exporters Association, Hyderabad, India; also Vice Chair, IEEE, Hyderabad Section
Dr. Nirvikar Singh, Ph.D., Professor, University of California, Berkeley, CA USA

Israel

Financial Statistics and Growth

Demographics

Israel is unique among the countries included in this report because it has only existed since 1948. Furthermore, unlike other countries that have experienced significant "brain drains" as their educated workforce moved to other countries in search of opportunities, Israel's immigrant population has grown nearly 5 times since its inception to more than six million. ("Central Bureau" 2003) In 2002, the civilian labor force was 2.32 million, up from 1.65 million in 1990. ("Monthly Bulletin" and "Challenges" 2003)

The following diagram illustrates the number of immigrants that have flooded to Israel during each decade since statehood.

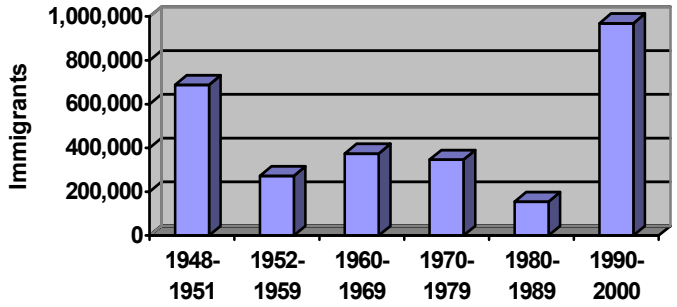

Figure 12 – Israel: Immigration to Israel

Jewish people represent about four-fifths of Israel's populations. The remaining population is Palestinian Arabs who are mostly Muslim, however, a small fraction are Christian and Druze. Arab families are, overall, much poorer than the rest of society. According to the records of the National Insurance Institute, over 60% of Arab children live below the official poverty line, even after benefits and taxes are taken into account.
Israel's official language is Hebrew, but Arabic is also recognized as an official language. English has become a common language for business commerce. As a result, both English and Arabic are taught in school from the fifth grade onward. Israel has a 95% literacy rate.

Figures show that in 1997 more than 250,000 personal computers were sold in Israel, compared to 102,000 in Egypt for the same period. Today there is almost a single personal computer for every two households in Israel. As a result, Israel's population is very computer savvy.

Historical Patterns and their Effect on Workforce Development

Shortly after formation of the Israeli state in 1948, neighboring Arab nations declared war. In addition to building a nation, Israel was faced with the need to quickly develop the infrastructure to protect its new country. To defend a small country with limited national resources, Israeli leadership decided to develop a small, smart, technically advanced army. Israel immediately began building this army using Research & Development (R&D) to drive innovative weapons and security technology, training to create a technically skilled force, and industry to build their high tech tools.

Israelis also recognized that in order to grow their economy, they needed to reduce their dependence upon imports. The country focused on developing agriculture and other industries using the best technology they could develop. With these nation building activities underway, Israelis identified their uniqueness and opportunities in the global economy. Israel's philosophy may be best summed up in the words of their first president, Chaim Weizmann, when in 1949 he stated ("What's Ahead" 2000):

> "The potentialities for industrial development must be surveyed and harnessed by the State as one of the supreme tasks… We have a mighty weapon which we must utilize with ingenuity and skill, with every means available to us: Science is that weapon, our vessel of strength and our source of defense."

Driven by safety and security needs, Israel focused their R&D on military communications and electronics and then began building their engineering and manufacturing industries. In the early 1950s, the Weizmann Institute developed and assembled the country's first computer. During the '50s and '60s several other computers were purchased from IBM and Philco. In the '70s and '80s, mainframe and mini computers became widely used in the financial and business sectors. They were followed by the adoption of the personal computer in the 1980s.

In the late '80s, entrepreneurs began the first generation high-tech companies in Israel.[iii]The following list highlights areas in which Israel's high tech industry has excelled:

- Medicine - Advanced medical equipment and systems.
- Security – Solutions to combat terrorism against the national airline.
- Energy Alternatives – Geothermal applications and solar energy.
- Equipment Automation – Diamond polishing automated equipment has allowed Israel to maintain their competitive edge compared with low-wage producers.
- Communications – Israel was the eighth country to build and launch a satellite.

In addition to Israel's native population, the significant number of immigrants has played an important role in the development of the ICT sector. Many immigrants were highly educated and had experience in science, mathematics, engineering, and more. Many of these immigrants helped to build the ICT sector in Israel.

Prior to the high-tech boom years, Israelis would typically complete their army service, earn university degrees and then immigrate to the United States for job opportunities. During the 90s, however, the growth of the high-tech sector in Israel not only kept graduates in the Israel, but it also attracted many natives back home. In order to meet the IT demands during the 1990s the universities and colleges increased the numbers of students, but the return of skilled Israelis from abroad was crucial to filling the workforce shortages.

In summary, the keys to the successful evolution of the Israel ICT market were:

1. Highly educated, affluent, productive population that has recognized the value of and used computers as tools for many years.
2. Innovation through high-end research and development.
3. The nation's military focus has encouraged sophisticated high-tech communications and electronics development as well as developing young people with technical, analytical and leadership skills.
4. The Israeli culture supports and encourages innovative, entrepreneurial people to take risks.

[iii] For Purposes of this analysis we want to focus on Information Communications Technology (ICT). For most people, high-tech encompasses ICT; however, it may also include biotechnology, pharmaceuticals and other industries. Israel is very strong in these areas and often the available research rolls them together under the high-tech umbrella. We will attempt, for this paper to differentiate, if appropriate, ICT from other high-tech companies.

5. Government policies that provide financial support, incentives and tax breaks to the ICT industry. In addition, the country's legal framework enforces binding contractual agreements.
6. Many highly educated, experienced immigrants have added their skills to the Israeli workforce. Furthermore, government programs assisted immigrants in making a smooth transition to productive Israeli citizens.
7. Immigrants to Israel brought contacts with the United States and Europe that were used to develop the industry.

Industry Focus for ICT Organizations

Israel's primary industry is manufacturing with a focus on technological innovation. Primary product groups include: medical electronics, agro-technology, telecommunications, computer hardware and software, solar energy, food processing and fine chemicals.

In 2000, Israel ranked sixth in the World Economic Forum Creativity Index, following the US, Finland, Singapore, Luxembourg and Sweden. ("Global" 2000) This index is calculated based upon results from an Executive Opinion Survey. The survey attempts to measure innovation and technology transfer.

The following diagram shows the breakdown of the electronics industry.

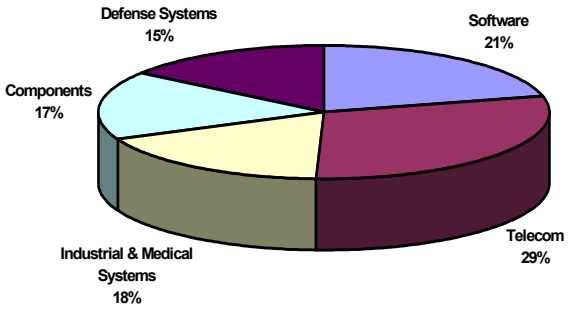

Figure 13 – Israel: Components of Israel's Electronics Industry

Figure 14 below indicates that Israel has traditionally provided very high-value software and hardware products as well as R&D and other high-value consulting services. Because this strategy has been extremely successful and is largely responsible for the exceptional per employee revenue of $250,000 for the ICT sector, the industry will continue to do more of the same.

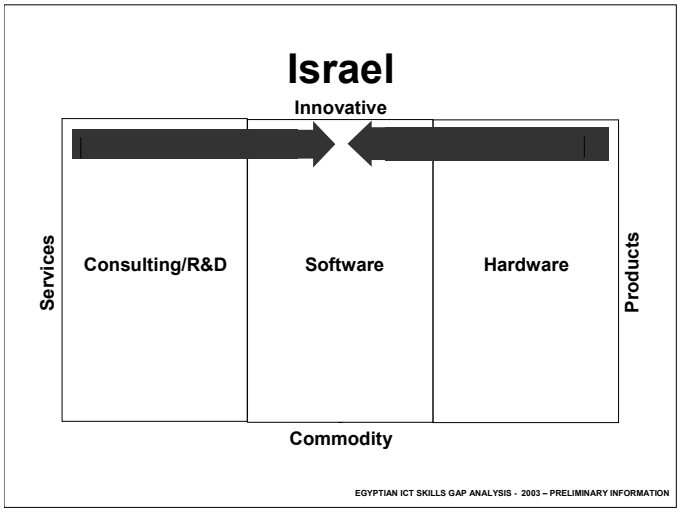

Figure 14 - Israel: Relative ICT strengths in export markets

Labor Organizations

Israel has many professional organizations in the ICT, mathematics, engineering and scientific sectors. The primary purpose of these organizations is to encourage education, collaboration and information exchange. It does not appear that there are any labor organizations within the ICT sector in Israel for the purpose organizing a collective voice to defend workers rights.

Future Mainframe Opportunities

Israel has not identified basic mainframe programming as a future market opportunity. Unlike India, Israel's business model is to focus on the extremely high-end innovative development, not basic support and migration services.

IT Industry Goals

Israel IT Industry goals are to grow the IT sector by continuing their focus on innovative, high-end technological advancements. The country's requirements for defense technology, their success in agriculture, and the large number of physicians per capita make security, communications, agro-technology and biotech natural target segments within the IT sector. In these areas, Israelis can effectively apply their skills to maximize their competitive edge.

Impact of Education and Workforce Development Initiatives on Financial Growth

Research and interviews have confirmed that Israel's advanced, world-class education system was a vital component for the success of the high tech sector. The education system and workforce development were vital for the following reasons:

- Even prior to the high-tech boom, the education system required all students to receive computer education and to learn to use the computer as a tool.
- Many Israelis have received advanced degrees allowing them to work productively in the high-tech sector.

- When the high-tech sector required more employees, the government sponsored retraining programs. Many people easily transitioned to the new sector because they already had a minimum of 12 years of education.
- Government sponsored education programs were set up to quickly integrate immigrants from the former Soviet Union and other countries into the Israeli culture and high-tech requirements. The objective was to make the highly educated and experienced immigrants productive as quickly as possible.

Workforce Characteristics

According UN Human Development Report, in 2001 Israel ranked 18th among the World's Technology Leaders. The leadership ranking is based upon the number of patents granted, receipts from royalties and license fees, Internet hosts per capita, telephones, cell phones, electricity supply, education and training in science, mathematics and engineering.

It also ranks high in the United Nations Human Development Index, which examines the overall pace of advancement over the long-term. ("Challenges" 2003) The Human Development Index is a composite index measuring average achievement in three basic dimensions of human development: a long and healthy life, knowledge, and a decent standard of living. (Human 2002) In 2000, Israel placed 22nd over all, behind many North American and European countries. Israel was the highest ranked Middle Eastern country to appear on the list and was followed by the other countries that comprise this report, including the Philippines (77), Jordan (99), Egypt (115) and India (124).

It is reported that 20% of Israel's workforce are university graduates, which is the highest proportion after the United States, and followed closely by Canada (17%), then Britain (12%), and Italy (8%). Israel has the highest percentage of engineers and they also have the highest number of medical doctors per capita. ("Israeli High-Tech" 2003) As we have mentioned previously, many of these highly educated workers have emigrated from other countries and often they have even more advanced educational experience than the average Israeli.

In Israel 135 out of every 10,000 workers are scientist and engineers and nine out of ever 1,000 workers are engaged in R&D. In comparison within the United States, which rates in second place, 85 out of every 10,000 workers are scientists and engineers. ("Fast Facts" 2003)

Size and Skills

Overview

Israel's school population represents about 30% of the total population. For 2000/01 the total number of students enrolled in the education system from pre-primary to the end of secondary school was 1,953,936. ("Israel at 54" 2003) In 2002 there were 180,229 students at all degree levels, in addition 36,710 students enrolled in the Open University, of these students 65.2% were in universities, 23.7% colleges, and 11.1% teacher training. (Council 2003)

The following is a sample of how students breakdown into the various fields of study, based upon 2000/01 enrollments:

Primary Field of Study	Percentage of Students
Humanities	26.3%
Social Sciences	26.0%
Mathematics & National Sciences	20.8%
Engineering & Architecture	14.5%
Medicine & Related Fields	7.8%
Law	3.4%
Agriculture	1.2%

Table 7 – Israel: Fields of Study for Israeli Students

As result of three years of compulsory military service for men and almost two years for women, most Israeli students are over age 21 when they begin their higher education. At the current time, more than half the Israelis from age 20-24 are enrolled in post-secondary or higher education. ("Higher Education" 2003)

The percent of the Israeli population with 12 or more years of schooling in 1999 was 76%, compared to an average of 65% for other top-ranked countries. This score ranks Israel above countries like Finland, Korea, France, UK, and Ireland. ("Level" 2001) The percentage of the population with an academic degree is 20%, which ranks Israeli third to the United States and the Netherlands. ("Percent" 2003) The percentage of the population over 15 years of age with 13 years or more years of formal schooling is 37.4%, which reflects an impressive increase from 19.2% in 1980. ("Israel at 54" 2003) Thirty two percent of students in universities are graduate students. ("Higher Education" 2003)

Within Israel's university system, approximately 13.2% of the students are studying engineering and 16.1% are studying science and mathematics. ("Israel at 54") According to the Israel Association of Electronics and Information Industries, in 2003, 4,900 college students will graduate with degrees in high-tech fields; this is up from 1,035 in 1993. Over the past ten years, the number of high-tech college graduates per year has increased by an average of 17% per year.

Arab Israelis

Compared with the impressive education numbers for Israel as a whole, the median years of schooling of Arab Israelis in 1996 is 10.4 years. On a positive note, this number represents a significant increase from a median of 1.2 years in 1961. ("Arab Israelis" 2003)

The average number of Arab students per teacher is 31, compared to 26 in Jewish schools. Typically the Arab schools are small, rented spaces that lack many services and facilities including counseling and laboratories. As a result of the poor conditions and other factors 46% of Arab students never complete school and 31% leave before the end of the tenth grade. (Badarni 2003)

In 2000, the Government of Israel designated resources to reduce the gaps between the Arab and Jewish sections of the country, in particular in the areas of education, housing and employment.

Education

History of Education

Education has been a major focus for the Israeli people, even before they achieved statehood. School attendance in Israel is mandatory from age five and free through age 18. In addition, most three- and four-year-olds attend preschool programs. ("Israel in Brief" 2003)

Higher education in the area began in the 1920s with the founding of the Technion and The Hebrew University of Jerusalem. In 1948, when Israel was established, these two institutions were still the only ones available for higher education. At the time, the Technion student body totaled just 676 and the majority of students were in the army. With the mass influx of immigrants during the 1950's and '60's, Israel needed more higher education institutions and opened five more universities. In the mid-1970's they started the Open University following the British model.

The Ministry of Education's focus has been to mandate gender equality, upgrade teacher status, broaden the humanistic curricula, and promote scientific and technological studies. With that focus, in the late 1970s teacher training was upgraded from post-secondary seminars to institutions of higher education. In further education reform in the 1990's, the Council for Higher Education Law was amended making it possible for general colleges, technical colleges and other colleges targeting a single profession to be opened.

In the early 1990s the Israeli Ministry of Education concluded the following roles for ICT[iv] in education: (Aviram 2003)

- ICT will be the medium of education in the foreseeable future, and will change many aspects of the education system as we have known it in the twentieth century.
- ICT should be introduced into the education system within a framework of a national computerization plan that is based on a holistic and systemic understanding of the role of ICT in education.

As a result of these two assumptions, the "Tomorrow 1998" plan was launched in the early 1990s to create a "technologically-saturated learning environment". The program was initiated to maintain and enhance Israel's advanced technological level by introducing modern tools to children as soon as possible. (Izenbert 2003) As a result of this program, Israel has computerized more than half of their schools and kindergartens. Almost 90 percent of their teachers are taking courses on integrating ICT into education. Furthermore,

[iv] Note: In this instance they use ICT to mean "Information and Computer Technology" and not Information and Communications Technology.

they hope to achieve a ratio of at least one computer for every ten students with all computers connected to the Internet.

Seventy percent of the higher education budget is paid by public funds, twenty percent comes from tuition and the remaining ten percent is from private sources. From 1990 to 2000, Israel expended 8 -10% of Gross Domestic Product (GDP) on education. In 2000, Israel's expenditure was 8.4% of GDP, ranking Israel higher than Sweden, Denmark, Korea, France, Japan, Spain, the UK or Germany.

The large numbers of immigrants into Israel has created specific educational challenges. The immigrants arrive with various levels of education and cultural backgrounds. Special short-term classes have been developed to introduce students to the Hebrew language and Jewish history. There have also been special training programs to educate teachers in how to teach immigrant students, and to retrain immigrant teachers so they can become productive members of the educational system.

One example of how Israel is bringing technology to the educational system is the Amal 1 system. Amal 1 provides vocational and technological training to a network of schools and programs at the junior high, high school, college and adult education levels. (Amal 1 2003) In this system, students can learn without being in the classroom because teachers and materials are on-line.

The Amal 1 system includes 48 high schools and technical schools and 54 adult training centers. There are more than 3,000 educators instructing approximately 45,000 students in scientific, high-tech, paramedical and engineering fields. They also have programs to retrain unemployed workers and new immigrants and to provide training for government institutions.

As another means of delivering educational material to the population, Educational Television (ETV) operates 10 hours per day, 6 days a week on two channels. ETV provides a wide range of educational programs for preschoolers through adults.

Public Institutions

The higher education system includes eight universities. Universities also have academic responsibility over 23 regional colleges that allow students who live away from the universities to receive higher education. (Council 2003)

There are also non-university institutions that provide instruction at the bachelors degree level only. Traditionally these institutions focus on specific fields of study like teaching, arts and design, nursing, technology, management, agriculture, textile, hotel management, radiology and dental hygiene. Some colleges are public institutions, some are privately owned and others operate under the relevant government ministries.

Finally there are non-academic post secondary schools. Programs may include paramedical professions like radiology and dental hygienists, but also technology, administration, practical engineering and more.

Israel Defense Forces

An important source of high tech talent comes from the Israel Defense Forces. The army acts as a screening program to identify the most talented workers and then they are put through rigorous and elite technology and military programs. The result is a quality education combined with effective leadership and problem solving skills.

Government Programs

The Council for Higher Education, headed by the Minister of Education, grants accreditation, authorizes the awarding of degrees and advises the government on education and scientific research, development and financing. The Council is made up of 25 members including academics, community representatives and a student representative. The Chairman is the Minister of Education.

The Planning and Grants Committee (PGC) is a subcommittee of The Council for Higher Education. In addition to acquiring books and journals, providing grants, supporting research activities, they also support the development of computer facilities at universities by contributing to the development costs, expenses, or to the acquisition of super-computers.

Research and Development

The fastest growth rates in the economy are found in the high-tech sector. These skill- and capital-intensive businesses require considerable investment in Research & Development to be successful. Dozens of government, defense and public research institutes, medical centers and universities conduct R&D. Universities have established companies to register patents and commercially exploit their developments. High-tech industrial parks and neighboring universities have formed close cooperative relationships to develop R&D. In addition many private companies have opened R&D centers in Israel.

Country-level Skills Gap Strategy

While Israel has many high-tech strengths, there are also some skill gaps that possibly hinder companies from investing in or doing business with Israeli high-tech firms. The gaps include:

- Executive Management Skills – Large companies often act as "finishing schools" for future managers because many small, fast paced start-ups do not provide the opportunity to groom future managers.
- Marketing Skills – Because of a strong technical focus, development of business skills is often overlooked. When the IT sector was booming it was easy to focus on the technical resources, however, in more difficult economic times, a different set of skills – marketing, sales, advertising, support, marketing analysis – is required to attract and capture every possible opportunity.
- Market Analysis – Companies must be able to capture and analyze market information in order to set long-term plans instead of merely following the current markets. However, at the same time, companies must not set business targets and

blindly follow them. Companies require staff with the right skills to observe trends that indicate when the market is shifting or that opportunities lie in other directions.

During the interviews, several people suggested that the lack of market analysis skills can result in the waste of substantial amounts of money. Without proper market analysis, companies often develop and build products because they can, not because they should, frequently resulting in delivering products that consumers don't need or want.

The input from skilled managers and marketers during the research and development stage can also help to ensure the usability of a product. Engineers and scientists often view the solution from a technological point and may lack the perspective to see how the product will be accepted and used by the consumer.

Education Programs

The education system is recognizing the need to develop management skills to complement sophisticated technical skills. For example, the Georges Leven High-Tech Management School and the Tel Aviv University's Leon Recanati Graduate School of Business Administration introduced the Kellogg-Recanati High-Tech Management MBA. The program is built on cooperation between Northwestern University's Kellogg Graduate School of Management and Tel Aviv University's Leon Recanati Graduate School of Business Administration.

National Initiatives

The Ministry of Industry and Trade (MoIT) has created a program for the development of human resources in Industry, in part to expand the number of people available to work in high tech. In addition, the program enhances the qualifications of the workforce and accelerates continuous development and advancement of employees.

The MoIT program is targeted at four areas:

Program	MoIT will
Development Area Plants	Finance a portion of the expenses incurred by plants located in development areas in order to provide instruction for continuous employee development.
Sector-Specific Training	Subsidize the instruction costs for trainees at new or existing plants. Possible provide a living allowance for employees who are not receiving unemployment allowances.
Joint Project with an Education Institution	Approve and subsidize special human development projects made in cooperation with education institutions.
High Tech Industry Development	Finance studies to retrain university graduates, engineers and technicians to needed professions in high tech industries. Program will also finance the cost of living for students who do not receive unemployment benefits.

Table 8 – Israel: MoIT Human Resource Development Program

The Israeli government also implemented special education programs while there was a mass influx of immigrants from the former Soviet Union. The purpose of the program was to help the highly educated workforce quickly come up to speed regarding the Israeli culture. The program also helped scientists and mathematicians to learn the high-tech field so they could fill workforce shortage in that area.

As the mass influx of Soviet immigrants and the high-tech boom have waned, the focus on special programs for human resource development targeted toward high-tech has diminished. Students within in the University system continue to elect electronics, science, information technology and mathematics as areas of study, but the demands from shortages in the workforce have been eliminated.

Regional Initiatives

Being a comparatively small country, the high-tech industry has centralized in the Tel Aviv and Central districts. There appear to be no specific regional initiatives within the country.

Cluster Impact

As we have previously indicated, high-tech in Israel revolves around their innovative research and development. Furthermore, the nation's educational strengths in defense, medicine and agriculture attract the high-tech R&D in those areas. As a result Israel's success is clustered around the high-tech communications, medical and agricultural technology.

Technology Skills Gap versus Business and Supporting Skills Gaps

Prior to and during the high-tech boom years, business, industry associations and the government recognized that the IT sector was experiencing a shortage of skilled workers. All groups worked together to develop and implement programs to educate or re-educate the workforce for the IT sector.

Since the IT sector has slumped, businesses are not identifying technological skill gaps. Companies will address technological needs if a market demand arises, however, the focus is on creating and maintaining business opportunities and not on employee training.

In the current environment, a shortage of business, marketing and supporting skills are the larger problem. As demonstrated in this paper, associations and government organizations are implementing programs to help minimize these business gaps.

Government/Industry Programs and Initiatives

The Israeli government, trade associations and the private sector have actively supported and sought out opportunities to develop the high-tech industry in Israel, expand its exports, and encourage foreign investment. The Office of the Chief Scientist, the US-Israel Science and Technology Commission, MATIMOP and the Israel Association of Software Houses are examples of programs that focus on advancing the high-tech industry, promoting technology transfer and education.

Office of the Chief Scientist

The Office of the Chief Scientist (OCS) is part of the Ministry of Industry and Trade and has been operating since 1973. OCS is responsible for implementing government policy related to supporting and encouraging industrial research and development. OCS goals include:

- Expanding the technological and scientific infrastructure.
- Developing a science-intensive industry and improving its competitiveness.
- Facilitating job placement for scientific and technological manpower.
- Increasing industrial production and the national balance of trade.

One of OCS's main programs is the disbursement of approximately $400 million annually in grants to cover 30-60% of the R&D expenditures for companies building marketable processes and products. According to interviewees, it is relatively easy to get a quarter of a million dollars in funding, provided the company presents a good business plan. Professional consultants monitor companies participating in the program to ensure they are following their business plan. When successful products are sold, the OCS receives royalty payments, which amount to approximately US$100 million per year. ("Israeli High-Tech" 2003)

OCS also has an advanced program in which companies can receive as much as US$ 5-8 million. The key to this program is that companies must build consortiums and provide plans for how the group will work together. Independent consultants are nominated and paid to monitor the progress of the plan and to ensure that agreed upon milestones are achieved. One interviewee became involved in this program with the goal of getting money for his own organization and did not expect a lot of value from the consortium. Now, years later, he is finding the relationships built within the consortium are creating partnerships and opportunities that he never thought were possible and are providing enormous value.

As another initiative, the OCS has established approximately twenty-five technological incubators since 1991. Their purpose is to create an environment to nurture innovative ideas from native Israelis and new immigrants. The incubators provide financial support, business advice, subsidized office resources and exposure to interested investors. Companies accepted into the incubator qualify for a grant that covers 85% of their budget to a maximum of US$ 170,000 annually for two years. ("Israeli High-Tech" 2003)

Israel's incubators are unique because the government is a full partner in the process. Many of the incubators are located near the country's universities allowing the entrepreneurs to work with university researchers.

US-Israel Science and Technology Commission

The US-Israel Science and Technology Commission (USISTC) was established by President Clinton in 1993 to enable more effective cooperation between the US and Israel. The mission of the USISTC is to:

- encourage high-tech industries to engage in joint projects
- foster scientific exchanges between universities and research institutions

- promote development of agricultural and environmental technologies and assist in the adaptation of military technology to civilian production.

The commission is co-chaired by the US Secretary of Commerce and Israel's Minister of Industry and Trade, and administered by an Executive Director at each organization. The commission includes representatives from government agencies and ministries. It has a high-level advisory panel with private sector representatives from academia and industry.
The commission meets twice a year. Initially each country contributed US$ 5 million per year for three years. Today it continues to receive its funding through grants from the United States and Israel.

The commission established a foundation to disburse grants that support the organization's mission. USISTC sponsored projects support the following topic areas:

- Intellectual property rights
- Information technology
- Economic benefits of environmental practices
- Defense commercialization
- Telemedicine
- Hazardous Waste Management

The Foundation is just initiating a Technology Excellence Fellowship Program that will provide grants to cover the cost of hosting mid- to senior level managers and executives for six weeks of hands-on professional training in US business practices. The program encourages joint ventures and investment in the US and Israel high-tech sectors. Ideally the Foundation hopes to close Israel's marketing skill gap through this program.
Similar cooperative programs exist between Israel and other countries.

MATIMOP – Industry Center for R&D

MATIMOP is an Israeli public, non-profit organization founded by three major manufacturing associations. The organization promotes joint developments of advanced technologies by acting as an interface between Israeli companies and their international counterparts. Furthermore, the organization encourages participation in programs for bi-lateral and multilateral cooperation in industrial R&D.

MATIMOP also acts as a clearinghouse in Israel by providing a daily listing of projects plus detailed profiles of Israeli companies looking for foreign high-tech partners. Some of MATIMOP's tasks include (OCS):

- Contact point for bi-lateral industrial R&D programs of the OCS.
- Liaison for the EUREKA program, which helps companies and research institutes pool their resources for technology development.
- Administration for the EU "Fourth Framework" R&D programs, enabling full participation of Israeli companies, universities and research institutes.

- Running the Innovation Relay Center (IRC) to enhance technology transfer for small and medium enterprises.

Interviews Conducted for this Report
Mr. Naftali Obatowski, Vice President, Eyron Computerized Information Systems Ltd., Ramat-Gin, Israel
Mr. Amiram Shore, Chairman, MLL Software & Computers Industries Ltd, Haifa, Israel
Dr. Marc Siegel, Interim US IT Program Director, US-Israel Science and Technology Foundation; also Adjunct Professor, San Diego State University, San Diego, CA USA
Mr. Jonathan Yaron, CEO, Enigma, Inc., Burlington, MA USA

Jordan

Financial Statistics and Growth

Demographics

Between 1979 and 2001, the population of Jordan more than doubled from 2.1 million to over 5 million people. The majority of the population is young, with a median age of 19.3 years. As much as 43% of the population of Jordan is under the age of 15. ("Jordan in Figures" 2003)

Jordan enjoys one of the highest literacy rates in the Middle East/North Africa region at 88-90%. Literacy is not equally distributed between the sexes in Jordan, however, as two thirds of the illiterate population are women.

Historical Patterns and their Effect on Workforce Development

Though the population growth rate in Jordan has slowed to under three percent, family sizes are large and the tremendous number of young people in the country will affect the education system, the need for jobs and the economy in general for the next several decades.

Like other progressive countries in the Middle East, the role of women has changed dramatically and will continue to change as women take a more active role in economic and political affairs. However, Jordan is a country of contrasts for women.

- Overall unemployment rates for women are double those of men.
- More women are attending and staying in school longer, yet two thirds of illiterate citizens are women.
- Women perform extremely well in school but often don't or can't work outside the home – the highest rate of unemployment (47%) is among female graduates of community colleges. (Jordan Human 2000)
- According to a 1999 United Nations report "Educators comment that high academic achievers among females often experience a 'fear of success' syndrome after graduation from high school or college: if they succeed in the workplace, they might be perceived as over-stepping the boundaries society set for them; yet if they do not take advantage of their proven credentials, they feel they are letting themselves down." (Jordan Human 2000)

Industry Focus for ICT Organizations

The majority of ICT organizations are small companies selling into relatively small domestic or regional markets. As a result, companies have a tendency to be generalists and to do what will sell today, rather than focus on building a company around a specific niche. For example, It is not unusual to find a software company that also produces some hardware and has a division that does graphic arts and web design.

Figure 15 below indicates that Jordan has traditionally provided moderate-value software and hardware products to external markets. Like most countries, especially those that do not have a great a labor price advantage, Jordan is attempting to move up the value axis by providing higher quality and higher value products.

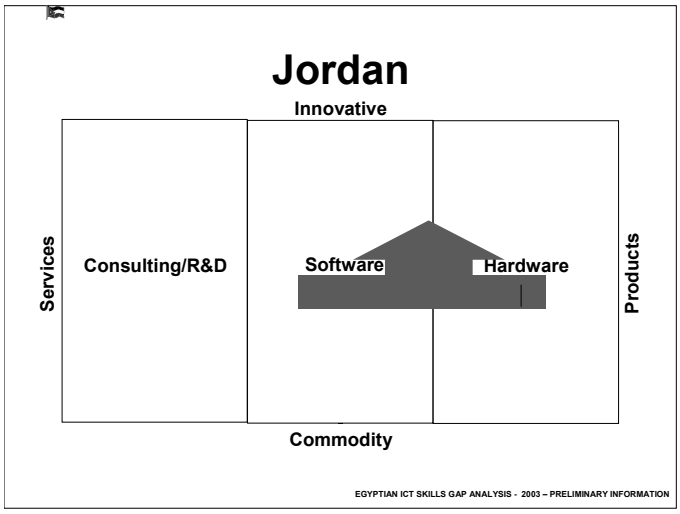

Figure 15 - Jordan: Relative ICT strengths in export markets

Labor Organizations

Less than a third of Jordan's workforce is unionized. The General Federation of Jordanian Trade Unions consists of 17 unions that operate mostly in the public sector and in mining. Jordanian law stipulates a maximum workday or 8 hours and a workweek of 48 hours. Beyond 8 hours and 48 hours, overtime is generally paid at 125%. Minimum wage is approximately US$114 per month and typical monthly salaries range between US$150 and US$250. (About Jordan 2000)

Future Mainframe Opportunities

While there are some mainframe skills in Jordan, most of the development in the IT sector has occurred in the hardware, PC and server areas. Mainframe skills development does not appear to be a goal in the country.

IT Industry Goals

Please refer to the *National Initiatives* on page 130.

Workforce Characteristics

The work force in Jordan numbers approximately one million people, with female participation at only 13%. While the birth rate is relatively flat at about 2.8%, the size of the workforce is increasing more rapidly and will double before 2020. If the proportion of women in the workforce increases above the current 13%, which seems quite likely, the growth in the workforce will be even greater.

The Jordanian government provides education at no cost through high school and schooling is compulsory until the 6th grade. The average length of schooling for Jordanian adults is only 7 years, although a typical Jordanian factory worker has graduated from high school with eight years of English education and may have undertaken some vocational training.

The enrollment rate for youths 14-17 has increased from 44% to 73% since 1973-74. The growth in enrollment of 16-17 girls is particularly impressive, having more than doubled to 75% since that same period. Unfortunately, the dropout rate is significantly higher for low-income youth to the point that less than half have completed their secondary education or are still in school at age 18. (Jordan Human 2000)

17% of the Jordanian work force has attained some form of higher education, which includes study in universities, colleges or vocational technology programs. 19,000 Jordanians hold advanced degrees, and the country claims to produce more PhD graduates per year on a proportional basis than Israel. (Jordan Vision 2003)

Approximately 115,000 students are enrolled at higher education institutions, with another 24-25,000 enrolled in community colleges.

Size and Skills

Because the population of Jordan is skewed so heavily toward youth, there is a significant burden on the educational system. 130,000 students will enter the school system in Jordan every year through the first two decades of the twenty first century.(Jordan Human 2003) One of the most significant challenges for the country is to ensure that the school systems not only can accommodate the sheer number of students, but that they can provide a quality education. Further, the skills and knowledge imparted to students in Jordan, as is true anywhere, must constantly change and be updated to match the evolution of industry and the world.

A closely related problem is to ensure that there will be an adequate number of jobs available for those students who enter the workforce when they leave school.

One of the foremost challenges to ICT companies in Jordan, is the lack of "soft" skills among graduates. For example, while it is true that almost everyone graduating high school has studied English for eight years, there are often gaps between their textbook English and the practical style of English required in the business world. This is especially true in the ICT sector where a high percentage of the industry's customers are outside of Jordan and other Arabic-speaking countries.

Other soft skills shortcomings involve presentation skills, communication skills and the ability to work in teams. In addition, marketing, business development and project management are particularly weak in IT and Computer Science majors.

Education

History of Education

Jordan's first university opened in the early 1960s at a time when only one third of the people in the country could read or write. Forty years later, that university is one of more than twenty college and universities and by itself has more than 21,000 students from Jordan and the Arab world. In addition to serving as an educational destination in the region, the opposite is true as well – Jordan sends a large number of students to college and universities in other parts of the world, especially the US and Europe.

Current spending on education in Jordan is approximately 6.3% of GDP. (Dutta 2003) Unfortunately, the quality of education in Jordan is not always of the highest caliber. Science and math testing of 13 year olds in the early 1990s showed Jordan to be near the bottom of 20 countries surveyed. The authors of the *Jordan Vision 2020 Report* question whether the fundamentals of Jordanian education have changed sufficiently in that time to affect Jordan's rank.

Colleges and Universities

The Jordanian Cabinet includes both a Ministry of Education (MoE), for Kindergarten through 12th grade, and a Ministry of Higher Education (MoHE). In the opinion of several interviewees for this report, the MoE is very interested and willing to work with IT trade groups but will need to do even more in the future, especially to help close soft skills gaps. Many of the skills shortcomings described in the Size and Skills section on page 114 are best cultivated long before university.

Unfortunately, the same interviewees feel that the MoHE is so busy dealing with the sheer numbers of current and future university students that they have not been able to focus on ICT issues. As a result, there is very little cooperation between MoHE and the industry in reshaping higher education in Jordan.

In contrast, the Ministry of ICT has been very influential and continues to play an active role directly and through initiatives like REACH and organizations like int@j (see pages 130 and 117, respectively). However, MoICT can offer advice but they cannot affect educational policy. Officials at MoICT believe that tripartite cooperation between the government, universities and private industry is essential for closing skills gaps, yet neither of the latter two groups has taken initiative to start the necessary dialog. In the few cases where such dialog has happened, it has usually been initiated by Int@j, a non-governmental organization or a donor agency.

Universities in Jordan are not tightly regulated. Consequently, most schools operate very autonomously. Interviewees for this report suggested that many schools operate as though they know what is best with regard to teaching students and preparing them for ICT careers, despite 1) complaints from software company executives and 2) the significant

gaps identified by int@j between graduates' skills and the requirements of private companies (see *ICT Skills Gap Study* on page 119).
Universities have been extremely slow to adapt their programs to meet identified skills gaps, although this appears to be changing. For example, a growing number of schools have invited people from ICT companies to serve on their boards. Yarmouk University, the University of Jordan and the Jordan University of Science and Technology have been particularly aggressive about revising their programs to meet real world needs. Even when universities agree to adapt their ICT curricula, getting buy-in from individual professors is a separate problem.

Approximately one-third of the 22 universities in Jordan are public but the majority are private, for-profit schools. While the best private universities seek to shape their programs to meet market demand, many lag behind. In addition, most educational development programs focus on the public universities so private schools often fall outside the scope of such projects. In addition to the twenty two universities, there are many colleges and community colleges.

Private Training Organizations

A number of multinational IT companies have established training programs in Jordan, including those listed below. While these programs do deliver solid benefits, it is safe to assume that the companies sponsoring them have the specific motivation to create skills in and demand for their own products.

Intel

In September 2002, Intel opened the first Internet Laboratory (I-Lab) in the Middle East at Jordan University's King Abdullah II College of Information Technology. The I-Lab will serve as an incubator for e-business startups in Jordan and should serve as a model for this type of activity in the Arab world.

Sun Microsystems

Sun helped to launch a Java certification program at Princess Sumaya University for Technology following several short-term training programs in their own technology and general e-commerce topics. The certification program should provide considerable assistance to the filling the need for Java programmers.

Cisco

Cisco partnered with UNIFEM, the United Nations Development Fund for Women, to create up to ten academies in Jordan designed specifically to provide technology training for women. In addition, these "gender academies" are designed to provide gender sensitization for both students and instructors. The tactical goal of this joint program is to certify women as Cisco Certified Network Associates (CCNA). The strategic goal is to enhance the status of, and opportunities for, women in the Jordanian workforce.

Business Partnerships

Historically, links between Jordanian companies and educational institutions have not been strong. There are a few recent examples of success but the ties between higher education and industry are not strong (refer to *University – Industry Cooperation* on page 133).

Several people interviewed for this report indicated that companies have actively solicited higher education partnerships in order to improve the skill levels and immediate utility of new graduates. However, interviewees have found the response from universities to be lukewarm. They believe that the Ministry of Higher Education (MoHE) should take a much more active role fostering relationships between schools and private companies in order to improve education quality.

Research and Development

With its large number of PhD holders and strong interest in advanced research, Jordan has developed world-class R&D skills in several areas, especially pharmaceuticals.

Infrastructure

Connecting Jordanians

Recognizing that the country cannot build a globally competitive ICT industry without a much broader base of Internet and computer users, HM King Abdullah II initiated the Connecting Jordanians program. The goal is to link all schools and libraries in Jordan and to provide IT Community Centers. The plan for the project is to build a fiber optic network by 2005 that links 1.5 million students and lifelong learners in:

- 3000+ public schools
- 23 community colleges
- 67 community IT centers
- 8 universities

In part at the urging of Canadian national infrastructure consultant, Doug Hull, the Jordanian government decided to build a broadband network immediately without first installing lower speed connections. Public schools, community colleges and the IT centers will be linked at 100 Mbps, while universities will be connected at gigabit per second speeds.

Country-level Skills Gap Strategy

int@j

The Information Technology Association of Jordan (Int@j) was formed in 2000 as a private, non-profit association to represent, promote and advance the IT industry in Jordan. Int@j has the following objectives (as reported on their website, www.intaj.net):

- **Advocate** industry issues – represent IT industry interests and lobby with government and international groups; propose national initiatives and conduct public relations efforts.
- **Promote** industry investment opportunities in Jordan – promote Venture Capital (VC) and Initial Public Offerings (IPOs); form relationships with local export-

oriented groups; represent the industry at conferences and trade shows; set up databases and publicize membership through websites, newsletters, hyperlinks, promotional materials and advertising.

- **Provide** industry research and market information – conduct market studies; disseminate local, regional and international opportunities; provide market trends.
- **Effect** standardization, certification and quality control in the IT industry – promote certification bodies and their value addition; enforce an IT industry code of ethics; standardize employment contracts and benefit packages.
- **Support** human resource development – work with educational institutions to focus on critical skills; strengthen ties with local universities and collaborate with overseas universities; and initiate industry programs to benefit university students.
- **Advance** industry intellectual property rights – certify IPR compliance; update members in IPR law changes; and work towards local IPR regulations conducive to IT industry growth.
- **Form** international IT industry alliances – actively seek alliances with global players; develop and attract venture capital funds; and disseminate success stories.
- **Manage** industry stakeholder relations and resolve industry conflicts – build and reinforce bridges among association Members; and between association Members and government, media, universities, NGOs and donors.

Because int@j was formed as an association for companies, not individuals, the group did not initially pay much attention to identifying and improving skills for individuals. Instead, they focused on infrastructure and legislative issues as summarized in the description of REACH on page 130.

However, Int@j member companies had difficulty finding people with the right skills, which led to the research and publication of *A Detailed Analysis on Jordan's ICT Expertise*. (A Detailed 2001) As the report shows, the problem is not that there aren't enough IT/CS graduates – in some ways there are too many for the number of jobs that currently exist – but that they don't have the right skills and experience.

Universities generally aren't teaching soft skills and, as noted earlier, they have been extremely slow to adapt their curricula to incorporate training required by the ICT industry. To highlight the problem in one key job category, that of project management, the CEO of int@j offered two examples:

- int@j sponsored a project management course in 2002. They hired an outside firm to teach the course, which cost approximately 4500JD per student. They arranged a subsidy of nearly 1000JD, which meant that the cost to software companies was about 3500JD, more than a year's salary for most software professionals. Yet the course sold out in less than two weeks, clear evidence of the demand.
- Software companies in Jordan have been known to hire a person with project management experience even if they don't have an immediate need. The companies would rather have the person on staff in anticipation of an actual need because it is so difficult to find qualified project managers.

ICT Skills Gap Study

An initial attempt to establish a database of available IT skills at www.it.jo in 2000 stalled after the first year, partly because the site offered a passive data collection vehicle with limited benefit to people who enrolled. Int@j took over development and restructuring of the site with the express goals of estimating demand for IT skills within the private sector, continuing to collect IT talent definitions from site registrants, and using both sets of data to estimate the skills gaps.

Int@j recommended in the summary of their findings that the country focus on providing training specifically aimed at those gaps. The largest gaps they identified were in three skill areas: IT Strategy Developers, System Documenters and System Designers. Int@j also points out that, while it may appear that certain skills do not have a shortage of people, a shortage may still exist because the available people do not have a sufficient level of experience to meet the demand. Indeed, int@j makes the specific point that many of the real gaps that exist lie "mostly in skills that are acquired through practical experience, and need to be further developed to ensure appropriate availability of human resources for the needs of the private sector." (A Detailed 2001)

Table 9 through Table 14 reprinted from *A Detailed Analysis on Jordan's ICT Expertise, 2001* with permission from Int@j. (A Detailed 2001)

Participant Profile

Over 5000 people registered at the web site to participate in the study but eliminating duplicates and invalid records resulted in 3508 valid participants.

- 3117 reside in Jordan, with nearly three quarters of those in Amman.
- 86% of registrants were male.
- More than 3300 consider their Arabic skills to be good or excellent (3124 said excellent)
- 3222 consider their English skills to be good or excellent, though only 1500 claimed excellent.
- 14% have post-graduate degrees (one-third with Ph.D.s, two-thirds with masters), while 85% have undergraduate degrees.
- 88% of degrees are ICT related.
- 21% of participants hold at least one vendor-sponsored certification (the average is 2.26; Microsoft and Oracle outdistance the next closest by a factor of 8).
- Only 43% of respondents indicated that they had working experience in ICT. Int@j assumed that the 47% who did not list their level of experience have none.
- Just over one-third of experienced respondents indicated 1-2 years experience; another third said 3-4 years, and about 10% indicated each of the final three categories: 5-6, 7-10 and more than 10 years.

Available Skills

The table below illustrates the experienced skills by service category. Service categories are taken from a model obtained from the British Computer Society (Annex II in the Int@j report provides the category breakdown).

Table 9 – Jordan: Experienced Skills by Service Category illustrates the relative inexperience of the Jordanian IT workforce, as fully two-thirds of survey respondents have four or fewer years of experience. Table 10 – Jordan: Experienced Skills by Title/Position on the following two pages details length of experience by job description.

Service Category	Supply by Years of Experience					
	1-2	3-4	5-6	7-10	>10	Total
Admininstration	54	31	12	7	16	**120**
Application Support Services	115	114	38	44	32	**343**
Business Development	4	4	1	1	-	**10**
Financial	4	7	3	1	-	**15**
Hardware Sales	9	10	2	4	1	**26**
Hardware Technology Provision	30	31	7	9	7	**84**
Hardware/SW Sales	7	17	3	1	-	**28**
Human Resources	-	-	-	-	-	-
Interactive Media	10	1	1	1	4	**17**
IT Strategy Development	17	25	8	19	19	**88**
Network Comm. Systems & Mgt.	13	22	8	7	3	**53**
Packaged Software Sales	17	18	4	6	2	**47**
Project Management	14	15	3	7	6	**45**
Remote Sensing & GIS	4	1	-	1	-	**6**
Research & Development	6	1	-	-	1	**8**
Service Desk Management	1	1	-	-	-	**2**
System Design	6	16	9	5	14	**50**
System Development	188	186	51	60	33	**518**
System Documentation	3	-	1	-	-	**4**
Web Development & Admin.	22	14	4	3	-	**43**
Grand Total:	**524**	**514**	**155**	**176**	**138**	**1,507**
	34.77%	**34.11%**	**10.29%**	**11.68%**	**9.16%**	**100.00%**

Table 9 – Jordan: Experienced Skills by Service Category

IT Job Description/Position	Supply by Years of Experience					
	1-2	3-4	5-6	7-10	>10	Total
Administration	54	31	12	7	16	120
Comp. Proces. O. / System App Operator/Inf. Prod. O.	4	2	-	1	1	8
Data Entry Officer	3	2	-	3	-	8
Data Preparation/Capture Officer	3	1	-	-	-	4
Data Storage/Archive Officer	-	2	2	1	-	5
Maintenance Programmer	-	-	-	-	-	-
S/W Product Support Engineer	3	10	4	1	1	19
Software Applications User Trainer	66	61	18	23	18	186
Technical Support Engineer	36	36	14	15	12	113
Marketing Position (International Experience	-	-	-	-	-	-
Marketing Support Business Development Officer	4	4	1	1	-	10
Financial Analyst	4	7	3	1	-	15
H/W Sales Support Technician	6	7	2	3	1	19
PC Support Specialist	1	1	-	-	-	2
PC Systems /Peripheral Coordinator	2	2	-	1	-	5
Hardware Maintenance Specialist	18	9	4	6	3	40
Network Engineer	3	9	1	2	-	15
Network Installe/Technician	5	8	2	1	1	17
Network Technician	-	-	-	-	-	-
Telecommunication Engineer	-	-	-	-	3	3
Voice Communication Engineer	-	-	-	-	-	-
Wireless Network Specialist	4	5	-	-	-	9
Sales Support	7	17	3	1	-	28
Human Resources Expert	-	-	-	-	-	-
2D/ 3D Designer/ User Interface Specialist	3	-	1	-	1	5
Animator	-	1	-	-	2	3
Audio/ Video Engineer	3	-	-	1	-	4
Multimedia Developer/ Specialist	4	-	-	-	-	4
Producer/ Production Assistant	-	-	-	-	1	1
Contingency Planning Disaster Recovery	-	-	-	-	2	2
Cross-Enterprise Integrator	-	-	-	-	-	-
Data Architect	-	3	-	-	-	3
e-Business Specialist	-	3	-	1	-	4
Information System Policy Manager	-	-	-	-	1	1
Information System Projects Planner	-	-	-	-	1	1
Information Systems Architect	-	-	-	1	-	1
Information Systems Resource Planner	12	17	7	16	13	65
IT Business Strategy Manager/Strategists	5	2	1	1	2	11
IT Cost Analyst	-	-	-	-	-	-
Knowledge Architect	-	-	-	-	-	-
Data Communications/Data Networks Analyst	4	3	2	2	1	12
IT Security Manager	-	2	-	-	-	2
LAN/WAN Network Sec Analyst/Inf. Sec. Specialist	2	3	2	1	-	8
Network Administrator	5	8	4	4	2	23
Network Architect	2	6	-	-	-	8
S/W Product Sales/ Post Sales Officer	-	-	-	-	-	-
Software Support Engineer/Product Sales	17	18	4	6	2	47
IT Budgeting Analyst	-	-	-	-	-	-
IT Contract Manager	-	-	-	-	-	-
IT Project Manager/ Leader	14	15	3	7	6	45
IT Purchasing Officer/ Evaluator	-	-	-	-	-	-

IT Job Description/Position	Supply by Years of Experience					
	1-2	3-4	5-6	7-10	>10	Total
GIS Specialist / Developer	4	1	-	1	-	6
Research and Development	6	1	-	-	1	8
Help Desk/ Customer Support Specialist	1	1	-	-	-	2
Application/System Analyst	3	10	8	5	13	39
Business Analyst	3	6	1	-	1	11
Data modeler/Database Designer	-	-	-	-	-	-
Technical Analyst	-	-	-	-	-	-
Computer Engineer	8	11	2	3	1	25
Database Developer/Administrator	6	8	3	10	2	29
Localization Engineer	-	1	-	-	-	1
Operating System Engineer/Designer	12	10	1	1	-	24
Programmer / Analyst	20	30	13	14	13	90
Programmer/ Software Developer	122	113	29	28	17	309
QA Specialist	9	3	1	3	-	16
System Administrator	9	4	1	-	-	14
Test Engineer / Tester	2	6	1	1	-	10
Desktop Publisher	-	-	-	-	-	-
Documentation Specialist/Editor	-	-	-	-	-	-
Technical Communicator/Instructional Designer	-	-	-	-	-	-
Technical Writer	3	-	1	-	-	4
Web Administrator/ Webmaster	1	4	-	1	-	6
Web Architect	-	-	-	-	-	-
Web Content Management	-	1	1	-	-	2
Web designer/ Producer/ Specialist	13	4	-	-	-	17
Website Developer	8	5	3	2	-	18
Grand Totals	524	514	155	176	138	1,507
	35%	34%	10%	12%	9%	100%

Table 10 – Jordan: Experienced Skills by Title/Position

Skills Demand

The data in Table 11 and Figure 16 below were gathered during a focus group session with Int@j members as a way to measure market demand for skills, by years of experience. Figure 17 on page 124 shows that the service categories with the highest demand are System Development, System Design and IT Strategy Development.

Service Category	Demand by Years of Experience					
	1-2	3-4	5-6	7-10	>10	Total
Admininstration	-	-	-	-	-	-
Application Support Services	11	11	-	-	-	22
Business Development	5	7	10	2	-	24
Financial	1	1	1	-	-	3
Hardware Sales	2	7	2	-	-	11
Hardware Technology Provision	5	8	3	-	-	16
Hardware/SW Sales	5	6	7	-	-	18
Human Resources	3	-	1	-	1	5
Interactive Media	4	7	5	-	-	16
IT Strategy Development	8	12	16	9	-	45
Network Comm. Systems & Mgt.	4	22	6	-	2	34
Packaged Software Sales	7	18	5	3	-	33
Project Management	1	18	9	1	2	31
Remote Sensing & GIS	-	1	1	-	-	2
Research & Development	-	-	-	-	-	-
Service Desk Management	5	9	2	-	-	16
System Design	5	20	16	5	3	49
System Development	13	34	15	-	-	62
System Documentation	7	11	8	-	-	26
Web Development & Admin.	6	17	6	2	-	31
Grand Total:	92	209	113	22	8	444
	20.72%	47.07%	25.45%	4.95%	1.80%	100.00%

Table 11 – Jordan: Skills Demand by Service Category

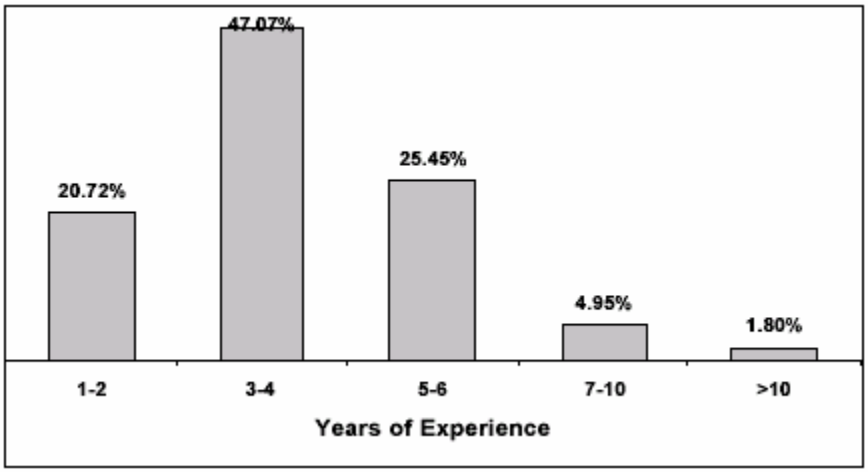

Figure 16 – Jordan: Demanded Skills by Level of Experience

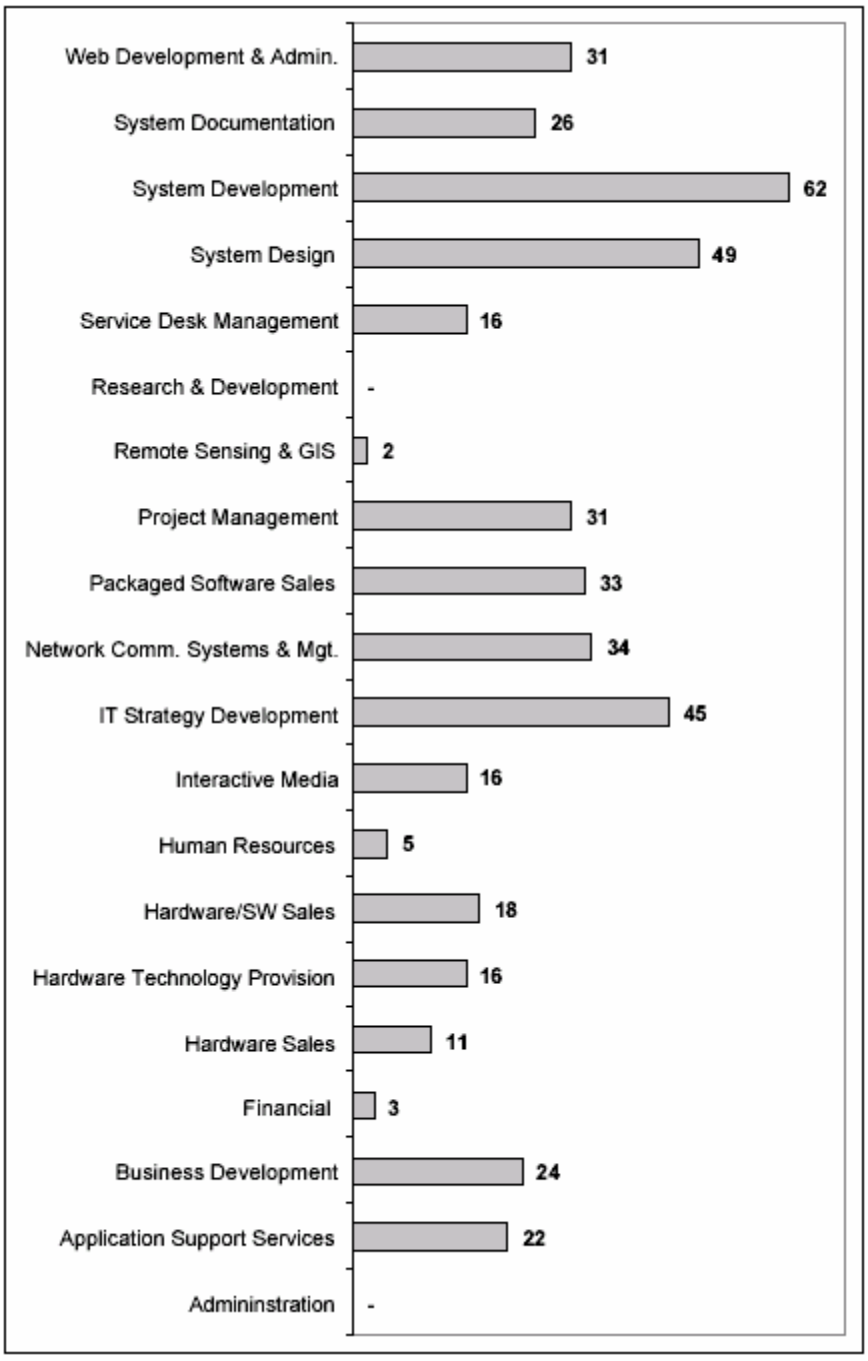

Figure 17 – Jordan: Demanded Skills by Service Category

Table 12 – Jordan: Demanded Skills by Title/Position on the following two pages shows demand for specific IT job descriptions, by length of experience.

IT Job Description/Position	Demand by Years of Experience					
	1-2	3-4	5-6	7-10	>10	Total
Administration	-	-	-	-	-	-
Comp. Proces. O. / System App Operator/Inf. Prod. O.	-	-	-	-	-	-
Data Entry Officer	4	2	-	-	-	6
Data Preparation/Capture Officer	-	-	-	-	-	-
Data Storage/Archive Officer	-	-	-	-	-	-
Maintenance Programmer	1	2	-	-	-	3
S/W Product Support Engineer	-	-	-	-	-	-
Software Applications User Trainer	2	3	-	-	-	5
Technical Support Engineer	4	4	-	-	-	8
Marketing Position(International Experience)	2	2	1	1	-	6
Marketing Support Business development Officer	3	5	9	1	-	18
Financial Analyst	1	1	1	-	-	3
H/W Sales Support Technician	1	1	-	-	-	2
PC Support Specialist	1	2	1	-	-	4
PC Systems /Peripheral Coordinator	-	4	1	-	-	5
Hardware Maintenance Specialist	-	2	1	-	-	3
Network Engineer	1	2	-	-	-	3
Network Installe/Technician	-	1	-	-	-	1
Network Technician	1	1	-	-	-	2
Telecommunication Engineer	1	1	2	-	-	4
Voice Communication Engineer	1	1	-	-	-	2
Wireless Network Specialist	1	-	-	-	-	1
Sales Support	5	6	7	-	-	18
Human Resources Expert	3	-	1	-	1	5
2D/ 3D Designer/ User Interface specialist	1	2	2	-	-	5
Animator	1	4	2	-	-	7
Audio/ Video Engineer	1	1	-	-	-	2
Multimedia Developer/ Specialist	1	-	1	-	-	2
Producer/ Production Assistant	-	-	-	-	-	-
Contingency Planning/ Disaster Recovery	2	-	1	-	-	3
Cross-Enterprise Integrator	-	-	2	-	-	2
Data Architect	2	-	1	2	-	5
e-Business Specialist	-	3	2	1	-	6
Information System Policy Manager	-	-	1	-	-	1
Information System Projects Planner	-	1	1	-	-	2
Information Systems Architect	2	4	3	2	-	11
Information Systems Resource Planner	-	1	1	-	-	2
IT Business Strategy Manage/Strategists	2	1	3	2	-	8
IT Cost Analyst	-	2	1	-	-	3
Knowledge Architect	-	-	-	2	-	2
Data Communications/Data Networks Analyst	3	5	-	-	1	9
IT Security Manager	-	3	1	-	1	5
LAN/WAN Network Sec Analyst/Inf. Sec. Specialist	-	8	1	-	-	9
Network Administrator	-	2	2	-	-	4
Network Architect	1	4	2	-	-	7
S/W Product Sales/ Post Sales Officer	-	5	1	3	-	9
Software Support Engineer/Product Sales	7	13	4	-	-	24
IT Budgeting Analyst	-	2	1	-	-	3
IT Contract Manager	-	2	1	-	-	3
IT Project Manager/ Leader	1	11	7	1	2	22
IT Purchasing Officer/ Evaluator	-	3	-	-	-	3

IT Job Description/Position	Demand by Years of Experience					
	1-2	3-4	5-6	7-10	>10	Total
GIS Specialist / Developer	-	1	1	-	-	2
Research and Development	-	-	-	-	-	-
Help Desk/ Customer Support Specialist	5	9	2	-	-	16
Application/System Analyst	3	8	8	2	-	21
Business Analyst	1	3	1	-	3	8
Data Modeler/Database Designer	1	5	4	2	-	12
Technical Analyst	-	4	3	1	-	8
Computer Engineer	-	4	1	-	-	5
Database Developer/Administrator	3	5	4	-	-	12
Localization Engineer	-	1	2	-	-	3
Operating System Engineer/Designer	-	3	1	-	-	4
Programmer / Analyst	1	5	3	-	-	9
Programmer/ Software Developer	3	11	1	-	-	15
QA Specialist	3	3	3	-	-	9
System Administrator	1	1	-	-	-	2
Test Engineer / Tester	2	1	-	-	-	3
Desktop Publisher	-	-	1	-	-	1
Documentation Specialist/Editor	2	4	2	-	-	8
Technical Communicator/Instructional Designer	3	-	-	-	-	3
Technical Writer	2	7	5	-	-	14
Web Administrator/ Webmaster	1	3	1	1	-	6
Web Architect	-	2	1	1	-	4
Web Content Management	1	3	2	-	-	6
Web Designer/ Producer/ Specialist	3	7	2	-	-	12
Website Developer	1	2	-	-	-	3
Grand Totals	**92**	**209**	**113**	**22**	**8**	**444**
	21%	**47%**	**25%**	**5%**	**2%**	**100%**

Table 12 – Jordan: Demanded Skills by Title/Position

Skills Gaps

Table 13 – Jordan: Skills Gap by Service Categories illustrates the gaps between Table 9 – Jordan: Experienced Skills by Service Category on page 120 and Table 11 – Jordan: Skills Demand by Service Category on page 123.
Figure 18 – Jordan: Skills Gap by Year of Experience, just below Table 13 summarizes the skills gaps by years of experience.

Service Category	Shortage by Years of Experience					
	1-2	3-4	5-6	7-10	>10	Total
Admininstration	-	-	-	-	-	-
Application Support Services	2	2	-	-	-	4
Business Development	2	3	9	1	-	15
Financial	-	-	-	-	-	-
Hardware Sales	-	3	2	-	-	5
Hardware Technology Provision	3	3	2	-	-	8
Hardware/SW Sales	-	-	4	-	-	4
Human Resources	3	-	1	-	1	5
Interactive Media	1	6	4	-	-	11
IT Strategy Development	6	7	14	6	-	33
Network Comm. Systems & Mgt.	-	8	3	-	1	12
Packaged Software Sales	-	5	1	3	-	9
Project Management	-	7	6	-	-	13
Remote Sensing & GIS	-	-	1	-	-	1
Research & Development	-	-	-	-	-	-
Service Desk Management	4	8	2	-	-	14
System Design	1	9	7	3	2	22
System Development	-	-	5	-	-	5
System Documentation	5	11	7	-	-	23
Web Development & Admin.	1	7	5	1	-	14
Grand Total:	**28**	**79**	**73**	**14**	**4**	**198**
	14.14%	**39.90%**	**36.87%**	**7.07%**	**2.02%**	**100.00%**

Table 13 – Jordan: Skills Gap by Service Categories

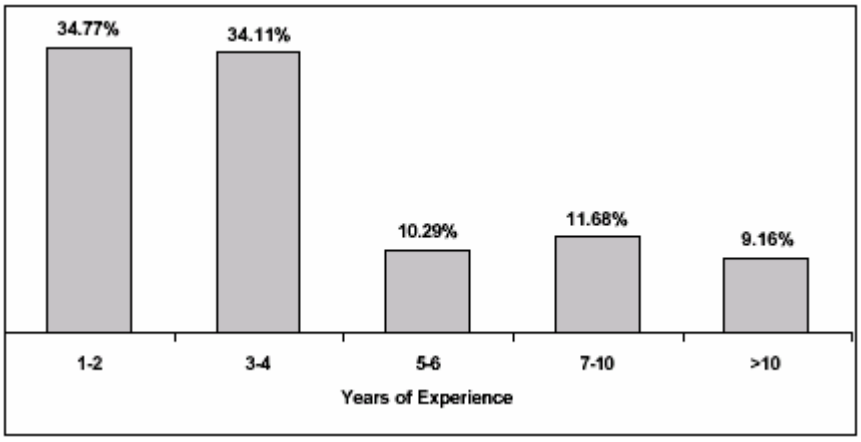

Figure 18 – Jordan: Skills Gap by Year of Experience

Figure 19 below summarizes skills gap data by service category. Note that this summary incorporates the years of experience in both the supply and demand, so that a need for a skill with 8 years experience will not be satisfied by an individual with 5 years experience. As the int@j reports suggests, "although a total supply of 100 may [appear to] cover a demand of 90, there may be a shortage of 5, due to a shortage in the amount of experience available."Clearly, the most critical need in the Jordanian IT sector, showing nearly 50% greater demand than the next closest category, is for IT Strategy Development. The next highest categories are System Development and System Design.

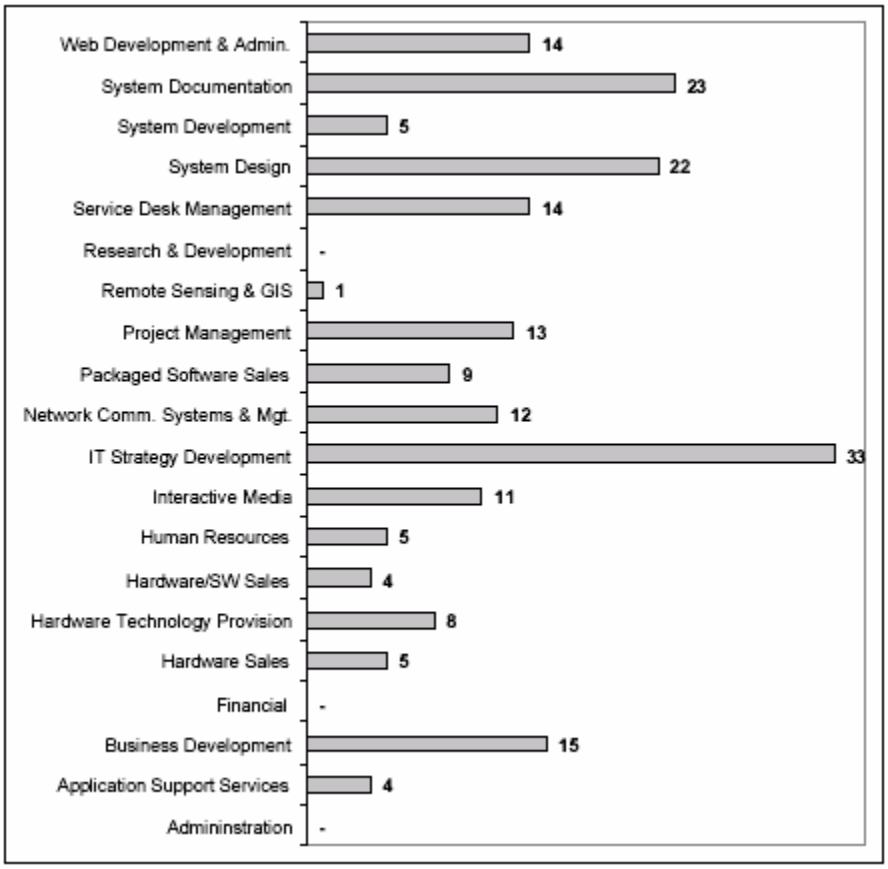

Figure 19 – Jordan: Skills Gap by Service Category

Finally, Table 14 summarizes skills gaps in Jordan by service category, regardless of experience requirements, and is ranked by the size of the shortage. Even measured this way, IT Strategy Development still hold the top spot on the list of needs.

Service Category	Supply	Demand	Shortage
IT Strategy Development	88	45	23
System Documentation	4	26	22
System Design	50	49	20
Business Development	10	24	14
Service Desk Management	2	16	14
Packaged Software Sales	47	33	9
Project Management	45	31	9
Web Development & Admin.	43	31	8
Hardware Technology Provision	84	16	5
Human Resources	-	5	5
Interactive Media	17	16	4
Network Comm. Systems & Mgt.	53	34	4
Application Support Services	343	22	3
Hardware Sales	26	11	2
System Development	518	62	2
Admininstration	120	-	-
Financial	15	3	-
Hardware/SW Sales	28	18	-
Remote Sensing & GIS	6	2	-
Research & Development	8	-	-
Grand Total:	**1,507**	**444**	**144**

Table 14 – Jordan: Skills Gap for All Levels of Experience

Education Programs

The strong focus on IT in Jordan has produced very significant shifts in college study patterns. IT/CS is now the second most popular major in Jordanian colleges, up from 24th only a few years ago. In 2000, nearly half of all degrees granted in Jordan were ICT-related.

Demand for vendor certification is high. The REACH 2.0 report claims that Jordan has the highest number of Microsoft and Oracle certified professionals per capita of any country in the world.

Soft Skills

The Int@j skills survey did not include very many categories of soft skills. Yet Jordanian software company executives unanimously said that their most critical needs are for people who know how to work in a team and have good presentation, communication and interpersonal skills. They also identified project management as a crucial lacking skill, even though that does not come through in the tables and charts above.

Software Engineering Processes

Most software company executives are comfortable with the software engineering skills of their employees and new hires. Though the Int@j statistics show a critical need for strategists and systems designers, the process skills of their teams appear adequate.

National Initiatives

Jordan Vision 2020 was launched in April 1999 to ensure that the country is "proactive in shaping a response to [the challenges of entering the 21st century] rather than being overwhelmed by them." (Jordan Vision 2003)

The ambitious goal of the Jordan Vision 2020 initiative is to double per capita GDP from 1100JD to 2200JD by the year 2020. The Vision 2020 report is very well researched and written and offers useful background information, comparisons to other countries that are similar to Jordan, and specific recommendations in seven strategic areas:

- Project dynamic leadership
- Establish an effective private-public partnership
- Instill international competitiveness
- Ensure access to markets
- Modernize our business environment
- Develop world-class infrastructure
- Develop skilled human resources

REACH

Shortly after his ascension to the throne in June 1999, His Majesty King Abdullah II, chose to focus considerable attention on the development of the ICT sector in Jordan. Guided by the example of other small countries that were also people-rich but resource-poor, His Majesty sought to capitalize on the success of Ireland, Singapore and others.
In Jordan the REACH Initiative is the framework that guides the required public/private cooperation for the development of a successful industry, and more particularly, a successful ICT export industry in Jordan.

REACH stands for:

Regulatory Framework
Enabling Environment and Infrastructure
Advancement of National IT Programs
Capital and Finance
Human Resource Development

REACH 1.0

The initial REACH report, presented to King Abdullah in October 1999 (and now referred to as REACH 1.0) highlighted the strengths and weaknesses of the Jordanian economy, infrastructure and resource base and laid out a five-year plan for the ICT sector. In particular, the REACH report included three specific goals for the period 1999-2004:

- Create 30,000 new ICT jobs
- Achieve direct foreign investment of $150m
- Produce annual IT exports of $550m

The REACH document identified six strategic focuses for development activity:

1. IT Industry Development
2. Regulatory Framework Strengthening
3. Human Resource Development
4. Government Support
5. Capital and Finance
6. Infrastructure Development

One of the most significant results of the REACH initiative was the formation of a trade association called the Information Technology Association of Jordan, or int@j. As described on page 117, int@j has played, and will continue to play, a vital role in the development of the ICT sector.

The REACH 1.0 document is available at http://www.reach.jo/documents/reach.pdf.

REACH 2.0

The second phase of REACH was launched in July 2000. More than 1000 people met in focused groups over 71 days to review REACH 1.0 progress and to set new goals and milestones. A clear purpose of REACH 2.0 was to identify legislative changes that were required to make successful development and export of ICT services possible.

Legislative changes focused on everything many aspects of life in Jordan: labor, employee stock ownership, employment, incorporation, investment, telecommunications, banking, e-government, venture capital, electronic transactions and signatures, patents and many others. Action on a surprisingly large number of laws has occurred quickly as a result of the coordinated emphasis provided by REACH 2.0.

The REACH 2.0 document is available at:
http://www.reach.jo/documents/final_reports/3-6-2001/REACH%202.0%20REPO.pdf.

REACH 3.0

The most recent REACH review began in June 2002. The REACH 3.0 document pays particular attention to the business issues involved in the development of the ICT industry.

The REACH 3.0 document is available at:
http://www.reach.jo/documents/R3/Final_Document/REACH%203.0.pdf.
Other REACH documents can be found at http://www.reach.jo/document.html.

REACH Results

Speaking in early 2003, the chairman of int@j said that the REACH initiatives are on their way to accomplishing their 2004 objectives. (Dutta 2003)

- 8,000 to 10,000 new jobs have been created because of the initiative
- 45% of the foreign direct investment objectives have been achieved

- Annual ICT exports are estimated between US $ 70 and 100 million, up nearly ten-fold in five years.

The industry's focus on job creation has targeted start-up companies and labor-intensive businesses like call-centers and customer care as effective ways of achieving growth. In addition, because of direct support from the King and other senior government officials, Jordan has passed an enormous amount of new and revised legislation recommended by Reach. The legislation is aimed at easing the business climate for ICT companies, enhancing employee ownership potential and improving the climate for investment in ICT companies.

Within the Arab region, Jordan sees export opportunities for the following ICT products and services:

- Software creation
- Arabization
- Language localization
- Consultancy services

Authors Dutta and Coury suggest that the REACH model "is transposable to other Arab states. The model is successful because it has managed to build consensus between the public and private sectors and because it has government endorsement at the highest level. The level of trust among stakeholders and the lack of complacency were critical factors in turning what was initially a sectoral plan into a national endeavor." (Dutta 2003)

The Human Resources Development Information System Project (2000-2003)

From http://www.nchrd.gov.jo/DevPro.asp (see also http://www.almanar.jo/English/index.html)

> "[NCHRD] started working on this project at the beginning of 2000 in cooperation with the Ministry of Planning, the National Information Center, the General Directorate of Statistics, the Ministry of Education and the Vocational Training Corporation. The project comprises two broad aspects of information: First, information on education and training, addressing the present and future labor force supply according to educational and skill characteristics. Second, information addressing the present and the future characteristics of the labor market in terms of educational and skill requirements, work conditions, pay, and the supply-demand indicators. The project will yield reliable information that provides fast and efficient linkage between the available skills of work seekers and job opportunities. It will further enable employers and work seekers, or those planning to join the labor market, to make informed decisions. The system will also provide information that helps educational and training institutions (Ministry of Education, Universities, Vocational Training Corporation and the private sector) to modify their training programs in accordance with the changes in the labor market. Besides, the system will provide information that enables decision makers, planners, employers, employees and students to better understand issues related to labor market trends. The project comprises the following components: 1. Basic data (statistics and indicators) on labor force, human resources, supply and demand. 2. Business database. 3. Counseling tools including requirements of skills, study programs and demand expectations. 4. Electronic labor exchange (electronic recruitment), whereby the system will provide a search service through matching the job seeker's skills with available job opportunities. CIDA (Canadian International Development Agency) has allocated

one million Canadian dollar (half a million JDs) as a grant to implement the project in three years. The Canadian Ministry of Human Resources Development in conjunction with the NCHRD and other bodies have started implementing the project. The estimated cost of the project amounts to about one million JDs, half of which is a grant by CIDA. It is expected to be accomplished by the end of the year 2002."

Five Year Plans

Refer to the description of the REACH initiative above.

Other Initiatives

Internships

There are few formal internship programs in Jordan that would give students or recent graduates first-hand experience working in an ICT company. Int@j recently began an informal program, placing interns into summer jobs with ICT companies. The program is very unofficial but it does seem to work.

University – Industry Cooperation

As one way to foster closer working relationships between universities and industry, int@j has worked to have universities conduct research and development activities for private companies. For example, a team from Yarmouk University will be helping a manufacturing company analyze their energy consumption. The company knows it's using too much electricity but doesn't know why.

While they have had some success int@j believes that this idea hasn't taken off more quickly because of conflicts over intellectual property (IP) rights. Universities want to retain a greater percentage of IP rights, and with it a larger share of potential future revenue, than companies are willing to permit.

NetCorps Jordan

NetCorps Jordan is a new effort in Jordan to train and place youths as interns in small and medium businesses, schools, and government agencies, as well as in the community IT Centers created as part of the Connecting Jordanians Initiative. Interns will receive both technology and business training to prepare them for their assignments. In return, the interns "will provide training and expertise in order to build the Information and Communications Technology (ICT) capacities of [host] organizations and assist Jordanians in integrating ICT into their daily lives." NetCorps Jordan will dovetail with the Connecting Jordanians Initiative by helping local communities make more effective use of the broadband networks linking their schools and community centers with the rest of the country.

The objectives for NetCorps Jordan are:

- Increased Awareness of the benefits of using ICT – Youth become ambassadors for technology across the country raising awareness of the benefits of effectively using ICT.
- Improved Access – Through the development of sustainable training programs and ICT promotion youth will improve access to technology for all Jordanians.

- Human resources development – The program will build an ICT skilled workforce.
- Entrepreneurship – The program will build the next generation of technology entrepreneurs, stimulating the Jordanian economy and thus developing an 'innovative' ICT sector.
- Youth employment: Increased youth employment through valuable work experience and skills. (NetCorps 2003)

NetCorps Jordan is modeled on a highly successful Canadian program and is being supported by The Digital Opportunity Trust, a Canadian based non-government organization (www.dotrust.org).

INJAZ

INJAZ is based on the eighty-year-old Junior Achievement program that has helped over 5 million youth in America and 100 other countries learn about business and entrepreneurship by planning, starting and running a small business while in grades K-12. INJAZ relies on private sector volunteers to teach basic business skills in public schools and to train kids to be entrepreneurs. The CEO of Int@j see INJAZ as a very positive experience not just for the children involved but for Jordan as a whole. He believes that youths who have started and run a small business will drive university faculty and curriculum to be more intense, more focused on the real world and less bound in tradition and old ways of thinking. Kids raised with INJAZ experience will not allow higher education to consist of outdated material or irrelevant topics.

Interviews Conducted for this Report

Ms. Batoul Ajlouni, Executive Manager, Integrated Technology Group, Amman, Jordan
Mr. Ra'ed Bilbessi, CEO, int@j, Amman, Jordan
Mr. Emile Cubeisy, Advisor to Minister for E-Initiatives, Ministry of Information and Communication Technology, Amman, Jordan
Mr. Doug Hull, Senior Advisor, CANARIE Inc., Ottawa, Canada
Mr. Maher Mouasher, Managing Director, BOSSit, Amman, Jordan
Mr. Walid Tahabsem, President and CEO, Integrated Technology Group, Amman, Jordan

Philippines

Financial Statistics and Growth

Demographics

The Philippines has a land area of 298,170 square miles, made up of more than 7,100 islands in the southeastern part of Asia. Most of the country is Christian Malay (91.5%) and Roman Catholic is the dominant religion. Fifty-nine percent of the population lives in urban areas, with 40% of the population living below the poverty line.

The adult literacy rate in the Philippines is approximately 94 percent. Furthermore, it is estimated that 72% of the population is fluent in English, both of which give the Philippine workforce a competitive advantage. ("ITECC" 2003)

The Philippine government is a Republic. In January 2001, the Supreme Court declared that Joseph Estrada was unable to rule due to mass resignations in his government. At that time acting Vice-President Gloria Macapagal-Arroyo became the President, Chief of State/Head of Government.

Historical Patterns and their Effect on Workforce Development

The history of the Philippines is marked by its regime changes led by countries with widely diversified cultures, languages, and motives. First Spanish, then American, Japanese, and then again American influences have all affected the country. Even in the absence of control by another country, the Philippines has been forced to deal with their own challenges and upheaval as they have built their own government.

Throughout the country's history, people have been eager to exploit its natural mineral and agricultural resources and the workforce has been geared to meet those demands. Public education wasn't introduced until 1863, but under Spanish rule the curriculum was church controlled and all higher education was in clerical studies.

It wasn't until after the Spanish American War, when the United States took control in the early 1900s, that education became a legitimate opportunity for many Filipinos. In the 1920s, one half of the government's expenses were on education, schools expanded fivefold and illiteracy dropped to 50%. During this time, hundreds of US teachers helped to educate the populace, but also trained the teachers. As a result, English became the common language in education. Aside from a brief occupation by the Japanese during World War II, America has participated in, influenced or aided the Philippine government for much of the past century and English has remained prominent in business, government and higher education.

As part of an effort to create a national identity, a National Language Institute was formed in 1937. The Institute surveyed various dialects from around the country and selected Tagalog to be the basis for a new national language. In the 1960s and 70s, a renewed drive for national identity caused the national language, now known as Pilipino (note: this is the correct spelling for the language not Filipino or Philipino) to become more widely used in primary schools, government and everyday conversation.
As the country moved into the information age in the 1990s, they, like many other countries, recognized that they had a surplus of educated, English-speaking workers who could work in this market. Since that time, the country has had moderate success in this area. Today, the nation acknowledges the potential opportunities in the IT-enabled services sector. They also recognize that the American influence on their language in the early to mid 1900s gave them a competitive edge. Thus while they continue to cling to their own cultural identity they are also taking renewed interest and actions in teaching English in the primary school system, thereby, helping to ensure that they can drive toward a competitive position in the ICT sector.

While ICT has been identified as an opportunity by the government, the percentage of the workforce participating in this sector is still barely 2% of the total workforce. Employment in agriculture, hunting and forestry remains a clear leader employer at 37% followed by wholesale and retail trade at 19%. (Toral 2002)

Industry Focus for ICT Organizations

The Philippine's primary focus in the ICT sector has been on developing the IT-enabled services sector, which focuses on Call Center, Medical Transcription, Animation, Engineering/Design, Shared Financial Services and Software Development. Some countries distinguish between software development and other IT-enabled services, but the Philippines appears to group them together.

The following table illustrates the breakdown of this sector based upon the number of companies in each target area.[v] (Valdez 2002) ("Approved" 2002)

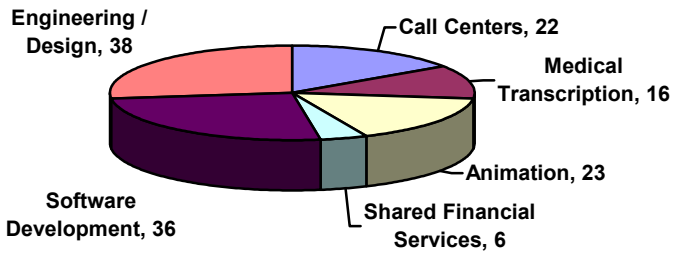

Figure 20 – Philippines: Distribution of Companies in ICT Sector

Studies have shown that there are approximately 1.5 million call center seats that could be outsourced in the United States alone. The growth and emphasis in this sector is already showing, compared to just two years ago. Today the Philippines has about 30 call centers providing 25,000 jobs. (Call Centers 2003) India is also targeting this sector and already has 100 call centers with 300,000 seats. Foreign call center companies and local telecommunications companies have announced plans to establish operations in the Philippines, resulting in more than 4,500 new jobs in this sector. ("24,000 Jobs" 2002)

Figure 21 below indicates that the Philippines has traditionally provided mid-value products and consulting services to export markets. As described elsewhere in this section, the Philippine government and ICT industry have chosen to exploit the large English-speaking population in the country by focusing on providing call center services, hence the upward facing arrows.

[v] *Note: We were unable to identify the number of Engineering / Design companies in 2001, so we used numbers from mid 2000 provided by another source.*

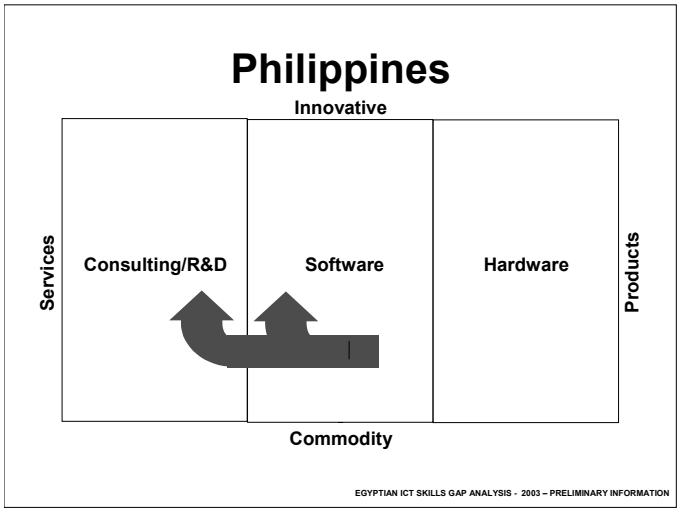

Figure 21 - Philippines: Relative ICT strengths in export markets

Workforce Characteristics

According to *The State of Philippine IT Manpower,* a study of 163 Filipino companies conducted by DigitalFilipino.com from July to November of 2002, the IT Labor force is estimated at 567,802 with approximately 15% being part time. (Toral 2002)

The chart below shows the percentage of the total labor force in a sample set of sectors, as well as a breakdown of the IT Labor force in those same sectors. (Toral 2002)

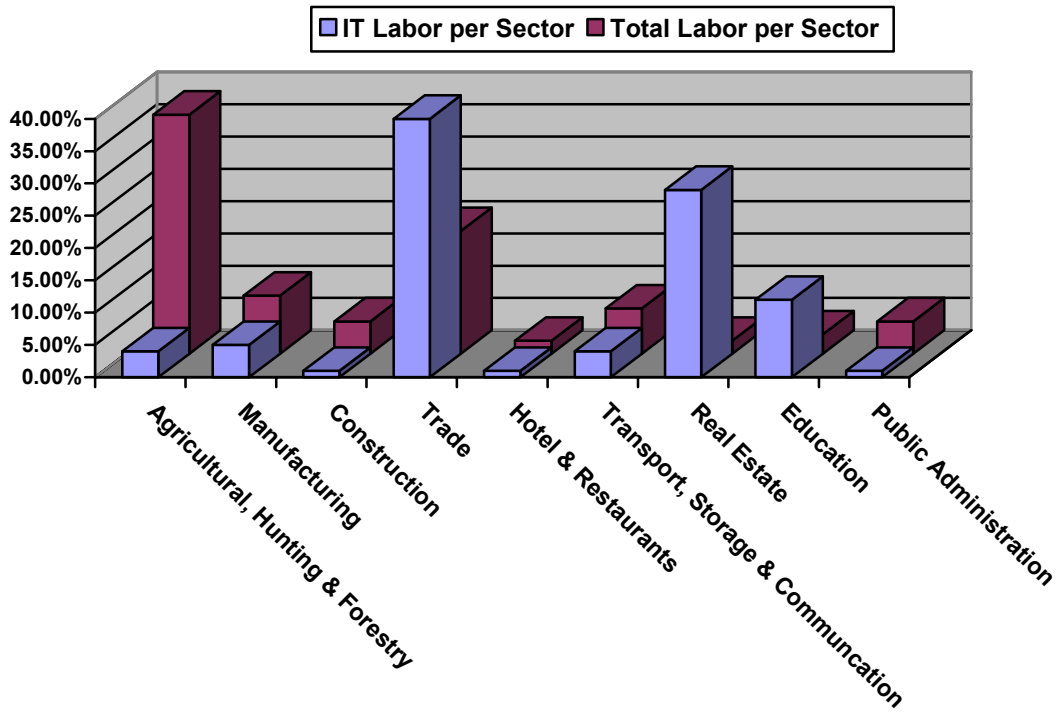

Figure 22 – Philippines: IT and Total Labor per Sector

The following diagram illustrates the fields of service for IT professionals hired from 1998-2002. (Toral 2002)

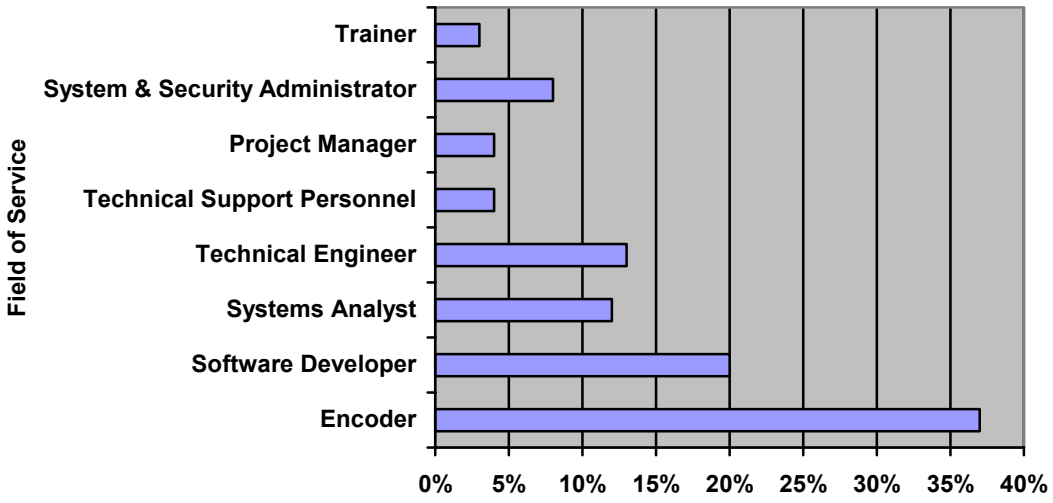

Figure 23 – Philippines: ICT Jobs filled from 1998-2002

Salaries in the ICT sector are above average for the Philippines and typically include attractive compensation packages. (Casiraya 2003) According to *The State of Philippine IT Manpower*, software developers with 1 – 3 years experience are paid from US$ 3,600 to US$ 8,400 per year. As one specific example, starting salary for engineers at Fujitsu is P11,000 (US$ 206) per month, and upon regularization they get a minimum pay of P14,300 (US$ 268). (GMA Apr. 2002) Even though IT salaries remain above average for the Philippines, they have declined from their peak approximately two years ago.

According to *The State of Philippine IT Manpower* report from Digital Filipino, call center employees are paid from US$ 2,400 to US$ 8,400 per year, which is competitive with software developers. (Toral 2002) Interviewees, however, indicate that the push to develop the call center industry has driven salaries even higher than the traditional ICT sector jobs. As a result, they are attracting many IT graduates away from traditional IT positions and into the call centers. According to some research, call center employees in the Philippines view their position as a career and as a result there is a lower turnover rate than in the United States. Several interviewees suggested, however, that this is not always the case. Initially, graduates are attracted by the call center positions and the opportunity to deal with people all over the world, particularly in the United States. Unfortunately, after a short time the Filipino call agents grow just as tired of dealing with complaints and frustrated callers as anyone else would. Interviewees also suggest that while the call center jobs are currently commanding higher salaries and benefits, they expect that will level out over time, as it has for other positions, and that there will be just as much trouble finding and attracting qualified agents as other countries experience.

Size and Skills

In 2001-2 there were 5,813,879 students enrolled in public and private secondary education. Seventy-one percent of the students who participate in the first year of secondary school complete secondary school, however, only 48% of those students who start Grade 1 complete secondary school. (Department of Education 2002)

Approximately 325,000 students graduate from the universities each year. Of those graduates, about 70,000 have IT/Computer Science related degrees and an additional 100,000 have ecommerce and IT enabled services concentrations. ("Contact Center" 2003a)

According to the president of the Philippine Society of IT Educators, Dr. Jaime Caro, student enrollment in IT programs has decreased 30% over the last three years. In part this is because of the slump in the IT market, however, Dr. Caro also indicates that a major contributor is the higher demand for nursing and teaching professionals in the US and Europe. Both regions are experiencing severe shortages in these fields and Philippine businesses are targeting these areas as market opportunities. As a result, many students are looking at these career opportunities. The net effect on the IT training is lower enrollments, which in turn leads to less money to upgrade hardware, software and programs. Dr. Caro, indicated that some IT schools are even adding nursing programs to boost enrollments and stay in operation.
According to *The State of Philippine IT Manpower*, the top programming skills sought by employers are as follows:

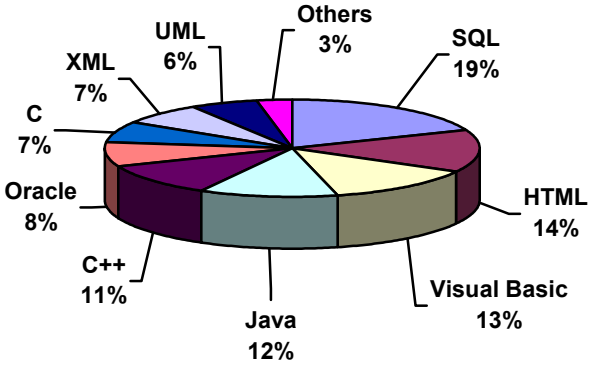

Figure 24 – Philippines: Most Desired Programming Skills

The top Operating System and Hardware Skills are:

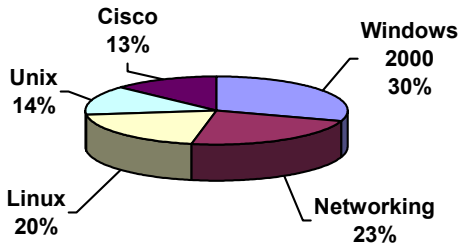

Figure 25 – Philippines: Top Operating System and Hardware Skills

For the most part, Filipino employers are looking for certifications in the identified skill areas in order to gain credibility and improve their competitive position.

The State of Philippine IT Manpower lists the skills required for analysts, project managers and technical support personnel in addition to the usual engineering, developer and administrator skills. It does not identify any of the critical, non-technical skills that are required for software companies, e.g., project management, marketing, sales and business management, because the study was funded largely by USAID and the surveys were conducted using a USAID form that did not request information about those skills.

Education

History of Education

Occupation by foreign countries has dictated much of the evolution of the Philippine educational system. The Spanish, then the Americans, followed by the Japanese, each brought their own agenda for education. Through acts established by these regimes, free and compulsory elementary and primary education were developed; universities, trade schools and other specialized education institutes were established; and Spanish and English were taught to the student bodies.

During the 1970s, the Philippines was a leading education center in Asia. Unfortunately, the quality of education has declined in recent years, and they are no longer the leader. For example in a recent survey, the country's leading university, the University of the Philippines, ranted 44th out of the top 80 universities in Asia. ("Reforming" 2003)

Today the Department of Education, Culture and Sports oversees the educational system. In 1994-5 the Commission on Higher Education (CHED) and the Technical Education and Skills Development Authority (TESDA) were established to supervise tertiary degree programs and non-degree technical-vocational programs. Earlier this year the Asian Development Bank awarded a US$ 500,000 grant to help strength CHED in an effort to reform the education system and return it to its leading position in Asia.

Educational Institutions

Primary school in the Philippines lasts for six years, secondary education for four, and college courses for four to nine years. Vocational schools offer specialized training for one to two years. Most state-run universities and colleges are located in Metro Manila. In addition there are a number of private institutions and many technical institutions and community colleges in the provinces. In 2001 the Filipino President noted that the Asian computer directory indicates that the Philippines had the second highest number of training facilities for computer programming and other related courses among the Asian countries. (GMA Oct. 2001)

One key to understanding ICT skills gap issues in the Philippines is to realize that there are reasonably strong connections between ICT business leaders and the major higher-educational institutions. Conversations between these two groups have helped to identify deficiencies and set direction for educational programs.

Public Organizations to Support Education

Commission on Higher Education (CHED)

The Commission on Higher Education (CHED) was established by the Higher Education Act of 1994. This Commission is responsible for both public and private higher education institutions as well as degree-granting programs in all post-secondary institutions. Its mandates include:

- Promote quality education.
- Ensure education is accessible to all.
- Ensure and protect academic freedom for the continuing intellectual growth, the advancement of learning and research, the development of responsible and effective leadership, the education of high-level professionals, and the enrichment of historical and cultural heritage.

In 1996, CHED implemented a higher education computerization program to support the equipment and training requirements at private and state universities and colleges. The program was funded by a PhP 300 million appropriation from Congress, although the funds had to be reduced to PhP 251 million because of a mandatory reserve. The program worked with the Philippines Association of State Universities and Colleges and the Coordinating Council for Private Education Association for the implementation. There were 876 Private Higher Education Institutions (PHEIs) and 97 State Universities and Colleges (SUCs) that participated in the program.

In 1997 and 1998 additional funding of PhP 54 million and PhP 300 million, respectively, were provisioned for training and other operational requirements. However, in 1997 only PhP15 million was actually released, and the 1998 allocation was suspended due to a budget deficit. We found no other financial information related to this program after 1998.

CHED produced a ten-year national research agenda to provide policies, strategies, priorities and procedures.

Technical Education and Skills Development Authority (TESDA)

The Technical Education and Skills Development Authority (TESDA) was established by law in August of 1994. TESDA was created by merging several organizations within various governmental departments in order to reduce overlapping skill development activities. As a result, TESDA is a single authority responsible for formulating skill development plans, setting standards, coordinating and monitoring manpower policies and programs and providing policy direction and guidelines for resource allocation for the vocational education and training institutions targeted toward middle level workers. TESDA's mandates include: ("Brief History" 2003)

- Integrate, coordinate and monitor skill development programs.
- Restructure efforts to promote and develop middle-level manpower
- Approve skill standards and tests.
- Develop an accreditation system for institutions involved in middle-level manpower development.
- Fund programs and projects for technical education and skills development.
- Assist training programs for trainers.

TESDA's supports or develop many programs to achieve their mandates. For example, the Community-Based Training Enterprise Development program has been in operation since the 1960s. Its purpose is to strengthen the delivery of training through intermediaries in the communities. When it was formed, the primary focus was on agriculture-based programs. Today, training is in broad categories from rural electrification to entrepreneurship. The program is also looking at distance learning technologies as a new method of delivering their programs.

The National Manpower Information System (NMIS) was developed through grants from the World Bank. NMIS was designed to collect, process, analyze and disseminate labor market and technical/vocational information.

The College Faculty Development program provides teachers or faculty in private education with scholarships and workshops/seminars to complete masters or doctoral degrees or improve their skills. The goal is to improve the academic qualification and competencies of Technical Vocational Education and Training (TVET) faculty.

The TVET Trainers Training program is intended to update the skills of trainers in physics, chemistry and mathematics in addition to specific skills in construction, electronics, telecommunications, information technology, electro-mechanical, garments, footwear, leather-goods and land transport.

Another program, the International Skills Technology Transfer program is intended to create arrangements between companies in developed countries with Philippine companies in order to train industry works on new technologies.

To ensure competitiveness and quality in the call center sector, TESDA has developed call center competency standards for customer service representatives, telesales or telemarketing officers and team leaders. ("24,000 Jobs" 2002)

TESDA has also produced the National Technical Education and Skills Development Plan that focuses on the development of middle level manpower for global competitiveness, rural development and social integration.

In order to support TESDA's mandate to integrate, coordinate and monitor skill development programs, they have recognized the need to conduct research and studies to aid policy and decision making and monitor progress. To that end, TESDA has produced the National TESD Research Agenda (2000-2004). The agenda does a good job of describing the background and rationale, highlighting existing studies, identifying the research priorities and describing the submission and evaluation process for research proposals. The agenda also defines strategies for achieving the priorities and monitoring and evaluating the agenda; however, if a criticism could be placed it is that the agenda lacks the details in the strategies and monitoring areas. Without these details, these important steps may never be completed.
TESDA is respected by the IT business community. Many higher-education graduates will participate in TESDA programs to round out their education or gain practical experience before they enter the workforce.

Technology and Livelihood Resource Center (TLRC)

The Technology and Livelihood Resource Center (TLRC), operating under the Office of the President, celebrated its 25th anniversary, 2002 with a weeklong celebration with the theme, "Technology and Livelihood: Key to Progress". During the celebration, TLRC's e-library system was announced. The system puts online 20,000 titles aimed at educating the population and ending poverty. The system operates under the "Knowledge is Power" theme. In addition to the e-library, TLRC has six other initiatives including (GMA Feb 2002):

- The TLRC Distance Learning via satellite system – transmits training seminars to local government unit-based learning centers nationwide.
- Greater Multimedia Access Technovans Project – uses technology vans to distribute information in print, video and CD formats.
- Technology and Livelihood Zones – establishes facilities in strategic zones for training, product manufacturing and marketing and small business incubators.
- Re-integration Program for Overseas Filipino Investors – providing livelihood and business training to Overseas Filipino Investors and their families.
- TLRC-KALAHI Entrepreneurship Development Program – training and funding to community-based projects in urban port areas.

- TLRC Silver Book – success stories of TLRC assisted enterprises.

Department of Science and Technology (DOST)

The Department of Science and Technology has introduced a mobile classroom to provide students and teachers in Southern Tagalog with access and exposure to technologies. The mobile classroom (known as the Mobile IT Classroom) is an air-conditioned bus equipped with 17 Pentium 4 microprocessor based notebooks, PC peripherals and audio-visual equipment. (GMA Sept. 2002)

Business Partnerships

Most, if not all, businesses recognize the requirement to train new employees and continually develop existing staff. According to Dr. Caro, most new employees receive 1 to 6 months of training when they start with a company. The training typically consists of lecture and hands-on experience. Often the training includes the use of software development tools that do not exist within the education systems because the schools cannot afford to purchase and implement them or to train their instructional staff on their use. To that end, many software companies have partnered with other organizations to develop, produce and deliver highly targeted training programs.

ASEAN Java Competency Program (AJCP)

Sun Microsystems Philippines has collaborated with the Mapua institute of Technology and the University of the Philippines to establish the Association of Southeast Asian Nations (ASEAN) Java Competency Program (AJCP). The program will assist the Philippines, Singapore, Malaysia, Vietnam, Cambodia and Indonesia in becoming a regional force for Java Consultancy services and application development.

ConnectEd.ph

Launched in late 2001, the ConnectEd.ph program provides public high schools with computer laboratories, software, training and education, local area networks and Internet or e-mail connections. The program is the result of Microsoft Philippines joining forces with the Makati Business Club and other organizations. In late 2001, 95 of the 100 targeted public schools were already equipped with computer labs. (GMA Nov. 2001)

Country-level Skills Gap Strategy

According to TESDA (described on page 142) the number of unemployed and underemployed IT graduates is a problem in the Philippines. In response to perceived demand in the global and domestic markets, many students pursued IT degrees or participated in technical training at computer institutions. Unfortunately, the demand for computer engineers and technicians was lower than expected.

One reason for the shortfall in jobs is that the Philippines is targeting ICT-enabled services and other outsourcing services that don't necessarily need computer science skills. Instead many call centers and other business process outsourcing jobs need "knowledge workers" who understand the field in question, e.g., legal, medical, financial services or accounting, have excellent English proficiency, and are comfortable using ICT tools to do their jobs.

In 2001, APEC studied select multinational corporations to assess skill gaps and training needs in the manufacturing, financial and business service industries. As a result of this study it was determined that: (LMIR.20 2003)

- Educated, English-speaking, trainable people attract foreign capital to the country, while infrastructure deficiencies and political unrest are detractors.
- Skill shortages are the result of:
- Problems in the education system including: poor curriculum, inadequate teacher training and low public and private investment.
- Movement of labor to other countries that has drained the domestic labor pool.
- Fast changing technologies that have made skills obsolete.
- Recruiting for technical positions is more selective and as a result more difficult. Recruiting clerical, sales, services and production personnel is easier. According to the survey it takes 4 to 7 weeks to find electronic and maintenance engineers and communication, computer and network technicians. Project managers, program designers, system consultants and analysts are even harder to find taking on average 12 to 15 weeks to fill vacancies.
- Skill deficiencies include:
- Management and supervision
- Interpersonal and communication skills
- Planning and problem solving
- Use of technology
- Self management
- Multi-skilling
- Teamwork
- Skill strengths include:
- Literacy
- Numerical skills

The multinational corporations indicated they dealt with skill shortage/deficiency problems through training, improving recruiting processes to ensure competitiveness, and outsourcing one or more general tasks like maintenance, security and clerical. The study also showed that 17 percent of managers and less than 1 percent of professional and technical staff are expatriates hired to fill skill shortages and deficiencies. These numbers reflect the large base of unemployed people in the Philippines eager for new opportunities and the impact of labor market restrictions. The difference between the management and professional numbers also highlights the challenges of finding qualified management staff in the Philippines.

According to the APEC study, manufacturing, business and service firms in the Philippines tend to spend more on training than Malaysia but less when compared to Singapore,

Taiwan and Thailand. Compared to Indonesia, manufacturing firms in the Philippines spend less on training; whereas, business and service firms spend more.
The APEC study recommends that firm-level training should be encouraged to generate the specific skills required by companies. Additionally, the educational system should undergo additional reforms to improve generic skills.

Finally, the study suggests that the key to resolving skill shortages and unemployment is to improve the education quality, not to simply increase the number of educated people.

In order to help develop the contact center industry the government has recently instituted several new policies:

- Focus the country's educational curriculum on English, Math and Sciences.
- Mandate that public schools use English as the primary instructional language.
- Provide scholarship funds from TESDA for students interested in pursuing the call center profession.

The last provision is because call centers are having difficulty finding both agents experienced managers because of the rapid growth in that sector.

Education Programs

Foundation for Information Technology Education and Development (FIT-ED)

The Foundation for Information Technology Education and Development (FIT-ED) is a Philippine non-governmental organization, founded to increase IT awareness and enable the society for the information age. The Foundation: (About FIT-ED 2003)

- Provides a forum for discussions of issues, expectations, goals, regulatory issues and infrastructure.
- Sponsors original research on relevant IT issues.
- Links foreign providers and potential users for IT training and applying IT in education, training, government and business.
- Initiates IT projects to encourage wider use of IT.
- Contributes local and regional policy discussions on issues relating to the Information Society in the 21st Century.
- Acts as the secretariat for the e-ASEAN Task Force.

Several companies have partnered with FIT-ED to help them accomplish their objectives, including Cisco Systems, IBM Philippines, Philippine Long Distance & Telephone Co., Oracle Philippines and Lucent Technologies.
FIT-ED projects include: (Programs 2003)

- FIT-ED and the Ateneo Center for Educational Development (ACED) collaborated on an educator training program to provide 450 public high school teachers and instructors from Social Welfare institutions for boys and girls with the skills they need to maximize the use of existing computer equipment and improve the quality

of education. The training program was funded by a four-year grant by the Lucent Foundation.

- Participating in the Oracle Academic Initiative (OAI), which offers credited college-level courses in information technology and assists students in gaining hands-on IT experience. The program is in 15 universities nationwide and still growing.
- Assisting the Department of Social Welfare and Development in obtaining necessary IT hardware and networking equipment by linking them with IT providers who were able to donate systems.
- With the Philippine Foundation for Global Concerns, FIT-ED forged a public-private sector dialogue on the development of the ASEAN Information Infrastructure (AII) roadmap. The resulting white paper and presentation to the heads of state, in 1999, led to the formation of the e-ASEAN Task Force (http://www.fit-ed.org/easean/index.html).
- Organizes periodic networking meetings in cooperation with the AIM W. SyCip Policy Center and the Philippine Venture Capital Investment Group. The meetings, called MindShare, are a venue for people to network and be updated on the latest industry trends and policy developments.
- Through a Memorandum of Understanding (MOU) with Ayala Foundation, FIT-ED launched Pilipinas Schoolnet in July 2000. The programs components are: Connectivity, Training, and Telecollaboration. For example, the program has developed an agreement with several telecom companies to provide free or discounted telephone and ISP service to the schools.
- Managing, as part of the Pilipinas Schoolnet project, the ed.venture initiative of the Coca-Cola Export Corporation. ed.venture provides computers and Internet connectivity, training and post-training support services. In February 2003, Coca-Cola announced a further contribution of $650,000 to the second phase of the project, after an initial $350,000 commitment. The first phase of the program built 15 fully equipped, Internet-connected, air-conditioned computer labs delivering ICT access, training and resources to more than 150,000 students, teachers and administrators. The program has also provided over 600 teachers with the skills to leverage ICT, through "educational telecollaboration" in their teaching. (GMA Feb. 2002b)
- E-ASEAN

ASEAN is the Association of Southeast Asian Nations. E-ASEAN examines the physical, legal, logistical, economic and social infrastructure needed for the region to succeed in the Information Age and design a framework for e-commerce development. The initial strategy focused on three areas including enhancing the information infrastructure, creating a supportive regulatory environment and developing human capital.

> "Among the outcomes expected for this year towards the development of a broad and comprehensive action plan is a draft e-Agreement on goods, services and investment in information technology. FIT-ED will hold a forum series on several issues affecting the development of the IT industry and its use in the Philippines. These fora will tackle, among

others, sectoral competitiveness, management attitudes towards IT preparedness, issues in e-government, IT professional competency standards, and a comparison of national efforts to the development of cybercorridors in the Asian region." (About FIT-ED 2003)

National Initiatives

Information Technology and E-Commerce Council (ITECC)

The Information Technology and Electronic Commerce Council (ITECC) was formed in 2000. ITECC was created by merging the National Information Technology Council (NITC) and the Electronic Commerce Promotion Council (ECPC). The Council is chaired by President Macapagal-Arroyo, thereby allowing her to directly oversee the direction of ITECC and ICT development in the Philippines. Also through her high-level participation, the Council is able to accelerate policy implementation and decision-making. Also on the council are 8 government representatives and 7 members from the private sector.

The Council meets quarterly and has five committees to focus on specific ICT areas: Business Development, eGovernment Implementation, Information Infrastructure, Human Resource Development, and Law and Regulations.
The Human Resources Development Committee is responsible for developing:

- policy and programs on e-learning
- guidelines for the enhancement of basic education
- programs on government/private sector initiatives to increase the supply of IT skills

ITECC hopes to conduct a national skills gap analysis. While some business, government and trade organizations believe they have identified the country's primary skills gaps, ITECC believes that a formal study will provide the documentary proof of those gaps. They hope that formal survey results will help them encourage the government to adequately fund programs to close the gaps.

Technology Skills Gaps versus Business and Supporting Skills Gaps

In a speech commemorating the 75th anniversary of the founding of the Far Eastern University (FEU), Philippine President Gloria Macapagal-Arroyo stressed the importance of education for the future of the country, in part because education generates jobs. She also stressed the importance of English in the global economy and especially for ICT, suggesting that there might be some subjects that should still be taught in Filipino but that English should be the norm in education.

President Macapagal-Arroyo also focused attention on basic mathematics and science education in order to "…prepare the youth to be the next generation of knowledge workers." (GMA Jan 2003)

Businesses in the Philippines recognize that management, marketing, business analysis and project management skills gaps exist. Unfortunately, the government and most trade and training organizations have limited resources for education and continue to focus those resources on technical programs. As a result, individual companies are left to solve "soft skill" gap problems themselves.

According to a study conducted by Janette Toral for a report on the state of the Philippine outsourcing industry, while 92% of the respondents indicated they were content with the quality of the workforce for meeting outsourcing requirements, 42% also expressed concerns about the manpower quality. Most of their concerns centered on non-technical skills and included: (Toral 2002)

- Filipino IT workers continue to migrate to other countries.
- More Filipinos are less exposed to English in schools and on television.
- Graduates from lesser-know universities have poor communication and analytical skills.
- Some IT school graduates are poorly trained and even have been "black listed" by companies because of their poor technical and communication skills.
- Latest programming technologies and methodologies are not being taught.

Interviews Conducted for this Report

Mr. Gerardo Anigan, Manager TAPS, Philippine Exporters Confederation (PHILEXPORT), Pasay City, Philippines

Dr. Jamie D.L. Caro, Associate Professor, Department of Computer Science, College of Engineering, University of the Philippines, Quezon City, Philippines; also President, The Philippines Society of Information Technology Educators

Mr. Roberto Deluria, President and CEO, Tridel Technologies, Pasig City, Philippines

Mrs. Sylvia Lorenzo-Stalk, Owner/Executive Vice President, stag Philippines, Inc., Quezon City, Philippines

Ms. Janette Toral, President, Digital Filipino, Quezon City, Philippines

Key Data

Table 15 below contains key summary data for each of the countries surveyed for this report. All data are for 2001 unless otherwise noted. All economic data in this chart are presented in US dollars unless otherwise noted.
Note that it was not possible to obtain every data point for every country.

	India	Rank[1]	Israel	Rank[1]	Jordan	Rank[1]	Philippines	Rank[1]	Key[2]
Population									
Total	1,033,390,000		6,362,950		5,030,925		77,015,490		B
Growth rate per year	1.70		2.06		2.91		1.88		B
Urban / Rural (percentage)	28 / 72		91 / 9		78 / 22		59 / 41		
Percentage under age 15					43		40		
Literacy									
Overall (percentage)	57.24	78	94.57	42	89.67	57	95.29	41	A
Men (percentage)	68.96		96.98		95.39		95.63		B
Women (percentage)	46.35		92.79		84.65		95.34		B
Workforce									
Total	27,960,000[3]		2,320,000		1,000,000		33,600,000		
Men / Women (percentage)					87 / 13				
IT Workforce	520,000		54,800				568,000		
Unemployment									
Overall (percentage)	9.2		9.3		14.7		11.2		C
Number of vendor certificates held									
Microsoft					722				
Oracle					702				
Cisco					99				
Sun					63				
Education									
Education spending as % of GDP	2.95	71	7.66	7	6.30	16	3.20	66	A

	India	Rank[1]	Israel	Rank[1]	Jordan	Rank[1]	Philippines	Rank[1]	Key[2]
Secondary school enrollment (as percentage of those of proper age)	38.82	77	84.59	29	59.52	52	58.85	53	A
Higher Education									
Number of universities	244		8		22				
Number of colleges, community colleges, other forms of higher education	11,089+		23						
Total students enrolled	75,000,000+		180,229		140,000		29,000,000		
Bachelors graduates per year	2,200,000						380,000		
MA graduates per year									
PhD graduates per year	10,000								
IT/CS graduates per year	140,000		4500				170,000		
IT/CS as percent of total					50				

Table 15 – Key Data for Countries in this Report

NOTES

1.The columns labeled "Rank" show how each country fares in selected categories as ranked by the World Economic Forum (WEF) in their publication *The Global Information Technology Report 2002-2003*. WEF ranked 82 countries. 1 represents the best score and 82 is the worst score in each category.

2.Primary data sources are listed in the table below. If the "Key" field is blank, the data on that row was compiled from various sources.

Key	Source
A	World Economic Forum, *The Global Information Technology Report 2002-2003*
B	World Bank Indicators 1997-2001 (http://devdata.worldbank.org/data-query/)
C	World Economic Forum Competitiveness Profiles (www.weforum.org/site/knowledgenavigator.nsf/Content/KB+Country+Profiles)

3. Number represents organized sectors only for year 2000.

Appendix A – Interview Instruments and Skills Categories

The interview instruments are designed to capture the maximum amount of relevant information during the interview process.

The Interview Forum

Each of the company interviews will be a detailed 2-3 hour session to ensure that participants understand what will be expected of them, and how the information gathered will be useful to them and to the development of the ICT Sector in Egypt. Prior to each interview, planning sessions will identify the characteristics of the firm to be interviewed, to allow for any special influences of information that will be relevant to the meeting.

Firms will receive advance notification of the topics to be covered and the staff that will need to be present in order to complete the research effectively.

Attendees

General Manager, President or Senior Executive of Business Operation/Unit
Human Resources Manager or relevant Hiring Exec(s)
Training Manager or responsible Manager for Training and employee development

Agenda

1. Review of the ICT Sector Gap Analysis Study and why it is being conducted
2. Corporate or organization review to confirm characteristics of organization cluster, size, industry focus, growth and export activities.
3. Review of questions and rating model
4. Job categorization and review
    a. Capture of information for skills gap
5. Skills categorization and review
    a. Capture of information for skills gap
6. Education and training review
    a. Public institutions ratings
    b. Private institutions ratings
    c. Experience level ratings
    d. Job categories rating
7. Wrap up and capture of any other relevant areas in the Skills Gaps that are being addressed by other programs. (Either USAID or other sources)

Capture Method

Presentation of the agenda and items 3-6 will be either electronic or paper based visual aids, depending on the availability of an electronic "projector" and the preference of the attendees to the meeting. This will be determined in advance, so the appropriate materials and equipment is attached.

As the primary goal is to focus on Skills Gaps, a review of the job categorization and skills areas will provide the guide to identify specific areas for review and rating.
The following tables outline the Job Classification scheme. As recommended by the SO17 Statement of Work, Classification for the NWCET standard will be used extensively through the project.

Skill Work Category Clusters - NWCET

Categories	**Database Administration and development**		**Digital Media**	
Job Functions	Data Analysts	Database administrators	Animator	2D/3D Artists
	Database developer	Data Modeler	Virtual Reality Specialist	Multimedia Author
	Database architect	Data Architect	Media Specialist	Media Instructional Designer
Categories	**Enterprise Systems Analysis and Integration**		**Network Design and Administration**	
Job Functions	Systems Analyst	Systems Integrator	Network Technician	Network Engineer
	Data systems manager	E-commerce specialist	Network Operations Analyst	Network Architect
	Infrastructure analyst	Chief Information Officer	Data Communications Analyst	
Categories	**Programming/Software Engineering**		**Technical Support**	
Job Functions	Software Engineer	Software Tester	Technical Support Representative	Customer Support Representative
	Software Application Specialist	Software Development Engineer	Help Desk Technician	Sales Support Technician
			Maintenance Technician	
Categories	**Technical Writing**		**Web Development And Administration**	
Job Functions	Technical Writer	Document Specialist	Web Page Developer	Web Site Developer
	Electronic Publication Specialist	Technical Publication Manager	Webmaster	Web administrator
			Web Designer	

NWCET standards that will be used extensively in the capture and subsequent analysis of data

In addition to the NWCET standards, several other job functions and classifications are important to the success of the project. For this reason the PfCE team has identified several job classifications and roles that are important to track and measure for Skills Gap and capability within the organizations. These are shown in the following table:

Skill Work Category Clusters – Additional Categories

Categories	**Business and Project Management**		**Education**	
Job Functions	Project Manager	Product Manager	Undergraduate Professor	Post graduate Professor
	Sales executive	Sales Manager	Specialized instructor	Reseller of education programs

	Marketing communications	Marketing Manager	Facilitators	Organizational consultants
	Market research analyst	Business Process Consultant		
	Contract Manager	Proposal Manager		
Categories	**Hardware and Operations Management**			
	Datacenter manager	Electronic Design Engineer		
Job Functions	EE Manufacturing Engineer	Operations Manager		
	Manufacturing engineer	Industrial designer		

Additional categories tracked by the PfCE program

During the interview process, each of the classification areas will be examined for potential Skills Gap. As areas are identified, each company will collectively rate (by attendees agreement) the gap by:

a. 3 level system ranging from High, Medium and Low

b. Industry requirement associated with Skill Gap

c. Short and Long term requirement for Skill

d. Job Classification

e. Job Function

Ratings for the 3 levels will be based on the following criteria:

- H High Gap versus need. Affecting business operations on a daily basis.
- M Considerable gap versus desired goals for operation. Affecting ability to grow or move into more lucrative markets
- L Not very important to the organization, might make a difference if we had these skills

The following instrument illustrates how this information will be captured for future analysis. In addition to the Classification grouping, another level of detail will be examined at the Skills level.

Near Term Ratings

Group – Database administration and support

Data analysts	High	Medium	Low	Job role
	O	O	O	

High

Industry Classification

Retail/Wholesale	O	Banking/Finance	O	Healthcare	O	Services	O	Insurance	O	Legal	O
Manufacturing	O	Entertainment	O	Government	O	Software	O	Publishing	O	Engineering	O
Aerospace	O	Manufacturing	O	Automotive	O	Aerospace	O	Computers	O	Pharma	O
Chemical	O	Marine	O	Construction	O	Food & bev.	O	Agriculture	O	Telecom	O
Oil and Gas	O	Energy	O	Transportation	O	Travel	O		O		O

Med

Industry Classification

Retail/Wholesale	O	Banking/Finance	O	Healthcare	O	Services	O	Insurance	O	Legal	O
Manufacturing	O	Entertainment	O	Government	O	Software	O	Publishing	O	Engineering	O
Aerospace	O	Manufacturing	O	Automotive	O	Aerospace	O	Computers	O	Pharma	O
Chemical	O	Marine	O	Construction	O	Food & bev.	O	Agriculture	O	Telecom	O
Oil and Gas	O	Energy	O	Transportation	O	Travel	O		O		O

Low

Industry Classification

Retail/Wholesale	O	Banking/Finance	O	Healthcare	O	Services	O	Insurance	O	Legal	O
Manufacturing	O	Entertainment	O	Government	O	Software	O	Publishing	O	Engineering	O
Aerospace	O	Manufacturing	O	Automotive	O	Aerospace	O	Computers	O	Pharma	O
Chemical	O	Marine	O	Construction	O	Food & bev.	O	Agriculture	O	Telecom	O
Oil and Gas	O	Energy	O	Transportation	O	Travel	O		O		O

LONG TERM RATINGS

Data analysts	High	Medium	Low	Other
	O	O	O	

High

Industry Classification

Retail/Wholesale	O	Banking/Finance	O	Healthcare	O	Services	O	Insurance	O	Legal	O
Manufacturing	O	Entertainment	O	Government	O	Software	O	Publishing	O	Engineering	O
Aerospace	O	Manufacturing	O	Automotive	O	Aerospace	O	Computers	O	Pharma	O
Chemical	O	Marine	O	Construction	O	Food & bev.	O	Agriculture	O	Telecom	O
Oil and Gas	O	Energy	O	Transportation	O	Travel	O		O		O

Med

Industry Classification

Retail/Wholesale	O	Banking/Finance	O	Healthcare	O	Services	O	Insurance	O	Legal	O
Manufacturing	O	Entertainment	O	Government	O	Software	O	Publishing	O	Engineering	O
Aerospace	O	Manufacturing	O	Automotive	O	Aerospace	O	Computers	O	Pharma	O
Chemical	O	Marine	O	Construction	O	Food & bev.	O	Agriculture	O	Telecom	O
Oil and Gas	O	Energy	O	Transportation	O	Travel	O		O		O

Low

Industry Classification

Retail/Wholesale	O	Banking/Finance	O	Healthcare	O	Services	O	Insurance	O	Legal	O
Manufacturing	O	Entertainment	O	Government	O	Software	O	Publishing	O	Engineering	O
Aerospace	O	Manufacturing	O	Automotive	O	Aerospace	O	Computers	O	Pharma	O
Chemical	O	Marine	O	Construction	O	Food & bev.	O	Agriculture	O	Telecom	O
Oil and Gas	O	Energy	O	Transportation	O	Travel	O		O		O

Notes

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Individual Skills Categorization Model

In addition to the work clusters, PfCE will also review the Skills Gap at a lower level than job function. The following categories will be tracked in the program, and rated in the same manner as the Job Classification Skills Gaps.

Categories	**Programming languages**		**Platforms And Operating Systems**	
Skill detail	Java	C and C ++	Websphere	Microsoft .net
	C#	Cobol	Mainframe OS	LINUX
	Fortran	Microcode and Machine code	UNIX	
	Portable Operating Systems			
Categories	**Interface and Media design**		**Database platforms**	
Skill detail	Graphical User Interface	Multi-media graphics	Access	DB2
	Film and TV production	Usability design	Informix	Microsoft SQL server
	Courseware development		Oracle	Sybase
Categories	**Connectivity and integration**		**Certification**	
Skill detail	Communication protocols	EDI	CMM	ISO9000 TickIT
	XML	W3 standards	Vendor specific	CompTIA
	EAI			
Categories	**Business and Communication**		**Project and customer management**	
Skill detail	Business Writing	Customer communication	Project Management	Product Management
	Sales	Market research and planning	UML	Business Process Modeling
	Business Planning	Proposal development	QA testing	QA engineering
	International business development	Negotiation skills	Software Lifecycle Management	Finance and accounting for non-finance staff
Categories	**Hardware**		**Datacenter Operations**	
Skill detail	PCB Design	Manufacturing Engineering	Datacenter security	Redundancy planning
	Vendor specific maintenance	Preventive Maintenance	Disaster planning	Operations Management systems
	Industrial Design	Proposal development	Operations	Monitoring tools
	Environmental planning	Safety and emissions approval	Network optimization	

Categories of Individual Skills and their groups (1)

Categories	**Applications**		**Applications**	
Skill detail	Customer Relationship Mgmt	Enterprise Resource Planning	Telephony	Geographic Information Systems
	Knowledge Management	Portals	Wireless	Security
	Financials	Collaboration		

Categories of Individual Skills and their groups (2)

Interviews of Organizations from Target Base

Six organizations were interviewed during this testing phase, in most cases the General Manager or CEO was present and conducting the meeting. Our goals from these meetings were to:

- Gain agreement that the study would provide useful input and potential service to the ICT Sector
- Review the methodology in detail and either gain support or input to modify the targets or approach specifically:
- Skills classification clusters and job functions
- Individual skill set classifications and skills
- Education and training metric measurement

Organizations provided input to the study instrument and process during these sessions. The following tables indicate areas that the interviewed organizations believe that either job function or skills levels need to be tracked in detail.

	RAYA	DMS	PT	FUJITSU	CISCO	IBM
Job categorization						
Project Manager	Y	Y	Y	Y	Y	Y
Product Manager		Y				Y
Sales executive	Y	Y	Y	Y	Y	Y
Sales Manager	Y	Y	Y	Y	Y	
Marketing communications	Y	Y	Y		Y	Y
Marketing Manager			Y		Y	Y
Market research analyst	Y	Y	Y	Y		
Business Process Consultant		Y	Y	Y	Y	Y
Contract Management	Y	Y	Y	Y	Y	Y
Proposal development	Y	Y	Y	Y	Y	Y
Datacenter manager	Y	Y	Y	Y	Y	Y
Operations Manager	Y			Y		
Datacenter manager	Y		Y		Y	Y
Electronic Design Engineer						
EE Manufacturing Engineer	Y	Y	Y	Y	Y	Y
Operations Manager	Y	Y	Y	Y	Y	Y

Job classification identification during the interview process by firm

Individual interviews with each of the firms produced considerable input and some consensus on job function requirements. During the interview process considerable efforts were made to ensure that new positions and classifications not covered by the NWCET standards but important to the firms were included in the instruments.

	RAYA	DMS	PT	FUJITSU	CISCO	IBM
Skills						
Business Writing	Y	Y	Y	Y	Y	Y
Sales	Y	Y	Y	Y	Y	Y
Business Planning	Y	Y	Y	Y	Y	Y
International business development	Y	Y	Y		Y	Y
Customer communication	Y	Y	Y	Y	Y	Y
Market research and planning	Y	Y	Y			
Proposal development	Y	Y	Y	Y	Y	Y
Negotiation skills	Y	Y		Y	Y	Y
Project Management	Y	Y	Y	Y	Y	Y
UML						
QA testing	Y	Y	Y	Y	Y	Y
Software Lifecycle Management	Y	Y	Y		Y	Y
Product Management		Y	Y		Y	Y
Business Process Modeling		Y	Y	Y	Y	Y
QA engineering	Y	Y	Y	Y	Y	Y
Finance and accounting for non-finance staff	Y	Y	Y	Y	Y	Y
Datacenter security	Y			Y	Y	Y
Disaster planning	Y	Y		Y	Y	Y
Operations	Y	Y	Y	Y	Y	Y

Skill classification identification during the interview process by firm

Similarly in skills requirements discussions, many new areas were identified as important to measure. This table reflects much of the input from the firms.

Interview Summary

The interviews were conducted during mid and late December 2002, the staff at PfCE assisted and attended all of the meetings. Dr Moustafa El-Gabaly and Nermine Kamel attended all, and Mehdi Majidi attended the IBM meeting.

Without exception all attendees provided excellent input regarding the program, and resulted in the following extensions and refinements being made:

Job Classifications:

- Data Center and Operations Management
- Project Management
- Product Management

Skill sets and measurements:

- Business writing and communications
- Sales skills
- Customer facing and interaction skills
- Technology selection and evaluation

- Product Lifecycle Management
- Market research skills

Country benchmarking selections:

- Ireland moved to second level selection
- Suggested Philippines, Malaysia and others
- Confirmed that India, Jordan and Israel were good candidates

Each of the interviewees expressed considerable interest in participating in detail in the study when the program starts in January. All agreed that information captured from the study would remain confidential at the individual organization level, and that results would only be released at an aggregated level.

As a result of these interviews, we have a high degree of confidence that a comprehensive and precise view of Skills Gaps can be obtained from these and the target organizations.

Harvard Computing Group, Inc.
December 2002

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IT CLUSTER

ICT PENETRATION AND SKILLS GAP ANALYSIS

SECTION II:
ICT PENERATION GAP IN EGYPTIAN INDUSTRIES

JULY 2003

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This study is the synergistic result of the collaborative work and contribution of over 250 professionals. We would like to express our deepest gratitude and appreciation to everyone who participated in the study. Companies' executives allocated their companies' resources and time to share their knowledge and experiences with high level of transparency and cooperation. Industry experts provided continuous support to the team to analyze the dynamics of examined industries. The team exerted an outstanding effort to undertake the study and hopes that the result will prove useful to the community. The study team wishes to thank MCIT & USAID teams for their contribution in providing guidance and support to the study in its different phases.

Moustafa El-Gabaly, Director

IT Cluster, P*f*CE

E-mail: mgabali@internetegypt.com

Mehdi Majidi, Executive Director

IT-in-Education, P*f*CE

E-mail: Mehdi.Majidi@us.ibm.com

ACRONYMS

CRM	Customer Relationship Management
ERP	Enterprise Resource Management
F&B	Food and Beverage / Food Processing Industry
GDP	Gross Domestic Product
HCG	Harvard Computing Group
ICT	Information and Communications Technology
IT	Information Technology
KM	Knowledge Management
KRA	Key Result Area
MCIT	Ministry of Communications and Information Technology
OTS	Off The Shelf
P4	Purpose 4, P*f*CE project
P*f*CE	Partners for a Competitive Egypt
ROI	Return On Investment
SCM	Supply Chain Management
SGA	Skills Gap Analysis
LOE	Level of Effort
SMEs	Small and Medium Enterprises
SO17	USAID Strategic Objective # 17 (2000-2009 plan for Egypt)
SOW	Scope of Work
USAID	United States Agency for International Development

Sections

I. INTRODUCTION

Under its Strategic Objective 17 (SO17) the United States Agency for International Development (USAID) provided its contract to operate and implement *"Skills for Competitiveness Developed Initiative"*. The initiative that is being implemented by "Partners for a Competitive Egypt- P*f*CE" project was crafted to respond to the challenges of global competitiveness and workforce development. It aimed to build private sector coalitions, develop global thinking, and promote Egyptian leadership and innovative public/private sector partnerships.

A principal objective of P*f*CE project is to support the activities of the Ministry of Communications and Information Technology (MCIT) in implementing its National ICT Development Program as well as developing the IT Cluster in Egypt.

The ICT Penetration and Skills Gap Analysis (SGA) study was developed to respond to the immediate inquiries for information of MCIT and USAID on the needs for ICT skills covering the local, regional, and global markets. The outputs of the study will help alleviate the need for basic information on skills required by various planning activities undertaken by USAID and the MCIT. The results of the assessment and the related recommendations will add to the continuity of the ICT workforce development. The study will help in selecting the educational and training interventions supported by USAID and MCIT. It will provide the ICT stakeholders with the basis for continued ICT human resource and workforce development plans for maximum growth of the ICT sector. It will also serve as a basis for expanding the use and adoption of ICT practices and applications by Egyptian industries with the purpose of raising productivity and increasing Egyptian products competitiveness.

This report is one section of the ICT penetration and skills gap analysis report. It starts with an encompassing executive summary of the compiled executive summary of the three sections of 'ICT Penetration Gap', ICT Skills Gap', and 'the Study Institutionalization'. The repetition of the executive summary is intentional to serve our various readers.

II. EXECUTIVE SUMMARY (ICT Penetration & Skills Gap)

The ICT penetration and skills gap analysis study is composed of three separate but related sections. The first section—SGA in ICT Industry—provides a comprehensive analysis of ICT skills currently used in ICT companies and the existing gap these companies face to respond to their market needs. This section focuses on identifying the gap between the skills needed by the industry and those currently existing. The methodology adopted was based on identifying and selecting the main ICT cluster segments, identifying the need and types of educational institutions to be included in the study, and setting the criteria to select targeted sample organizations and countries benchmarked.

The second section—ICT penetration in Egyptian Industries—focuses on the demand side of the ICT industry. It analyses the level of ICT penetration and the ICT technologies required for enhancing their productivity and hence their competitiveness. On the other hand, the study will allow identifying the required skills needed for the ICT sector to help increasing the ICT penetration. This section examined pharmaceutical, ready-made garments, and food and beverage as potential industries for implementing ICT applications. It aims at providing an industry analysis and determining the level of ICT penetration gap within the industry's supply chain. It also provides benchmark data on the use of ICT in industrial development.

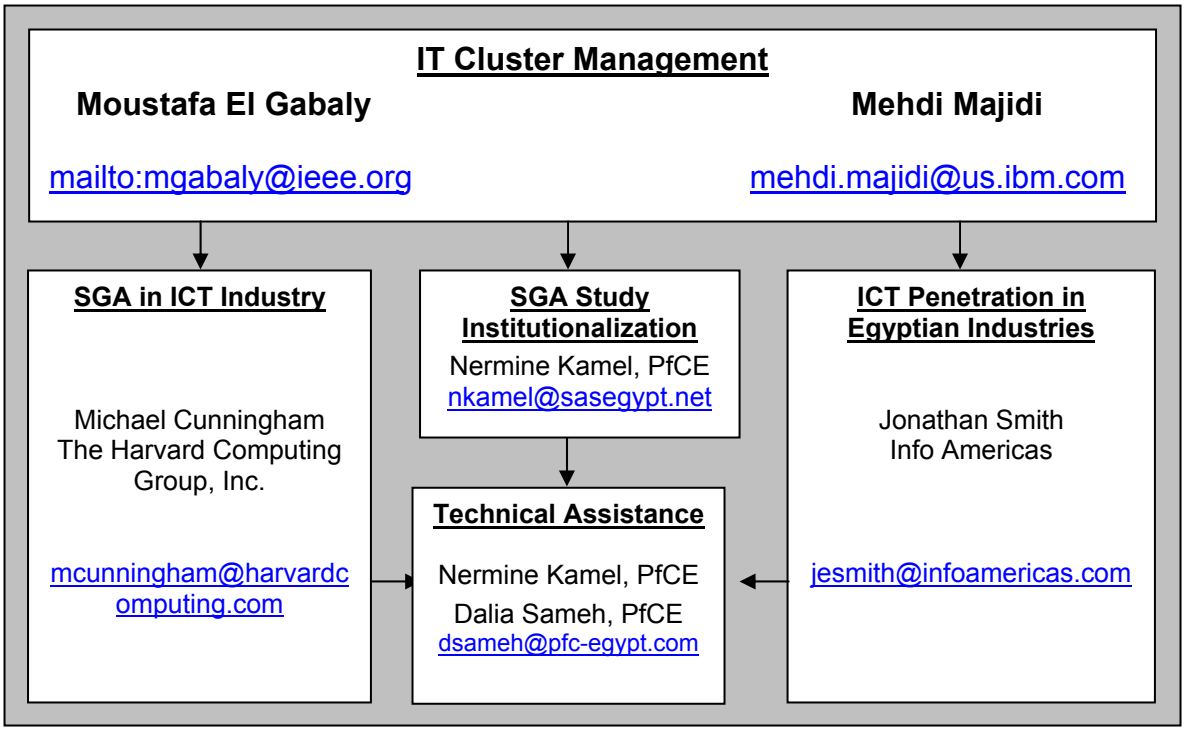
The third section—SGA Study Institutionalization—provides guidance and explanation on the way the study was conducted as well as suggestions and recommendations for repeating the study. The objective of this section is to ensure the continuity and usefulness of the study by defining the research process, methodology, and plan to repeat the study, as well as to share the lessons learned from the current experience with the implementers of the study.

The third section was developed by PfCE IT cluster team and the first two sections of the study were respectively conducted by Harvard Computing Group (HCG) and InfoAmericas companies in collaboration with PfCE IT Cluster management team who provided managerial and technical supervision in developing the related methodologies, selection criteria, and implementation. The final report on the findings and recommendations were conducted and completed by HCG and InfoAmericas.

A .Study Team

The following diagram illustrates the structure of the team that implemented the study.

ICT Penetration and Skills Gap Analysis Structure



Following summary of each section provides an encompassing overview of the entire study.

B. ICT Skills Gap in ICT Industry

Egypt's ICT sector exhibits skills gaps in two primary areas. First, there are gaps within individual ICT organizations. Second, there are gaps in the external consulting support that is required for the development and management of a healthy sector. For the most part, Egypt does not have severe skills gaps for technology-based skills, with the exception of significant gaps in advanced technologies such as Business-to-Business (B2B) and complex security and enterprise systems. In the telecom segment, wireless and mobile applications represent concerns. The advanced skills gaps are the result of "late adoption" of these technologies in the domestic and regional market, and are not a question of inherent ability in the workforce. These gaps will diminish as market demand increases in these areas and export activities increase.

The most significant gaps lie in business and personal communication skills and project management skills. It is difficult to hire employees with baseline skills such as Business Writing and Technical Writing in both Arabic and English. For export-oriented firms, foreign language skills in English and French are critical. In general, most organizations

feel that graduates from both the universities and the general education system are not equipped with the right skills.

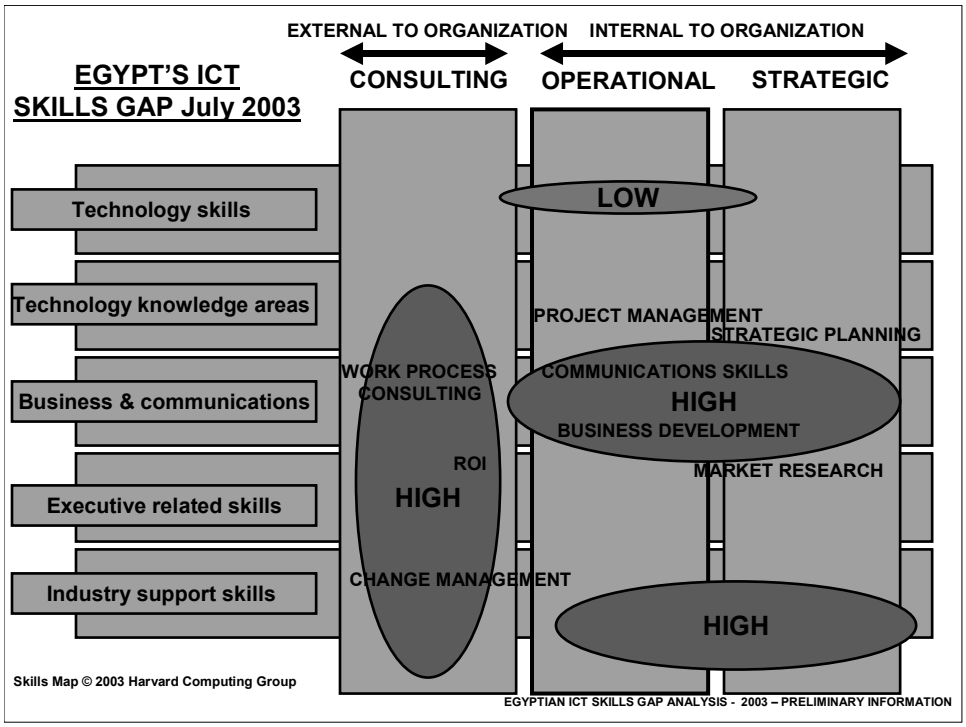


Figure 1 – Egypt's ICT Skills Gaps July 2003

Figure 1 shows the severity of Egypt's skills gaps in particular skill categories that are arranged from top to bottom on the left side of the figure. At the top, the figure also illustrates whether skills gaps are internal to the organization (such as an ICT firm), or external to individual firms but endemic to the industry. In addition to the oval representing a huge gap in the area of business and personal communication skills, required industry support skills are also missing in the marketplace. This gap in particular causes a considerable problem for the sale, support and expansion of many markets. Increasingly, firms are realizing that this gap is placing severe limitations on the expansion of their businesses, and they are starting to change hiring policies accordingly. By having the right consultants and staff in place, for example, organizations can better serve their clients with industry-specific knowledge and solutions. Many ICT firms are trying to source specialists with financial, healthcare, manufacturing and other relevant industry experience to complement their technology and software skills. Technology gaps are today frequently filled by multi-national vendors who provide the specialist skills and software to implement many of the leading-edge systems being deployed. Unfortunately, this practice does little to transfer experience and knowledge to the local firms, aside from those few that are large enough to handle these projects directly.

The status of the Egyptian ICT industry can be described as having an excellent telecom and Internet infrastructure today, particularly compared with pre-MCIT status in 1999. The Internet and telecom environment now provides a foundation upon which new business platforms can be developed, including call centers, data centers, B2B systems

and Virtual Private Networks using the Internet as a framework. However, the adoption of these new technologies creates challenges for the ICT sector in the future.

C. ICT Penetration Gap in Egyptian Industries

The study of the Gap Analysis of ICT Penetration in Egyptian Industries was carried out in three Egyptian industries: ready-made garments, pharmaceutical drug manufacturing and food and beverage industries, all three of which are strategically important Egyptian industries. Drug manufacturing is a strategic socio-economic sector for the country, producing 92% of the local market needs. Food and Beverage falls within the nation's agricultural sector, which occupies 29% of the nation's workforce and contributes to 16.4% of the nation's annual GDP. Ready-made garments industry, as part of the textiles industry, falls within a national economic sector that accounts for 30% of the nation's workforce and 49% of total Egyptian manufactured goods. All three industries are dynamic exporters.While the three industries analyzed are smaller than the macro-economic sectors in which they are situated, all three themselves, as well as the larger industry contexts in which they are situated, play a vital role in future employment generation, safety, and economic security of the country. All three industries have large, committed corporate players who operate globally through joint ventures, associations and partnerships, as well as on the national market, and a large number of SMEs (Small & Medium Enterprises) as dynamically within regional and international markets, albeit on smaller scales.

All three industries will be significantly impacted when the GATT conditions change in 2005. There is little reason to believe that after 2005 Egyptian manufacturing sectors will not experience shake downs, such as what occurred with the Mexican food and beverage SMEs when the NAFTA (North American Free Trade Agreement) went into effect: about 50% of the SMEs in that industry disappeared through their outright failure to compete, much of that failure was attributed to not leveraging ICT for business competitiveness.

The findings from the Gap Analysis of IC Penetration in Egyptian Industries show what the current ICT use and needs are in the production, management and growth operations of the three industries. The study also presents important comparative information about how ICT solutions have importantly bolstered the ability of those same industries in other countries similar to Egypt, to compete on international markets and to perform efficiently in their own national markets. The findings in the particular case of Mexico emphatically underscores what the negative impacts on industry can be when it did not leverage the advantages and benefits of ICT for global and national competitiveness and growth. Inversely, when ICT is used to such ends (as in the cases of Portugal, France, Argentina, Brazil, and Turkey), competitiveness can be raised and growth stimulated.

There is openness to learn from these examples, as nearly 100% of the companies in the three industries stated that ICT is "very important" to their business performance and growth. Nonetheless, only 46% of the companies have dedicated ICT budgets (67% of pharmaceuticals; 44% of food and beverage; 27% of ready-made garments). This large gap between how ICT is perceived to be important versus what companies are actually doing to strategically address ICT solutions is mainly due to three important factors:

1. General lack of management awareness concerning how leveraging ICT solutions impacts the bottom line.
2. General lack of management awareness concerning how leveraging ICT solutions impacts the bottom line.
3. Concentration of decisions concerning ICT in the hands of top management, who tend to not involve their ICT departments in the decision-making processes (30% of all companies analyzed do not even have IT departments).

The use of ICT in the three industries studied reflects the respective structures and characteristics of the industries' supply chains. In simple terms, the main differences of ICT use in the three industries are:

Food & Beverage

- The food and beverage industry is characterized by a heavy reliance on planning for crop planting and harvesting, quality farming and harvesting (even high-tech farming for hazard safety), and efficient inbound farm-to-plant logistics and efficient outbound logistics in general, but mainly concerning the demand for efficient outbound logistics for fresh products. The actual production operations in food and beverage are a mix of manual and automated, with a relatively low dependence on ICT solutions, given the relative low level of production line sophistication. This determines that much of the food and beverage ICT solutions are being leveraged on the farm, for safety and health controls, for crop quality and export market specs, for logistics and for complicated physical and information movement between (remote) farms and offices.
- Penetration of Internet, Intranet and Interactive Web-sites is low, particularly as compared to benchmark countries. Demand is highest for management and growth oriented ICT solutions.
- Food and beverage companies show a relatively healthy awareness of the importance of ICT for production management solutions, with 56% of the companies stating that over the coming twelve months they plan to migrate to more sophisticated ICT solutions for integrating production and management. At the same time, however, all but one of the 19 companies analyzed admit to having insufficient knowledge for deciding what ICT uses would be best for which solutions.

Pharmaceutical

- The pharmaceutical supply chain has heavy reliance on inbound logistics for imports of 85% of their active ingredients, which are transformed in the high-tech drug production lines. Drug sales are subjected to cyclical demands from end consumers and intermediary

buyers. Planning for sales and purchasing is thus a vital activity that kick-starts the supply chain operations, for which ICT applications are consequently found throughout much of the planning, sales and orders operations of the pharmaceuticals industry, linking broad production and management operations, including warehousing and distribution operations in addition to the aforementioned ones.

- Different from the private companies and multinationals, where ICT solutions are ubiquitous, the public firms are using ICT for production operations, but comparatively little in management and almost none for growth. None of the public firms are importantly enjoying the benefits of leveraging ICT for inter-/intra- communications and growth.

Ready Made Garments

- The ready-made garments industry supply chain is characterized by a complex production operation that depends on using cutting-edge textiles production machinery for meeting quality and quantity customer demands. That, plus the traditional reliance of the textiles industry on machinery, determines that ICT solutions in ready-made garments are mainly concentrated in the production areas.
- ICT solutions are relatively weak in management areas, particularly when it comes to ICT for communications systems and for global sales and markets sourcing. This is partially due to the inadequate penetration of basic infrastructure, particularly as concerns the stock of computers and use of corporate email.
- ICT solutions are sought for efficiency gains in production management, as well as for market development.

All three industries share the following trends:

- An increase in ICT expenditures and involvement of IT departments in decision making.
- A moderate improvement of basic ICT infrastructure.
- A slow tendency toward greater penetration and diffusion of ICT solutions.
- A growing interest in locally developed ICT solutions.
- An increase in the number of companies participating in sector market places and cluster initiatives.

The most important economic implications of these trends will be:

- Greater dissemination of ICT if supported by appropriate education and training.
- Greater dissemination of ICT if ICT suppliers and host industries collaborate in creating case studies, developing joint solutions, and propagating success stories.
- Higher adoption of ICT applications and infrastructures if industry and distribution clusters integrate further.
- Shared network initiatives if increased international competition prompts mergers and acquisitions in the industries.
- Short-term loss of jobs if labor saving technologies are adopted and as companies not adopting said technologies succumb to competition.
- Long-term job creation if the use of labor-saving technologies is more prevalent across the host industry, leading to general growth as a consequence of greater competitiveness.

Overall, although the industries perceive ICT as an instrument to increase efficiency and reduce costs, there is a ubiquitous lack of awareness as to what the optimum ICT systems and tools are for doing so. In each industry there is a clear demand for tailored ICT solutions, which many companies are commonly doing by adapting and customizing MSOffice applications. Most companies state that the ICT industry experts are too eager to push their solutions, and generally unacquainted with the particularities of their industry, thus not fully competent to advise them on best solutions.

The study's findings divulge that, to apply ICT strategically to improve business management activities, there is a serious two-way need for knowledge development: business2ICT and ICT2business. ICT use in industry depends on collective actions guided by strategic planning, drawn from a well-defined strategic market position. To this end the host industries, ICT industry, Government and NGOs/Associations, have roles to play to foster an environment that will foster the uptake of ICT. These roles can be summarized as follows:

HOST INDUSTRY	■ Create and provide aggregate industry information ■ Prepare for industry growth through use of ICT solutions
ICT INDUSTRY	■ Develop consultancy skills to create tailor made ICT solutions for host industries ■ Develop Business and Financial Cases for ICT use
GOVERNMENT	■ Encourage ICT uptake through use of e-Government ■ Facilitate and Promote Industry Growth through e-Marketplaces
NGO & ASSOCIATIONS	■ Raise Awareness ■ Promote ICT Education and Training

III. ICT Penetration Gap in Egyptian Industries

This section was conducted and completed by InfoAmericas
For additional information, please contact:

Jonathan Smith-

CORPORATE HEAD OFFICE

2655 Le Jeune Road, Ste 807
Coral Gables FL 33134 USA
Tel 305-569-9133 TollFree 888-927-7448
corporate@infoamericas.com - www.infoamericas.com

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Executive Summary

The study of the Gap Analysis of ICT Penetration in Egyptian Industries was carried out in three Egyptian industries: ready-made garments, pharmaceutical drug manufacturing and food and beverage industries, all three of which are strategically important Egyptian industries. Drug manufacturing is a strategic socio-economic sector for the country, producing 92% of the local market needs. Food and Beverage falls within the nation's agricultural sector, which occupies 29% of the nation's workforce and contributes to 16.4% of the nation's annual GDP. Ready-made garments industry, as part of the textiles industry, falls within a national economic sector that accounts for 30% of the nation's workforce and 49% of total Egyptian manufactured goods. All three industries are dynamic exporters.

While the three industries analyzed are smaller than the macro-economic sectors in which they are situated, all three themselves, as well as the larger industry contexts in which they are situated, play a vital role in future employment generation, safety, and economic security of the country. All three industries have large, committed corporate players who operate globally through joint ventures, associations and partnerships, as well as on the national market, and a large number of SMEs (Small & Medium Enterprises) as dynamically within regional and international markets, albeit on smaller scales.

All three industries will be significantly impacted when the GATT conditions change in 2005. There is little reason to believe that after 2005 Egyptian manufacturing sectors will not experience shake downs, such as what occurred with the Mexican food and beverage SMEs when the NAFTA (North American Free Trade Agreement) went into effect: about 50% of the SMEs in that industry disappeared through their outright failure to compete, much of that failure was attributed to not leveraging ICT for business competitiveness.

The findings from the Gap Analysis of IC Penetration in Egyptian Industries show what the current ICT use and needs are in the production, management and growth operations of the three industries. The study also presents important comparative information about how ICT solutions have importantly bolstered the ability of those same industries in other countries similar to Egypt, to compete on international markets and to perform efficiently in their own national markets. The findings in the particular case of Mexico emphatically underscores what the negative impacts on industry can be when it did not leverage the advantages and benefits of ICT for global and national competitiveness and growth. Inversely, when ICT is used to such ends (as in the cases of Portugal, France, Argentina, Brazil, and Turkey), competitiveness can be raised and growth stimulated.

There is openness to learn from these examples, as nearly 100% of the companies in the three industries stated that ICT is "very important" to their business performance and growth. Nonetheless, only 46% of the companies have dedicated ICT budgets (67% of pharmaceuticals; 44% of food and beverage; 27% of ready-made garments). This large gap between how ICT is perceived to be important versus what companies are actually doing to strategically address ICT solutions, is mainly due to three important factors:

1. General lack of management awareness concerning how leveraging ICT solutions impacts the bottom line.

2. Concentration of decisions concerning ICT in the hands of top management, who tend to not involve their ICT departments in the decision making processes (30% of all companies analyzed do not even have IT departments).

3. The use of ICT in the three industries studied reflects the respective structures and characteristics of the industries' supply chains. In simple terms, the main differences of ICT use in the three industries are:

Food & Beverage

- The food and beverage industry is characterized by a heavy reliance on planning for crop planting and harvesting, quality farming and harvesting (even high-tech farming for hazard safety), and efficient inbound farm-to-plant logistics and efficient outbound logistics in general, but mainly concerning the demand for efficient outbound logistics for fresh products. The actual production operations in food and beverage are a mix of manual and automated, with a relatively low dependence on ICT solutions, given the relative low level of production line sophistication. This determines that much of the food and beverage ICT solutions are being leveraged on the farm, for safety and health controls, for crop quality and export market specs, for logistics and for complicated physical and information movement between (remote) farms and offices.

- Penetration of Internet, Intranet and Interactive Web-sites is low, particularly as compared to benchmark countries. Demand is highest for management and growth oriented ICT solutions.

- Food and beverage companies show a relatively healthy awareness of the importance of ICT for production management solutions, with 56% of the companies stating that over the coming twelve months they plan to migrate to more sophisticated ICT solutions for integrating production and management. At the same time, however, all but one of the 19 companies analyzed admit to having insufficient knowledge for deciding what ICT uses would be best for which solutions.

Pharmaceutical

- The pharmaceutical supply chain has heavy reliance on inbound logistics for imports of 85% of their active ingredients, which are transformed in the high-tech drug production lines. Drug sales are subjected to cyclical demands from end consumers and intermediary buyers. Planning for sales and purchasing is thus a vital activity that kick-starts the supply chain operations, for which ICT applications are consequently found throughout much of the planning, sales and orders

operations of the pharmaceuticals industry, linking broad production and management operations, including warehousing and distribution operations in addition to the aforementioned ones.

- Different from the private companies and multinationals, where ICT solutions are ubiquitous, the public firms are using ICT for production operations, but comparatively little in management and almost none for growth. None of the public firms are importantly enjoying the benefits of leveraging ICT for inter-/intra- communications and growth.

Ready Made Garments

- The ready-made garments industry supply chain is characterized by a complex production operation that depends on using cutting-edge textiles production machinery for meeting quality and quantity customer demands. That, plus the traditional reliance of the textiles industry on machinery, determines that ICT solutions in ready-made garments are mainly concentrated in the production areas.
- ICT solutions are relatively weak in management areas, particularly when it comes to ICT for communications systems and for global sales and markets sourcing. This is partially due to the inadequate penetration of basic infrastructure, particularly as concerns the stock of computers and use of corporate email.
- ICT solutions are sought for efficiency gains in production management, as well as for market development.

All three industries share the following trends:

- An increase in ICT expenditures and involvement of IT departments in decision making.
- A moderate improvement of basic ICT infrastructure.
- A slow tendency toward greater penetration and diffusion of ICT solutions.
- A growing interest in locally-developed ICT solutions.
- An increase in the number of companies participating in sector market places and cluster initiatives.

The most important economic implications of these trends will be:

- Greater dissemination of ICT if supported by appropriate education and training.

- Greater dissemination of ICT if ICT suppliers and host industries collaborate in creating case studies, developing joint solutions, and propagating success stories.
- Higher adoption of ICT applications and infrastructures if industry and distribution clusters integrate further.
- Shared network initiatives if increased international competition prompts mergers and acquisitions in the industries.
- Short-term loss of jobs if labor saving technologies are adopted and as companies not adopting said technologies succumb to competition.
- Long-term job creation if the use of labor-saving technologies is more prevalent across the host industry, leading to general growth as a consequence of greater competitiveness.

Overall, although the industries perceive ICT as an instrument to increase efficiency and reduce costs, there is a ubiquitous lack of awareness as to what the optimum ICT systems and tools are for doing so. In each industry there is a clear demand for tailored ICT solutions, which many companies are commonly doing by adapting and customizing MSOffice applications. Most companies state that the ICT industry experts are too eager to push their solutions, and generally unacquainted with the particularities of their industry, thus not fully competent to advise them on best solutions.

The study's findings divulge that, to apply ICT strategically to improve business management activities, there is a serious two-way need for knowledge development: business2ICT and ICT2business. ICT use in industry depends on collective actions guided by strategic planning, drawn from a well-defined strategic market position. To this end the host industries, ICT industry, Government and NGOs/Associations, have roles to play to foster an environment that will foster the uptake of ICT. These roles can be summarized as follows:

HOST INDUSTRY	■ Create and provide aggregate industry information ■ Prepare for industry growth through use of ICT solutions
ICT INDUSTRY	■ Develop consultancy skills to create tailor made ICT solutions for host industries ■ Develop Business and Financial Cases for ICT use
GOVERNMENT	■ Encourage ICT uptake through use of e-Government ■ Facilitate and Promote Industry Growth through e-Marketplaces

NGO & ASSOCIATIONS	■Raise Awareness ■Promote ICT Education and Training

METHODOLOGY SUMMARY

The methodology is basically a multi-tier approach, simply designed, to pick two or three industries in Egypt that are ICT-ready and have the capacity to export. The methodology was designed to choose sectors to analyze within each of these industries using an industry supply chain as a common yardstick. Companies within each industry or industry sector were then selected, based on a set of common criteria. The methodology included the use of a questionnaire to interview 45 of these companies that are representative of their industries and sectors. The findings of this survey were benchmarked against the ICT development of parallel industries in six other countries.

A straightforward survey was conducted to compile the list of industry groups that exist in Egypt. A carefully devised set of filters was used to examine the characteristics of over twenty different industry groups. Three industries passed the filters to emerge as the industries that are mature enough to export, contribute substantially to the total country's manufacturing, enjoy government support for their exports, have a positive export trend and are ICT-ready. These selected industries were Food & Beverages, Pharmaceutical Drugs and Ready-Made Garments. The filters were selected because they constitute pertinent and available tools that can help determine the ICT readiness of the industry.

After exploring the three industries in detail and researching their history and development within the country, it became clear that each of the three industries demonstrates a distinctive set of characteristics. Those sets are not only germane to industries within Egypt in general, but they also resemble the diversity of ICT-ready industries in the country. While the Food & Beverages industry displays a wide range of specialty production areas, the Pharmaceutical Drugs industry, because of its nature, is characterized by a subdivision of multi-national and national companies, and the Ready-Made Garments industry exhibits an interrelated and complex supply chain of outsourced manufacturers.

> InfoAmericas used a generic supply chain as a common tool to investigate the industry's specific supply chain in general and the position of the company interviewed within this supply chain in particular.

The selection of companies within each of the industry sectors relied on a host of data that was collected to substantiate the selection process. A comprehensive list of companies under each industry was gathered. An industry intelligence specialist was consulted to understand the industry's history and development. Extensive discussions and analyses were carried out with the industry specialist to devise the proper manner to select companies. Since the data available for each industry is different, the means to select the companies varied from one industry to the other. Despite particularities among the industries, InfoAmericas developed a common set of criteria that can be

superimposed over the sector companies to result in the final selection of 45 companies. These criteria captured the competitiveness of the company within its industry, its comparative volume of export revenue, and its geographic representation. The companies selected were examined by the industry specialist to ensure their representation of their respective industry.

A general questionnaire was developed to collect information concerning the nature of the company, its present ICT use and vigilance, its human resource capacity and needs, and its plans for developing ICT in the future. This questionnaire was structured for use with the nature of industrial companies in general and their use of ICT within their different operations. The questionnaire was structured to also capture how ICT is typically used in one or all of the company's operations of production, management and growth. The questionnaire made the best use of this classification to indicate the company's preparedness for ICT use.

Industry Selection
An elaboration on the use of these filters:

- Mature enough to export;
- Contribute substantially to the total country's manufacturing;
- Enjoy government support for their exports;
- Have a positive export trend;
- Are ICT-ready.

Industry Sectors
After selecting Food & Beverages, Pharmaceutical Drugs, and Ready-Made Garments through the industry filters, and after meeting with the industry intelligence specialist for each of the three industries, it became apparent that, although the three industries are quite distinctive in both their nature and operations, they can be all comparatively analyzed by using a "snapshot" of their horizontal supply chain. Therefore, it was agreed that the supply chain was the proper means to divide the sectors within each industry, generally breaking it into inbound logistics, operations, outbound logistics, marketing & sales, and service operations.

The Food & Beverage industry is driven by variety and, therefore, displays a great number of specialty sectors (twenty-four, based on ALEB -Agriculture-Led Export Business- a USAID agricultural industry project). This wide diversification of products appears to be a prominent vertical characteristic of the industry. The supply chain within the Food & Beverages industry starts with national produce growing as its prime inbound logistics aspect, with processing as its main operations, and packaging as its chief outbound logistics aspect. These operations seem to be the leading horizontal sectors of the industry.
The Pharmaceutical Drugs industry is widely structured among multinational, public sector, and national privately owned companies. The first group mainly produce drugs

under license issued from a foreign mother company, while the latter two are primarily focused on the production of generic drugs that are available at lower production costs, complemented by other licensed drugs acquired from foreign firms. This is a predominant attribute throughout the Pharmaceutical Drugs industry and thus constitutes a vertical characteristic in examining the ICT readiness of companies within this industry. Also, particular to the Pharmaceutical Drugs industry is the fact that it does not exhibit the kind of comprehensive national inbound logistics within its supply chain, simply because almost all of its raw material is imported, except for one or two companies that use local, naturally-grown herbs. Therefore, packing operations and outbound logistics are its core supply chain operations. It is interesting that while the specialty categorization in the food & beverages industry is important, within the Pharmaceuticals industry it does not appear to be an essential characteristic, because nearly every company produces a wide range of products that are not specific or particular to a certain specialty.

It is safe to state that the Pharmaceutical Drugs industry is a highly ICT-ready industry overall, at least in production. ICT needs are mostly detected in the areas of management, and notably in growth. Because research and development are not done in most Egyptian pharmaceutical companies, the industry is highly reliant on technology developed outside the country and therefore depends on communication to keep abreast of technological breakthroughs, to keep in contact with foreign affiliates and to outsource raw materials.

The Ready-Made garment industry is synonymous with a distinctively familiar supply chain. The basic characteristics of the ready-mades are that of a vertically structured industry of big manufacturers who often rely on a large number of outsourced companies for producing a wide variety of ready-made apparel. The principal dynamic is a large manufacturer who has the resources to bankroll large orders of materials for producing large orders of garments for export. The materials are either imported textiles for finishing in Egyptian companies that the large company outsources, or they are domestically-produced cotton which must be woven, spun, etc. by other companies that the large company outsources. Typically, the large company receives and distributes the materials to the outsourced companies: weavers, dyers, sewers, spinners, cutters, stampers, shrinkers, and the like.

Basically, the ready-mades supply chain is an inbound logistics of national and offshore ordered materials that flow into the main company that forwards a number of its operations out to the companies they outsource. The outsourced companies then complete their part of production. A garment may go to more than one outsourced service. The garments come back into the large company, which may finish the production and plan its outbound logistics to simply inspect, pack and forward ship to the client. The large company also manufactures, but many times it cannot handle the volume of the order, so it outsources as described. Where possible, the large company does start-to-finish manufacture of certain ready-mades, where there is a more complete supply chain within the company itself.

Company Selection
ALEB's company classification indicates the Food & Beverages specialties that are most and least competitive according to their number of subscribers. Fresh Fruits & Vegetables seem to have the highest number of companies, with eighty four companies listed, while Baby Food has the least number of producers, with only five companies listed in this specialty area.

InfoAmericas used export revenue as the main value behind the selection process, for identifying the twenty target companies from the list of the top 100 exporting companies. The companies were subsequently selected and classified with respect to their belonging to the most and least competitive specialty in addition to their location on the export revenue scale.

Similar methods were applied to the other two industries. An elaboration of the selection process is detailed in the annex section of this document.

Questionnaire
The questionnaire was structured to be harmonious with the approach of analyzing an industry through the characteristics of an industry's specific supply chain. Recognizing that each industry has a particularity to its supply chain, InfoAmericas fashioned the questionnaire to permit capturing a snapshot of what the ICT needs and skills gaps are in a company's production, management and growth operations. All industries and companies share the commonality of having production, management and growth functions within their operations.

Interviews
Interviews were planned to meet with the company authorities who can provide the information needed to complete the survey. Pharmaceuticals mainly, and Ready-Made Garments partially, rely on imported inbound logistics as a core source of their raw material. Also, all three industries were selected because of their ICT readiness ability to boost their export revenue. Therefore, an important aspect of the survey was to investigate the inbound and outbound port logistics as an essential part of the industry supply chain. Interviews were lined up with freight forwarders and wholesalers at both ends of the spectrum to gather objective observations concerning claims by industries about the delay and bureaucracy that hurt them at the inbound and outbound points of their supply chain. It was also imperative to understand the ICT readiness of these two government control points and explore their existing ICT uses and skills available.

Benchmark Competitiveness
Simultaneously, while companies representing the three selected industries were interviewed in Egypt, a host of other similar companies were surveyed within the same industries, but in similar countries. These companies were selected because they witnessed an ICT development that contributed to the growth of the economy within their respective countries.

Industry Overviews

- Food & Beverage Industry
- Pharmaceutical Industry
- Ready Made Garment Industry

Food and Beverages: Industry Overview

EGYPTIAN FOOD & BEVERAGE INDUSTRY AT A GLANCE *	
Global Sample: Food & Beverages Markets-2000*	
EU	$US593 billion
US	$US510 billion
Japan	$US259 billion
China	$US65 billion
Brazil	$US46 billion
Australia	$US35 billion
Global Sample: Importance in National Manufacturing-1999*	
	Brazil & Australia: 20%
	Japan: 13.1%
	Canada: 12.7%
	USA : 10%
Global Market Driving Force	Competitive & Bipolar: 1) transnationals like Nestlé; 2) SMEs in regional markets, cater to regional/local tastes & specialties
Egyptian GDP**	$US98 billion
Egyptian Agriculture - Macro**	
Workforce (Agriculture & Irrigation)**	5,069 million (27.8% national total)
Total Agr. Production***	16.4% GDP
Total Agricultural Exports (including cotton)***	10% total national exports (including cotton @ 8%)
Egyptian Food & Beverages**	
Total production 1999-2000	$US10.4 billion
F&B exports	$US100 million
Egyptian Food & Beverages Driving Force	Bipolar: mega national firms w/ JVs & partnerships w/transnationals, major retailers & agents, mostly EU; SMEs in national, regional & international markets, cater to regional/local tastes & specialties

Sources :

**Conféderation des Industries Agro-Alimentaires de l'UE (CIAA) ; secondary sources : UN, Japan Food Industry Center, US Census Bureau, Eurostat, CIAA/UNEP Report 2001, InfoAmericas analysis.*

***Central Bank of Egypt: " Egypt Agricultural Production Figures 1991-1998", (citing Ministry of Planning); and State Information Service Yearbook 2001-2002, Egypt 2001, 5th edition, (citing Ministry of Foreign trade primary & secondary data)*

****World Bank Report 2001 (exports exclude oil exports figures)*

Egyptian Food & Beverage Industry Overview

The Egyptian food and beverage industry is similar to that of other major food and beverage producing countries. The market is quite bipolar: on the one hand, there are large national firms and multinationals, like Vitrac, Americana, Kraft Foods and others, who are growing and producing in Egypt for both the domestic markets and for export to regional and global markets. On the other hand, there is a significant group of SMEs operating mostly in regional and national markets. They may tend to concentrate on national and regional preferences for local specialties. It is uncertain what the shakeout of the Egyptian food and beverage producers could be after 2005, when the GATT conditions change, but industry experts foretell of possible increased consolidation of smaller players under larger multinationals.

The production lines of food and beverage manufacturers are not very sophisticated, although much of the crops planting and cultivating use sophisticated technology applications. Large firms typically are the most technologically advanced. The SMEs often lack the supply chain advantages the big companies have, especially in adopting ICT upstream of the various product lines. SMEs lag behind in: 1) maintaining the life cycle of the product, 2) supporting produce with efficient and effective farm-to-market, both upstream and downstream to the harvest cycles, and 3) sourcing raw materials from international suppliers.

Food safety and quality assurance require investments that the large companies can easily afford and in which they invest, while the SMEs cannot do so as easily. The smaller firms show less ability to use computers, the Internet, the web-technologies and applications that require specific personnel skills and investments in network technologies. This said, while the large firms are not financially disadvantaged in this regard, in general the large firms are not using very advanced ICT applications in their administrative areas. Larger or wealthier firms do use sophisticated farm and crop management tools and methods, however.

There is only a nascent awareness among both large and small firms about the leveraging that ICT can bring when applied systemically in the organization. Most companies lack in-depth knowledge about how ICT can be leveraged to affect their bottom line, so they do not generally invest in management systems. This means that most companies are still operating with structural inefficiencies (e.g. islands of operations). The companies recognize the need to respond to new markets potential by adapting products and services and by seeking partners or alliances, but the strategy for doing so seems to be to maintain

long-term customer bases (EU and Gulf States) rather than to develop real market intelligence for learning how to penetrate new international markets. This is due in part to a comfortable historical relationship with EU commercial partners and to lack of knowledge of other food and beverage markets, particularly that of the United States. Nearly every company interviewed was unaware of how ICT could be leveraged for helping to overcome their lack of knowledge of what their potential new markets could be.

Integration of production and management is still a challenge for most firms, especially if the firm has their own land and grows their products. The remoteness of farms pushes these firms to integrate their communications infrastructures and, to a much lesser degree, to develop more efficient production management systems. Companies attribute their lack of integrated production and management systems (farm-to-office connectivity; remote access to data, etc) to the high-cost of communications for being connected between remote and urban areas. Companies say they would be willing to consider ICT-solutions for communications, but most state they do not have sufficient technical knowledge about which applications would be most pertinent to their needs.

The lack of ICT solutions awareness is made more complicated in the food and beverages companies because of highly specialized needs for farm products software, which must be crop-specific. The lack of ICT-based solutions awareness has a more acute impact on companies who are producing across the entire supply chain (importing seeds, raw materials for planting and growing, packaging materials, and then onward to farm-to-packing or production plant, to storage and then to outbound shipments of fresh and prepared produce). Companies that have operations across the complete industry supply chain have complex needs for technology solutions to improve their business management activities, particularly needs for logistics solutions that could reduce costs. Large or small company, they do not have a good knowledge of what ICT applications can best take care of those kinds of production management needs.

The Egyptian food and beverage industry strategies will increasingly be focused on:

- Niche market production and organic growing markets (biological/ecological production techniques and produce)
- Diversified production and product differentiation for meeting buyer demand, for satisfying discriminating end- consumers with buying power, and for maximizing utilization of existing plant infrastructures
- Large multinational affiliations, JVs, affiliations and so forth
- Upstream distribution and retail chains, both national and international, to take on the responsibility of stock replenishment and deliveries, increasingly becoming the responsibility of producers. For example, to meet demands of Wal-Mart, Carrefour and other large EU and US chains.

- Leveraging communications with outside markets, through locally-available services (ALEB, Chamber of Food Industries, ExpoLink, etc) or directly online, while still relying on personal contact as main sales and marketing approach
- Increased usage of own websites for advertising and internet for communications in general
- Outbound logistics efficiencies improvements for enabling fresh produce exports to far markets, e.g. vertical integration with raw materials suppliers and building collaboration with distribution operators
- Significance of 2005 GATT agreement impacts
- SMEs producing for larger firms and for niche markets

Food & Beverage Industry Strengths and Weaknesses

STRENGTHS	WEAKNESSES
• Cheap labor • Proximity to EU for fresh produce • EU & Gulf State familiarity with Egyptian market quality • Virgin land apt for organic growing • Water availability; not subjected to drought cycles • Meet EU & other countries' non-growing season demands • Hi-tech farm & plant infrastructure • Participation of multinational investors • Local specialty offerings • Presence of services from HEIA, ALEB, ExpoLink and Chamber of Food Industries, although first two are projects with fixed life spans • Firms interested in exploring how IT solutions can help businesses • National market takes non-export-quality production	• Know-how in certain specialty production areas (import foreign experts) • Farm-to-market harvest waste • Centralized management in the hands of owners, resulting in no inclusion of ICT personnel in strategic planning and budgeting for ICT use and development • Traditional EU focus, contributing to lack of knowledge of their international competition (who buys what from where and from whom) and to a low awareness of US and other non-EU markets potential • Low leverage of ICT for markets knowledge building, esp. just-in-time information for highest foreign buying cycle capture, awareness of foodstuffs portals specializing in specific food sectors • Reliance on importing seed, fertilizers & packaging materials • Inbound/outbound logistics inefficiencies, including Customs • SMEs lack supply chain advantages larger producers have, so lag behind larger producers

PRINCIPAL CHALLENGE:

Integration of production and management and improvement of farm-to-market logistics are high priorities companies must face up to. At the moment, management tends to see production facilities as a first priority investment. Often they neglect building a solid business

infrastructure and ICT-based business management systems. In the case of SMEs, the neglect leads to inability of company to respond to customer demand for their products. Indicates lack of awareness concerning the concept and practice of total management solutions.

*Sources: *company interviews; industry experts (esp. ALEB & Chamber of Food Industries).*

Pharmaceuticals: Industry Overview

PHARMACEUTICAL INDUSTRY AT A GLANCE *	
Global Pharmaceuticals Market (Human pharmaceutical drugs only; excludes OTC, veterinary, devices, etc.)	$US400.5 billion
World's Top 50 Companies	81% world sales
Sales Ranking by Region	US: 40.5%
	EU: 26.2%
	Japan: 15.2%
World Pharmaceutical Production	93% concentrated in US, EU and Japan
Global Market Driving Force	R&D; ageing population health care
Egyptian GDP	$US98 billion
Egyptian Pharmaceuticals Industry**	
Population	Total pharmaceutical industry = 364 companies
Total pharmaceutical sales	$US1 billion/year (1% GDP)
Infrastructure	60,000 registered physicians; 20,000 registered pharmacies
Egyptian Pharmaceutical Drug Manufacturers**	
Population	29 drug manufacturers
Exports	$US113 million
Revenue factor	Top 26 drug manufacturers = >65% total Egyptian pharmaceutical industry annual revenue
Egyptian Drug Manufacturers Driving Force	Strategic industry consisting of a good variety of public, quasi public, private and multinational companies. Positive growth drug manufacturing market nonetheless dependent on importing 85% of raw materials; increasing population.

*Sources: *Global statistics-Wisconsin Technical Network, Michael Rosen, May 28, 2003 (citing IMS and others).**Economic Research Forum; IMS Q/V 2001*

Pharmaceutical Industry Overview

Egypt's pharmaceutical industry has over 350 companies, most of who trade in pharmaceutical products either by importing, distributing, packaging or acting as agents for offshore companies. There is a large segment of these companies who manufacture medical supplies and devices. A total of 29 companies actually manufacture drugs in Egypt. Their production satisfies over 92% of the local market needs. The drug manufacturers export regionally and internationally, with the greatest part of their market concentrated in regional (MENA) countries and to a lesser degree in Africa. Some

companies, such as EIPICO, have diversified markets as far as Asia, but this is not a typical case.

About 8% of the local market needs are for prescription drugs that are either not commonly used or have recently been on the market and, therefore, do not have a manufacturer partner in Egypt. These drugs are mainly for coronary, neurological- or cancer-related illnesses.

Because of the objective and purpose of this study (to analyze industries who export), the 29 manufacturing companies are the focus of the Gap Analysis of ICT Penetration in Egyptian Industries. These 29 companies are divided into four different categories according to their type of ownership. Eight public companies under the Holding Company for Pharmaceuticals, Chemicals and Medical Appliances. Four quasi-public companies under the Arab Company for Drug Industries and Medical Appliances (ACDIMA) which is a public/private ownership with the government having a controlling share. Nine companies are referred to as "local private firms". Eight multinational companies operate in Egypt, under local branches of their international parent pharmaceutical companies.

Almost none of the non-multinational manufacturing pharmaceutical companies in Egypt perform any research and development and, therefore, do not develop new curing drugs. They either manufacture generic drugs whose licenses have expired and therefore are available for manufacturing without paying royalties, or they produce patented drugs for which they purchase licenses from the offshore manufacturing company, or they produce non-curing derivatives of vitamins, digestive medicines or nutraceuticals (natural herbal medicines).

The licensing phenomenon coincides with the type of company ownership. Public companies typically manufacture generic drugs along with a few licensed ones. ACDIMA companies produce a solid combination of both generic and licensed drugs, the generic ones constituting the bulk of their business. Private companies tend to produce more of the generic drugs because of their low cost, but they also acquire licenses for the drugs that have a good demand on the market, since this helps them retain good sales revenues. Multinationals have direct access to the mother company licensed drugs, but they must have headquarters approval. Some multinationals still manufacture a few generic drugs, by having acquired local pharmaceutical companies that owned patents for those drugs.
Licensed drugs are sought by the drug manufacturers because they have less competition on the market and because they bring in higher revenues. The added revenue advantage must be weighed against the cost of the drug license. Given those kinds of up-front costs, multinational companies are the ones with the most licenses, while public companies have the least number of licenses.

The Ministry of Health regulates the industry by setting the price of every drug sold on the local market. It also allows each manufacturing company to introduce only five new drugs every year. It is thus the responsibility of each manufacturing company to select its

five drugs wisely each year. They do this by monitoring the market needs, drugs performance and consumption trends.

Manufacturing companies use global sourcing to purchase their active and inactive materials. The generic drug companies global source their active materials at the best available prices. Companies that manufacture licensed drugs must, by law, purchase their active materials from the sole invention source specified by the patent owner and at the price agreed upon in the license agreement. Even multinational companies must adhere to this requirement. They deal with their parent companies that specify the permitted sourcing points. Multinationals also directly import finished manufactured drugs that they package in Egypt for sale either domestically or for export. Inactive materials may be sourced globally at the most competitive prices. Multinationals purchase their inactive material from the parent company's specified sourcing points.

All four types of Egyptian drug manufacturing companies export their products to various regional and international markets. All aim to increase their export share every year. Multinationals are allocated a territory by the parent company, usually coinciding with their company's regional office operations. They may not exceed certain export parameters set by their company. Other Egyptian companies export based on the demand for their competitive prices and product quality. The former Soviet Union and Eastern European countries constitute a primary export partner to Egyptian pharmaceutical companies, in addition to the Arab States. Exporting is done either through scientific offices (sales representation office) operating in targeted export countries. Very often the drug manufacturers have resident agents and/or distributors in those sales target countries. Agents have to apply for drug approval within their respective countries prior to being able to sell it there. Manufactures bid to supply their drugs.

Most drug manufacturing employees, regardless of the type of their company ownership, are aware of the need of ICT and recognize how directly ICT applications have a bearing on their corporate success. By the very nature of the drug business, companies' performance depends on their ability to acquire cutting technology for running their business at all levels. Top management is acutely aware of ensuring their employees possess top-level skills and knowledge of ICT programs and applications, both in the laboratories, on the production line, and in all administrative levels of the company.

This awareness and use of ICT as a standard application in the company's operations is not present in most public and quasi-public companies. Persons who lack the necessary ICT awareness manage these companies. As a result, their companies are quite distanced from the ICT-culture-based private companies. Private companies are not only aware of how technology affects their business profitability and market competitiveness, most of them are moving to aggressively invest in acquiring ICT systems and applications. There are still a reasonable number of companies who remain skeptical about ICT uses and benefits. Their skepticism is born of a lack of guidance and experience with ICT in general. Multinationals have been through the cycle of trial and error with ICT solutions and now use ICT in their businesses as comfortably as wearing a shirt. A couple of the multinationals consider that they do not "have an IT department" because they are a

"business technology" company. This attitude reflects how mainstreamed ICT has become in the blood of the company. These companies are leaders in their field and constitute best practices of ICT use. There are a couple of national private drug manufacturers whose adoption of ICT applications and solutions is very similar to that of the multinational pharmaceutical firms. When one regards the level of their market success, it becomes evident that ICT mainstreamed use in the business culture is a major contributing factor to their market position.

ICT penetration in the pharmaceutical industry is common in production since it is naturally high tech. Drug manufacturing requires precise and quality processes to ensure safety and effectiveness. Much of drug manufacturing deals with drugs for life quality and life safety. ICT applications are used for ensuring quality control and quality assurance all along the computerized drug production lines. Management operations use ICT applications in various areas such as financial, administration, human resources, sales and marketing and inventory. They utilize either office applications at the lowest end, or proprietary specialized software on the highest end, with modified office applications or locally developed software in- between. ICT is least used for business growth activities. In the case of the multinationals, this is explained by the fact that the parent company market growth operations are conducted principally from the main offices. In the case of the non-multinational firms in Egypt, little use of ICT for helping business growth is a question of awareness. In general, apart from drug production areas and aside from sophisticated production management systems which most companies have already got, ICT use is primarily limited to communication by email and internet browsing.

There is a growing trend of the more advanced drug manufacturers to equip their sales and marketing force personnel with laptops and palm devices. The sales and marketing personnel constitute a huge percentage of the drug manufacturers' personnel base. Sales are intricately linked to on-stock active ingredients and packaging supplies, as well as to cyclical product demand. Much of the end-consumer demand and the hospital and pharmacy demand are monthly. This requires an elaborately sophisticated just-in-time information system that links planning to sales to purchase demand to warehouse to offshore orders to production line and then back again through the same loop, all on a monthly, quarterly, semester and annual basis. ICT tools and applications at street level between the sales reps and the customer (pharmacies, hospitals, etc) are thus beginning to be used among some of the more successful national drug manufacturers, since they can directly link the purchase orders to the company data base in real time and tell the customer on the spot what the drugs supplies availability is and what the product production dates will be. Operations efficiency that ICT uses bring to this level of the business have substantially reduced direct purchase order processing costs and they are streamlining supply line logistics enormously in those companies whose sales and purchases departments are using ICT applications for these operations.

The level of ICT penetration in drug manufacturing companies is in direct correlation to the type of company ownership of the manufacturer. On one end, multinationals use ICT profusely within widely used ERP and CRM system applications. On the other end,

public companies have the least ICT penetration, since IT hardware and software are regarded as capital investments that require high-level approvals for purchasing. ACDIMA and private companies are situated somewhere in-between.

The Egyptian pharmaceutical manufacturing companies' business strategies will increasingly be focused on:

- Acquiring international certification and approvals by respective country standard boards and associations to be able to export more.
- Developing additional export partners.
- Improving company top management awareness of ICT capabilities and successes.
- Allowing more ICT penetration in the management processes.
- Exploring ICT applications in growth processes.
- Investigating the possibilities of establishing real research and development activities in Egypt.
- Developing new means to monitor the market trends and needs to better decide on production of new drugs.

Pharmaceutical Industry Strengths and Weaknesses

STRENGTHS	WEAKNESSES
• Low labor costs in a labor intensive industry that uses the same active materials • Large, highly-skilled, experienced national talent pool • Long years top market reputation • Generic drugs superior to those of other middle-income industrialized nations (1) • Serious investment by multinationals that transfer technology and know how. • Competitive pricing by international standards • Negligible tariff and non-tariff protection • Strong alliances with Former Soviet Union and Eastern Europe countries • Strong local market demand • High tech, high ICT production • Companies on the verge of exploiting ICT applications	• Negligible R&D investment • 50% national production by inefficient public firms • Imported know-how • Ministry of Health pricing regulations • Dependency on imports: 85% active ingredients; packaging materials • Built-in restrictions on multinationals' exports • Limited market penetration outside regional Arab markets • Low awareness of ICT impact on business growth potential • Exorbitant cost of drug licenses • Public and quasi- public top management staff lack of ICT awareness. • Skepticism on the ROI in ICT

PRINCIPAL CHALLENGES

Inefficient public firms and even profitable and efficient national private firms will be facing stiff challenges from rich multinational companies who realize that Egypt has a large potential consumption rate with an improvement in literacy, as people learn that they should be taking certain medicines, in addition to an improvement in the Growth Domestic Product (GDP). Therefore, multinationals who are already enlarging market penetration in anticipation of market expansion, will continue to be a market dynamic to watch. Drug manufacturers confront government regulations which affect their ability to sell many medicines at profit, even obliging certain medicines to be sold at below-production costs. In addition to the regulatory framework (pricing) challenge, drug manufacturers and the Egyptian Pharmaceutical industry face the following major challenges: GATT reforms impact in 2005; Quality assurance tests; Research and development; Health insurance coverage; Production contracts

** Sources: Industry experts; company interviews; InfoAmericas analysis.*

(1) The comparative study was conducted by Coopers & Lybrand in 1995.

Ready-Made Garments: Industry Overview

EGYPTIAN TEXTILES AND READY-MADE GARMENTS AT A GLANCE *	
Global Textiles and Clothing	$US360 billion/year total textiles & clothing
	$US200 billion/year total clothing industry
Global Retail Market	$US7 billion
200 largest retailers	$US2.1 billion (30% of global retail market)
Global Retail Market Driving Force	Concentrating under largest retailers
Egyptian GDP	$US98 billion
Egyptian Textiles	$US12 billion total output
	30% of total Egyptian workforce
	25% of total Egyptian exports
	49% of all Egyptian manufactured goods
Egyptian Ready-Made Garments	$US4 billion total production
	$US600 million total exports
	500 RM manufacturing companies (1500 w/intermediary manufacturers included)
	250 RM exporting companies
	250,000 employees
Textiles Driving Force	Hourly labor @ $US1.50

**Sources: A-Arafa Group; Sahara Group; International Textile Manufacturing Federation; Egyptian Garments Exporters Association (EGEA); Ministry of Foreign Trade, "Monthly Economic Digest", January 2003.*

Ready Made Garments Industry Overview

In 2002, the total production of knitted and woven garments by Egyptian ready-made garments companies reached $US4 billion, or 30% of the $US12 billion Egyptian textile manufacturing output. Garments exports represented $US600 million for the same year. About 41% of exports went to European markets in 2002, 37% to the United States, and

the remainder to "other" countries. While the regional markets shift slightly, Europe traditionally has been Egypt's most important export market, followed by the United States.

The international textiles marketplace is characterized by the presence of fierce global competitors and tariffs and quotas (the rules of which will significantly change in 2005). The ready-made sector of textiles is a population of private sector companies which are characterized by a mixture of customer-design-driven or "tailored" production and large retailer chain demands for a wide variety of popular garments such as jeans, t-shirts, and the like, all of which require cutting-edge production line technology in order to comply with client quality and quantity requirements.

Egyptian ready-made garments private manufacturers are largely self-contained, although many rely to some degree on intermediary manufacturers who may be other private manufacturers or public sector "feeders". National companies range in size from the largest weaving manufacturer in the Middle East, which produces a wide range of outer and under garments for men, women and children, and employ nearly 4,500 employees, to a one-product "boutique" manufacturer of ladies lingerie.

There are no multinationals manufacturing in Egypt, although many Egyptian companies have dedicated production lines for exclusive international customers for whom they produce customers' own designs under the customers' tag names. In many of their exports markets, Egyptian garments manufacturers lose brand identity, although many companies who export also have their own national and regional retail stores that sell their own brand name garments.

The industry is traditionally highly reliant on national cotton as one of its most valuable and inexpensive raw materials. Many companies import specific raw materials by global sourcing or from customer-specific raw materials suppliers in order to comply with special client requirements. Recently, Egypt has been exporting a large percentage of their annual cotton production to generate foreign reserves, causing a shortage of cotton on the local market. To compensate, Egyptian manufacturers are importing more cotton from India, Turkey or elsewhere. This adds a logistics complication in the garments manufacturing supply chain.

The heavy activity in the supply chain of ready-made garments is the garments production line itself. The supply chain is "kicked off" by confirmed customer orders for client-specific models or models which the company offers, or kicked off by large retailer-based orders for "me too" types of garments. The production lines are a complexly inter-related and inter-dependent set of operations: designing, spinning, weaving, shrinking, dyeing, cutting, sewing, among others. An assembly line might "collect" over five different pieces for final sewing into one single garment. A large operation could produce over 10,000 finished garments a day, meaning over 50,000 separate pieces must come together and be boxed, labeled, invoiced and ready for shipment. Garments manufacturing rely heavy on effective and efficient inbound logistics

activities for receiving raw materials and piece manufactures for assembly into final garments, and on the outbound end for ensuring on-time delivery of goods.

The garments manufacturers are using highly-sophisticated and expensive production line machinery. ICT use in production is thus machine-specific. Since production is often customer-specs-driven, and the customer will buy only if the garments are made according to exact specs, the manufacturers have cutting-edge garments design capability on the front end of production and highly-sophisticated machinery on the factory floor.

IT penetration in management areas is weak compared to the production line area, because traditionally management views the production line as being the end-all and the be-all of their supply chain activities and it is there that they see their investment priority. While all companies state that ICT is "extremely important" to their business, none have specific budget line items for IT purchases or strategic plans for ICT development in their companies. "When we need a machine, we buy it" is the prevailing statement, despite the fact that machines talked about can cost well over a quarter of a million dollars. That decision is usually made by top management, usually the owner of the company, and normally not in consultation with their ICT department personnel, in the few cases where the company has an ICT department.

The focus on technology for production is a natural tendency in textiles, given the traditional dependency on machinery for production. Production management systems is a relatively new demand, driven by high volume client orders and by the need to compete with other global players who have already adopted ICT solutions for integrated production management. In general, companies have not yet understood how ICT for integrated management solutions can positively impact their profitability.

Illustrative of the lack of awareness of ICT for management and growth: many company managers are not PC-literate and rely on personal secretaries. Many firms rely on software solutions for stand-alone operational functions, much of that being MSOffice applications and/or adaptations. A LAN usually means connecting a few finance department or HR department PCs together, but few if any companies have their finance systems integrated with any other functional areas. Direct sales and marketing are mostly done through traditional personal contact. Customer relations are often handled by email, particularly when dealing with orders, but channeled through one or two authorized persons whose PCs have an account. Fax communication is still a regular communications tool.

Overall, the numbers of PC users in management functions is modest. Where there may be the rare case of "one PC per employee" in management and administration support areas, the numbers of employees with direct Internet and email access from their PCs is very low. This is because management distrusts how employees would use personal Internet and email access if they had it. There is almost a total absence of using e-business solutions, beyond having a basic web site and some company email accounts that are concentrated in the hands of some employees with the strict "need" for email and Internet access.

The Egyptian ready-made garments companies' business strategies will increasingly be focused on:

- Keeping production up to date with latest technology machines that produce to customer specifications;
- Technology-driven production lines for meeting high-volume and wide-product-variety retailer demands;
- Diversified efforts to penetrate other regional markets, particularly the United States, for increasing product demand, while capitalizing on Gulf State market proximity and affinity;
- Retention of loyal clients in front of tough global competitors;
- Retention of national markets in the face of cheaper but often inferior finished garments or raw materials from outside (China especially);
- Decreasing inbound and outbound logistics times for increasing efficiency and cost-effectiveness of the flow of goods;
- Increased use of communication tools and persons in the company who use them;
- Improving and modernizing business management practices, including bar coding production line and retail sales outlets for back office efficiency;
- Increasing awareness and applications of ICT solutions for management and growth.

Ready Made Garment Industry Strengths and Weaknesses

STRENGTHS	WEAKNESSES
• Textiles tradition and skills • Egyptian textiles market traditionally well-known outside Egypt • Easy access to European markets • COMESA/Arab countries trading advantages • Essential infrastructure • Cutting-edge manufacturing equipment and technology, incl. EDI, SCM and PDM • Hourly labor @ $US1.50	• Scarcity of management skills & experience • Traditional industry with residual tendencies to produce "me too" products • Centralized, owner-based decision making • Low leverage of ICT for integrating production management systems • High capital interest rate (15%) • Non-refundable sales tax (10%) • Duties on machinery (5%) • Duties on spare parts/chemicals • Red tape for manufacturing • Government regulations • Production of woven & tricot apparel @ 70% capacity

PRINCIPAL CHALLENGE

On a worldwide level, local suppliers need to change views and learn about global flow of goods for large retail chains like Carrefour and Wal-Mart, who are concentrating around large suppliers who offer a large range of products. The concentration of the ready-made garments industry on a global scale will be a threat to the survival of the smaller, local suppliers.

** Sources: A-Arafa Group; Sahara Group; International Textile Manufacturing Federation; Egyptian Garments Exporters Association.*

ICT Study Findings

The following section discusses the diffusion of ICT infrastructure in the three Egyptian sectors chosen for this study, including information on attitude toward technical infrastructure, general IT use and IT skills.

Role of ICT

All companies surveyed across all three industries regard ICT as key to competitiveness and basic business functions. Only in the Food & Beverage industry did some companies note that ICT was less important given that their growing, packing and processing activities are not sophisticated enough to leverage ICT solutions effectively.

TABLE 1.1 IMPORTANCE OF ICT IN BUSINESS

	Important	Very Important	Average	Total
Food & Beverage	75%	13%	12%	100%
Pharmaceuticals	100%	0%	0%	100%
Ready Made Garments	100%	0%	0%	100%

Source: InfoAmericas/PFC Survey 2003

TABLE 1.2 COMPANIES THAT CONSIDER ICT SOLUTIONS AS PART OF THEIR STRATEGIC PLANNING PROCESS

	Yes	No	Total
Food & Beverage	87%	13%	100%
Pharmaceuticals	83%	27%	100%
Ready Made Garments	27%	73%	100%

Source: InfoAmericas/PFC Survey 2003

Companies in the Ready Made Garment industry consider ICT to be most important in the production phase of operations, particularly as relates to processing and manufacturing. This causes many companies in this industry to disregard ICT as essential to strategic planning and instead consider it simply as an integrated function of production. The value of ICT solutions further up the supply chain remains largely unknown to them, hence their tendency not to see its strategic importance.

The comparatively low number of companies in the Ready Made Garment industry that do not have an internal IT department further underscores this trend, as these are companies generally clustered in the earlier stages of the industry supply chain. Only in the Pharmaceutical industry, where ICT is more prevalent in the sales phase of the industry supply chain, does the number of companies with an internal IT department become more prevalent. Publicly owned pharmaceutical companies represent the near entirety of companies in the industry that do not include ICT in their strategic planning process and who do not have and an internal IT department.

TABLE 1.3 COMPANIES WITH AN IT DEPARTMENT

	Internal	External*	None	Total
Food & Beverage	63%	13%	24%	100%
Pharmaceuticals	85%	5%	10%	100%
Ready Made Garments	55%	27%	18%	100%

**Outsourced services*

Source: InfoAmericas/PFC Survey 2003

Internal IT departments in the Pharmaceutical industry are concerned with basic infrastructure maintenance and upkeep of any ICT solutions. This is often conducted in tandem with the developers of any existing ICT solutions being used by the companies. The same is true for the other two industries, although in the case of these latter, internal IT departments are often charged with developing in-house software solutions based on MSOffice applications. Solutions include such things as developing Excel Macros as a substitute for more robust financial management programs. In the case of Food and

Beverage and Ready Made Garments, external IT service providers are usually referred to as the developers or installers of proprietary or more sophisticated ICT solutions.

The general lower presence of an internal IT department in the Ready Made Garments industry is mirrored in the general absence of an IT budget. In both cases this obeys a generally lower diffusion of basic ICT infrastructure, including computers and networks, as compared to the other two industries.

Publicly owned pharmaceutical companies openly recognize that they do not have an IT budget and generally feel their IT/ICT purchases are reactive and leave little room for developing or purchasing more adequate solutions.

Across all three industries, where a budget is available it usually ranges between 3% and 6% of operating budget. Where budget is not allocated, but companies recognize the need for it, the desire for an ICT budget is usually symptomatic of companies' desire to acquire more sophisticated ICT solutions to become more efficient. Indeed, across all industries, between 60% and 70% of all companies surveyed believed ICT solutions if acquired could help them improve management efficiency.

TABLE 1.4 COMPANIES WITH A BUDGET FOR IT/ICT

	Yes	No but Required	Not Required	Total
Food & Beverage	44%	38%	18%	100%
Pharmaceuticals	67%	20%	13%	100%
Ready Made Garments	26%	37%	37%	100%

Source: InfoAmericas/PFC Survey 2003

In Food & Beverage and Ready Made Garments, where family owned companies account for 92% and 61% of businesses respectively, Executive Management tends not to consult with the IT department or with the Department Head when purchasing ICT solutions.

The concentration of ICT related decisions amongst Executive management points to a schism between IT departments and owners, often mentioned by interviewed companies. Company owners often complain that the IT department and their respective department heads are too desirous to invest in ICT. The respective IT and department heads in turn complain that Executive Management often considers ICT an expense rather than an investment, despite what their saying that ICT is key to business and competitiveness. This divergence of values regarding ICT was often attributed by owners and department heads as resulting from the lack of malleable knowledge regarding how ICT would affect the bottom line of the business.

Many companies in the Food & Beverage industry have more than one major production or processing center, thereby contributing to the greater participation of Department Heads in regards to the choice of ICT infrastructure and solutions.

TABLE 1.4 WHO DECIDES ON PURCHASES OF IT/ICT

	Executive Management Only	Department Head Only	Jointly	Total
Food & Beverage	65%	12%	23%	100%
Pharmaceuticals	50%	0%	50%	100%
Ready Made Garments	90%	0%	10%	100%

Source: InfoAmericas/PFC Survey 2003

Most company executives had trouble correlating specific ICT solutions with individual components in the industry supply chain. However, they could associate ICT solutions with areas of operation within their company. Therefore the three generic operations used in the survey as a backdrop against which said ICT tools could be viewed were: Production, Management, and Growth.

- **Production**: Related to activities in the supply chain related to sourcing, packaging, processing, and storing the goods in question.
- **Management**: Related to the coordination of production with sourcing, sales, costs and general front and back office activities.
- **Growth**: Related to sales.

In such light company executives were able to place where they believed ICT had the greatest importance upon their operations. In all industries, ICT was considered to play a pivotal role in production. Whereas in the Pharmaceutical industry interviewees considered production to include supply chain logistics, sourcing and the actual production activities per se; executives in the other two industries associated ICT in production to its specific role in manufacturing and producing and generally failed to see production as encompassing other "softer" operations.

This point of view has lead to a heavy emphasis on ICT as related to modern machinery and automated assembly and production lines but a less insightful consideration for ICT solutions in other areas such as warehousing, sourcing, and distribution.

TABLE 1.5 IMPORTANCE OF ICT BY TYPE OF OPERATION

	Production	Management	Growth
Food & Beverage	61%	56%	22%
Pharmaceuticals	71%	71%	71%
Ready Made Garments	64%	71%	50%

N.B. Answers note incidence and do not sum 100%

Source: InfoAmericas/PFC Survey 2003

Most companies considered ICT solutions a potentially powerful tool for helping them grow. This viewpoint was generally limited to development of web sites and e-commerce capabilities rather than the streamlining of information under solutions such as Customer Relationship Management (CRM) and Knowledge Management (KM).

ICT Infrastructure Penetration in Egypt

TABLE 2.1 SCOREBOARD OF ICT INFRASTRUCTURE IN EGYPT

	Food & Beverage	Pharmaceutical	Ready Made Garments
LAN	53%	50%	55%
WAN	6%	11%	0%
Intranet	18%	35%	18%
Internet	38%	65%	45%
Corporate E-mail	31%	55%	36%
Website	37%	75%	64%

Source: InfoAmericas/PFC Survey 2003

The diffusion of ICT infrastructure continues to be low across all industries despite demand for increased ICT integration. Unsurprisingly, the size of companies correlates closely with the level of penetration. Larger companies have more evolved infrastructures, while smaller businesses normally "lag behind".

Given the rather high level of computer penetration, is not surprising that network infrastructure should also show relatively high penetration. WAN penetration is almost exclusively limited to large companies with significant international operations. The gradual creation of industrial groups (tied to mergers and subsidiaries) is gradually encouraging the installation of interconnected local networks, particularly in the Food and Beverage industry.

TABLE 2.2 COMPUTER PENETRATION BY INDUSTRY

	Food & Beverage	Pharmaceutical	Ready Made Garments
Computer Penetration*	100%	100%	100%
Sufficient Penetration	70%	84%	36%
Deficient Penetration by Ratio of <30%	10%	4%	39%
Deficient Penetration by Ratio of >30%	20%	12%	25%
Total	100%	100%	100%

**All companies surveyed owned computers, hence a penetration of 100%. Companies were asked to measure their current stock of computers to the ideal amount. The difference between current stock and ideal stock is represented as a Deficient Penetration Ratio*

Source: InfoAmericas/PFC Survey 2003

At face value all industries present optimal computer penetration, but the survey revealed that although the entirety of companies interviewed had a computer in the work place, the number of computers was often insufficient. Asking companies the optimal number of computers they needed and comparing their current stock measured deficiency. Companies across all three industries noted that shared computer access was often sufficient for many of their computer literate employees and that a one-to-one ratio of computers to computer literate personnel was not always required.

The Pharmaceutical industry being the most sophisticated in terms of ICT solutions showed unsurprising high penetration ratios for computers. Almost exclusively publicly owned companies noted deficiencies, and privately owned companies reported satisfaction with current computer stocks. In the Food & Beverage and Ready Made Garments industries, companies with the largest deficiency ratios cited cost or low liquidity as the main culprits in keeping the gap wide.

TABLE 2.3 INTERNET ACCESS BY INDUSTRY

	Food & Beverage	Pharmaceutical	Ready Made Garments
No Internet	8%	0%	3%
Dial-up	54%	35%	52%
DSL	23%	30%	18%
Network	15%	35%	27%
Total	100%	100%	100%

Source: InfoAmericas/PFC Survey 2003

Internet access is dominated by dial-up connections, and usually limited to company owners or heads of department. Egypt's access to Internet is relatively recent and penetration rates reflect roughly five years of active uptake. Dial-up connections will continue to dominate in the short and medium term as the Egyptian government offers free or subsidized Internet connections.

Fast speed Internet connection is most predominant in the pharmaceutical sector where industry standards demand streamlined communication. In the Food & Beverage it is symptomatic of companies with various locations, while in the Ready Made Garments industry it is usually reserved for larger exporters.

Companies in the Food & Beverage and Ready Made Garments industries, who do not have internet connection rely on faxes to process customer orders.

TABLE 2.4 WEBSITE PENETRATION BY INDUSTRY

	Food & Beverage	Pharmaceutical	Ready Made Garments
Have Website	81%	75%	64%
Interactive	37%	20%	36%

Source: InfoAmericas/PFC Survey 2003

The survey revealed that although nearly three fourths of all companies have a website, most of these can be characterized as a first stage, one-way information to their customers with minimal interactivity. Very few companies have implemented ERP to integrate their information systems with their customers. For many Egyptian companies this can be a low-cost marketing and communication tool, mostly for the presentation of company activities and available products, but remains underused.

Second stage websites (those with greater interactivity) are usually limited to larger companies with exports representing over 30% of their annual revenue. This is particularly true in the Food & Beverage and Ready Made Garment industries, whereas in the Pharmaceutical the objective of more sophisticated websites is to provide end users and doctors with product information.

Egyptian companies across all sectors are skeptical of developing more sophisticated websites. This hesitance stems from two factors. The first is derived from the enthusiasm of the dot.com era during which many companies were promised greater e-commerce and paid high prices for very basic websites that never generated any traffic, let alone clients. There is therefore a general mistrust about the potentials of e-commerce. The second factor affecting low desire to develop websites is the lack of business portals to which companies can link and collectively promote themselves. Without these business portals, website promotion rests more on the shoulders of individual companies who neither have the time nor skills to promote their websites internationally.

ICT Solutions

Sophisticated technologies and applications are still not prevalent. Although there is demand for increased ICT integration and solutions, diffusion of such solutions remains low outside the Pharmaceutical industry, or beyond large exporters or suppliers of multinationals in the Food & Beverage and Ready Made Garments industries.

TABLE 3.1 TYPES OF ICT SOLUTIONS USED

	Food & Beverage	Pharmaceutical	Ready Made Garments
	Business Applications		
None	12%	0%	18%
OTS or Tailored Office Applications	81%	31%	78%
Local Proprietary Solutions	21%	70%	17%
Sophisticated Applications	7%	27%	4%

N.B. Sum is not 100% as companies may use more than one solution

Source: InfoAmericas/PFC Survey 2003

Despite the most sophisticated solutions being limited to the largest players, the absence of ICT solutions is however not inversely limited to small companies. Small batch processes feeding into different stages of the supply chains of the Food & Beverage and Ready Made Garments industries are characterized by employing high amounts of personnel and labor that prove difficult and costly to integrate into ICT solutions. The reliance on labor, coupled with very competitive labor costs will continue imposing a significant barrier to greater ICT diffusion and explains the high marks given to "sufficiency" of ICT solutions in these industries.

TABLE 3.1A PENETRATION OF SOPHISTICATED ICT SOLUTIONS

IT Business Solution	Food & Beverage	Pharmaceutical	Ready Made Garments
SCM	2%	8%	0%
ERP	3%	27%	1%
CRM	1%	5%	1%

Source: InfoAmericas/PFC Survey 2003

SCM (Supply Chain Management)

SCM is in an embryonic phase. Greatest interest for future adoption was demonstrated by the Food & Beverage industry, as large companies supplying the European market are interested in decreasing time-to-market and distribution cost within Egypt. Long term implications will result in the reshaping of relationship with suppliers, producers, distributors and retail stores, as integration of processes moves up the complete supply chain, gradually displacing traditional relationships and communication techniques that are currently favored by suppliers to these larger companies.

CRM (Customer Relationship Management)

CRM is gradually being implemented with particular opportunity for growth in the Pharmaceutical industry where customer contacts within the company are various and across a large sales force. Companies with helpdesks and interactive websites demonstrated the highest interest and knowledge of CRM.

ERP (Enterprise Resource Planning)

The low percentage of companies using ERP is not surprising give the high costs with respect to company size and because the market is only now beginning to offer solutions for SMEs. Pharmaceutical companies, who are generally larger, will provide the best medium term prospects for ERP solutions. The growing need to increase efficiency as a factor in winning market share in European exports is encouraging companies in the Food & Beverage industry to explore ERPs, particularly with domestic suppliers.

TABLE 3.2 ARE CURRENT ICT SOLUTIONS AND SOFTWARE SUFFICIENT

	Food & Beverage	Pharmaceutical	Ready Made Garments
Profuse	19%	16%	18%
Sufficient	43%	50%	55%
Deficient	38%	34%	27%
Total	100%	100%	100%

Source: InfoAmericas/PFC Survey 2003

Large software houses have developed flexible ICT solutions for all industries, particularly as concerns ERP systems. The larger companies mainly deploy this software. Nonetheless, and particularly in the Food & Beverage industry, there are examples of bespoke (low-cost, low-complexity, friendly interfaces) being developed by small in-house IT teams and by local Egyptian suppliers. These solutions focus mainly on intra-company processes and procedures, rather than interfacing and streamlining communication with markets and other elements across the respective industry supply chain.

These types of Locally Developed Proprietary Solutions are gradually making inroads against OTS (Off The Shelf) applications or tailor made office applications that dominate the market (although the latter may technically not be considered ICT solutions per se). Fully one-third of companies surveyed in the Food & Beverage and Ready Made Garments industries planning to make ICT solution purchases in the next year, consider these types of solutions very attractive and in suit with their resources. The high penetration of such solutions in the Pharmaceutical industry underscores this trend.

TABLE 3.3 COMPANIES PLANNING ON PURCHASING ICT SOLUTIONS IN THE NEXT 12 MONTHS

Food & Beverage	Pharmaceutical	Ready Made Garments
56%	75%	36%

Source: InfoAmericas/PFC Survey 2003

OTS solutions are often considered "Pseudo-solutions" and are characteristic to companies with networks but limited Internet connectivity, and to companies that grade their level of ICT knowledge as "normal" or "poor" (see ICT Skills). In the Pharmaceutical industry, such applications are limited almost exclusively to publicly owned companies

TABLE 3.4 WILL NEW ICT SOLUTIONS INCREASE REVENUE

	Food & Beverage	Pharmaceutical	Ready Made Garments
Yes	29%	100%	15%
No	12%	0%	19%
Unsure	59%	0%	66%
Total	100%	100%	100%

Source: InfoAmericas/PFC Survey 2003

The growing role of Locally Developed Proprietary solutions is helping make companies aware to the benefits of ICT solutions, because the suppliers of these solutions are more adept at understanding company needs and tailoring solutions, than the large international software houses. This is contributing to shifting the perception that ICT solutions are mere tools for maximizing production/manufacturing efficiency to one of truly creating support for supply, logistics and strategic decision-making. Indeed, across all three

industries, companies generally believe their manufacturing/production processes are competitive and that attention should be focused on improving logistics, reducing costs and responding to increased international competition by increasing sales.

TABLE 3.5 WHERE ARE ICT SOLUTIONS SOUGHT ACROSS OPERATIONS

	Food & Beverage	Pharmaceutical	Ready Made Garments
Production	25%	0%	14%
Management	38%	30%	21%
Growth	60%	50%	73%

N.B. Results do not add to 100%. Results denote incidence of response

Source: InfoAmericas/PFC Survey 2003

IT Skills

The success of ICT technologies depends not only on adequate penetration of infrastructure and solutions, but also on the presence of specialized personnel with the skills needed to access and use the technologies.

TABLE 4.1 COMPANIES SATISFIED WITH THE ICT KNOWLEDGE OF THEIR EMPLOYEES

	Food & Beverage	Pharmaceutical	Ready Made Garments
Satisfied	32%	83%	81%
Not Satisfied	68%	17%	19%
Total	100%	100%	100%

Source: InfoAmericas/PFC Survey 2003

Companies across all three industries are generally satisfied with the level of ICT of their personnel. In the Pharmaceutical industry this is a direct result specialized training programs offered on a continual basis.

Satisfaction in the Food & Beverage sector is attributed to the low penetration of more sophisticated solutions. This has caused companies to consider their employees proficient in the limited number of ICT solutions used. As companies obtain more ICT solutions for higher supply chain areas, the need for training will rise.

In the Ready Made Garment industry companies showed a general lower threshold of awareness concerning ICT solutions. As a consequence of this, their level of satisfaction concerning employees' knowledge of ICT, beguiles an underlying lack of awareness of ICT solutions as opposed to a true measure of satisfactory proficiency and understanding of ICT solutions.

TABLE 4.2 COMPANIES OFFERING IT OR ICT TRAINING

Food & Beverage	Pharmaceutical	Ready Made Garments
29%	57%	36%

Source: InfoAmericas/PFC Survey 2003

Obstacles to Growth

TABLE 5.1 MAIN OBSTACLES TO GREATE ICT USE AND UPTAKE

	Food & Beverage	Pharmaceutical	Ready Made Garments
Infrastructure Deficiency	19%	0%	41%
Cost	44%	18%	23%
Too Expensive	74%	17%	70%
Lack of Liquidity	26%	83%	30%
Lack of In-house expertise	25%	17%	18%
Unfamiliar with Available Solutions	42%	0%	32%
Doubtful about Cost-Benefit	3%	33%	4%

Source: InfoAmericas/PFC Survey 2003

Basic shortcomings in computers, high speed internet access and network connectivity are a serious impediment to further ICT uptake in the Ready Made Garments industry. This is partially attributed to more conservative and "old –school" management styles that tend to be unfamiliar with ICT solutions. More important is the high reliance on labor; ICT solutions are perceived as job killers, and in light of the low cost of Egyptian labor, regarded as too expensive.

Cost is frequently cited as an obstacle to further ICT diffusion, although lack of liquidity is often the direct cause than the actual cost of solutions. This points to the need for ICT suppliers to provide more flexible payment terms and for the need to obtain financing from third parties. In cases where the actual cost of the solutions is considered too expensive, most of the recipients are medium sized companies. Heads of IT departments (when existent) often noted that this perception often arose from executive management not realizing that investing in ICT would actually free-up resources from other areas in the medium term and contribute to amortizing the cost of the initial investment.

Roughly one fifth of all companies across the three industries noted that they lacked in-house expertise with which to determine what ICT solutions were best for them. This answer often reverts directly to the lack of an IT department and a general tendency to limit decision making amongst the company owners and not make more use of the input of department heads. ICT suppliers, who are patient enough to explain, measure and re-explain the benefits of tailor-made solutions could bridge this credibility gap.

Of enormous importance is the general lack of awareness of ICT solutions. Again, this points to a lack of IT personnel in some cases, but it brings to light the dire need for the ICT industry to reach out to companies and carefully explain how solutions will affect bottom line. This indicator ties in with the number of companies citing low cost-benefit

as an inhibiting factor. Generally only companies with some experience of ICT solutions would be savvy enough to be able to estimate cost-benefit and turn down solutions based on this analysis. The high number of Pharmaceutical companies that doubts the cost-benefit of many solutions is symptomatic of this because they are amongst the most experienced users of ICT and therefore the most demanding users.

Country Benchmark Comparisons

Food & Beverage – Mexico

MACRO COMPARISON

	Mexico 2003*	Egypt 2003**
GDP	US$ 663 bi	US$98 bi
Food & Beverage Industry Production	US$78 bi	US$10.4 bi
Food & Beverage Exports	US$1.3 bi	US$ 100 million
Number of Companies	2,700	1,900

*Source: * INEGI (Instituto Nacional de Estadistica y Geografia), Banco de Mexico*
*** Central Bank of Egypt, Chamber of Food Industries*

Rationale

Mexico's Food & Beverage industry was chosen as a benchmark to Egypt because of the similar size of their respective industries. Furthermore, the export dynamics of both countries is similar wherein the USA represents as key potential customer and potential competitor in a similar way Europe is to Egypt.

Situation

In 1995 Mexico's Food & Beverage industry enjoyed tariff exemptions on exports to the US and was poised to increase exports dramatically. Furthermore, US imports of similar goods were not to be exempt until 2003, granting the Mexican industry plenty of time to prepare for competition. At the time, Mexican exports were further favored by a devalued currency and a growing US market.

Demand was particularly strong for processed tomato products, frozen fruits and vegetables, and canned goods. With the exception of a dozen large companies, Mexico's Food & Beverage industry was dominated by SMEs who could not readily assume greater demand without a reorganization of production and management procedures.

Although US importers were eager to import cheap Mexican produce, they were reluctant to sign large deals because of deficiencies in logistics, warehousing and time to market. Suppliers were scattered and not integrated into purchasing portals. The Support Services for the Agricultural Marketing Agency (ASERCA) estimated that in 1997 that the loss of produce from farm to factory was an average of 23% and that deliveries were late 35% of the time. A further need to move toward HAACP and similar type

certifications was identified if the Mexican industry was to also compete in safety and quality standards.

Action

Simply put, Mexican Food & Beverage companies failed to act. Outside an elite group of large conglomerates, companies have failed to streamline their operations. Many factors contributed to this, yet both associations of the industry and the Mexican Ministry of Agriculture (SAGARPA) note that the failure to build ICT solutions on top of growing ICT infrastructure hampered the industry.

In 1996 a government package worth US$700 million was created with the purpose of increasing competitiveness in the industry in time for 2003 when US imports of similar products would be tariff free. Included within the package was a mandate to increase basic ICT infrastructure penetration in three stages, and from these new platforms of penetration, allow companies to make better use of ICT solutions.

TABLE 6.1 ICT INFRASTRUCTURE PENETRATION

	Mexico 1997*	Mexico 2003*	Egypt 2003**
LAN	35%	43%	53%
WAN	3%	3%	6%
Intranet	10%	12%	18%
Internet Access	21%	44%	38%
Corporate E-mail	19%	39%	31%
Interactive Website	13%	43%	37%

*Source: *INEGI (Instituto Nacional de Estadistica y Geografia), Confederacion de Productores Alimenticios, InfoAmericas Análisis*
***InfoAmericas/PFC Survey 2003*

The program was largely successful in diffusing ICT infrastructure but failed to create mechanisms through which ICT solutions could be adopted and affect operational efficiency. The population of companies that uses ICT solutions today is roughly the same as that in 1997. Although this group of companies often upgrades solutions and their sales increase, the industry as a whole still lags in the uptake.

The absence of programs that fostered two-way awareness of ICT solutions allowed a pivotal disjunction to emerge between the Food & Beverage and ICT industries. The ICT industry attempted pushing ready-made solutions without seriously adapting them to local needs. Many Food & Beverage companies complain about buying expensive solutions since to this date these solutions are not truly useful to them. This fostered a continued reliance on cheap labor and raw materials.

TABLE 6.2 ICT SOLUTIONS USE

	Mexico 1997*	Mexico 2003*	Egypt 2003**
None	16%	8%	12%
OTS or Tailored Office Applications	78%	86%	81%
Local Proprietary Solutions	32%	37%	21%
Sophisticated Applications	6%	6%	7%

N.B. Sum is not 100% as companies may use more than one solution

*Source: *INEGI (Instituto Nacional de Estadistica y Geografia), Confederacion de Productores Alimenticios, InfoAmericas Análisis*
***InfoAmericas/PFC Survey 2003*

Results

The inability of the Food and Beverage industry to increase efficiency as a whole is making front-page news. ICT uptake is not entirely responsible for this, but over the given time span, greater diffusion could have made a difference. Mexico will be unable to compete with the expected influx of US good as a result of the tariff elimination in 2003. Imports for Q1 2003 from the US already grew 20% and Mexico is expected to have a US$770 million trade deficit in this sector by end 2003, an increase of more than 100% over 2000.

Lessons Learned

- Diffusion of basic ICT infrastructure will not raise competitiveness unless ICT solutions are built upon this base.
- ICT industry must understand local industries better, so as to develop tailor-made solutions that are useful and thereby avoid skepticism from the recipient industry.
- Failure to consider ICT solutions as a legitimate means of raising industry efficiency may contribute to serious loss of competitiveness and compromising of industry health.

Food & Beverage – Portugal

MACRO COMPARISON

	Portugal 2003*	Egypt 2003**
GDP	US$1820bi	US$98 bi
Food & Beverage Industry Production	US$10.5 bi	US$10.4 bi
Food & Beverage Exports	US$1.2 bi	US$ 100 million
Number of Companies	1,916	1,900

*Source: * EIU (Economist Intelligence Unit), Association of Food Producers*
*** Central Bank of Egypt, Chamber of Food Industries*

Rationale

Portugal's Food & Beverage industry was chosen as a benchmark to Egypt because of the similar size of their respective industries and because Europe represents the main export market for both countries.

Situation

Increased competition regionally and domestically from European companies made Portugal's Food & Beverage industry assess how it could increase competitiveness. Two issues were of particular importance: a) raising the value added component of Portuguese production and b) allowing SME greater access to market. ICT solutions were seen as potential catalysts for both issues. In the case of the former, ICT solutions could help decrease costs and thereby raise value added. In the case of the latter, ICT could flatten the competitive landscape through e-commerce solutions.

Action

Portugal's Food & Beverage industry used its associations of the industry to study industry dynamics and supply chains and identify key areas where ICT solutions could have an impact. Parallel efforts were coordinated with the European e-Business Market Watch to measure levels of ICT penetration n the industry.

TABLE 6.3 ICT INFRASTRUCTURE PENETRATION

	Portugal 1998*	Portugal 2003*	Egypt 2003**
LAN	31%	36%	53%
WAN	17%	19%	6%
Intranet	15%	20%	18%
Internet Access	64%	76%	38%
Corporate E-mail	50%	66%	31%
Interactive Website	49%	61%	37%

*Source: *E-Watch 2003, Centro de Pesquisa Tecnológica do Portugal, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

Results of the studies were followed by concerted efforts at the industry and government level. Government provided financial assistance to purchase basic ICT infrastructure and funded NGO workshops designed to train SME owners as to the benefits of ICT solutions and maximum uses of infrastructure. Industry level efforts focused on grouping companies in clusters along the industry supply chain and then using these clusters to foment collaborative ICT solutions.

Large retailers and processors were used as magnates around whom clusters of suppliers could be shepherded. Once clusters were established network solutions such as EDI were introduced with the benefits of economies of scale and collective bargaining. Exporter portals became more prevalent under similar groupings, with the backing of associations of the industry.

TABLE 6.4 ICT SOLUTIONS USE

	Portugal 1998*	Portugal 2003*	Egypt 2003**
None	<5%	<2%	12%
OTS or Tailored Office Applications	85%	87%	81%
Local Proprietary Solutions	51%	63%	21%
Sophisticated Applications	10%	11%	7%

N.B. Sum is not 100% as companies may use more than one solution

*Source: *E-Watch 2003, Centro de Pesquisa Tecnológica do Portugal, InfoAmericas Analysis*

***InfoAmericas/PFC Survey 2003*

Results

Portugal's Food and Beverage increased diffusion of ICT infrastructure and uptake of ICT solutions, particularly CRMs and KMs. This resulted in an 11% rise in production per employee. Although exports did not rise substantially, greater efficiency translated into a stronger participation of Portuguese companies in the local market. Associations interviewed for the study indicated that over 8% of their members reported spending significantly less time lost supervising or remedying delivery of orders. Indeed, 73% of companies reported ICT bringing them "good" or "very good" benefits to their operations as a whole.

Lessons Learned

- Diffusion of basic ICT infrastructure must be accompanied with fostering of ICT solutions.
- ICT solution uptake requires fostering of environments where ICT industry and the host industry can exchange ideas and together create specialized solutions.
- Adoption of ICT solutions, particularly amongst SMEs, requires awareness building of neutral parties, perceived by the host industry as not simultaneously selling solutions.
- Efficient leveraging of ICT solutions can be obtained by clustering groups across a host industry's supply chain.

Pharmaceutical – France

MACRO COMPARISON

	France 2003*	Egypt 2003**
GDP	US$ 1.6 tri	US$98 bi
Pharmaceutical Production	US$31 bi	US$1 bi

Pharmaceutical Exports	US$ 12.8 bi	US$ 113 million
Number of Companies	280	364

*Source: * EIU (Economist Intelligence Unit), Association of Drug Manufacturers*
*** Central Bank of Egypt, Economic Research Forum*

Rationale

France's Pharmaceutical industry was chosen as a benchmark to Egypt's because regionally it is an important competitor and offers solid reference for best practices. Furthermore, the industry has made conscientious efforts at exploring how ICT can improve their competitiveness.

Situation

France historically has a good level of ICT infrastructure and a well-educated work force that is reasonably proficient in ICT solutions. The Pharmaceutical industry is looking to increase its exports regionally, particularly to the former Soviet Union and Eastern Europe.

France's Pharmaceutical industry is actively involved in fostering uptake of ICT at an industry level and participates with the EU's e-Watch program in identifying trends in ICT diffusion.

Action

Since the early 1990's, and particularly as of 1998, France's Pharmaceutical industry is sharing ICT information amongst its players. The first steps involved internal monitoring of ICT uptake and then the identification of "champions" or case studies that could be shared across the industry in an effort to disseminate best practices. Associations of the industry commissioned these studies.

Under the umbrella of associations of the industry, the Pharmaceutical industry further grouped its members into activity clusters along its industry supply chain and into groups with common export or production areas. The objective was to reinforce the use of common networking and communication uptake technologies.

TABLE 7.1 ICT INFRASTRUCTURE PENETRATION

	France 1998*	France 2003*	Egypt 2003**
LAN	63%	67%	50%
WAN	32%	34%	11%
Intranet	49%	51%	35%
Internet Access	95%	99%	65%
Corporate E-mail	81%	87%	55%
Interactive Website	55%	60%	75%

*Source: *E-Watch 2003, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

The penetration of basic infrastructure and ICT solutions is well spread, and the industry is focused on improving current solutions.

TABLE 7.2 ICT SOLUTIONS USE

	France 1998*	France 2003*	Egypt 2003**
None	10%*	8%*	0%
OTS or Tailored Office Applications	84%	86%	31%
Local Proprietary Solutions	34%	37%	70%
Sophisticated Applications	6%	6%	27%

N.B. Sum is not 100% as companies may use more than one solution

*Source: *E-Watch 2003, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

Results

Continued improving of ICT uptake and solutions has resulted in a widespread use of mobile platforms with CRM solutions being used by the sales' forces. Annually, since 1998, 40% of companies report "positive" and "very positive" impact on logistics sourcing and management process.

Electronic trading platforms are more widespread, facilitating the "cooperation" of production facilities.

In 2003, the latest survey of the industry indicated that the time spent filling orders was reduced 75% since 2000 thanks to more and better use of EDI.

Lessons Learned

- Diffusion of best-case practices is important to the continuous uptake of ICT solutions, even in areas already considered profuse with ICT solutions.
- Industry must develop regular internal benchmarking studies, and gather continuous information about the industry so as to make best use of ICT solutions and provide the ICT industry with information that will help create better solutions.
- ICT solutions require continuous updating at an industry level if competitiveness is to be maintained.

Pharmaceutical – Argentina

MACRO COMPARISON

	Argentina 2003*	Egypt 2003**
GDP	US$142 bi	US$98 bi

Pharmaceutical Production	US$2.1 bi	US$1 bi
Pharmaceutical Exports	US$1.2 bi	US$ 113 million
Number of Companies	230	364

*Source: * Argentine Ministry of Economy, Association of Drug Manufacturers*
*** Central Bank of Egypt, Economic Research Forum*

Rationale

Argentina's Pharmaceutical industry was chosen because of the similar size it has with Egypt's. Furthermore, Argentina presents a clear example where ICT solutions were used in concerted effort to raise efficiency.

Situation

In 1997, Argentina's Pharmaceutical industry had good levels of ICT infrastructure with pockets of serious deficiency in smaller urban areas. The industry was facing growing regional competition and the onset of an economic recession. Government was increasing taxes on the industry.

Action

Argentina's Pharmaceutical industry made enormous efforts to consolidate under associations of the industry and face the impending economic and fiscal crisis as one front, and seek common solutions.

In 1998 the industry held the first of various workshops designed to build two-way awareness between the ICT and Pharmaceutical industry. This resulted in a regular dialogue concerning of tailored solutions.

By 2000, these workshops became quarterly events. SME drug manufacturers were strongly targeted. These work shops evolved into common training seminars by mid-2001. All participating members of the Pharmaceutical industry could send their employees to off-site training in specific ICT solutions common to the entire industry. Enthusiasm amongst the industry was such that by 2001, the first penetration studies were commissioned in Buenos Aires and then replicated in elsewhere.

TABLE 7.3 ICT INFRASTRUCTURE PENETRATION

	Argentina 1997*	Argentina 2003*	Egypt 2003**
LAN	65%	71%	50%
WAN	13%	16%	11%
Intranet	39%	47%	35%
Internet Access	85%	97%	65%
Corporate E-mail	17%	68%	55%
Interactive Website	14%	32%	75%

*Source: *INDEC, Asociacion of Drug Manufacturers, InfoAmericas Analysis*
*** InfoAmericas/PFC Survey 2003*

TABLE 7.4 ICT SOLUTIONS USE

	Argentina 1997*	Argentina 2003*	Egypt 2003**
None	-	-	-
OTS or Tailored Office Applications	65%	55%	31%
Local Proprietary Solutions	47%	63%	70%
Sophisticated Applications	35%	45%	27%

N.B. Sum is not 100% as companies may use more than one solution

*Source: *INDEC, Asociacion of Drug Manufacturers, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

Results

Pockets of basic infrastructure deficiency improved, while uptake of ICT solutions across the industry saw important gains over the period.

The regular holding of workshops contributed to a regular flow of tailored solutions that were considered useful by the industry. Furthermore, common training sessions helped uniform ICT skills across the industry and reduce in-house training costs. These results were particularly noticeable amongst SMEs.

Since 1998, exports increased 3% and the sector actually grew 21.8% during 2002, reaching over US$1 billion, and despite an economic recession.

Associations of the industry report that the expansion of the sector contributed to more sales force positions being opened, and this in turn is feeding the need for wireless LAN and CRM solutions.

Better training and less cost have meant a relative protection of salaries and higher levels of employee satisfaction resulting in lower HR turnover.

Lessons Learned

- Host industry must make efforts to regularly interface with the ICT industry.
- Shared diffusion and education of ICT solutions will not only affect the bottom-line of individual companies, it will also contribute to greater industry competitiveness and gains.
- Host industry associations are highly responsible for rallying individual companies behind common causes and disseminating information amongst members of the host industry.

Ready Made Garments – Brazil

MACRO COMPARISON

	Brazil 2003*	Egypt 2003**
GDP	US$556 bi	US$98 bi
Ready Made Garment Production	US$4.6 bi	US$4 bi
Ready Made Garment Exports	US$1.1 bi	US$ 600 million
Number of Companies	760	500

*Source: * Brazilian Central Bank, Textile Manufacturers Federation*
*** Central Bank of Egypt, Egyptian Garments Export Association*

Rationale

Brazil's Ready Made Garments industry was chosen as a benchmark to Egypt because of the similar size of their respective industries. Furthermore, Brazil made enormous use of ICT as a means of obtaining competitiveness and reverting an import dependency on ready-made garments.

Situation

In the early 1990's Brazil's Ready Made Garments industry was opened to international markets. The industry had repeatedly failed to invest in new technologies and solutions and was quickly overwhelmed by imports. The sudden onslaught of imports threatened many local jobs and made the government focus on ways of improving competitiveness and reverting an import dependency.

The industry was highly concentrated in Brazil's SE states—it's most affluent region and government interest was to introduce ready-made garment manufacturing to other regions.

Action

From 1997 to 2001 the industry spent US$653 million in upgrading machinery. The new equipment allowed for ICT solutions to be built around them if proper ICT infrastructure existed. To this end the government provided fiscal incentives to purchase basic ICT infrastructure. Incentives included subsidies on purchases of equipment and lower VAT taxes on ICT equipment and services.

Large companies invested in EDI, CAS and SCM solutions and through them fostered ICT uptake of amongst suppliers.

TABLE 8.1 ICT INFRASTRUCTURE PENETRATION

	Brazil 1995*	Brazil 2003*	Egypt 2003**
LAN	50%	59%	55%
WAN	5%	7%	-
Intranet	8%	10%	18%

Internet Access	20%	57%	45%
Corporate E-mail	12%	20%	36%
Interactive Website	3%	18%	36%

*Source: *IBOPE, Textile Manufacturers Federation, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

SMEs invested more in basic networks and Internet Portals that were promoted by associations of the industry for exports and as supplier databases for large local retailers. More networks allowed faster and greater dissemination of design to factory and greater tracking of inventory and orders.

Associations of the industry held yearly contests to prize the best ICT solutions. Categories were split according to size of the garment company and to the type of solution being developed.

Government training institutions (SENAC and SENAI - Serviço Nacional de Aprendizagem Commercial/Industrial) offered courses specifically designed for ICT solutions in the Ready Made Garment industry and tied these courses within the greater framework of ICT solutions of management and industrial production.

TABLE 8.2 ICT SOLUTIONS USE

	Brazil 1995*	Brazil 2003*	Egypt 2003**
None	17%	8%	18%
OTS or Tailored Office Applications	80%	86%	78%
Local Proprietary Solutions	20%	37%	17%
Sophisticated Applications	3%	6%	4%

N.B. Sum is not 100% as companies may use more than one solution

*Source: *IBOPE, Textile Manufacturers Federation, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

Results

In 2001, Brazil posted a positive trade balance in the sector by raising exports 29% over 1999. Total production reached US$1.3 billion (this figure since varies given currency fluctuations). ICT solutions and modern machinery were credited with contributing to this success.

Associations of the industry reported an overall increase in efficiency of 25% (as measured by a fall in defects, completion of orders, and tracking of inventory). Furthermore, the diffusion of basic ICT infrastructure contributed to new industrial poles emerging in the NE and Central regions.

Lessons Learned

- Determined government coordination can rapidly increase uptake of ICT solutions.
- Web presence, if properly promoted, can be the key to rapid export growth.
- Widespread access to ICT training by neutral third parties contributes to uptake of solutions
- Associations and other third parties can create incentives for the ICT industry to be more pro-active in seeking opportunities and developing solutions for the host industry.

Ready Made Garments – Turkey

MACRO COMPARISON

	Turkey 2003*	Egypt 2003**
GDP	US$470 bi	US$98 bi
Ready Made Garment Production	US$10 bi	US$4 bi
Ready Made Garment Exports	US$1.3 bi	US$ 600 million
Number of Companies	840	500

*Source: * Euromonitor 2003, University of Bogazici*
*** Central Bank of Egypt, Egyptian Garments Export Association*

Rationale

Turkey's Ready Made Garment industry was chosen as a benchmark to Egypt's because of the similar dynamics of their respective industries and because Europe represents the main export market for both countries. Furthermore, Turkey has adopted EU strategies for fostering ICT uptake in key industries.

Situation

Falling market share regionally from European companies made Turkey's Ready Made Garment industry assess how it could increase competitiveness. There is particular fear about China being able to export without protection barriers under the ATC as of 2005.

Action

Plans for increasing competitiveness first emerged from the government and from the local ICT industry. Local ICT industry had developed action plans for fostering uptake across a variety of industries including textiles and ready-made garments. The action plan included creating horizontal applications within clusters of companies and developing solutions in conjunction with universities and associations of the industry.

TABLE 8.3 ICT INFRASTRUCTURE PENETRATION

	Turkey 1998*	Turkey 2003*	Egypt 2003**
LAN	54%	62%	55%
WAN	4%	5%	-
Intranet	13%	16%	18%
Internet Access	35%	49%	45%
Corporate E-mail	14%	22%	36%
Interactive Website	12%	48%	64%

*Source: *University of University of Bogazici, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

Government focused heavily on increasing penetration of basic infrastructure and relied on propagation of Internet services largely through its state-run telecom company. E-commerce solutions and infrastructure in particular were embraced by the Ready Made Garment industry. Internet portals were regarded as important tools for flattening the competitive landscape and offering Turkish companies an opportunity to obtain more suppliers and sell more easily in Europe.

TABLE 8.4 ICT SOLUTIONS USE

	Turkey 1998*	Turkey 2003*	Egypt 2003**
None	13%	10%	18%
OTS or Tailored Office Applications	72%	73%	78%
Local Proprietary Solutions	16%	21%	17%
Sophisticated Applications	15%	17%	4%

N.B. Sum is not 100% as companies may use more than one solution

*Source: *University of University of Bogazici, InfoAmericas Analysis*
***InfoAmericas/PFC Survey 2003*

Results

Turkey's success in promoting exports of Ready Made Garments is not entirely attributable to the uptake of ICT infrastructure and technologies, however it is regarded as an important contributor. The diffusion of basic infrastructure grew over 30% since 1997 and this directly influenced the propagation of e-commerce solutions. Exports through Internet portals are now estimated to account for 9% of exports, up from 1% in 1997.

Companies surveyed by the University of University of Bogazici, report cutting their procurement costs by 50% and increasing the number of suppliers as a consequence of participating in and creating supplier portals for the industry.

Lessons Learned

- Industries require specific business cases or action plans to be drawn up for the ICT industry to follow and thereby increase penetration in the host industry.
- Diffusion of basic Internet infrastructure and e-commerce solutions can be quickly leveraged and provide a competitive means of reaching markets.
- Participation of third parties, such as universities, helps develop solutions and provide information to the host industry.

Conclusions

Economic Implications

The economic impact of ICT solutions across any industry is dependent on five general considerations:

1. Disposition toward ICT solutions
2. Diffusion of Basic Infrastructure
3. Prevalence along the entire industry supply chain
4. Practicality and adaptability of ICT solutions
5. Measurable results

The first consideration emerging from the section *ICT Role,* is that across all industries, all companies consider uptake of ICT solutions to be important to their current activities. More importantly, most respondents expect to see ICT solutions bring them future benefits. Such views are not limited to larger companies already using ICT solutions to some degree, but are widely held across the entire gamut of companies in each industry.
The second consideration is that the economic impact to companies through uptake of ICT solutions must be measured in terms of the ICT infrastructures currently at their disposal (e.g. Website, Internet, Corporate Email, etc.). Noticeable gaps in basic infrastructure continue to exist as made evident by the section *ICT Penetration.* These gaps will continue to drain the potential of ICT solutions across the supply chain of any industry.

Thirdly, only a relatively small number of companies have so far been involved to a significant extent in the uptake of ICT solutions. Without a critical mass of uptakers, ICT will continue to have only minor implications for the improvement of the industry as a whole. Furthermore, suppliers of ICT solutions will be less interested in improving and adapting their products and services to fit a particular industry or bloc within it.

The fourth consideration ties in with the lack of "adequate" ICT solutions caused by a lack of enough uptakers in the host industry. As made evident in the section *Obstacles to ICT Growth*, many companies are at a loss when having to find and choose the right ICT

solution. Partially this is the result of low or non-existent ICT budgets and inadequate skill sets and training. This is also symptomatic of a schism between supply and demand of ICT solutions. Companies want tailor-made solutions. They want to understand how these solutions will affect them but often lack the means to measure this for themselves. They are, therefore, skeptical of sophisticated solutions that are too costly. ICT suppliers have yet to successfully bridge this gap with impartial information and tailor-made solutions.

Finally, this gap can be breached with tangibles that show bottom line benefits of ICT solutions. This can only be achieved if ICT suppliers understand enough of an industry so as to be able to adapt their products and services accordingly. At this point ICT suppliers can make more accurate estimates of savings and gains in efficiency. For this to occur however host industry companies must be more forthcoming and provide not only more information about themselves but create and provide information at an industry aggregate level through associations of the industry.

Having explained these considerations it is important to see what implications they hold for the companies surveyed.

There are two implications for the supply chain of the companies interviewed. The first is increase efficiency of company processes, especially in the areas of logistics, administration and order management. The second implication is subtler because it hinges on increased customer satisfaction. Improved customer satisfaction through faster delivery, easier communication and increased visibility on the market will foster greater loyalty and sales.

Another important implication is the affect on the structure of the host industry. So far, uptake of ICT at the levels observed in the three industries has not resulted in any structural changes, but it is encouraging a number of processes already underway. Case in point is the formation of industrial groups along key points of industry supply chains that both causes the need and is a consequence of interconnected local networks and data exchange formats. (e.g. Pharmaceutical and Food & Beverage companies more frequently share production facilities and raw materials, and suppliers to large clients in all three industries share visibility on export and industry portals).

All three industries show the following trends:

- An increase in ICT expenditures and involvement of IT departments in decision making.
- A moderate improvement of basic ICT infrastructure.
- A slow tendency toward greater penetration and diffusion of ICT solutions.
- A growing interest in locally developed ICT solutions.

- An increase in the number of companies participating in sector market places and cluster initiatives.

The most important economic implications of these trends will be:

- Greater dissemination of ICT if supported by appropriate education and training.
- Greater dissemination of ICT if ICT suppliers and host industries collaborate in creating case studies, developing joint solutions, and propagating success stories.
- Higher adoption of ICT applications and infrastructures if industry and distribution clusters integrate further.
- Shared network initiatives if increased international competition prompts mergers and acquisitions in the industries.
- Short-term loss of jobs if labor saving technologies are adopted and as companies not adopting said technologies succumb to competition.
- Long-term job creation if the use of labor saving technologies is more prevalent across the host industry, leading to general growth as a consequence of greater competitiveness.

Policy Implications

The following implications arise from the singular and comparative analyses conducted. Some points are likely to be important for future development and could be considered relevant to policy formulation at this point.

Policy Implications for Industry
"Industry development depends on collective actions guided by strategic planning, drawn from a well-defined strategic market position".

Host Industry Role

Co-Implementation of Projects and Initiatives

Co-implementation of ICT projects and initiatives by clusters of companies along key points of an industry's supply chain could help reduce the "islands of activity" that prevail today. To a small degree, some industry integration is already occurring among companies who "rent out" idle production lines, or among suppliers clustered around large consumers who demand particular network connectivity and data exchange formats. Developing co-implementation of projects and initiatives will stimulate uptake of ICT solutions particularly as concerns production and growth operations. It would also serve to flatten industry structure by unburdening larger companies of the need to grow vertically in order to guarantee proper supply and distribution.

Similar initiatives include the creation of marketplaces and portals for companies in the host industry and surrounding market and supply chain. This will promote an orientation toward cooperation among parties and can be delimited by product type or industry cluster category.

Plan for Growth

Companies at an individual and aggregate industry level must plan for the effects of growth and, in particular, the effects of growth instigated by ICT solutions. Growth requires management and efficiency if it is to be successfully capitalized. ICT solutions must be considered within this context: as mediums to achieve growth and as tools to manage growth. (Refer to the adapted Burke Litwin model for systemic change in the annex section of this document as a guideline for planning for growth with ICT solutions).

Planning for growth also involves developing aggregate host industry information so the industry as a whole can be traced, as well as a particular company's trajectory within an industry. Leveraging ICT solutions for transparent information availability across a host industry will enhance the quality of industry planning for growth and skills development. Transparent information at company levels aggregates to industry-level information and knowledge that can be consolidated and centralized by leveraging IT solutions. This information can be made available to all, facilitating the transfer of know-how across the industry and allowing for easier export promotion and FDI.

Update Skills of Staff

Companies must have strategic HR development programs for ensuring that the individual skills improvements of their personnel can translate into improved business performance. It is particularly important to ensure that they provide budget and time for their personnel to continually update their ICT skills. This will foster maximum leverage of existing ICT solutions and facilitate searching for new ones. Most importantly, it will ensure a brief learning curve whenever new ICT solutions are adopted in the company.

This can be achieved through industry associations that offer workshops for clusters of companies, and even through ICT-supplier-led workshops. As a stimulus for uptake of new ICT applications, ICT suppliers could include with the purchase orders for their products and services, programs and applications training for all the users in the client company.

ICT Industry Role

Develop Consultancy Capabilities and Create Tailor-Made ICT Solutions

The ICT industry has a clear need to understand industry-specific management needs at a systemic level. Host industries feel the ICT industry is still too aggressive in pushing its products and not focused on adapting them to particular industry and company needs. If the ICT industry fosters creating a solid stable of ICT experts with top-level management consultancy skills to industry from the host industry's viewpoint, they will be better positioned to advise industry on leveraging ICT for integrating management and

production systems. This will help overcome the lack of confidence of the host industry in the potential and benefits of new technologies.

Develop Business/Financial Cases

Company and industry case studies should be developed for showing how ICT solutions positively impact industry. Demonstrating the positive effect of ICT solutions on the ROI and competitiveness of companies' supply chains will illustrate how those ICT solutions can positively create a ripple effect on the overall industry and facilitate ICT uptake by industry. In many instances, the case studies would involve using tailor-made ICT solutions that zero in on overall supply chain logistics solutions and scaled business management solutions. Success stories could be developed, in which successful use of tailor-made ICT solutions would be explained and the information disseminated. This would help build up confidence between ICT suppliers and industry ICT customers.

Government Role

Encourage Uptake of ICT amongst SMEs

Customs

Government may find it useful to establish a dialog with industry players to discuss the question of duties for ICT hardware and software imports. As companies and industry clusters adopt more and better ICT solutions, overall industry production efficiency will increase and government will be able to benefit from more tax revenues coming from increased industry production and sales. It is a win-win situation from the beginning. It seems potentially fruitful, therefore, to create a positive dialog with industry ICT users to work toward an understanding where industry does not feel "penalized" on both ends of their business: at one end, duties for ICT materials and on the other end taxes on sales and profits.

Tax declarations

Government can create data base systems so that the possibility of individual subjective interpretation in tax declaration reviews is minimized. Much of what are taxable export goods and at what rates specific good are taxable, can be made available as basic, data-based information, readily and easily accessible online to both industry and government. An open, transparent information database for all exporters and government offices could help build up more confidence and collaboration between industry and government. It also seems that this would help the government offices by making their access to this information easy and accurate.

Efficiency of public programs and services deliveries could be a good beginning point. The positive end point could be to establish a partnership arrangement between government and business, wherein government strengthens services systems in areas such as accountable public management of financial resources and customs duties information (such as streamlining the existing letter of credit/letter of guarantee procedures) and, "in return for" this, businesses could create accountable corporate processes for declaring their exports earnings and for paying taxes.

To increase confidence and partnership approaches to stimulating industry export growth, the monitors would be able to be monitored, and those who are monitored would be able to monitor.

Financial incentives

A tax policy with the objective of providing an incentive to business to become more efficient will result in generating more revenue and profit, and ultimately, paying more taxes. A couple of tax incentive examples to consider might be: tax breaks for certain types of reinvestment of revenue into businesses; or tax breaks for business job creation, such as indirect tax breaks provided in the form of training subsidies or paybacks for job-specific training for businesses who create new jobs but also need to upgrade job skills for new personnel. On the flip side of receiving incentives for growth and profitability and job stimulation, companies should be encouraged to support and participate in the establishment of a system of transparency, responsibility and accountability across and up and down the entire tax system—an expansion of the existing system of government recognition towards good business practices.

Companies appreciate the mentioned government system of recognizing exporters with a record of good business practices, by not obliging them to have each and every export item scrutinized before getting customs approval for export. This existing system might be expanded on. For example, it might be possible to initiate a type of improved government services in tandem with improved best practices in business. Much like an "employee of the year" program.

To support efforts such as the above ones mentioned, government might consider how they could effectively undertake campaigns for increasing transparency to build industry confidence. The purpose of the campaigns might be to generate stakeholder and expert dialog and action for creating new and modified approaches to providing financial incentives for industry investment in ICT. Reaching consensus on what could be fair conditionalties for getting incentives for investing in ICT might be positively debated and a "social contract" could be worked out between government and industry. Demonstrated production performance improvements linked to ICT uses could be one such conditionality.

Facilitate & Promote Market Places

Develop information about export destination markets and make it available. Increase visibility of exporters and suppliers through portals and databases. Commercial offices of embassies armed with highly-trained commercial experts using IT efficiently and effectively to promote Egyptian commercial interests overseas, can serve as a bridge to the international market.

There can be an aggressive campaign by the government to make full partners of all of their overseas consulates and embassies to leverage ICT applications for promoting of Egyptian business with accurate, complete and up-to-date industry information. The commercial offices of Egyptian diplomatic missions could be encouraged into becoming veritable hubs of efficient information sourcing for potential investors in Egypt and for

Egyptians seeking export markets information in the host countries where the embassies are located.

Facilitate & Promote Information

Promote appropriate and cost-effective internet-based solutions, supporting the development of an integrated platform for inter-/intra governmental and industry communications, transactions, training, service delivery and provision of two-way industry, business and government information, available to business and to the public.

The government central ministries, such as the Ministry of Foreign Trade and Ministry of Industry and CAPMAS all seem to have a vital role not only for creating excellent databases of industry statistics and information, but also for sharing with the Ministry of Communications and Information Technology the business of raising awareness of the importance of having timely information on all matters concerning government and business. At this time there is a paucity of reliable information and statistics on industry in Egypt. The end point of government ministries and organizations working positively together in common-interest areas might be to eliminate the current situation of having partial information that is often out of date or contradictory.

Government ministries can take natural leadership roles in ensuring easy, affordable access to the communications infrastructure, especially for the SMEs who are distinctly disadvantaged compared to the big companies. For example, government might study the possibility of providing high-volume telecommunications users some kind of discount rates.

The pressure for integration of management solutions through leveraging of ICT also raises policy challenges, especially in the area of harmonization of product legislation and regarding the monitoring of transports and logistics impacts on economy and environment. The Ministry of Communications and Information Technology might identify a natural leadership role to play here, since product harmonization requires consensus-building processes and common action by different ministries and government entities.

Government role for growth

As indicated above, there is a natural function of government in ensuring that local industry information is fully developed. The right, accurate and up-to-date market information to the right persons on a sustained and timely basis is crucial for market players. Government and private sector resources can be brought to bear to join resources for creating and maintaining a database on industry statistics.

With mutual confidence driving a dynamic government2business and business2government partnership type of relationship, government and industry can together create a dynamic strategy for promoting the creation of reliable export markets information, and key exporter databases. With industry rallied behind government efforts to help create such information bases, all would be well served, since information databases would be user-oriented.

Association and NGO Role

Raise Awareness

Host industry and ICT industry require greater interaction and exchange. Promoting success stories, motivating development of solutions (through prizes for example), and hosting round table discussions, all would improve the awareness of existing ICT solutions, how they may be used, and how they must be adapted to particular industry nuances.

Awareness building normally flows along a variety of channels. The host industry requires knowledge building of how solutions can help and what solutions are available. Use of "champions" is a particularly useful way of developing awareness in this arena. Awareness may also be created within the ICT industry regarding the dynamics of host industries. White papers, case studies and sector specialist seminars will help create this awareness.

Industry associations, chambers and federations are natural dynamic players in implementing these initiatives.

To perform their role associations, chambers and federations should and could play; government might consider how to help equip, connect and train the associations, chambers and federations in all varieties of IT software and software. They should be stimulated in leveraging IT solutions for collecting and disseminating industry information. It seems that government could be an extremely influential factor for helping to achieve the reengineering of associations, chambers and federations and other NGOs, with the end goal being the reinvention of those groups into being fast, efficient and reliable centers of expert information on industry at the click of a mouse.

The Ministry of Communications and Information Technology is already seen as a prime mover in helping to promote ICT and to change attitudes toward ICT uses. It might be interesting for them to develop interventions whose objectives would be the recreation of the above-mentioned organizations into centers of information excellence, whose mission would be straightforwardly simple: to serve as effective and efficient conduits that provide timely, accurate and useful information to those who request it.

This kind of information service would be especially important for and appreciated by the SMEs, who are still among the most conservative industry elements, and who lack confidence in the potential and benefits of new technology for their businesses. To insist a bit more on the above points: these organizations can be effective ripple-effect groups. But to be so, they themselves require modernization so they can effectively and efficiently assume the kind of potential pivotal role discussed above.

What types of information could the associations and chambers provide and how? Associations and chambers can be effective, credible transmitters of the ICT message and information. Government is a neutral entity with no commercial ICT product to sell business. So they would be seen as neutral interlocutors when showing businesses and

industry how ICT solutions can be leveraged for achieving competitive industry advantages and for enhancing corporate efficiency and profitability.

These organizations might also transmit information on successful initiatives from other industries around the world, which have developed forms of collaborative product design, joint marketing and integrated logistics among the various players in the value chain. They could promote the dissemination of these kinds of information and help build up common knowledge about ICT in the industry sectors.

There is a need to promote information about ICT potential in general, but in particular transmitting information on best ICT business practices, on business intelligence and on market research can enhance creating trust and confidence in what ICT solutions can bring business and industry. Best practices information can also help companies learn about what appropriate skills are required for leveraging ICT applications and solutions. To that end, again, industry associations can play an important part in taking up actions to disseminate this kind of information and for helping get their members involved.

The above examples are all tall orders. How can one begin? One of the first steps for achieving the above is would seem to be for government to create a systemic communications strategy for raising awareness between ICT suppliers and industry. It would be a strategy that is created by industry and government members who come together for that purpose. It is crucial that any communications strategy take into account what the receivers of information need and want to hear and in what form.

This communications strategy would probably have as its end purpose, the effective, repeated and constant bringing together of ICT suppliers and industry ICT users. Possible venues could be: customer-driven forums; constant media communications; round-table discussions; other mutually designed effective events and actions. The events would be designed to drive home the message about ICT for business solutions. They would be dynamic events for demonstrating how government and business are active, mutually supportive partners in increasing industry's adoption of ICT applications.

Promote ICT Education, Training & "Cultural Change"

In summary, therefore, some of the primary implications this report has for government and industry, are that government has a natural role as an important locomotive for facilitating transfer of know-how and skills in ICT technology. The different venues could be through training courses, workshops and establishment of centers of excellence, using available resources of associations, chambers, federations and other NGOs. Government has the outreach capability for bringing the two players together. Using their mandate and prestige will help facilitate change in attitudes toward ICT solutions, particularly in SMEs. Train-the-trainer programs can also be used to multiply the reach of ICT education programs.

And facilitating financial incentives for companies to use or obtain business or ICT consulting services is another key area for government to positively explore in, concert

with industry players, ideas for creating an ever-growing dynamic and collaborative relationship of government2business and business2government.

IT CLUSTER

ICT PENETRATION AND SKILLS GAP ANALYSIS

SECTION III:
INSTITUTIONALIZATION REPORT

JULY 2003

ACKNOWLEDGMENT

This study is the synergistic result of the collaborative work and contribution of over 250 professionals. We would like to express our deepest gratitude and appreciation to everyone who participated in the study. Companies' executives allocated their companies' resources and time to share their knowledge and experiences with high level of transparency and cooperation. Industry experts provided continuous support to the team to analyze the dynamics of examined industries. The team exerted an outstanding effort to undertake the study and hopes that the result will prove useful to the community. The study team wishes to thank MCIT & USAID teams for their contribution in providing guidance and support to the study in its different phases.

Moustafa El-Gabaly, Director

IT Cluster, P*f*CE

E-mail: mgabaly@ieee.org

Mehdi Majidi, Executive Director

IT-in-Education, P*f*CE

E-mail: Mehdi.Majidi@us.ibm.com

ACRONYMS

CRM	Customer Relationship Management
ERP	Enterprise Resource Management
F&B	Food and Beverage / Food Processing Industry
GDP	Gross Domestic Product
HCG	Harvard Computing Group
ICT	Information and Communications Technology
IT	Information Technology
KM	Knowledge Management
KRA	Key Result Area
MCIT	Ministry of Communications and Information Technology
OTS	Off The Shelf
P4	Purpose 4, P*f*CE project
P*f*CE	Partners for a Competitive Egypt
ROI	Return On Investment
SCM	Supply Chain Management
SGA	Skills Gap Analysis
LOE	Level of Effort
SMEs	Small and Medium Enterprises
SO17	USAID Strategic Objective # 17 (2000-2009 plan for Egypt)
SOW	Scope of Work
USAID	United States Agency for International Development

Sections

I. INTRODUCTION

Under its Strategic Objective 17 (SO17) the United States Agency for International Development (USAID) provided its contract to operate and implement *"Skills for Competitiveness Developed Initiative"*. The initiative that is being implemented by "Partners for a Competitive Egypt- P*f*CE" project was crafted to respond to the challenges of global competitiveness and workforce development. It aimed to build private sector coalitions, develop global thinking, and promote Egyptian leadership and innovative public/private sector partnerships.

A principal objective of P*f*CE project is to support the activities of the Ministry of Communications and Information Technology (MCIT) in implementing its National ICT Development Program as well as developing the IT Cluster in Egypt.

The ICT Penetration and Skills Gap Analysis (SGA) study was developed to respond to the immediate inquiries for information of MCIT and USAID on the needs for ICT skills covering the local, regional, and global markets. The outputs of the study will help alleviate the need for basic information on skills required by various planning activities undertaken by USAID and the MCIT. The results of the assessment and the related recommendations will add to the continuity of the ICT workforce development. The study will help in selecting the educational and training interventions supported by USAID and MCIT. It will provide the ICT stakeholders with the basis for continued ICT human resource and workforce development plans for maximum growth of the ICT sector. It will also serve as a basis for expanding the use and adoption of ICT practices and applications by Egyptian industries with the purpose of raising productivity and increasing Egyptian products competitiveness.

This report is one section of the ICT penetration and skills gap analysis report. It starts with an encompassing executive summary of the compiled executive summary of the three sections of 'ICT Penetration Gap', ICT Skills Gap', and 'the Study Institutionalization'. The repetition of the executive summary is intentional to serve our various readers.

II. EXECUTIVE SUMMARY (ICT Penetration & Skills Gap)

The ICT penetration and skills gap analysis study is composed of three separate but related sections. The first section—SGA in ICT Industry—provides a comprehensive analysis of ICT skills currently used in ICT companies and the existing gap these companies face to respond to their market needs. This section focuses on identifying the gap between the skills needed by the industry and those currently existing. The methodology adopted was based on identifying and selecting the main ICT cluster segments, identifying the need and types of educational institutions to be included in the study, and setting the criteria to select targeted sample organizations and countries benchmarked.

The second section—ICT penetration in Egyptian Industries—focuses on the demand side of the ICT industry. It analyses the level of ICT penetration and the ICT technologies required for enhancing their productivity and hence their competitiveness. On the other hand, the study will allow identifying the required skills needed for the ICT sector to help increasing the ICT penetration. This section examined pharmaceutical, ready-made garments, and food and beverage as potential industries for implementing ICT applications. It aims at providing an industry analysis and determining the level of ICT penetration gap within the industry's supply chain. It also provides benchmark data on the use of ICT in industrial development.

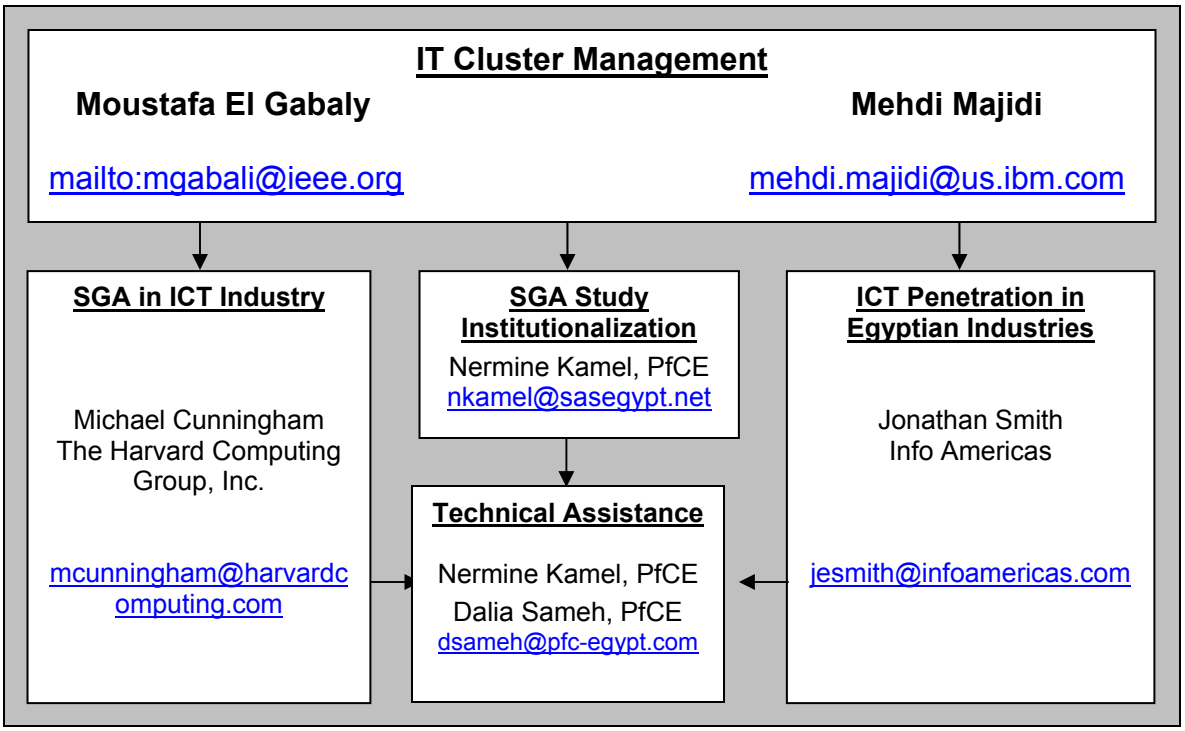
The third section—SGA Study Institutionalization—provides guidance and explanation on the way the study was conducted as well as suggestions and recommendations for repeating the study. The objective of this section is to ensure the continuity and usefulness of the study by defining the research process, methodology, and plan to repeat the study, as well as to share the lessons learned from the current experience with the implementers of the study.

The third section was developed by PfCE IT cluster team and the first two sections of the study were respectively conducted by Harvard Computing Group (HCG) and InfoAmericas companies in collaboration with PfCE IT Cluster management team who provided managerial and technical supervision in developing the related methodologies, selection criteria, and implementation. The final report on the findings and recommendations were conducted and completed by HCG and InfoAmericas.

A .Study Team

The following diagram illustrates the structure of the team that implemented the study.

ICT Penetration and Skills Gap Analysis Structure



Following summary of each section provides an encompassing overview of the entire study.

B. ICT Skills Gap in ICT Industry

Egypt's ICT sector exhibits skills gaps in two primary areas. First, there are gaps within individual ICT organizations. Second, there are gaps in the external consulting support that is required for the development and management of a healthy sector. For the most part, Egypt does not have severe skills gaps for technology-based skills, with the exception of significant gaps in advanced technologies such as Business-to-Business (B2B) and complex security and enterprise systems. In the telecom segment, wireless and mobile applications represent concerns. The advanced skills gaps are the result of "late adoption" of these technologies in the domestic and regional market, and are not a question of inherent ability in the workforce. These gaps will diminish as market demand increases in these areas and export activities increase.

The most significant gaps lie in business and personal communication skills and project management skills. It is difficult to hire employees with baseline skills such as Business Writing and Technical Writing in both Arabic and English. For export-oriented firms, foreign language skills in English and French are critical. In general, most organizations feel that graduates from both the universities and the general education system are not equipped with the right skills.

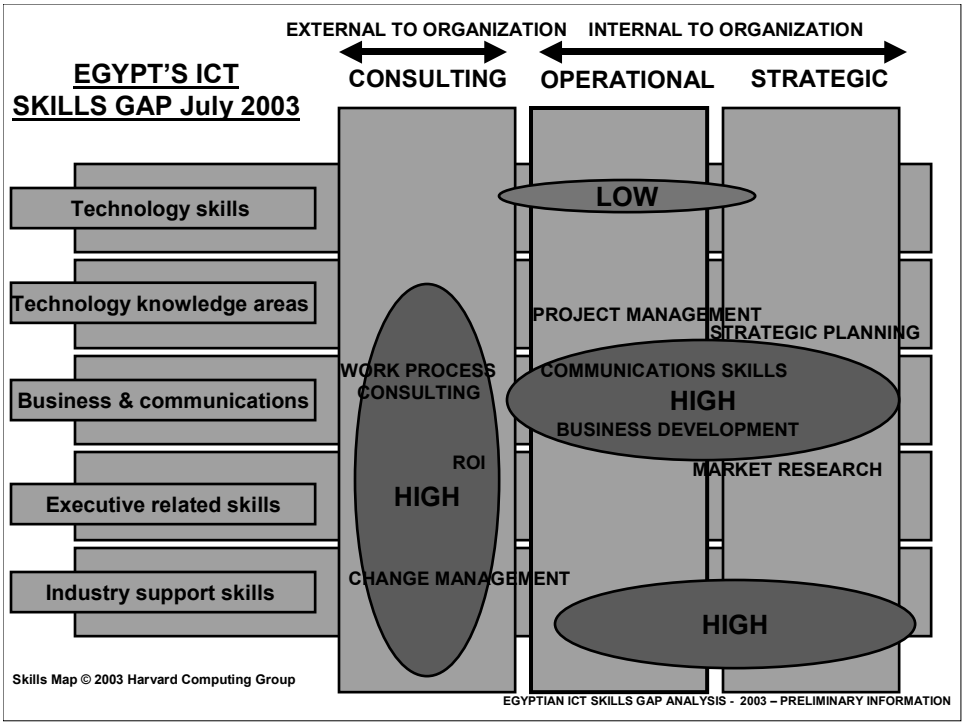


Figure 1 – Egypt's ICT Skills Gaps July 2003

Figure 1 shows the severity of Egypt's skills gaps in particular skill categories that are arranged from top to bottom on the left side of the figure. At the top, the figure also illustrates whether skills gaps are internal to the organization (such as an ICT firm), or external to individual firms but endemic to the industry. In addition to the oval representing a huge gap in the area of business and personal communication skills, required industry support skills are also missing in the marketplace. This gap in particular causes a considerable problem for the sale, support and expansion of many markets. Increasingly, firms are realizing that this gap is placing severe limitations on the expansion of their businesses, and they are starting to change hiring policies accordingly. By having the right consultants and staff in place, for example, organizations can better serve their clients with industry-specific knowledge and solutions. Many ICT firms are trying to source specialists with financial, healthcare, manufacturing and other relevant industry experience to complement their technology and software skills. Technology gaps are today frequently filled by multi-national vendors who provide the specialist skills and software to implement many of the leading-edge systems being deployed. Unfortunately, this practice does little to transfer experience and knowledge to the local firms, aside from those few that are large enough to handle these projects directly.

The status of the Egyptian ICT industry can be described as having an excellent telecom and Internet infrastructure today, particularly compared with pre-MCIT status in 1999. The Internet and telecom environment now provides a foundation upon which new business platforms can be developed, including call centers, data centers, B2B systems and Virtual Private Networks using the Internet as a framework. However, the adoption of these new technologies creates challenges for the ICT sector in the future.

C. ICT Penetration Gap in Egyptian Industries

The study of the Gap Analysis of ICT Penetration in Egyptian Industries was carried out in three Egyptian industries: ready-made garments, pharmaceutical drug manufacturing and food and beverage industries, all three of which are strategically important Egyptian industries. Drug manufacturing is a strategic socio-economic sector for the country, producing 92% of the local market needs. Food and Beverage falls within the nation's agricultural sector, which occupies 29% of the nation's workforce and contributes to 16.4% of the nation's annual GDP. Ready-made garments industry, as part of the textiles industry, falls within a national economic sector that accounts for 30% of the nation's workforce and 49% of total Egyptian manufactured goods. All three industries are dynamic exporters.While the three industries analyzed are smaller than the macro-economic sectors in which they are situated, all three themselves, as well as the larger industry contexts in which they are situated, play a vital role in future employment generation, safety, and economic security of the country. All three industries have large, committed corporate players who operate globally through joint ventures, associations and partnerships, as well as on the national market, and a large number of SMEs (Small & Medium Enterprises) as dynamically within regional and international markets, albeit on smaller scales.

All three industries will be significantly impacted when the GATT conditions change in 2005. There is little reason to believe that after 2005 Egyptian manufacturing sectors will not experience shake downs, such as what occurred with the Mexican food and beverage SMEs when the NAFTA (North American Free Trade Agreement) went into effect: about 50% of the SMEs in that industry disappeared through their outright failure to compete, much of that failure was attributed to not leveraging ICT for business competitiveness.

The findings from the Gap Analysis of IC Penetration in Egyptian Industries show what the current ICT use and needs are in the production, management and growth operations of the three industries. The study also presents important comparative information about how ICT solutions have importantly bolstered the ability of those same industries in other countries similar to Egypt, to compete on international markets and to perform efficiently in their own national markets. The findings in the particular case of Mexico emphatically underscores what the negative impacts on industry can be when it did not leverage the advantages and benefits of ICT for global and national competitiveness and growth. Inversely, when ICT is used to such ends (as in the cases of Portugal, France, Argentina, Brazil, and Turkey), competitiveness can be raised and growth stimulated.

There is openness to learn from these examples, as nearly 100% of the companies in the three industries stated that ICT is "very important" to their business performance and growth. Nonetheless, only 46% of the companies have dedicated ICT budgets (67% of pharmaceuticals; 44% of food and beverage; 27% of ready-made garments). This large gap between how ICT is perceived to be important versus what companies are actually doing to strategically address ICT solutions is mainly due to three important factors:

1. General lack of management awareness concerning how leveraging ICT solutions impacts the bottom line.
2. General lack of management awareness concerning how leveraging ICT solutions impacts the bottom line.

3. Concentration of decisions concerning ICT in the hands of top management, who tend to not involve their ICT departments in the decision-making processes (30% of all companies analyzed do not even have IT departments).

The use of ICT in the three industries studied reflects the respective structures and characteristics of the industries' supply chains. In simple terms, the main differences of ICT use in the three industries are:

Food & Beverage

- The food and beverage industry is characterized by a heavy reliance on planning for crop planting and harvesting, quality farming and harvesting (even high-tech farming for hazard safety), and efficient inbound farm-to-plant logistics and efficient outbound logistics in general, but mainly concerning the demand for efficient outbound logistics for fresh products. The actual production operations in food and beverage are a mix of manual and automated, with a relatively low dependence on ICT solutions, given the relative low level of production line sophistication. This determines that much of the food and beverage ICT solutions are being leveraged on the farm, for safety and health controls, for crop quality and export market specs, for logistics and for complicated physical and information movement between (remote) farms and offices.

- Penetration of Internet, Intranet and Interactive Web-sites is low, particularly as compared to benchmark countries. Demand is highest for management and growth oriented ICT solutions.

- Food and beverage companies show a relatively healthy awareness of the importance of ICT for production management solutions, with 56% of the companies stating that over the coming twelve months they plan to migrate to more sophisticated ICT solutions for integrating production and management. At the same time, however, all but one of the 19 companies analyzed admit to having insufficient knowledge for deciding what ICT uses would be best for which solutions.

Pharmaceutical

- The pharmaceutical supply chain has heavy reliance on inbound logistics for imports of 85% of their active ingredients, which are transformed in the high-tech drug production lines. Drug sales are subjected to cyclical demands from end consumers and intermediary buyers. Planning for sales and purchasing is thus a vital activity that kick-starts the supply chain operations, for which ICT applications are consequently found throughout much of the planning, sales and orders operations of the pharmaceuticals industry, linking broad production and management operations, including warehousing and distribution operations in addition to the aforementioned ones.

- Different from the private companies and multinationals, where ICT solutions are ubiquitous, the public firms are using ICT for production operations, but comparatively little in management and almost none for growth. None of the public firms are importantly enjoying the benefits of leveraging ICT for inter-/intra- communications and growth.

Ready Made Garments

- The ready-made garments industry supply chain is characterized by a complex production operation that depends on using cutting-edge textiles production machinery for meeting quality and quantity customer demands. That, plus the traditional reliance of the textiles industry on machinery, determines that ICT solutions in ready-made garments are mainly concentrated in the production areas.
- ICT solutions are relatively weak in management areas, particularly when it comes to ICT for communications systems and for global sales and markets sourcing. This is partially due to the inadequate penetration of basic infrastructure, particularly as concerns the stock of computers and use of corporate email.
- ICT solutions are sought for efficiency gains in production management, as well as for market development.

All three industries share the following trends:

- An increase in ICT expenditures and involvement of IT departments in decision making.
- A moderate improvement of basic ICT infrastructure.
- A slow tendency toward greater penetration and diffusion of ICT solutions.
- A growing interest in locally developed ICT solutions.
- An increase in the number of companies participating in sector market places and cluster initiatives.

The most important economic implications of these trends will be:

- Greater dissemination of ICT if supported by appropriate education and training.
- Greater dissemination of ICT if ICT suppliers and host industries collaborate in creating case studies, developing joint solutions, and propagating success stories.
- Higher adoption of ICT applications and infrastructures if industry and distribution clusters integrate further.
- Shared network initiatives if increased international competition prompts mergers and acquisitions in the industries.
- Short-term loss of jobs if labor saving technologies are adopted and as companies not adopting said technologies succumb to competition.
- Long-term job creation if the use of labor-saving technologies is more prevalent across the host industry, leading to general growth as a consequence of greater competitiveness.

Overall, although the industries perceive ICT as an instrument to increase efficiency and reduce costs, there is a ubiquitous lack of awareness as to what the optimum ICT systems and tools are for doing so. In each industry there is a clear demand for tailored ICT solutions, which many companies are commonly doing by adapting and customizing MSOffice applications. Most companies state that the ICT industry experts are too eager to push their solutions, and generally unacquainted with the particularities of their industry, thus not fully competent to advise them on best solutions.

The study's findings divulge that, to apply ICT strategically to improve business management activities, there is a serious two-way need for knowledge development: business2ICT and ICT2business. ICT use in industry depends on collective actions guided by strategic planning, drawn from a well-defined strategic market position. To this end the host industries, ICT industry, Government and NGOs/Associations, have roles to play to foster an environment that will foster the uptake of ICT. These roles can be summarized as follows:

HOST INDUSTRY	■ Create and provide aggregate industry information ■ Prepare for industry growth through use of ICT solutions
ICT INDUSTRY	■ Develop consultancy skills to create tailor made ICT solutions for host industries ■ Develop Business and Financial Cases for ICT use
GOVERNMENT	■ Encourage ICT uptake through use of e-Government ■ Facilitate and Promote Industry Growth through e-Marketplaces
NGO & ASSOCIATIONS	■ Raise Awareness ■ Promote ICT Education and Training

III. Institutionalization

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A. Executive Summary (Institutionalization)

The objective of the Institutionalization of the ICT penetration and skills gap analysis studies is to provide a step-by-step guide on the process and methods required for the recurrent studies. The intent is to avail the present experience and knowledge gained by the PfCE team, and transfer them to stakeholders and interested groups to repeat the study.

In order to ensure repetition of the study to provide a comparative report of findings on a yearly basis, a standard methodology needs to be in place. This will allow stakeholders to view comparable findings over a specific period of time, measure progress in closing the gap, and identify effective initiatives.

This section includes an implementation plan, shares past experiences in implementing the study, and offers some practical tips and recommendations to conduct the study. Research phases, research methodology, sample selection method, country benchmark selection, data collection mechanisms are covered in this section

Success of the study depends on strong project management skills and leadership and support of key players in the industry and stakeholders. The study should be based on an acceptable, logical, and standard research methodology.

Steps taken for the study:

- Planning: identifying scope of work and research method, developing implementation plan and methodology (selection of sample, benchmark, and survey instrument. Development of interview and analysis process), planning data collection, validating the methodology, and getting stakeholders buy-in.
- Implementation:, scheduling interviews, collecting data, and validating data.
- Analyzing and interpreting information.
- Developing the report.

Following are some of the success factors identified by the study team:

- A well-defined SOW and deliverables
- A well-defined and logical research method
- Technical knowledge of the industry
- Familiarity with the local culture
- Clear and realistic implementation plan
- Testing the methodology on the ground before implementation
- A well-justified and industry representative sample
- Data availability and accessibility
- Ongoing stakeholders expectation management
- Effective and efficient interview process
- Access to the right people to interview
- A standard survey instrument

- Clear and well–defined definitions specially for rating levels
- Data validation
- Clear explanation of research method
- Clear explanation of the benefit to interviewees
- Practical recommendations to be easily converted to action plans

Following is a summary of the methodology used in each section of the study:

B. ICT Skills Gap Methodology

Goals

The Skills Gap Analysis for the Egyptian ICT sector supports the development of a program to ensure that industry and market requirements become the driving forces for the development and delivery of training, education and consulting assistance for the industry. As supported by MCIT and USAID, the analysis and recommendations are intended to improve the competitiveness of the Egyptian ICT sector. The specific goals of the study are to provide:

1. Results that will guide and dictate the selection of education and training interventions supported by USAID and MCIT. Study results will provide USAID, MCIT, and other ICT stakeholders with the basis for continued ICT human resource and workforce development planning to ensure maximum growth of the ICT sector.
2. The basis for expanding the use and adoption of ICT applications and practices by non-ICT sectors, clusters, and businesses, for the purpose of enhancing Egyptian skills and competitiveness.
3. Benchmarking descriptions of four selected countries regarding the creation and optimization of their workforce development and education programs.
4. Information about short- and medium-term skills gaps in the ICT Sector in Egypt. Public education establishments, MCIT, private sector Workforce Development programs and other parties should be able to apply the results for near- and longer-term planning.

Overview

The first step in developing the methodology for this project involved identifying the segments of the ICT sector in which interviews would be conducted with individual companies. We also identified the need to interview educational institutions.

The next critical early phase involved identifying the right skills categories and job titles to use as the basis for the project. During December 2002, PfCE, MCIT, USAID and six industry firms in Egypt defined the details of the overall project and approved the skills clusters and segment selections. The program design and methodology was well-received by each of these groups, resulting in a consensus that the project was well-conceived and executable.

Next, the PfCE project team selected individual organizations to interview and developed the questionnaires to be used during the face-to-face interviews. The interviews were designed to include questions about skills classification, skill needs, and education and training needs.
Non-educational organizations were interviewed first, followed by education and training organizations. We felt it was important to capture as much of the Skills Gap information as possible before the education interviews in order to improve the quality of the research questions for the educational institutions.

C. ICT Penetration Gap Methodology

The methodology is basically a multi-tier approach, simply designed, to pick two or three industries in Egypt that are ICT-ready and have the capacity to export. The methodology was designed to choose sectors to analyze within each of these industries using an industry supply chain as a common yardstick. Companies within each industry or industry sector were then selected, based on a set of common criteria. The methodology included the use of a questionnaire to interview 45 of these companies that are representative of their industries and sectors. The findings of this survey were benchmarked against the ICT development of parallel industries in six other countries.

A straightforward survey was conducted to compile the list of industry groups that exist in Egypt. A carefully devised set of filters was used to examine the characteristics of over twenty different industry groups. Three industries passed the filters to emerge as the industries that are mature enough to export, contribute substantially to the total country's manufacturing, enjoy government support for their exports, have a positive export trend and are ICT-ready. These selected industries were Food & Beverages, Pharmaceutical Drugs and Ready-Made Garments. The filters were selected because they constitute pertinent and available tools that can help determine the ICT readiness of the industry.

After exploring the three industries in detail and researching their history and development within the country, it became clear that each of the three industries demonstrates a distinctive set of characteristics. Those sets are not only germane to industries within Egypt in general, but they also resemble the diversity of ICT-ready industries in the country. While the Food & Beverages industry displays a wide range of specialty production areas, the Pharmaceutical Drugs industry, because of its nature, is characterized by a subdivision of multi-national and national companies, and the Ready-Made Garments industry exhibits an interrelated and complex supply chain of outsourced manufacturers.

InfoAmericas used a generic supply chain as a common tool to investigate the industry's specific supply chain in general and the position of the company interviewed within this supply chain in particular.

The selection of companies within each of the industry sectors relied on a host of data that was collected to substantiate the selection process. A comprehensive list of companies under each industry was gathered. An industry intelligence specialist was consulted to understand the industry's history and development. Extensive discussions and analyses were carried out with the industry specialist to devise the proper manner to select companies. Since the data available for each industry is different, the means to select the companies varied from one industry to the other. Despite particularities among the industries, InfoAmericas developed a common set of criteria that can be superimposed over the sector companies to result in the final selection of 45 companies. These criteria captured the competitiveness of the company within its industry, its comparative volume of export revenue, and its geographic representation. The companies were examined by the industry specialist to ensure their representation of their respective industry.

A general questionnaire was developed to collect information concerning the nature of the company, its present ICT use and vigilance, its human resource capacity and needs, and its plans for developing ICT in the future. This questionnaire was structured for use with the nature of industrial companies in general and their use of ICT within their different operations. The questionnaire was structured to also capture how

ICT is typically used in one or all of the company's operations of production, management and growth. The questionnaire made the best use of this classification to indicate the company's preparedness for ICT use.

D. Appendix: Research Process Guideline

A. Planning

1. Identifying Scope of work

The first step in conducting the study is to clearly define and validate the scope of work (SOW). The SOW is the corner stone on which all of the study elements are developed and is the main source of reference. Thus, it should be realistic and manageable with a well-defined objective, and identify stakeholders, key players, and beneficiaries of the study as well as defining the outputs, boundaries, depth and deliverables of the study.

Recommendation(s)
• Defining SOW. A well-defined SOW and deliverables helps acquiring companies support, fast buy-in in scheduling, keeps the study focused on its objectives, and allows better management of stakeholders expectations.

2. Identifying Research Method

Once the research goals and objectives are determined, a research expert should identify the best research method for conducting the study. The selected method should explain the logical way, means and tools of conducting the study, and be based on a solid methodological ground allowing the researcher to generate confidently an overall understanding of the industry from a sample. It is recommended to test the selected research method on a representative sample before full implementation. In the process of testing and validating the methodology, the researcher(s) should try to select a simple method (or present more complicated method in a simple way). This will allow explaining and defending the methodology to all stakeholders to make sure they understand its logic, support the study, and have confidence on the recommendations.

The research team developing the methodology should have high technical expertise on the subject (i.e. Skills Gap in ICT industry and ICT penetration gap in other industries), and be familiar with the local culture. In the absence of technical and local cultural expertise, the research team should work closely with local counter parts and validate the methodology with them before implementation.

In addition to the technical knowledge, the research team should understand the dynamics of the industry they are studying keeping in mind that the research is a learning process and knowledge of the industry grows as the research moves ahead. Naturally, some adjustments on the implementation plan will become necessary.

Recommendation(s)
• Defining the research method. A well-defined and logical research method tested and validated on the ground before implementation. • Acquiring technical knowledge of the subject and the industry. • Being familiar with the local culture.

3. Developing Implementation Plan

In the early phases of the study, it might not be feasible to develop an accurate implementation plan. However, study team should be able to estimate the best time frame and level of efforts (LOE) required to complete the study once the methodology is developed and tested. The overall period for implementation can be estimated more accurately by first defining the study implementation phases and then breaking it down to the required time and LOE for each phase. The completion time of the study will depend on different variables such as the size of sample, depth of the analysis, available resources, experience of the team, and level of involvement of stakeholders. For instance, the size of the sample and the depth of information will affect the interviewing time. On the other hand, if alternative methods were used for data collection (e.g. web-based surveys) the data collection time will dramatically decrease. Similarly, the resources available to the study will impact the duration of the implementation plan.

A generic implementation plan highlighting the main phases and sequence of activities is included to provide guidance for organizations interested in conducting similar studies (Appendix I).

Recommendation(s)
• Developing a clear and realistic implement plan. • Considering and evaluate different ways of implementation (e.g. use of technology for collecting, if not all, some the information.)

4. Developing Methodology

The objective is to develop a logical and sequential method to collect data from a selected and industry representative sample, analyze the data based on a logical and justifiable method, and draw conclusions about the industry. In developing the methodology, researcher(s) should keep in mind that identifying cause and effect relationship of the industry environment allows them to draw actionable conclusions (versus accepting or rejecting a hypothesis.) Actionable recommendations are more useful for practitioners. Thus focusing on cause and effect relations will lead to a more useful and applicable recommendations. The methodology should focus on identifying the parameters related to the skills gap, and should lead to the objective of the study.

The research methodology should also define the following research elements and explain the method used for each element.

- ***Sample selection:*** Selection criteria, sample size, type (e.g. small, medium and large companies), depth and representation should be defined. Sample should be representative of the entire industry. For example, if we study the supply chain of the industry, our sample should represent the entire supply chain.
- ***Benchmark selection:*** Countries selected for benchmark should be relevant to the study and provide useful information for local industry. Some relevant factors could be similar size, similar background, exceptional success or failure, geographic location, market position, and competition.
- ***Survey Instrument / questionnaire:*** the instrument used in conducting the interview is recommended to be brief, address the issue directly, include cross-checking questions, and focus on ranges rather than numbers.
- ***Interviewing process:*** The interview process, information sharing among team members, and data storage process should be standard and well defined.
- ***Analysis process:*** The data is scoped by related topics, patterns are looked for, narrative discussions are translated to unified patterned information, and statistical analysis is run.

Recommendation(s)

- Developing the methodology and conducting test interviews in an early stage allows iterating and fine tuning the methodology and plan according to the inputs of the test interviews. Using the test interviews to getting early buy-in of key industry players and modifying the survey instrument, if needed.
- Selecting the sample (one of the most important components of the study) based on a logical and acceptable setoff criteria. Sample should be limited to minimum required by research method. It should be manageable within the SOW and representing the industry and its supply chain. It should allow the researcher to draw general conclusions about the industry. To select a representative sample:
    - Criteria for sample selection are identified, organized in a sequential order reflecting the objectives of the study, and validated. The sequence of criteria is important, as different order will result a different sample.
    - The industry is segmented and filtered through sample selection criteria.
    - The data collected from the sample is extrapolated.
- Selecting countries for benchmark based on pre-defined factors form the objective of the study. Countries selected should: at least offer some learning advantages (i.e. positive or negative experience to learn from), be comparable, be an actual or potential competitor in the targeted market, be important for government.

5. Planning Data / Information Collection

- Identifying information needed for each indicator.
- Data collection process should be practical in terms of accessibility and availability of the data sources and time to collect the data.
- Determining if data should be collected independent or parallel to other activities for cross-reference purposes.
- Defining methods, means, and tools for collecting data. (i.e. Questionnaires?; Interviews?; Surveys?; Document review?; Other(s)?)
- Defining the procedure for data collection and compilation. The procedure should identify the what, who, how, and when the data is collected as well as the procedure to compile the data.

Recommendation(s)
• Verifying data availability and accessibility before implementation.

6. Validating the Methodology

After finalizing the methodology it is recommended to conduct meetings with experts and companies in the industry to provide them with an overview of the scope of the study, methodology, data collection mechanism, time frame, and targeted output. Participants feedback helps fine-tune the methodology and implementation plan. Then, using a selected few companies as pilot, the methodology should be tested on the ground for final adjustment. The results of the test pilot will also increases the probability of usefulness and success of the study through:

- Validating the industry needs.
- Gaining the support of the key players in the industry.
- Focusing on the issues directly related the SOW.
- Validating the selection of industry filters (industry selection criteria), sample size, company selection criteria, countries' benchmarked, and questionnaire/survey instrument.
- Adapting data collection method to the local culture
- Estimating data collection time frame based on actual examples.

Recommendation(s)
• Testing the methodology on the ground before implementation.

7. Getting Stakeholders Buy-in

It is important to gain stakeholders and key-players buy-in and support before starting interviews. Usually an overview presentation of the methodology and implementation plan serves the purpose.

Once stakeholders' feedback is collected and incorporated in the study, as appropriate, the study team will proceed with the implementation and can rely on the stakeholders support to meet the right people within the industry and collect accurate data.

Recommendation(s)
• Managing stakeholders on ongoing-bases. Planning to manage stakeholders' expectations from the beginning.

B. Implementation

1. Scheduling Interviews

- Start scheduling interviews as soon as possible. This will allow managing data collection more effectively.
- With your request for interview, send the study background to make sure that the right interviewees are prepared and available.

Recommendation(s)
• Managing interviews effectively and efficiently by planning in advance and using experienced interviewers.

2. Collecting Data

i. Research

A scientific, focused, and concise study, requires some pre-research work. Below are some recommendations to follow:

- Reviewing similar studies.
- Collecting an overview of Egypt's economic, social, and political environment.
- Developing an industry profile, including trends and data.
- Collecting companies' general overview, to be used in selection of sample as well as understanding basic facts on the selected companies before the interview.
- Exploring other countries for benchmark sample selection.

The internet is a good start for these types of information. However, it is essential to do some fact-finding and conduct meetings with related entities (e.g. Ministries of Communication and Information Technology, Industry and Foreign Trade, or Federation of Egyptian Industries and its chambers, or specific projects or NGOs). In some cases the fact-finding process is not finalized before interviews start, but if sufficient information was collected the process can continue in parallel to interviews.

ii. Interviews

Using interviews as the main tool to collect data helps gaining a full range and depth of information, developing relationship with client, and allows flexibility to adapt data collection to the interviewee's style. Although collecting data through interviews is one of the most time and cost consuming methods, it is one of the most effective ways in a cultural and/or political sensitive environment. Following tips help in conducting an effective interview:

- Choosing a setting with minimum distraction.
- Explaining the purpose of the interview.
- Addressing terms of confidentiality.
- Explaining the format of the interview.
- Indicating the expected duration of the interview.
- Providing contact information for follow up and inquiries.
- Asking the interviewees if they have questions.
- Documenting answers during the interview session or immediately after.
- Choosing the best time for controversial questions (versus facts) based on the interviewees' style.
- Interspersing fact-based questions throughout the interview to avoid long lists of fact-based questions.
- Seeking to find out interviewees preferences in discussion questions related to past, present, or future.
- Phrasing questions as clear and neutral as possible.

Recommendations

- Conducting interviews with large companies in two parts for more accurate and detailed information. First with top management to cover business section. Second with middle or department managers to cover technical section.
- Selecting interviewers with technical knowledge of information and communication technology as well as business environment of ICT. Interviewers will play the role of a facilitator to help interviewees identify their skills gap.
- Considering the use of technology such as web-based data collection applications. , However, this option should be evaluated, particularly from cultural perspective, before implementation and should be combined with face-to-face orientation.
- Pre-preparing for interviews and a well-planned interview format and schedule increases the efficiency of collecting information, stimulates the discussion, and helps collecting data in a standard way.
- Developing a standard survey instrument to be used as a broad-based survey to facilitate comparative analysis. But the interview should be customized to each sub-sector in both style of collecting and conducting the interview to reflect sub-sector's specifications.
- Clearly defining the ratings levels (e.g. High, Medium, and Low for skills gap severity) as well as the time span on which a rating is used (for instance

a skills gap rating severity might be estimated on a 1 year plan basis not exact time of the interview).

- Considering at least a team of two experts to conduct parallel interviews to decrease the interviewing duration. However, a mechanism should be developed to ensure that interviewers are consistent in collecting the data.
- Considering a pre-interview seminar sponsored and supported by the related industry associations, to introduce the study to key industry players. The seminar would help getting the buy-in from companies and government and associations' endorsement for the study.
- Considering conducting the study with the support or under a governmental entity initiative. This will increase both public and private sector's collaboration.
- Selecting interviewers with some expertise and knowledge of the industry interviewed. Interviewer should be experienced and should not be considered a competitor.
- Getting the background and current situation of industries both from publicly available sources and from the people within the industry
- Gaining companies interest and support. Some public relations activities are needed to keep the interviewed companies interested and supportive (e.g. follow up with summary of meeting, thank you note for their support or other).

3. Validating Data

The researchers should validate the information and data collected before starting the analysis. In some situations the data collected in an interview might be missing or unclear and thus referring back to the interviewee will be necessary to have an accurate analysis. Interviewing more that one person in an entity or having more than one person attending the interview will decrease the probability of collecting inaccurate data. Following up with the interviewees to validate the interview results will increase the confidence of the interviewees that the information and the collected data were accurately captured. This process will also provide opportunity to inquire on missing or unclear information, if needed. Collected data should also be validated through secondary sources and industry leaders.

Recommendation(s)
• Validating the collected data with interviewees and through secondary sources.

C. Analyzing & Interpreting Information

When analyzing data (whether from questionnaires, interviews, focus groups, or other means), it is recommended to start by reviewing the scope of work. This will help to organize data and focus the analysis toward desired objectives. Following tips may help to conduct data analysis more efficiently and effectively:

- Making copies of data and storing the master copies away.
- Organizing comments into similar categories and labeling them with the common theme (e.g. concerns, suggestions, strengths, weaknesses…etc)
- Identifying patterns, or associations and causal relationships in themes. (e.g. people who attended similar training programs, people in the same salary range, people in the same sub-sector…etc.)
- Tabulating the information, and using statistical measures to describe quantitative data trends (e.g. mean, average or others)

Recommendations
• Providing actionable recommendations will increase companies' responsiveness in future similar studies. • Protecting companies' discretion by eliminating company name(s) and aggregating the data in the final analysis. • Documenting data analysis method and process. • Documenting steps and ways of developing, verifying, and justifying the research methodology, process and selection criteria for industries, company, and benchmark samples.

D. Developing Report

The level and scope of contents of the report depend on the intended audience expectations (e.g. funding agency, the ICT industry, educational and training institutions, MCIT, NGOs...etc.). The report language might vary from Arabic or English depending on the stakeholders needs. It is recommended to develop an executive summary, findings, and include all additional and useful information in the appendices to stratify different readers. Following are steps and tips that could be used as a guideline in writing the report:

A. Drafting Preliminary Findings

- Putting the information in perspective (e.g. compare results to previous skills gap analysis studies, to countries benchmarked, to industry standards…etc.)
- Recording conclusions and recommendations in the report, and associate interpretations.
- Translating the report recommendations to action plans
- Including an executive summary to brief the readers on the study findings and recommendations.
- Making sure to record the research method, plans, and activities performed.

B. Finalizing the Report

- After developing the first draft of the findings, it is recommended to share it with team members giving them the chance to carefully review and discuss the report. The team feedback is important to fine-tune the report.
- Developing the final draft and sharing it with the stakeholders for approval. Sometimes it is necessary to hold a presentation to provide an overview of the findings and collect the audience's feedback to incorporate them in the final report. This will ensure the stakeholders buy-in and approval of the report.

Recommendation(s)
• Explaining research method, plan, and activities. • Sharing the preliminary findings and final draft reports with key stakeholders.

Lessons Learned

The purpose of this section is to share the experience generated from conducting the study and highlight some of the practical challenges, milestones, and recommendations concluded by the research team.

A. Challenges

- Scheduling interviews may take more time and energy than originally expected resulting in delaying the implementation schedule.
- In many cases the top management of the interviewed entity is not fully aware of the exact skills needs and thus a follow up meeting will need to be scheduled with the responsible team.
- During the interview implementation some issues may be raised that are of higher importance than originally planed. These priorities need to be incorporated, to the extent possible, in the study to respond to the industry expectations.
- The study needs to be tuned to the companies' business and operational issues to help interviewees understand the objectives of the research, relate to it and provide accurate information.

B. MILESTONES

- The size of the sample may vary either to satisfy key players and stakeholders, or because the differences between the team's assessment and the actual size and composition of the industry. The increase of the sample size, halfway during implementation affects the schedule and the progress of the study.
- It is recommended to develop a logical and acceptable argument explaining the advantages of the study for the companies in participating in the study. (What's in it for them?)
- Interviewers should be aware that interviewing and collecting data from public sector companies requires clearance and approval from the government.
- Companies may be more interested in learning from the interviewer on issues related to competitiveness and business strategies. Therefore, the interview may take more time than originally planed.
- Companies may consider some financial data of high confidentiality (e.g. their revenue. Having an important fraction of the companies refuse to release this information will impact the analysis and comparison of some parameters.
- Considering the Egyptian culture, discretion becomes an issue of high importance that fall in the hands of the interviewer and expert doing the analysis. The information collected becomes a business intelligence database. Research team should use rational and caution to filter the sensitive data before distribution.

Implementation Plan

APPENDIX

ICT Penetration Gap Report - ANNEX SECTION

FULL GUIDELINE ON THE INDUSTRY ANALYSIS METHODOLOGY

There is no "one size fits all" when it comes to analyzing an industry or, in our case, analyzing the use and needs of ICT in a given industry. Each industry in each country has characteristics that distinguish it from another "same" industry in another country or from other industries in the same country. The challenge of setting down a replicable methodology for studying an industry is, therefore, increased by the fact that each industry is different.

Build a Replicable Methodology

With the before-mentioned caveat that the text concerning the institutionalization of this work methodology should be changed, our component was mandated to build a replicable methodology for:

- selecting the appropriate industries from among the many;
- identifying representative companies whose ICT use and needs should be studied in the selected industry;
- designing and using appropriate tools for analyzing the ICT use and needs in the companies so as to come up with a viable statement in the end that can correctly describe what the ICT use and needs are in that industry. In other words, that what was found in the individual companies describes what is generally true in the overall industry; and
- describing what the business case in the industry is for improving exports and market competitiveness in the industry by using ICT services and solutions.

The basic challenge was to develop a methodology that conformed to the specific limits and objectives that the Project had set and, at the same time, design a methodology that can be used in an industry analysis in general, this meaning in cases where the target universe of 2-3 industries and 45 companies could be different, the 3-month time frame could be shorter or longer, the available funds could be different, the Project infrastructure support might not be available, and so forth.

With this in mind, the following sections discuss details of our development of a technical methodology for carrying out an industry analysis. Specifically: for an analysis of IT penetration in three Egyptian industries.

Learn about the Target Industries

How does one begin? By learning. Before one can begin to analyze what is going on in the industry, one must first learn the following:

- What the industry's characteristics are.

- What features define how the industry functions and how it is constructed.
- How the features and characteristics determine the particularities of the industry's supply chain.
- Add another layer of complication: if, as in the case of this study, one must also *compare* ICT use and needs among different industries of a country, then one must find the similarities as well as the differentiating characteristics of the industries that will be analyzed.

Industry individualization is thus necessary. At the same time, as explained earlier, one objective of this project activity was to develop a *replicable* methodology for selecting an industry whose ICT use and needs must be studied.

Select the Target Industries

Before we jumped ahead to the aspect of replication, it was first necessary for us to find out what industry groups exist in Egypt. The only valid source of information that one can use to answer such a question for this or for any similar study is: what industries exist in the country according to official (local) government definition?

We conducted a straightforward research into official government sources and we compiled the list of the 21 industry groups that the Government lists for Egypt. We cross-checked the list with the Director of The Federation of Egyptian Industries to insure correctness. Once our list was vetted by the FEI and by industry experts, with whom we also consulted, we had our industry universe defined as 21 Egyptian industries.

After we identified that there are 21 industries in Egypt, we held brainstorming sessions to determine what might be or what should be our target population from among the 21 industries. We concluded that our first "filter" for selecting which industries from among the 21 we might work with, should be industries that export goods or which are "export-ready". This was in clear conformity to Project interests (including MCIT and USAID interests), and now it was stated as a qualifying filter.

Before actually going through a "qualifying" or "de-selection" process for determining which industries did or did not fit the definition of "exporters or export-ready", we felt that we should further decide whether or not it was necessary or desirable to identify and use other filters for choosing the 2-3 industry groups we would work with. We decided that we needed to have more filters, how many we did not yet know, which could satisfy the possible future question: "how did you *objectively and technically* get from 21 industries down to a target population of only 2 or 3, which is what your SOW calls for?" We kept a couple of key determinants on the horizon while debating what additional filters were logical and as objective as possible. An overarching concern in this phase of the work was to come up with industries where increased export potential and competitiveness through the adoption of ICT improvements could actually be measured. We decided that, in order to have measurable results in such a difficult area, it would be advisable to use some kind of scale of size criteria. This realization helped us to identify other filters: maturity of the export industry; contribution of the industry to the total GDP

or to the Total Manufacturing Index (TMI), these being benchmarks for which there are (reasonably indicative) figures and comparative data available.[1]

Because our SOW says we were to analyze how ICT is being used in industry, and how ICT could improve exports and competitiveness, we decided that one filter should be the ICT readiness of an industry.

Reliance on Experience

There comes a moment when experience and logic dictate that X-number of filters is sufficient. There is no magic formula for this. One uses experience and common sense for determining that the filters defined will properly help identify the final target population required.

Information Quantity and Quality

In countries such as Egypt, there is apt to be a scarcity of reliable, up-to-date information and statistics. At one point or another of an analysis such as this, one must be able to satisfactorily answer the following questions:

- Is the statistical data out there?
- Did we get it?
- If we got it, is it reliable?
- If we did not get it, is it because we did not find it or because it is not available?
- Is the information that we did get, good enough to support what we are doing?

If your answers to those questions show that you have done the search for information job to the degree that is logical and possible, and that further efforts to gather information would just become efforts of diminishing returns, then it is probably time to move on with the data you have.

In our case, when we defined the five filters which we believed to be the best and sufficient for the task of selecting the industry groups, we proceeded to perform the filtering and, on de-selecting an industry, we backed up our de-selection of the industry groups with the best statistical data we had been able to obtain. We documented our information sources on the methodology slides.

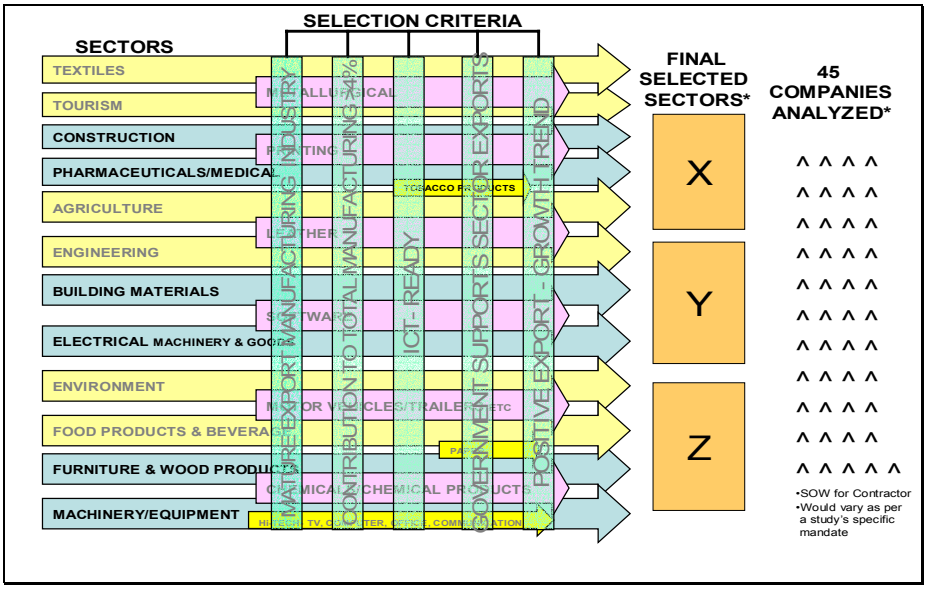
In general, we were satisfied that the information sources we did have were valid and satisfactory. We would have been happy to have more information on all of the 21 industries, but we discovered that this was not possible because not all industries are equally well documented. But we had the essential data to support our selection processes

[1] The data sources was a process of discovery and of asking Egyptian experts. To find reliable and up-to-date data is not always possible. In all cases, we documented our data sources. We also researched over 100 online sources for additional data on Egypt. Some is available from Egyptian sources. Some is available from such sources as IMF and World Bank online.

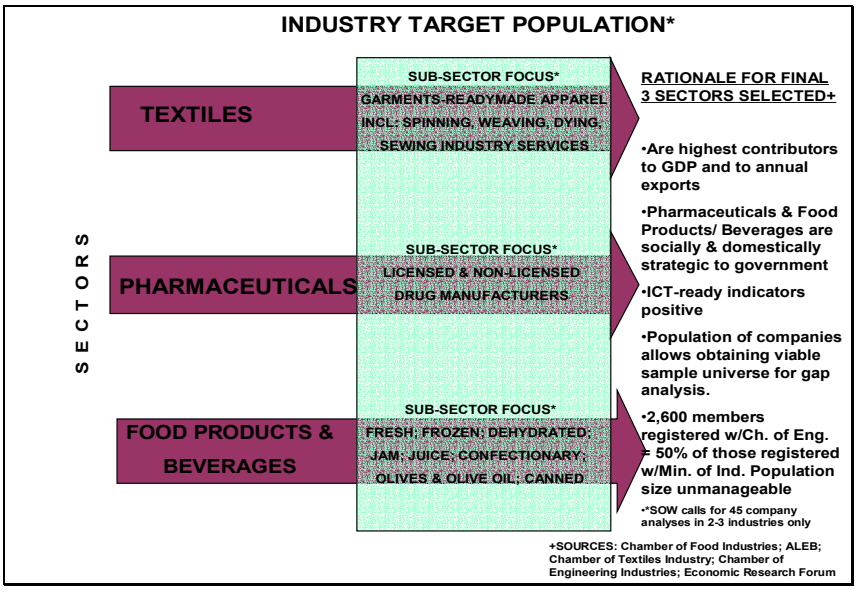
and results which had led us down to selecting three industries, all of which we believed would give the value added that our clients were seeking, once we performed the analysis of ICT use and needs in the three industries.

The outcome of the above process is shown in the following two slides.[2] Note in the second slide that the information sources are cited. This is an important part of the methodology.

FIVE SELECTION CRITERIA FOR FILTERING & FINAL SELECTION OF THREE EGYPTIAN INDUSTRIES



RESULTS OF INDUSTRY SELECTION PROCESS



[2] See annex for complete methodology application.

The industries which all Project parties now had agreed to be analyzed[3] were:

- Ready-made garments (sub-sector of textiles)
- Drug manufacturers (sub-sector of pharmaceuticals)
- Food & beverage (properly identified by the government as an industry, not as a sub-sector to agriculture, as might be commonly believed).

Vetting the Selection Filters and the Selection Results

During the different phases of identifying the filters and actually filtering the 21 Egyptian industries "down to" three, we rigorously applied our first methodology principle: continuous consultation with the client. We made multiple presentations to the Project officials, including MCIT persons, for their comment and agreement. We obtained useful feedback and, most importantly, we consistently got their endorsement on both the form and substance of our work as we were moving ahead.

We also referred several times back to various industry experts and organizations such as ExpoLink and ALEB (non-limiting list) and asked them their expert advice and reaction concerning: 1) our choice of filters and 2) the resultant three industries which "passed" the filtering process.

We got strong endorsement from the industry and associations and chambers with whom we consulted.[4]

Importance of Prior Client Knowledge about the Target Population to be analyzed

Having selected three industries, we now had to determine how we were going to choose companies in such a way as to ensure that for each industry we would have a large enough sample universe of companies that would permit us to make a valid conclusion about the use and needs of IT in each industry overall. Whatever methodology we would select for choosing the company targets, we faced two "limiting factors":

1. We could only study up to a total of 45 companies. How, therefore, to ensure on the front end of this study, before we even knew how many exporting companies populated the now-chosen industries, that we could come up with a list of companies for each industry that would be a representative sample of companies for stating what the ICT penetration

[3] Agreement by Project members on the selection of the three industries was reached by the end of the 3rd week of May, by which time we were already working on the sample selection of industry companies.

[4] A purely private client market analysis done by a markets analysis firm would not require such elaborate checking and cross-checking and vetting by the end-user of the study's results. The private client only wants the results they are paying for. This project is different from a private client market analysis, however, in that it is both a government-sponsored study and because our government clients require a replicable methodology at the end of the work. Therefore, methodical "reality checks" and on-going client satisfaction "surveys" are required. This distinction should be kept in mind when talking about "replicable methodology" for conducting such a market study.

is in each industry overall, thus making the business case for the industry?

2. How to ensure having a sufficient number of companies to constitute a satisfactory industry sample population in each industry, given that time limitations would oblige us to begin interviews in whatever industry group we first identified the company populations, before we had learned what the company population of the remaining one or two industries was.

In cases such as ours, where the target populations are already quantitatively defined by the client, the same kind of difficult questions will likely be repeated. We were fortunate to have learned as much as we could about the three industries we had chosen, and we had contacted reliable industry experts in food and beverage who had given us a pretty good idea of the population of exporting or export-ready companies. And a pharmaceuticals industry expert had early on defined for us the total population of drug manufacturing companies in Egypt.

By the time we had come down to three industries, therefore, we had conducted preliminary intelligence gathering on two and we knew already that if we interviewed between 17-20 food and beverage companies, we would have a satisfactory industry sample. We also knew that if we interviewed from 5-8 pharmaceutical drug manufacturers, we would also have a good industry sample. Of the contracted 45 companies to be covered, that left us with about 16 possibly remaining interviews at our disposal for the ready-made garments industry. But we had not yet found knowledgeable persons to tell us what the population of ready-made garments exporters was.

In this case, we probably got lucky, despite having set up a work methodology that was supposed to take the guesswork out of the equation. We had already begun to set up interviews with companies in our first two industry groups when we learned that the total population of ready-made garment exporting companies is about 250, meaning that we would be able to obtain a good industry sample with our available numbers.

The ideal solution to this kind of problem would be for the client who is contemplating an industry analysis to learn more about the target populations they would like to analyze *before* they delimit the study's universe. This would allow the scope of work in the RFP to accurately describe what is actually out there and what is required to cover the territory. If that is not possible, the proper alternative method would be to approach an industry analysis request like a private client would: identify potential contractors who would deliver a proposal for conducting an industry analysis, based on *their* preliminary industry survey. The proposal would identify for the client what the target population is and what resources the proposing contractor would require for adequately analyzing what the client is seeking.

Supply Chain (Value Chain) Focus

Simultaneous to having selected three industries, and in parallel to the days during which we were identifying the companies we would study, we made what is perhaps the most

important strategic design choice for the entire study. (More details on the methodology used for selecting the companies follow this section).

We decided to analyze companies in each industry through the optic of the industry's supply chain. We decided to use the generic value chain often attributed to Michael Porter and presented below here.[5]

PRIMARY VALUE CHAIN ACTIVITIES

An analysis of ICT use and needs across the supply chain analysis would facilitate the difficult business of how to select companies within an industry group. By using a supply chain model, our first benchmark indicator would be: do the companies selected, in their totality, cover all points within the supply chain?

If we could answer "yes" to that crucial question, we would have answered, on the front end, the all-important question: *does the study's analysis of ICT use and needs in companies reflect what is going on in the overall industry?* Clearly, if the companies selected were a sampling across the entire industry supply chain, we would be able to describe the ICT uses and needs of the overall industry in general.

We did not go straight to this conclusion. The conclusion to use the supply chain analysis was the result of much discussion and analysis with different members of the Project.[6] Part of the discussions revolved around defining what was not an appropriate methodology. For example, we discarded it idea of analyzing ICT in the different functional areas of a company. It would not allow us to make "apples to apples" comparisons within the different businesses/companies analyzed in each industry group. A functional area analysis would also not allow us to understand the work processes of the companies.

The Design of the Interview Questionnaires

The decision to study ICT use and needs along the industry supply chain determined the architecture of the questionnaires we would use for conducting the interviews. We had already designed two preliminary questionnaires along the lines of an ICT skills gap analysis.

We now refined the two questionnaires to allow us to focus on getting information on what the ICT penetration in the industry is. To do so, we would analyze how companies use or need ICT along their own supply chains, while at the same time situating where the companies are within their respective industry supply chain. The methodology behind

[5] See full value chain discussion in this annex.

[6] Team-based work is an essential part of our methodology. Failure to use a team approach would spell failure in work such as ours. It should be a given for anybody who would undertake a similar industry analysis, that they must use a team-based approach.

the new design of the questionnaires was to help our interviewees focus on their own supply chain and to describe how they use/need ICT in three basic areas of their businesses:

- their production (P),
- their management systems (M) and
- their growth (G).

We designed the interview process to ensure we got the interviewees to describe where their company is situated within the industry supply chain.

Vetting the Supply Chain Methodology

As clarified earlier, our basic work approach is to ensure that our methodology work is vetted on an "as you go" basis. We were particularly rigorous in doing this for our supply chain methodology which we had selected. We

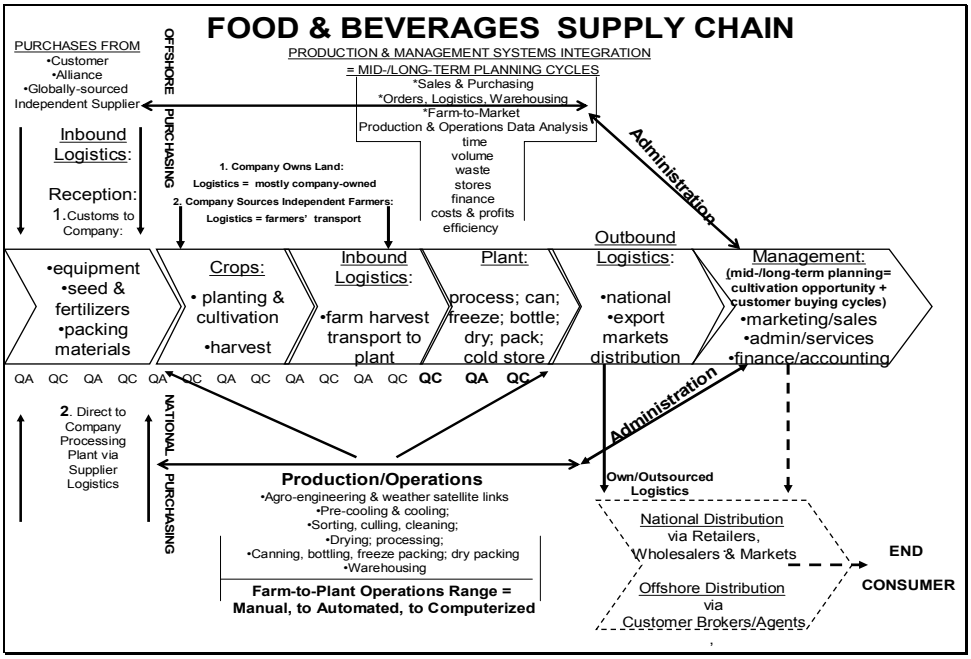
- visited key industry persons in each of three industries and ask them to define and/or explain to us the characteristics of their industry
- explained our proposed supply chain approach and got feedback from same experts.

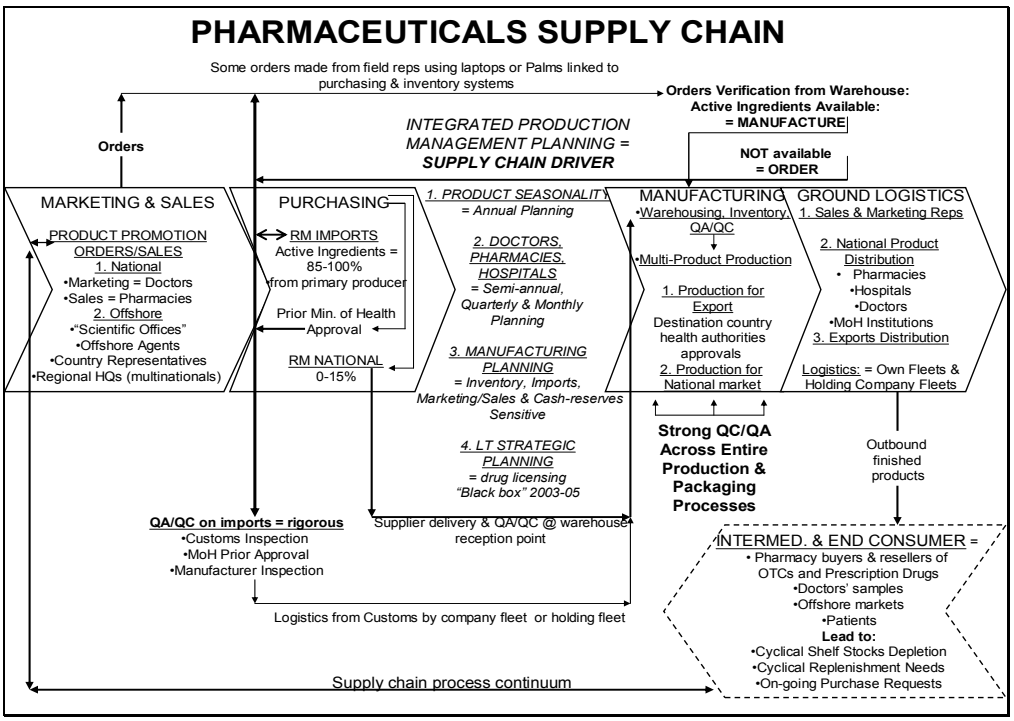
We got 100% approval from industry experts concerning the logic and usefulness of our approach and we got the experts to describe to us their specific industry's supply chain. Following the methodology of consulting from industry experts, we learned how very distinctive each industry's supply chain characteristics are. Those differentiating features are germane to each of those industries within Egypt and, as we also discovered, the three industries we had selected resemble the diversity of ICT-ready industries in the country.

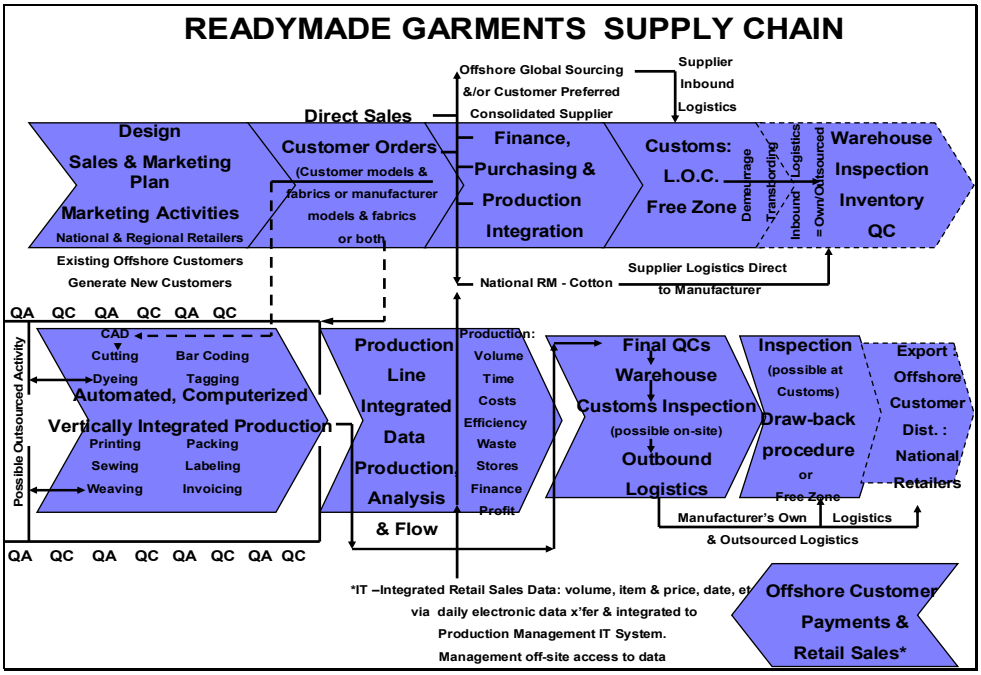
While the Food & Beverages industry displays a wide range of specialty production areas, the Pharmaceuticals industry is characterized by its subdivision of public companies, private companies, multi-nationals and holdings. The Ready-Made Garments industry is a faithful reflection of how the Textiles industry is comprised, and exhibits an interrelated and complex supply chain of outsourced manufacturers and national and offshore buyers and retailers.[7]

We now had good representations of each industry's supply chain (presented below). We now had one key plank in the platform for selecting companies to analyze in each industry. Specifically, we would be able to determine, from the start, where in the industry supply chain the companies we selected for interview are found.

[7] See the last three slides in the Methodology Presentation for a detailed description of each of the three industry supply chains.


FOOD & BEVERAGES SUPPLY CHAIN
PURCHASES FROM
•Customer
•Alliance
•Globally-sourced
Independent Supplier
OFFSHORE PURCHASING
PRODUCTION & MANAGEMENT SYSTEMS INTEGRATION
= MID-/LONG-TERM PLANNING CYCLES
*Sales & Purchasing
*Orders, Logistics, Warehousing
*Farm-to-Market
Production & Operations Data Analysis
time
volume
waste
stores
finance
costs & profits
efficiency
Administration
Inbound Logistics:
Reception:
1. Customs to Company:
1. Company Owns Land:
Logistics = mostly company-owned
2. Company Sources Independent Farmers:
Logistics = farmers' transport
•equipment
•seed & fertilizers
•packing materials
Crops:
• planting & cultivation
•harvest
Inbound Logistics:
•farm harvest transport to plant
Plant:
process; can; freeze; bottle; dry; pack; cold store
Outbound Logistics:
•national
•export markets
distribution
Management:
(mid-/long-term planning= cultivation opportunity + customer buying cycles)
•marketing/sales
•admin/services
•finance/accounting
QA QC QA QC QA QC QA QC QA QC QA QC QC QA QC
Administration
2. Direct to Company Processing Plant via Supplier Logistics
NATIONAL PURCHASING
Production/Operations
•Agro-engineering & weather satellite links
•Pre-cooling & cooling;
•Sorting, culling, cleaning;
•Drying; processing;
•Canning, bottling, freeze packing; dry packing
•Warehousing
Farm-to-Plant Operations Range = Manual, to Automated, to Computerized
Own/Outsourced Logistics
National Distribution via Retailers, Wholesalers & Markets
Offshore Distribution via Customer Brokers/Agents
END CONSUMER


PHARMACEUTICALS SUPPLY CHAIN
Some orders made from field reps using laptops or Palms linked to purchasing & inventory systems
Orders
Orders Verification from Warehouse:
Active Ingredients Available:
= MANUFACTURE
NOT available
= ORDER
INTEGRATED PRODUCTION MANAGEMENT PLANNING =
SUPPLY CHAIN DRIVER
MARKETING & SALES
PRODUCT PROMOTION
ORDERS/SALES
1. National
•Marketing = Doctors
•Sales = Pharmacies
2. Offshore
•"Scientific Offices"
•Offshore Agents
•Country Representatives
•Regional HQs (multinationals)
PURCHASING
RM IMPORTS
Active Ingredients = 85-100% from primary producer
Prior Min. of Health Approval
RM NATIONAL
0-15%
1. PRODUCT SEASONALITY = Annual Planning
2. DOCTORS, PHARMACIES, HOSPITALS = Semi-annual, Quarterly & Monthly Planning
3. MANUFACTURING PLANNING = Inventory, Imports, Marketing/Sales & Cash-reserves Sensitive
4. LT STRATEGIC PLANNING = drug licensing "Black box" 2003-05
MANUFACTURING
•Warehousing, Inventory, QA/QC
•Multi-Product Production
1. Production for Export
Destination country health authorities approvals
2. Production for National market
GROUND LOGISTICS
1. Sales & Marketing Reps
2. National Product Distribution
• Pharmacies
•Hospitals
•Doctors
•MoH Institutions
3. Exports Distribution
Logistics: = Own Fleets & Holding Company Fleets
Strong QC/QA Across Entire Production & Packaging Processes
Outbound finished products
QA/QC on imports = rigorous
•Customs Inspection
•MoH Prior Approval
•Manufacturer Inspection
Supplier delivery & QA/QC @ warehouse reception point
INTERMED. & END CONSUMER =
• Pharmacy buyers & resellers of OTCs and Prescription Drugs
•Doctors' samples
•Offshore markets
•Patients
Lead to:
•Cyclical Shelf Stocks Depletion
•Cyclical Replenishment Needs
•On-going Purchase Requests
Logistics from Customs by company fleet or holding fleet
Supply chain process continuum

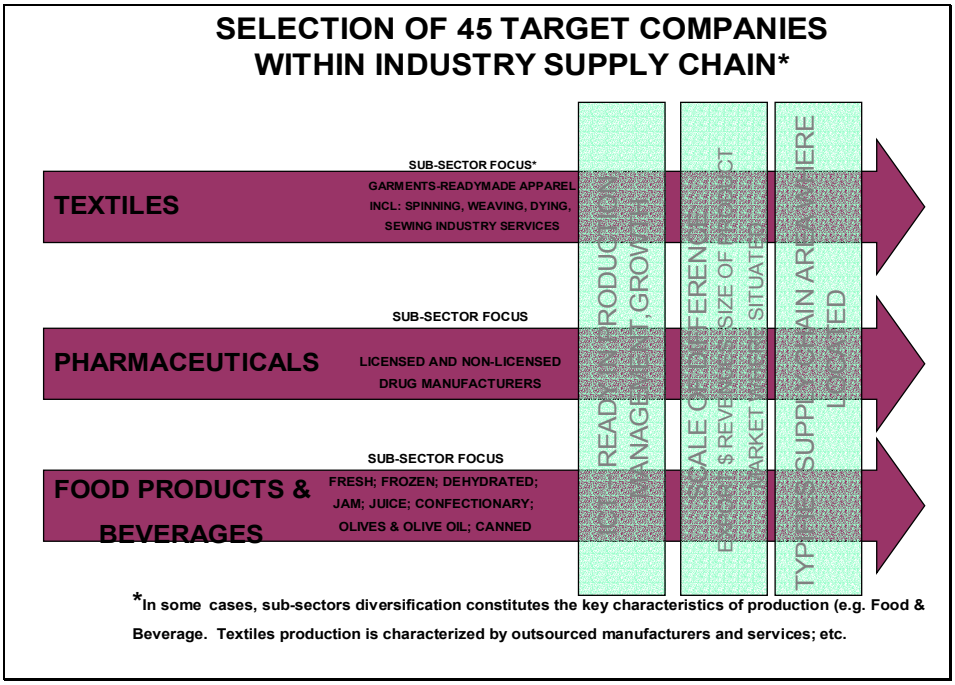


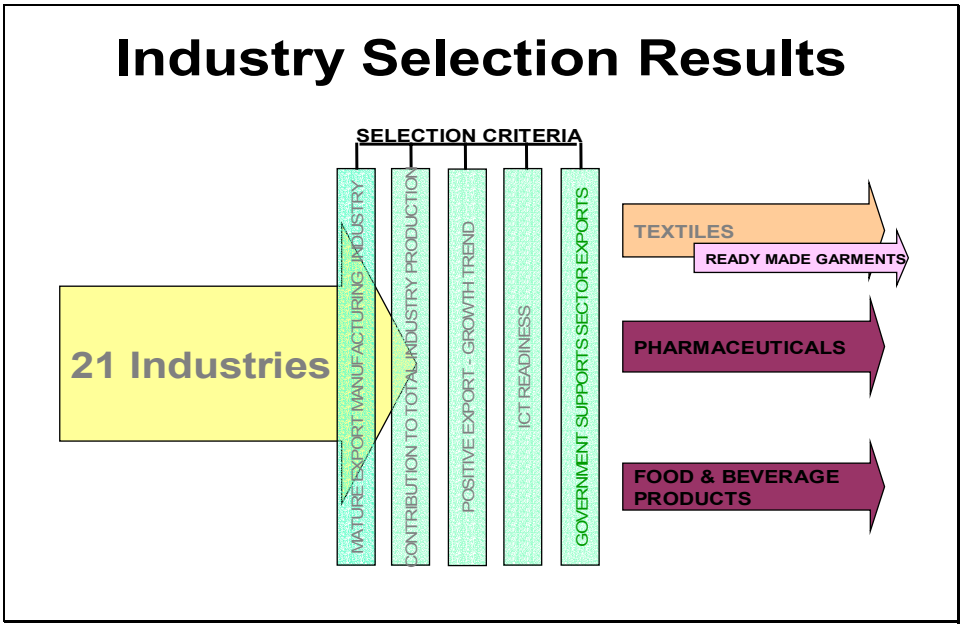
Selection Criteria for the Industry Companies

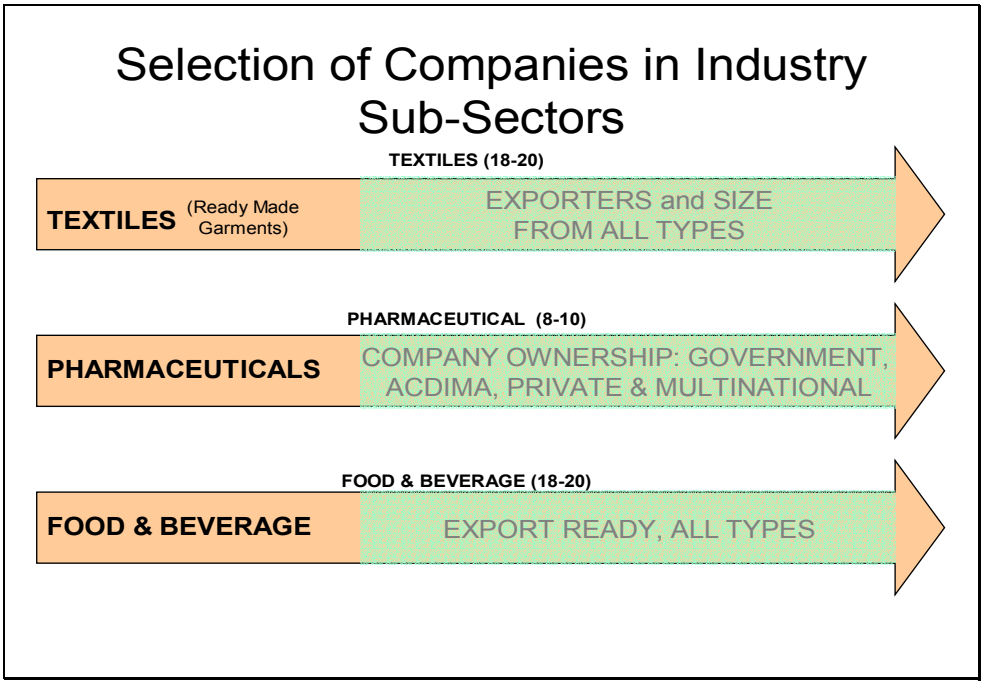
We now had descriptive information on each industry and its supply chain. We were now ready to define our selection criteria for choosing companies in each industry. We used the very characteristics of the industry for doing so. The company selection criteria was thus:

1. ICT-ready in production, management and/or growth areas.
2. Scale of difference: export revenues; production volume; labor count; market where situated, etc.
3. Typifies supply chain where located.

The same methodology for filtering for companies was used as that for industries, the difference being the applied criteria. The process is depicted in the following three slides.


SELECTION OF 45 TARGET COMPANIES
WITHIN INDUSTRY SUPPLY CHAIN*
SUB-SECTOR FOCUS*
TEXTILES
GARMENTS-READYMADE APPAREL
INCL: SPINNING, WEAVING, DYING,
SEWING INDUSTRY SERVICES
SUB-SECTOR FOCUS
PHARMACEUTICALS
LICENSED AND NON-LICENSED
DRUG MANUFACTURERS
SUB-SECTOR FOCUS
FOOD PRODUCTS &
BEVERAGES
FRESH; FROZEN; DEHYDRATED;
JAM; JUICE; CONFECTIONARY;
OLIVES & OLIVE OIL; CANNED
*In some cases, sub-sectors diversification constitutes the key characteristics of production (e.g. Food & Beverage. Textiles production is characterized by outsourced manufacturers and services; etc.


Industry Selection Results
SELECTION CRITERIA
21 Industries
MATURE EXPORT MANUFACTURING INDUSTRY
CONTRIBUTION TO TOTAL INDUSTRY PRODUCTION
POSITIVE EXPORT - GROWTH TREND
ICT READINESS
GOVERNMENT SUPPORT'S SECTOR EXPORTS
TEXTILES
READY MADE GARMENTS
PHARMACEUTICALS
FOOD & BEVERAGE
PRODUCTS



Statistics and Methodology

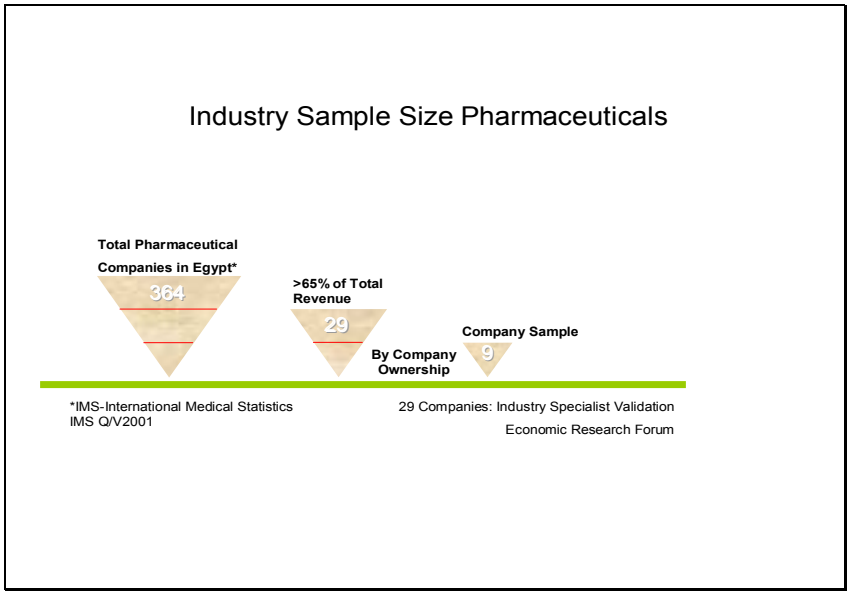
In order to be sure the number of companies we planned to analyze in each industry would provide a representative sample of what the ICT use/need is in the overall industry, the work methodology necessarily included getting the best statistics possible for each industry. From our total universe of 45 companies, we had pre-identified 18-20 companies for analysis in both textiles and food & beverages; and 8-10 in pharmaceuticals. We conducted on-going research on each industry to learn how many exporting or export-ready companies are in each industry. The information is below. It shows that we were getting a highly-satisfactory industry sample in each industry.

	PRODUCTION	EXPORTS	# COMPANIES	#EXPORTERS*
Ready Made Garments	US$4 billion	US$500 m	500	250
Pharmaceutical	US$1 billion	US$113 m	364	29*
Food & Beverage	US$10.4 billion	US$>130m**	1,900	300

*Pharmaceuticals are not typified by exporting companies. Our target population is Drug Manufacturing. The total industry population of Drug Manufacturers is 29.
**ALEB

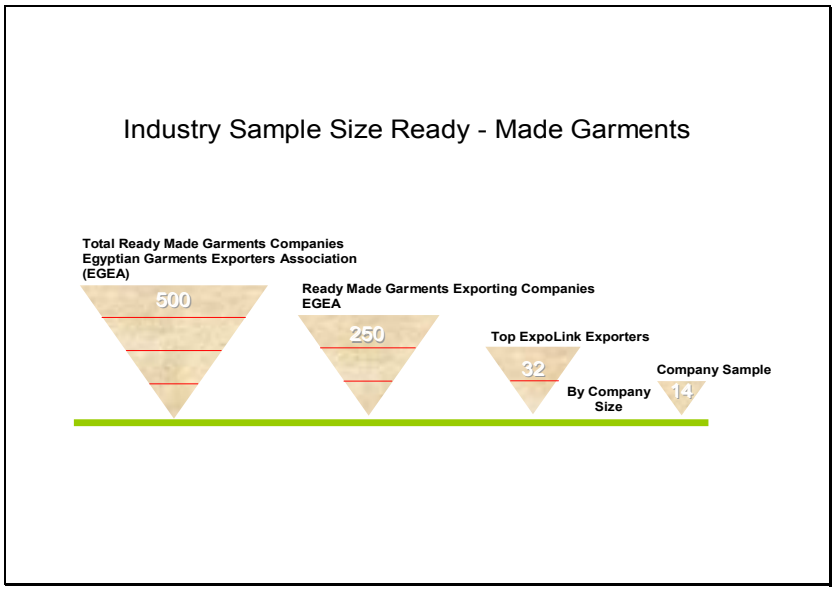
Further refinement of the industry statistics allowed us to see exactly what our analysis sample size was for each industry, according to the filters used and to the characteristics present in each industry. Those industry snapshots are seen in the following slides.

PHARMACEUTICAL DRUG MANUFACTURERS

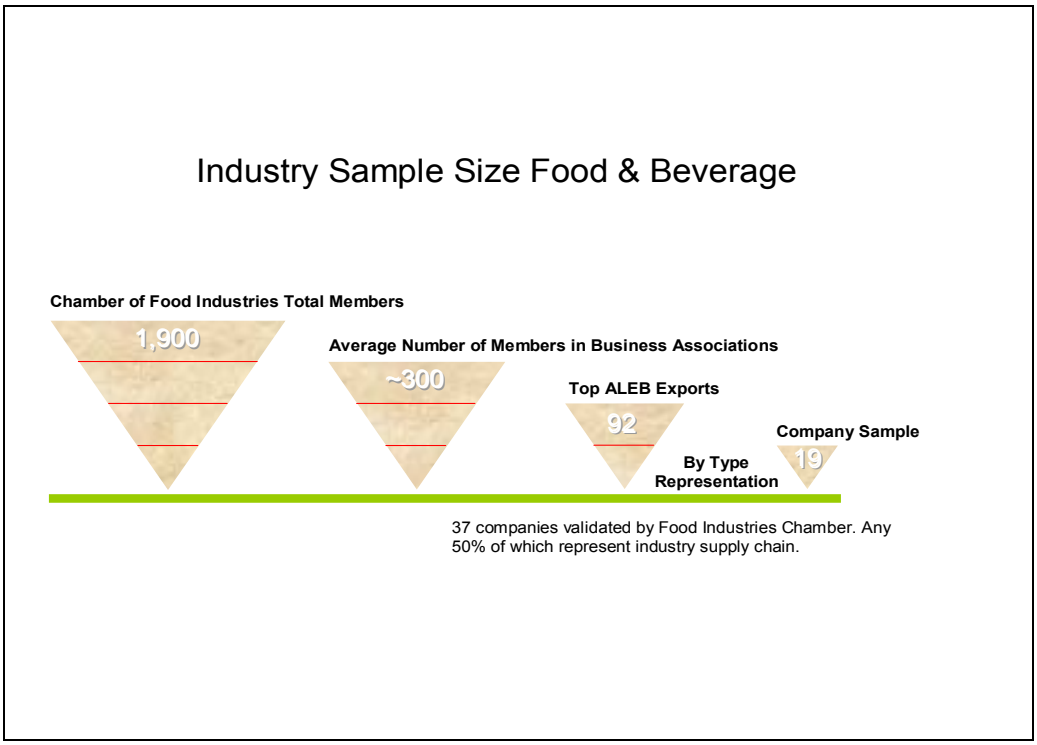


Pharmaceutical drug manufacturers are made up of companies who are identified by ownership: government; ACDIMA- Arab Company for Drug Industries and Medical Appliances (holding); private; and multinational.

READY-MADE GARMENTS



Ready-made garments is made up of small, medium & large companies by labor count; and manufacture of all categories of garments using all types of processes-tricot, weaving, spinning, etc.



Food & beverage exporters or export-ready companies are made up of companies who work in any/all of 24 foodstuffs categories.

Creating the List of Sample Companies to be interviewed

1. Ready-Made Garments

This was the most difficult industry group to define, because we could find little available descriptive information on ready-mades per se. While there is a wealth of information on the Egyptian textiles industry overall, particularly the public enterprises, it was difficult to find written documentation on ready-made garments.[8]

Following our basic methodology of reverting to industry experts for information and for vetting our work, we contacted the CEO of the Egyptian Garments Exporters Association (EGEA), also the owner of one of the largest ready-made garments companies in the country. According to the EGEA, the ready-made garments industry is comprised of 500 companies, 250 of which can be said to be exporting, with any reasonably acceptable definition of the term "exporting".

[8] Two or three industry experts, as well as a well-reputed Egyptian export association, said they had reliable data on ready-made garments and that they would provide it with us. Despite several attempts to obtain it, we ended up relying on a single authority: the Egyptian Garments Exporters Association (EGEA), fortunately a very knowledgeable and authoritative source.

ExpoLink, an authority on Egyptian exporting industries, provided us with their list of the 32 largest ready-made garments companies in Egypt, and basically confirmed that the EGEA information was correct.
According to ExpLink, ranking ready-made garments companies by size is a valid way to create a list of companies who represent the textiles supply chain. This is because nearly all the garments companies, regardless of size, are "present" in nearly all parts of the industry supply chain. ExpoLink advised that we would get a valid industry sample from the list they provided us. We later presented our "numbers" and names of the 20-25 ready made garments companies we were going to seek interviews with to two prominent Egyptian textiles experts. The list of the 32 largest companies by labor count and our list of 20+ interview targets was strongly endorsed by both.

We obtained interviews in 14 ready-made garments companies. This represents 5% of the total exporting companies and 44% of the largest companies. Both sample sizes are solidly within what are acceptable sample sizes for extrapolating what is happening in the industry overall.[9]

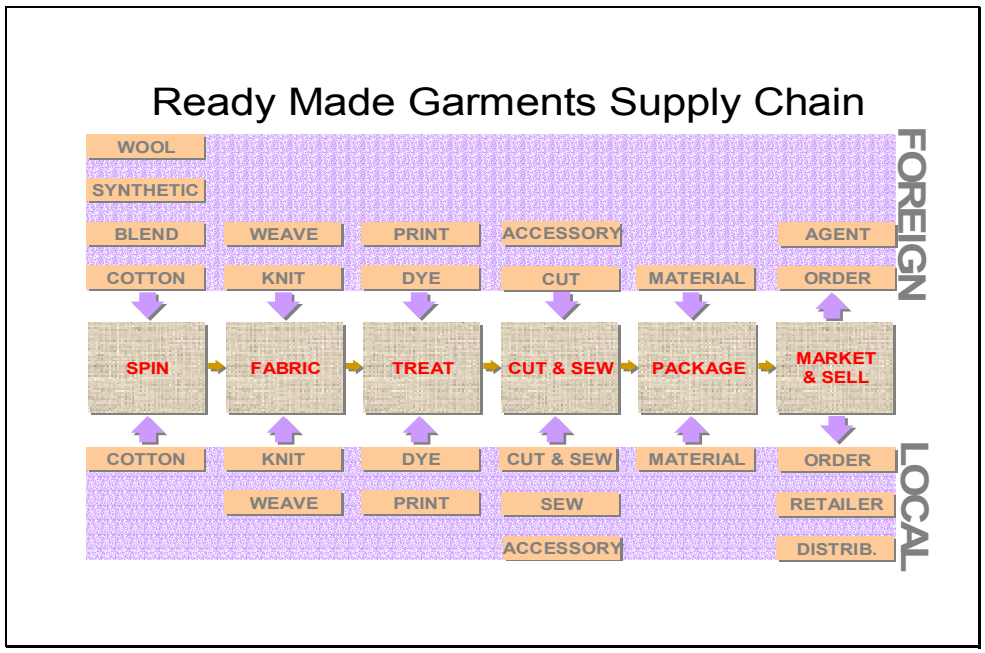
We overlaid the industry supply chain on the list of companies and saw that the entirety of the companies we interviewed represents all areas of the industry supply chain. Thus we could see that our sample size for ready-mades was solidly representative of the industry.

LABOR COUNT		SUB1	SUB2	COMPANY	CONTACT	CITY
3,500		Knitwear	Towels	Giza Spinning & Weaving	Mohamed Ghazal Marzouk	Giza
1,500	X	Knitwear	Underwear	Al Nasr Clothing & Textiles S.A.E (KABO)	Samir Riad	Alexandria
1,500	X	Knitwear	Outwear	Textile Industries Co. (TIC)	Mohamed Ihab Al Messiry	Cairo
1,400		Knitwear	Outwear	Cairo Cotton Center	Magdy Tolba	Cairo
1,400		Knitwear	Outwear	Dyetex (Egyptian Int'l Co. for Dyeing & Finishing)	Bassem Sultan	Alexandria
1,120		Knitwear	Underwear	Lonetex	Mohamed Samir Kamal	Cairo
1,000	X	Fabrics	Woven	Hesni Group	Sherif Hesni	10th of Ramadan
800		Childrenwear	Knitwear	Al Saiad Tricot Co.	Mohamed Al Saiad	El Mahal El Kobra
796		wovenwear		Lotus Garment Co.	Hossam Gabr	Port Said
751	X	Childrenwear	Knitwear	Baby Coca	Ms. Sherine Issa Eleish	Alexandria
750		Knitwear	Outwear	Afro American (Leina Tex)	Ahmed Samir Al Kafrawey	10th of Ramadan
750	X	Knitwear	Outwear	Egyptian Knitting and Ready Made Co.	Khaled Bahaa Rafaat	Cairo
670		Knitwear		Kazareen Co. Ltd	Khalid Lababidi	6th of October
650		Knitwear	Outwear	Fabrique De	Samir Raid	Cairo

[9] Professional market research firms set 3% sample size as a minimum. Anything above that is considered a very satisfactory sample size for an overall industry.

				Flanelles Samir		
550	X	Knitwear	Underwear	Egyptian Garments (JET)	Miazi Al Saadi	Cairo
500		Knitwear		Al Sheshai for RMG & Tricot	Ali Al Sheshai	Cairo
425	X	Knitwear	Pullovers	Bella Donna	Fouad Hodroj	Cairo
350	X	Knitwear	Pullovers	Nile Tricot Co.	Mahmoud Kamal	Giza
220	X	Knitwear	Underwear	Geem Co. for Manufacturing & Trading	Marc Chemali	6th of October
200	X	Fabrics		Egyptian Linen Co.	Mounir Ezz Al Din	Cairo
200		Knitwear	Outwear	Raja Clothing Company SAE	Claude Fattal	6th of October
160		Knitwear	Underwear	Magi El Showeikh & Co.	Sherif Magdy	10th of Ramadan
101	X	Yarn		Alkan Textile Co. (ALMATEX)	Jacob Thoppil	Giza
40	X	Knitwear	Pullovers	Fine Textiles Factory	Mohamed Ghannam	Cairo
25		Knitwear		Alexandria for Printing & Producing Ready Made Garments	Sameh Senoussi	Alexandria
		Childrenwear	Knitwear	Dice Sport & Casual Wear	Nagui Toma	Cairo
		Knitwear		Fabulous Sportswear Co. S.A.E.	Joseph Wassef	Cairo
		Knitwear		Halawa Garments	Ahmed Halawa	Sadat city
		Knitwear		Happytex Egypt	Hany Abd El Nour	10th of Ramadan
	X	Knitwear	Uniforms	Level Collection	Wafik Fanous	Cairo
	X	Knitwear	Outwear	Sherif Clothing Co. (Body Talk)	Sherif Moursi	Alexandria
		Knitwear	Outwear	Teeba	Samir Riad	Cairo

The following slide illustrates the particularity of the ready-made garments supply chain, with a particular focus on the production side of ready-made garments.



2. Pharmaceutical Drug Manufacturers

According to experts on the pharmaceuticals industry in Egypt, most notably the Economic Research Forum, the total universe of drug manufacturing companies in Egypt is 29 companies.[10] (According to International Medical Statistics –IMS- in Geneva, there are 364 companies in the Egyptian pharmaceutical industry, the ones not involved in manufacturing drugs representing distribution companies, trading companies, manufacturers of syringes, surgical cotton, and other medical and hospital supplies for the national and export markets).

The 29 drug manufacturers are divided as follows:
8 = Holding Company for Pharmaceuticals, Chemicals, and Medical Appliances.
4 = ACDIMA Group
9 = Private Egyptian companies
8 = Multinationals

All but two of the companies on the list are on the IMS list of the top 90 revenue generators in the Egyptian pharmaceuticals industry.[11] In addition, collectively 26 of the 29 Egyptian companies[12] represent over 65% of the total pharmaceutical industry revenues in Egypt for 2001. Although we had not created this percentage of revenue representation as a filter for selecting companies, we *had*, nonetheless, used a filter "scale of difference", so our methodology of cross-referencing by ownership and then by revenue was solidly reinforced with this indicator of 65%+ of all industry revenues held by our target population of 29 companies.

Following the companies marked in yellow, the table below shows how we sorted the drug manufacturing companies for interviews, using a balanced representation by ownership, that being the industry characteristic. We then took a high, medium, low ranking by revenue, across each of the four categories. This gave us a list of 8 company targets. We began setting up interviews according to that sorting of eight. Companies shown in grey highlight represent final choices because of substitutions. Some companies were reluctant to receive us, or received us but would not discuss details with us, stating lack of authorization to do so (these were Public companies). When we made substitutions, we used the same sorting methodology to select a new target, thus retaining the validity of the sorting methodology and its reflection to the industry's characteristics.

[10] The total universe of 29 was confirmed by each of the 9 pharmaceutical companies we interviewed.
[11] The indication is that they are not among the top 90 revenue makers.
[12] Using the IMS list

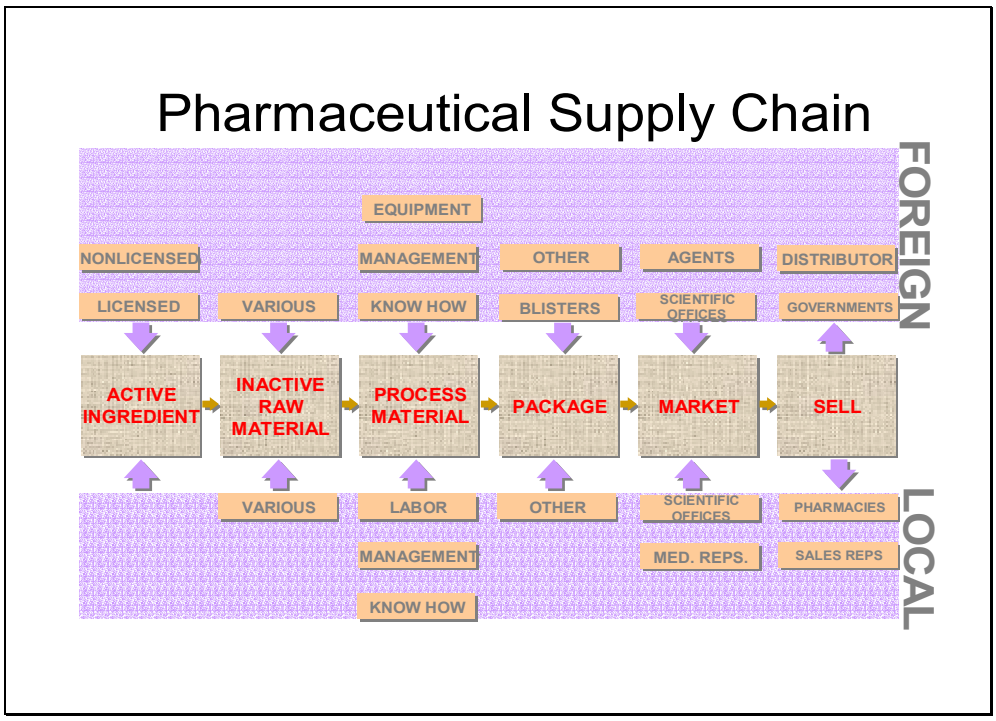
PHARMACEUTICAL COMPANIES: INTERVIEW SORTING BY OWNERSHIP AND BY REVENUE

	Company	Revenue in EGP	% of Total Industry (Int'l)	% Growth Rate	Sorting by % of Growth Rate	Holding Company	ACDIMA	Local	Foreign
1	GLAXOSMITHKLINE	374,508.7	8.6	11.0	GLAXOSMITHKLINE				X
2	NOVARTIS	301,178.6	6.9	7.3	CID	X			
3	BRISTOL MYERS SQUI	263,472.9	6.1	0.6	MISR	X			
4	AVENTIS	233,939.2	5.4	-0.9	ALEXANDRIA	X			
5	EIPICO	209,453.1	4.8	14.9	PFIZER				X
6	PFIZER	182,177.7	4.2	2.9	KAHIRA	X			
7	PHARCO	162,791.9	3.8	13.5	MEMPHIS	X			
8	SERVIER	128,491.9	3.0	16.3	NASR	X			
9	AMRIYA PHARMACEUT.	124,245.0	2.9	-3.5	EIPICO		X		
10	AMOUN PHARM.CO.	116,278.4	2.7	59.8	RAMEDA			X	
11	SEDICO	82,918.0	1.9	3.1	AVENTIS				X
12	NILE	77,432.3	1.8	8.5	NILE	X			
13	MEDICAL UNION PHAR	75,016.1	1.7	17.3	PHARCO			X	
14	CID	68,578.9	1.6	5.9	NOVARTIS				X
15	MISR	62,452.4	1.4	14.1	MEPACO		X		
16	KAHIRA	59,205.4	1.4	9.9	BRISTOL MYERS SQUI				X
17	ALEXANDRIA	48,725.9	1.1	-3.5	SEDICO		X		
18	MEMPHIS	44,368.8	1.0	-11.3	AMRIYA PHARMACEUT.			X	
19	NASR	27,755.8	0.6	31.8	T3A			X	
20	MEPACO	18,292.6	0.4	6.7	SERVIER				X
21	T3A	17,208.8	0.4	22.4	ELI LILLY				X
22	OCTOBER PHARMA	16,878.2	0.4	19.8	MEDICAL UNION PHAR MUP		X		
23	RAMEDA	15,673.1	0.4	39.0	MINAPHARM			X	
24	ELI LILLY	15,662.6	0.4	-27.5	OCTOBER PHARMA			X	
25	APEX PHARMA	12,267.6	0.3	24.5	AMOUN PHARM.CO.			X	
26	MINAPHARM	7,000.4	0.2	3.2	APEX PHARMA				
	Total	2,745,974.3	63.3						
	Total Industry	4334723							

In the end, we held 9 interviews, still with a balanced selection from across the 4 categories. That gave us a balanced sample universe of 69% of the Egyptian pharmaceutical drug manufacturing industry.

In all cases, we overlaid the companies on the industry supply chain and verified that our sample companies collectively represented the entire industry supply chain. We thus confirmed that we had an extremely solid sample universe.

The following slide illustrates the particularity of the drug manufacturers supply chain, with a particular focus on the production side of drug manufacturing.



3. Food and Beverage

The Chamber of Food Industries say they have approximately 1,900 companies in their Chamber's data base.

The average number of companies who are exporting or who are export-ready food and beverage producers and who are registered with the four main Egyptian exporting companies associations, is approximately between 140-300.[13]

ALEB (Agricultural-led Exporting Businesses) provided a list of the top 92 exports revenue companies in their data base. They list over 300 export and export-ready companies, showing the exporting companies in each of the 24 foodstuffs categories.

[13] HEIA and ALEB have slightly over 300 each. ExpoLink and EgTrade collectively present about 150 different exporting foodstuffs companies.

We cross-ranked the 92 companies by export revenues, and by largest number of companies in the 24 foodstuffs categories. We selected from high, medium and low exports revenues, making a diagonal slant across the foodstuffs categories, to generate an initial list of some 20-25 foods and beverages companies to interview (18-20 being our target population).

At the same time, the Food Industries Chamber provided us with a list of 36 of the most representative foodstuffs exporting or ready-to-export companies in Egypt, a cross-referenced list by supply chain representation and by the 8 most important food products categories. The Chamber informed us that if we interviewed any 18 of the 36 companies on their list, we would have a representative sample of the industry.

We overlaid the Chamber's 36 companies with our 20-25 initial targets. The two lists were fully compatible. We obtained 19 interviews with food and beverage companies, which represent 6-12% of the total exporting or ready-to-export companies listed in the four Egyptian association lists. They represent over 50% of the Chamber's sample universe and 21% of the top 92 exports revenue generators on the ALEB list.

The entire industry supply chain is represented in depth by the 19 companies interviewed. We obtained a very strong sample size for food and beverages interviews. The basic cross-sectioning methodology we used can be seen on the next page. It was overlaid with the list of company choices which the Chamber of Food Industries provided. That list is presented immediately following the matrix of the top 92 companies.

Company Name	2001	Fresh Fruits & Vegetables	Beverages/Juices/ Concentrates/Purees	Other Selected Items	Dairy Products	Biscuits, Confectionery Pastry Products	Frozen Fruits & Vegetables	Herbs & Spices	Dehydrated Fruits & Vegetables	Pickled Fruits & Vegetables	Processed Poultry Products	Condiments	Jams & Preserves	Processed Tomato Products	Oils, Flavors & Fragrances	Organic, Kosher & Specialty Foods	Pickled Olives	Processed Meat Products Mixes, Bouillon & Dry Sauce Mixes	Bagged, Canned & Glass Packed Products	Edible Oils Other than Olive Oil	Processed Fish Products	Olive Oil	Pasta Products	Baby Food	Company Total Number of Affiliations
		Affiliations Within Industry Sectors																							
Daltex Imbasco Co.	234	1	1																						2
Farm Frites	73						1		1						1										3
EI Marwa Food Industries Company	67.5		1																						1
SONAC	64.6	1		1			1																		3
Green Land for Dairy Products	40		1		1																				2
Egyptian Traders Company	28			1			1		1										1						4
Foodico	25		1				1							1											3
Sekem -ISIS -Hator -Libra	25	1		1		1	1	1		1		1		1	1	1				1				1	12
Vitrac	22.4		1									1	1	1											4
Viva -EDAFCO	21		1		1					1				1											4
Heinz	20		1									1		1											3
Spice Land	20									1				1											2
Montana	19.2						1									1									2
Edfina Co. for Preserved Foods	18.73		1	1			1			1			1	1					1		1				8
EI Aguizy	17	1																							1
EGINTEX Co.	16.85	1		1				1																	3
Aga	16		1				1			1			1				1								5
Unifood	15						1																		1
H -EI Tanbouly -Dehydro Foods Co.	13.39			1				1	1						1										4
Agro Alex	11.5	1					1		1																3
Koki	11.32										1														1
EI Nasr Dehyderating	11							1	1						1										3
Basma	9						1				1										1				3
Juhayna	9		1		1																				2
Arcotrade	8.5							1																	1
National Food Co. -Kato -Mano -Soupy -Doobee -Natfood	8.08		1									1	1					1					1		5
Dina Farm	7	1			1														1						3
Mansour Distribution Company -MDC	7		1		1																1				3
Mass Food -Temmy's -Nutssy	6.17			1		1																			2
Nile Fruit-Pulp	5		1																						1
Halwani Brothers	3.6		1			1	1			1	1	1	1				1	1	1						10
Farm Fresh -MISRCO	3.5	1	1							1			1	1			1		1						7
Comby	3		1				1					1	1	1											5
EI Salah Farm	3	1			1				1						1										4
Seclam Dairy Processing	3		1		1																				2
Bella	2.75		1										1	1		1									4
EI Nenaiea	2.72							1	1						1	1									4
Dr. Olivee	2.7									1							1					1			3
P & J	2.2		c											1											1
Delta Aromatic Internatiohal	2		1												1										2
Givrex -Robert Mansour & Co.	1.85						1				1							1			1				4
Wadi Food	1.85									1				1		1	1					1			5
Royal for Herbs & Spices	1.7							1								1									2
Hostess	1.33					1																			1
Hi Tadi	1.26		1			1							1						1						4
EI Misrieen	1.24		1		1																				2
Mina for Oils	1.16																					1			1
EI Salheya -New Salheya Olive Oil Mill	1.1	1								1							1					1			4
SONUT -Schweppes	1.1		1																						1
Light Food Co.	1.08												1					1							2
Dr. F. EI Shobaki Trade, Export Agencies	1							1	1						1										3
KATILO -Halayb	0.9				1																				1
Egyptian Trading Herbs & Spices	0.78							1																	1
Aromatico	0.75			1				1				1													3
Cesam Foods S.A.E. -Timmy	0.5		1									1		1											3
Sawa Food	0.5									1							1								2
Smco -EI Smellawy for Marketing Co.	0.45	1		1				1				1	1												5
EI Samahy Pickles -Continental Pickles	0.38									1							1								2
Safety Egypt	0.3		1						1			1	1										1		5
Green October -G.O.C.	0.27	1										1							1						3
APMAC	NA	1						1	1																3
Chicksy	NA										1														1
Dakahlia Poultry Co.	NA	1									1														2
EI Nadda	NA										1														1
Enjoy	NA		1		1																				2
Galina	NA										1							1							2
Grazia (ICLRC)	NA				1														1						2
Reika	NA				1	1																			2
Sameh Food Stuff Company	NA																		1						1
Sunbulah -Food & Fine Pastries Manufacturing Co. Ltd.	NA																								0
Super Foods	NA		1											1											2
Fakhry & Co.	NA														1	1									2
Agromisr	NA	1						1	1																3
Best	NA		1										1				1		1						4
Borio -Gober -Nighty -Family Nutrition	NA					1						1													2
Cold Alex	NA			1			1				1										1				4
EI Gawhara	NA	1			1		1		1	1							1								6
EI Menzalah	NA			1					1																2
Emcco for Oils & Food Industries	NA								1	1							1						1		4
Faragalla	NA		c	1	1	1	1				1	1		1				1	1		1				10
Flaminco Snack Food C .	NA		1	1		1			1																4
Frostie	NA		1									1	1	1											4
Giza National Dehydration-GND	NA								1																1
Golden Eagle Foods Co.	NA				1							1	1												3
Golden Frites	NA						1					1	1												3
Golden State Foods -G.S.F.	NA											1		1											2
Green Land Industries	NA								1																1
Herrawi Group -Froca, Misr for Rice and Herrawi	NA	1		1			1																		3
Kaha	NA		c				1			1			1	1			1		1	1					7
Riri Baby Food Co.	NA																							1	1
SFCO	NA						1		1																2
Wazerco	NA	1	c	1																1	1				4

CHAMBER OF FOOD INDUSTRIES LIST OF REPRESENTATIVE COMPANIES

Fresh Fruits & Vegetables
Mafa, Ein Shams, Agroprocessing, Pico, Charipack, Somal, Daltex Imbasco, El Roda, Balco

Beverages, Juices, Concentrates, Purees
Juhayna, Enjoy, Best, Super Foods

Biscuits, Confectionery, Pastry Products
Horreia 2000, Cadbury, Mass Food

Frozen Fruits & Vegetables
Farm Frites, Sonac, Montana, Orouba, Givrex, Cold Alex

Dehydrated Fruits & Vegetables
El Nenaia, El Nasr Dehydrating, Giza National Dehydration, Sekem, Agromisr

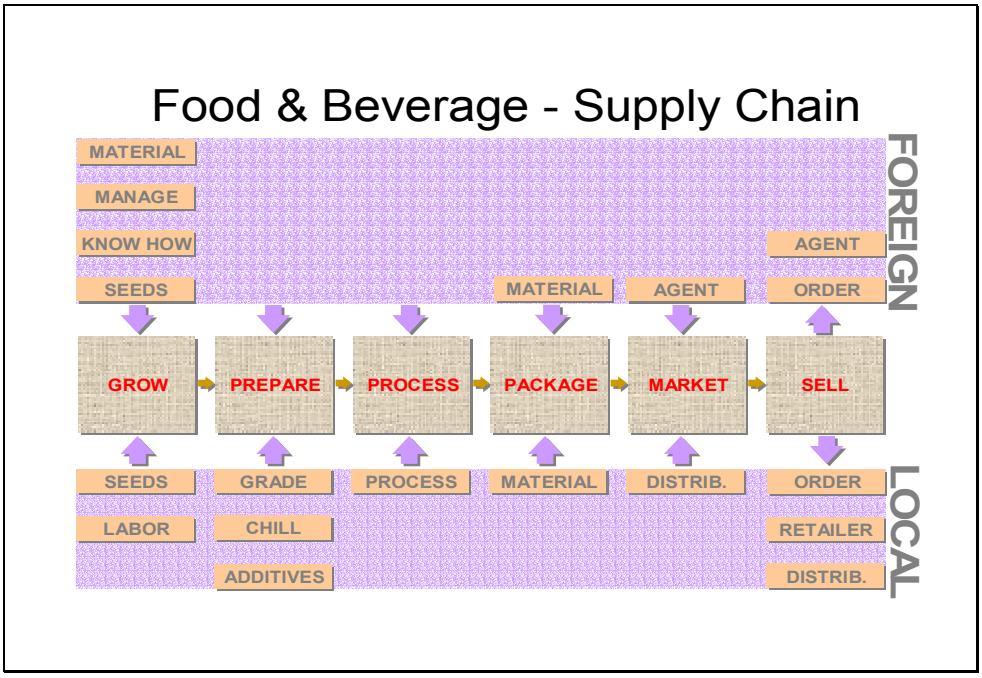
Jams & Preserves
Vitrac, Halwani, National Food Co.

Bagged, Canned & Glass Packed Products
Kaha, Harvest

Olive Oil
Wadi Food, Mina for Oils, El Salheya, Olive Hills, Dr. Olivee

1. Other Selected Items
2. Dairy Products
3. Herbs & Spices
4. Pickled Fruits & Vegetables
5. Processed Poultry Products
6. Condiments
7. Processed Tomato Products
8. Essential & Medicinal Oils, Flavors & Fragrances
9. Organic, Kosher & Specialty Foods
10. Pickled Olives
11. Processed Meat Products
12. Dry Blends, Soup Mixes, Bouillon & Dry Sauce Mixes
13. Edible Oils Other than Olive Oil
14. Processed Fish Products
15. Pasta Products
16. Baby Food

The following slide illustrates the particularity of the food & beverage supply chain, with a particular focus on the production side of food and beverage manufacturing.



Sequencing the Companies Interviews

We used the simple principles of Goal-Directed Milestone Planning (GDMP) planning to help distinguish sequential and in-parallel activities. In the case of making company interviews, we adopted a strictly first-come-first-served approach. That is, as soon as we had a list of industry companies to interview, we started setting up interviews. We did not wait to have all three industries "lined up and ready to go". As they came on line, we began setting up interviews. This type of planning differentiation helped ensure timely completion of the 45 interviews.

Creating and Interview Schedule and Conducting Interviews

The heavy logistical aspect of our work was foreseen by the Project administration who provided the contractor with logistical support for setting up the interviews and, in some cases, also provided local transportation. This may seem like a mere detail, but such a detail could become a major part of one's work methodology in a similar market analysis task. That is: were one to undertake an industry analysis for a private client, one would be completely responsible for planning for and providing one's own logistical support. This would require planning for a specific contractor level of effort.

On the flip side of the equation, if one were performing this task for a private client, one would not have to adopt one's work methodology in conformity to certain required bureaucratic procedures. If performing an industry analysis under the aegis of a government-sponsored project such as this one, it is advisable that one incorporate into one's work methodology certain "ways of doing business with the government" which one would not need to do in the case of conducting work for a private client. Mostly, the

work methodology aspects involve conforming to certain norms and regulations for *how* to do business. This translates into planning for the necessary time for dealing with the norms and regulations. An example on this project was the requirement to develop a Project-approved letter of introduction that properly introduced both the Project and the consultants in charge of carrying out the interview activities.

Tools for In-situ Analysis: Interviews & Questionnaires

The primary methodology for analyzing what the ICT penetration in Egyptian industries was interviews with key persons in the target companies that are representative of their industry supply chain. The key persons to be interviewed are:

- President, Chairman of the Board, Executive Directors and/or other executive management members of the company;
- Directors of company IT departments of the company, or other key persons who have detailed knowledge of IT in the company.

The tools for interviewing are closed questions and open-ended questions, using two tailored questionnaires to provide structure and consistency to the company interviews. The methodology included testing the questionnaires during the first four or five interviews and then modifying the questionnaires according to the first interview experiences.

We followed this methodology successfully. It allowed us to make important early changes in the company summary questionnaire, which made the remainder of our interviews more focused and pertinent.

Our method for creating the company summary questionnaire was to make several versions until we felt we "got it right". Basically, the best method for creating interview questionnaires is to write and rewrite the questionnaire several times before beginning the interviews. As one goes through the different architectural phases of a project such as this, one is on an important daily learning curve. This determines that the interview questionnaire will undergo several iterations. It is advisable to have various persons look over the questionnaire and provide feedback. We presented two or three draft copies for Project members to read and give feedback on. Despite following that approach, we still found the need to refine the company summary questionnaire after we had first used it.[14]

Methodology for Capturing Two Levels of Information

One questionnaire focuses on understanding the business in general and is designed for use with the Directors of companies. The other questionnaire is an ICT-inventory, to be used with the IT department heads of the companies interviewed. The two questionnaires were structured to obtain the following:

1. Document a baseline of what the target companies actually do now, (independent of leveraging of ICT) in the part of industry supply chain where they are situated, and focused on their own supply chain areas of production, management and growth. This part of the interview is

[14] Questionnaires are found in a different section of this annex.

conducted with top executives, since they are the individuals with the macro-view of their respective companies and within their industry overall.

2. Document a baseline of what the current status of the companies' ICT resources and uses are. The questionnaires and interview conversations for this part of the information gathering are to be held with directors of IT or with other technical managers who have in-depth knowledge of their company's IT setups and applications. This part of the interview process captures information on company such as:

   - Staffing
   - Hardware (IT and Tel)
   - Software (IT and Tel)
   - Networks (IT and Tel)
   - Connectivity

3. Examine the use of ICT across the company's own value chain (supply chain), focusing particularly on three main areas: production, management and growth. This part of the information is available from both top executives and key managers of the company. The appropriate company persons will provide information on issues like:

   - Baseline company ICT requirements and uses within the supply chain
   - In-source/out-source ICT needs
   - Company budget levels for ICT
   - Current company staffing, systems, etc.
   - Strategies and priorities for ICT use and for increasing the company's use of ICT
   - Company's ICT purchase dynamics (who decides; how decided, etc.)
   - Corporate market strategies, including how the company envisions that ICT solutions and systems can improve production and management, as well as for driving market growth.

The interview methodology allows for "latitude" in the discussions so that the company interviewees are provided ample opportunity to add detail, explanations and so forth, to clarify or amplify information about any specific questions contained in the questionnaire, or simply to add information the company feels is important for us to capture.

Interviews would normally last approximately 3 hours in order to adequately review the different items in the questionnaires. The top executives would normally be interviewed for about an hour, and the IT or other technical managers would be interviewed for an hour or an hour and a half.

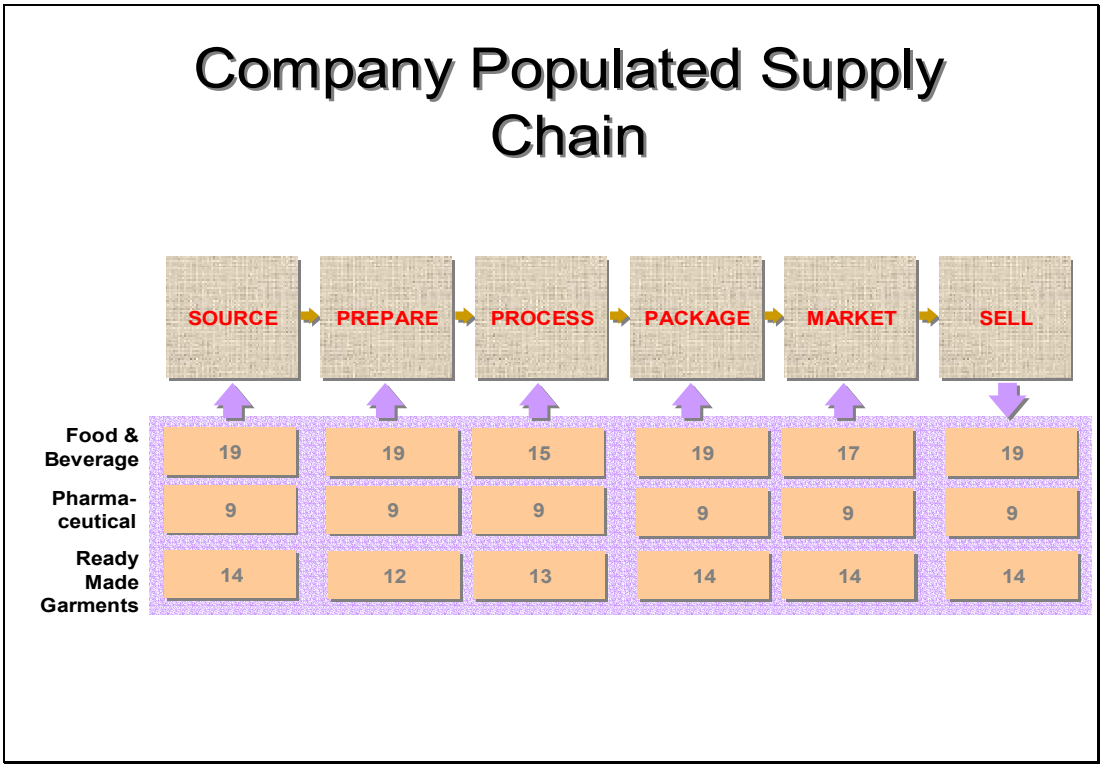
At the end of the interviewing process, the interviewer, in collaboration with a corporate-based InfoAmericas data analyst, synthesized the information gathered. A report on the findings was written up for each company visited. It includes conclusions and recommendations concerning an individual company business case for strengthening ICT use in that company. But the report was not meant to be used for the data analysis.

Data Analysis Methodology

The detailed information for the macro data analysis was obtained directly from the questionnaires. We created an Excel-based analysis program. The methodology was pretty straight forward. The answers given in the interviews were registered on the questionnaires, and then transferred in quantitative form to the Excel program, and then the data was run to get "snapshots" of what the answers were. Those snapshots were transformed into tables and charts of different sorts, to allow for making inter-and intra-industry comparisons, as well as to provide statistics concerning ICT use and needs which could be compared with information from the offshore countries which were benchmarked for showing comparisons with the Egyptian industries analyzed, as well as to show best practices and even failures.

One of the most important parts of our data verification process was to show in matrix form where each of the analyzed companies was in its respective industry supply chain. The verification was important, inasmuch as we needed to ascertain that in performing our analysis of ICT uses and needs in the industry supply, that we had not left any part of an industry's supply chain uncovered.

The numbers in the boxes which are shown in the slide on the next page correspond to the numbers of companies which were using some form of ICT in the identified part of the supply chain. The slide shows that our analysis had, indeed, covered every part of each industry's supply chain.



Companies analyzed: Food & Beverage-19; Pharmaceutical-9; Ready-made Garments-14.

Methodology for Verifying Company Information

Our work methodology included how to run a reality check on what companies were telling us. Not about their internal matters so much as about their problems with the inbound and outbound logistics parts of the industry supply chain. Namely, with Egyptian Customs. Basically, our information-gathering strategy was as simple as it can get: do not overly-rely on "subjective" information the users of Customs services are telling us. Do a reality check by talking to "third parties", in this case logistics firms and Customs themselves.

To do this, Project management requested we reserve two or three of the 45 company visits for visiting Egyptian Customs and/or ground, air and sea logistics firms to check on the veracity of what most companies were telling us concerning their negative experiences at Customs, at both the inbound and outbound "strangulation points" of the industry supply chain.

We visited two freight forwarders because they liaise between the services and demand sides of the supply chain logistics. And we visited the main Customs Office in Cairo, because they are the government service side that many companies had said could be improved, in some instances by using IT solutions.

The freight forwarders offered useful information for understanding more fully what the companies were telling us. The Customs Office did not want to speak with us beyond the statement, textually quoted: "Everything is fine with Customs. We do not have any problems". They referred us to the main Customs office in Alexandria, but insisted that we would need a letter of authorization to do so.

By that time we had completed 44 of the 45 visits. It was our opinion by then that the over 40 CEOs, Presidents, and General Managers we had visited across three industries companies had provided us with accurate information about how their supply chain activities work and where the industry supply chain bottlenecks exist and how IT solutions could help solve them. We had used a very simple, but effective, reality check methodology for reaching this opinion. For example, when one manager of a prestigious ready-made garments firm, in business for nearly 50 years, said: "Our business efficiency is negatively impacted at between 15-20% by Customs inefficiencies and arbitrariness", we did not outright accept that statement. We told other top managers in other companies what we had been told and we asked for their reaction to it. Their answers were consistent: "It might be a bit exaggerated to say 20%, but easily you can say Customs negatively reduces our efficiency and cost effectiveness by 10-15%".

Industry IT Skills & Jobs Clusters

When we began our work, the Project had not clarified that our component was not focused on performing a job and skills gap analysis for industries. As a result, our original questionnaire was off-focus and had to be redesigned. We also created several jobs and skills clusters matrices, thinking that an objective was to perform an IT skills gap analysis in companies interviewed. It was not and we had spent time developing work tools we would not need. We created:

- production clusters (specifically in a manufacturing environment)
- management clusters
- growth clusters

We broke out the cluster groups to reflect the specific kinds of job classifications that are found in each of the three industries we would analyze (textiles, pharmaceuticals and food and beverages). We limited the skills clusters to ICT skills, using the same ones as those created for the ICT analysis for this project. However, our job clusters were industry-specific.

The very creation of our methodology in close coordination with Project management brought out the fact that our work was not, after all, an ICT skills gap analysis. It was more of a business analysis to understand the current use of ICT in each industry and what the ICT needs in the industry supply chain are, as seen through the companies interviewed who typify the industry supply chain.

The job and skills clusters work is not presented in the annex, since it did not add any value to this component's methodology or activities and, as a result, we did not use it.

Contingency Planning as Part of the Work Methodology

This was briefly discussed earlier. It is appropriate to briefly re-emphasize the importance of contingency planning as part of one's work methodology, particularly since this part of our methodology determined our ability to deliver on time.

Our work methodology contemplated initiating company profiling and interviewing in the third week of activities. We actually began this activity in the fifth week. The reason for this goes back to Principle #3. Specifically, we did not:

- appreciate that the creation of a replicable methodology for this industry analysis would require such a high level of effort until we began to get involved it the work itself;
- envision that the level of difficulty we encountered for getting sufficient, reliable industry information that could lead us to choose companies that would represent the complete industry supply chain;
- foresee the need to convince our clients (as opposed to technically satisfying ourselves as market analysis experts) that the total number of companies we would analyze would constitute a satisfactory industry sample population.

The lesson learned from this experience is: one's methodology may be technically sound. But one cannot plan for every variable. One's work methodology should include Principle #3 to ensure one builds into one's planning methodology a certain safety net for dealing with an unforeseen level of effort. Our safety net was in having planned for the possible need to hire an assistant. We did so and we were thus able to deliver our product on time.

Goal-directed Milestone Planning:
We used a simple Goal-Directed Milestone Planning (GDMP) approach to ensure timely delivery of our outputs.

Regardless of what kind of planning tool one uses, one's work methodology should build in contingency plans ("fallback positions") to deal with the unexpected. One cannot plan for surprises, but surprises are always there. So one's work methodology should build in elements for dealing with them. We found we had to adjust for delays, unexpected demands and unforeseen problems. Fortunately, we had built into our plan the possible need to hire an assistant for the analysis of the 45 companies. After about three weeks into our activities, it became clear we would need to move over to "plan B". Had we not done so, we could not have delivered on time.

The sequential activities were obvious:

1. before identifying the 45 companies to be analyzed, we had to identify which industries we would work within;
2. before identifying the industries within which we would work, we had to create the selection methodology;
3. before we could begin to analyze the companies, we had to get Project approval for work done to date, including our work methodology itself.

Most of our activities had to be executed in parallel. There was a lot of inter-/intra-dependence, particularly taking care to ensure that we provided constant and adequate

feedback to our corporate offices so they could adequately select which countries to select for benchmarking ICT penetration in the same industries as the ones with which we were working. We had to be sure that we completed our in-country interviewing and data collecting and the countries benchmarking very close to the same date, since we needed to have the data from both available for running the comparative data.[15]

Ten Guiding Principles Underpinning the Work Methodology

There are subtleties in conducting this kind of industry analysis which, when observed, can help ensure a successful project. They are "principles", or fundamental concepts that come from experience. They may be seen as a work approach more than as technical aspects of one's methodology. The following ten principles are a non-inclusive list of work guidelines which one may add to or refine, as appropriate. They were particularly appropriate to this specific task and for developing our Egyptian industry analysis methodology.[16]

TEN PRINCIPLES OF THE WORK METHODOLOGY		
	PRINCIPLE	APPROACH/ACTION
1	You need client buy-in at several stages and at several levels of the work.	Use a consultative approach to ensure work is constantly client-oriented. Get (repeated) client feedback and obtain unambiguous vetting of methodology and content by industry experts and project officials.
2	Teamwork is vital. Communication helps ensure good teamwork.	Share information as a basic form of communication, especially with persons who helped you by giving you information, data and guidance. You may need an ally in a moment of need, and your best ally will be the person you stayed in touch with and appreciated as you went along.
3	Most project designers have not correctly estimated the level of effort required. Nor have most contractors realized what level of effort will really be required until they begin to work on the program.	The contractor is responsible for not letting that interfere with the outputs and outcomes.
4	Priorities and perspectives will likely have changed between the time of project design and the execution phase.	Do continual reality checks to discover what was but no longer is, and what is not but what should be. Work early on with the client to agree on what to do in such cases. Most clients are reasonable. They want a good job well done. Work positively with the client to that same end.
5	You may be in a ground-breaking project (such as this one). Much of what needs to be done is new, so there are no pre-set rules of the game.	Use common sense and be practical. Rely on good judgment that comes from experience. The clients often want things their way, while simultaneously expecting you to bring your expertise to the table. What the client may want and what you believe best serves the client may be different. Help ensure you get the right balance by working more with the client than for the client.
6	You may have multiple layers of "clients". You may think you are	You are probably right. You are the one who needs to get clarification. Do so early in the game.

[15] Refer to the Timeline slide and Methodology Overview slide shown in this annex.
[16] Some points are particularly client-sensitive. This was an industry analysis commissioned by government agencies, not a market analysis requested by market players.

	getting contradictory signals from your client(s).	
7	Much of the information required for the analysis is missing, non-existent, retained, contradictory or out of date, or all of the preceding	The client will not normally accept this as an excuse, even when they know it to be true. Work with that reality. Document what sources you do have, be they documents, online sources or information from country and industry experts.
8	The target audience and the industry experts you interview are your greatest allies and friends for getting the information you need, especially if there is little or poor documentation available.	Gain their confidence and trust within the first 15 minutes of your interview. Always thank your interviewees. Always stay in touch with them. Never betray their trust. And they will welcome you back when the occasion arises. You can repay them by sharing with them information you are collecting that they might not have.
9	A government-commissioned analysis will likely require extensive, even excessive background documentation on the work.	Count what counts. Do not count what does not count. Document everything as you go. A private client will not require this when they contract a market analysis. A government-commissioned analysis will likely require extensive background documentation on the work in case of an audit.
10	You are in a political-agenda-driven environment.	Stay technical. Be politic, not political. Let others take care of the politics.

Information and Personal Relations

Information availability or non-availability as is often the case, is particularly important. Persons doing an industry analysis such as ours must know how to "deal with" information shortfalls. While there is no single "method" for dealing with paucity or inaccuracy of information, there is a fundamental approach that one must take in order to decrease the danger of compromising the completeness of one's work because of unavailable information. The approach is deceptively simple: one creates solid human relations and business contacts in the early stages of investigative work because, sooner or later, vital parts of one's work might end up relying on who one knows as much as on what one knows.

The "method" (for lack of a better word) for dealing with information availability problems is to deal with the issue before it becomes a problem. Specifically, we applied Guiding Principles #7 & 8. We ensured that we established good professional relations with all the persons with whom we visited. We found that, indeed, we needed to revert back to industry experts whom we had visited earlier, in order to ask them for information we needed. Because we had developed a rapport of confidence and respect, we were well received and, in most cases, we were willingly given the best information the experts had.

One's work methodology must include creating good human relations. Build up your professional rapports and good human relations from the start of your work. They will often make the difference between success and failure in getting your job done. If you do not have a knack for the human and professional relations side of this kind of technical work, the appropriate advice is: develop the skill.

A methodology for analyzing IT solutions for systemic production management improvement is proposed below.

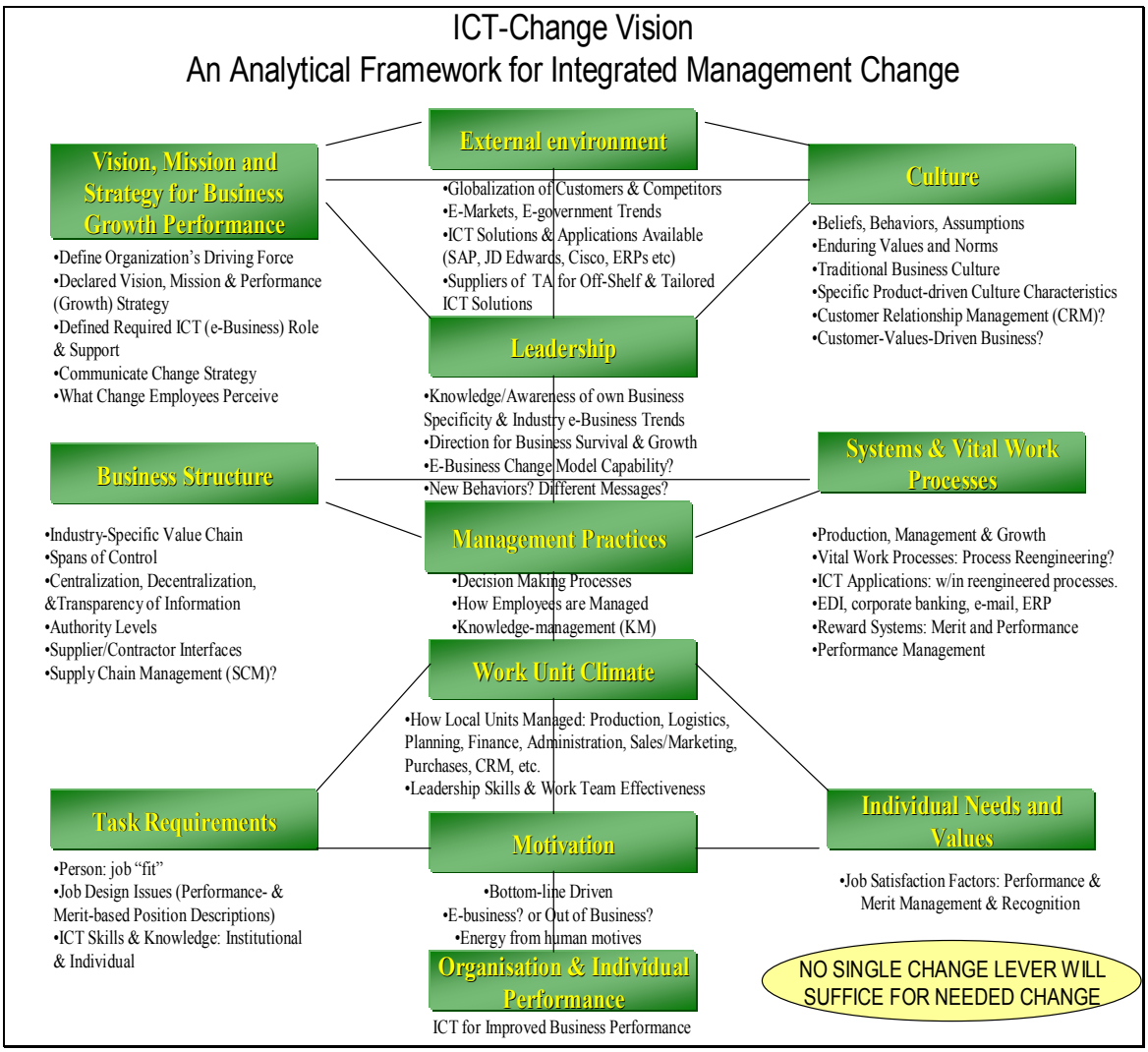
Methodology for systemic production management solutions

The adaptation of the Burke Litwin framework shown on the following page provides a systems overview for drawing the attention to the obvious: namely, that in adopting IT applications for realizing an end, account has to be taken of the complex interrelationship of organizational dependencies that exists. The Burke Litwin model illustrates this point by showing that any (IT) change lever for bringing about change in one area is not isolated within that one area of the supply chain where the end is to be realized.

The Burke Litwin model is used frequently for strategic planning exercises involving problem resolution. It is also used to show that one change lever, in this case we are discussing new IT applications, is not enough for achieving a systemic improvement in the supply chain. And if one does not achieve a systemic improvement, then the impact on the limited areas within the supply chain where improvements are made will be compromised, perhaps neutralized.

By making small modifications to the Burke Litwin framework, one can show a company's organizational framework or a supply chain interdependency of the company or an industry. When possible or proposed IT applications and solutions are overlaid with this model, one can appreciate that, when one string of the organization's "spider web" is affected, the results ripple through the organization and its supply chain.

Both the providers of IT services and products and end users of ICT applications should take an in-depth, systemic analysis of what their needs are and how different solutions will affect the organization and its supply chain before selecting the application. They can use the Burke Litwin framework for doing so.


ICT-Change Vision
An Analytical Framework for Integrated Management Change
External environment
•Globalization of Customers & Competitors
•E-Markets, E-government Trends
•ICT Solutions & Applications Available (SAP, JD Edwards, Cisco, ERPs etc)
•Suppliers of TA for Off-Shelf & Tailored ICT Solutions
Vision, Mission and Strategy for Business Growth Performance
•Define Organization's Driving Force
•Declared Vision, Mission & Performance (Growth) Strategy
•Defined Required ICT (e-Business) Role & Support
•Communicate Change Strategy
•What Change Employees Perceive
Culture
•Beliefs, Behaviors, Assumptions
•Enduring Values and Norms
•Traditional Business Culture
•Specific Product-driven Culture Characteristics
•Customer Relationship Management (CRM)?
•Customer-Values-Driven Business?
Leadership
•Knowledge/Awareness of own Business Specificity & Industry e-Business Trends
•Direction for Business Survival & Growth
•E-Business Change Model Capability?
•New Behaviors? Different Messages?
Business Structure
•Industry-Specific Value Chain
•Spans of Control
•Centralization, Decentralization, &Transparency of Information
•Authority Levels
•Supplier/Contractor Interfaces
•Supply Chain Management (SCM)?
Systems & Vital Work Processes
•Production, Management & Growth
•Vital Work Processes: Process Reengineering?
•ICT Applications: w/in reengineered processes.
•EDI, corporate banking, e-mail, ERP
•Reward Systems: Merit and Performance
•Performance Management
Management Practices
•Decision Making Processes
•How Employees are Managed
•Knowledge-management (KM)
Work Unit Climate
•How Local Units Managed: Production, Logistics, Planning, Finance, Administration, Sales/Marketing, Purchases, CRM, etc.
•Leadership Skills & Work Team Effectiveness
Task Requirements
•Person: job "fit"
•Job Design Issues (Performance- & Merit-based Position Descriptions)
•ICT Skills & Knowledge: Institutional & Individual
Motivation
•Bottom-line Driven
•E-business? or Out of Business?
•Energy from human motives
Individual Needs and Values
•Job Satisfaction Factors: Performance & Merit Management & Recognition
Organisation & Individual Performance
ICT for Improved Business Performance
NO SINGLE CHANGE LEVER WILL SUFFICE FOR NEEDED CHANGE

THE VALUE CHAIN

To analyze the specific activities through which industries and firms can create a competitive advantage, it seems useful to see the industries and firms as a chain of value-creating activities. Michael Porter identified a set of interrelated generic activities common to a wide range of industries and firms. The resulting model is known as the **value chain** and is depicted below:

Primary Value Chain Activities

The goal of these activities is to create value that exceeds the cost of providing the product or service, thus generating a profit margin. Our analysis will not analyze this aspect. We focus on understanding the ICT needs and skills gaps, and how improving ICT uses can bring about improved competitiveness and growth in export markets.

- **Inbound logistics** include the receiving, warehousing, and inventory control of input materials.
- **Operations** are the value-creating activities that transform the inputs into the final product.
- **Outbound logistics** are the activities required to get the finished product to the customer, including warehousing, order fulfillment, etc.
- **Marketing & Sales** are those activities associated with getting buyers to purchase the product, including channel selection, advertising, pricing, etc.
- **Service** activities are those that maintain and enhance the product's value including customer support, repair services, etc.

Any or all of these primary activities may be vital in developing a competitive advantage. For example, logistics activities are critical for an industry provider of distribution services, and industry and company service activities may be the key focus for a services industry or, at the individual services firm level, for offering on-site maintenance contracts for office equipment.

It is important to remember that these five categories are generic and portrayed in a general manner. Each generic industry activity area includes specific types of companies and industry activities that vary according to the specific Egyptian industry selected for this analysis.

Support Activities

The primary value chain activities described above are facilitated by support activities. Porter identified four generic categories of support activities, the details of which, again, are industry-specific and will vary according to our selected Egyptian industries. The first two support activities are found at both industry and firm levels. The second two are most commonly associated with firms.

- **Procurement** - the function of purchasing the raw materials and other inputs used in the value-creating activities.
- **Technology Development** - includes research and development, process automation, and other technology development used to support the value-chain activities.
- **Human Resource Management** - the activities associated with recruiting, development, and compensation of employees.
- **Infrastructure** - includes activities such as finance, legal, quality management, etc.

Support activities can be successfully leveraged to develop a competitive advantage. For example, in the case of Turkey's textile industry, over the past 15 years Turkey has used ICT to integrate their vertical textiles industry, thus developing a cost advantage through innovative management of information systems throughout the industry.

Value Chain Analysis

In order to better understand the industry activities leading to a competitive advantage, one can often begin with the generic value chain (as we have done) and then identify the relevant firms that are involved in those specific activities.

Once the "discrete" firms and their activities are defined, linkages between activities can be identified. A linkage exists if the performance or cost of one activity area affects that of another. An industry's (and a firm's) competitive advantage may be obtained by optimizing and coordinating linked activities.

The value chain also is useful in making outsourcing decisions. Understanding the linkages between activity areas of an industry can lead to more optimal make-or-buy decisions that can result in either a cost advantage or a differentiation advantage.

The Value System

(See diagrams of three industries in section on Methodology)

The value chain, or the industry production chain, links to the value chains of upstream suppliers and downstream buyers. The result is a larger stream of activities known as the *value system*, which we call production chain for the purposes of this study's limited scope. The development of a competitive advantage depends on the industry- and firm-specific value chain characteristics and efficiency.

INTERVIEW QUESTIONNAIRES

Company Profile

Date of Questionnaire _____

1. CORPORATE INFORMATION
2.

Company name:	
Industry:	
Sub/Business-sector	
Home office address:	
Telephone number:	
Fax number:	
Web site:	
Lead contact name:	
Lead contact title:	
Lead contact phone:	
Email address:	

1.a Discuss the company's Production Chain and ownership:

Inbound Logistics	>	Operations	>	Outbound Logistics	>	**Marketing & Sales**	>	**Service**

Production Chain position		Ownership		Ownership Information
Inbound Logistics	O	Private	O	Year established _____
Operations	O	Family-owned	O	Stock Ownership _____
Outbound Logistics	O	Multi-National	O	Ownership Shares _____
Marketing & Sales	O	Public	O	Year Established _____
Service	O	Holding Company Owned	O	Year Under holding Co. _____
Other_____	O	Privatized	O	Year Privatized _____

Explain your company's role within the industry's Production Chain?

_____

_____

_____

_____

1b. General discussion on company's market position
What are your target markets?

_____

_____
What makes you successful in your target markets?

_____

_____
What are your unique selling products?

_____

_____

1c. What is your strategy to achieve a higher revenue for your company?

_____

_____
How do you plan increase your current export capacity?

_____

_____

1d. Does your company have ISO certification or any of your operations, functions, or products/services?

_____

_____
If not: does your company intend to get ISO certification? When? In what areas?

_____

_____

3. BUSINESS BACKGROUND

4.

Year company established	Revenue in 2002		2003 figures if available		Annual Export revenue		Number of staff	
	Le 1,000K	O	Le 1,000K	O	$100K	O	1-10	O
	Le 2,000K	O	Le 2,000K	O	$250K	O	11-25	O
	Le 5,000K	O	Le 5,000K	O	$500K	O	26-50	O
	Le 10,000K	O	Le 10,000K	O	$1,000K	O	51-100	O
	Le 20,000K	O	Le 20,000K	O	$2,000K	O	> 100	O
Number								

For 2003 figures indicate if they include projections for the whole year _____
Or only up to current date_____

2a. Business background information

Does your company: direct export? _____
indirectly, thru an intermediary? _____

What are your principal export markets?

Principal product/service	%
1. Name:	
2. Name:	
3. Name:	
4. Name:	
5. Name:	

2b. Export Revenue as % of total annual revenue

_____

2c. Who do you consider your most important near-/mid- & long-term growth-potential Regional & International market/customers?

Near-/Mid- term regional: Near-/Mid- term International:

_____

Long-term Regional: Long-term International:

_____

2d. How do you see that ICT solutions can help you attain growth potential and competitiveness in your existing or in new regional and international markets/customers?

_____

_____

3. HUMAN RESOURCES

What is your company's annual training budget?	

% of your annual training budget by category

Production training	Management training	Growth training
%	%	%

Any ICT Training? Under which sector? Show as a percentage of the sector total training:

4. ICT

Do you outsource ICT services (yes/no)?

(If yes) What kind of services:

_____

_____

_____

Why do you outsource:

_____

_____

_____

4a. What kinds of services/products do you most need to invest in to improve your present ICT level, efficiency, effectiveness, etc?

- Training
- Outsourcing of services
- Hardware
- Post-sales services

4b. Do you believe that software licenses are moderately priced or within your reach?
4c. Are you willing to pay for a software which is available as a pirated copy?

Do you agree with scale payment for software licenseship?

ICT Inventory Questionnaire

Egyptian Industries/Companies Skills Gap Analysis

THE ROLE OF ICT IN YOUR COMPANY

How important is ICT in relation to your company's business?
☐ Very Imp. ☐ Imp. ☐ Average ☐ Low ☐ Very Low

How important is ICT in relation to your company's being competitive?
☐ Very Imp. ☐ Imp. ☐ Average ☐ Low ☐ Very Low

Do you have an internal department or person in charge of ICT?
yes | no, (but is required) | no,(but is not required)

_____
Name of person/department in charge

How do you make decisions about ICT ?
Sectorial | Corporate | Mixed | Not defined

Do you have a specific budget for ICT or systems?
yes | no, (but is required) | no,(but is not required)

If yes, what are your last 3 years budget compared to company budget? Divide, if possible, into Production, Management & Growth

What are your current ICT uses under:
Production

Management

Growth?

What are your future ICT needs under Production, Management & Growth:- (in computers, software, networks, service systems, Internet, telephone systems...)?

Where in the above three future sectors do these most urgent needs exist?

Do you have a strategic plan for using/expanding ICT use or positions?

What barriers exist in your company for developing ICT?
☐ Cost of Technology ☐ Difficult to Plan/Choose
☐ Have other more urgent needs ☐ Unqualified Personnel
☐ Other (knowledge of products, services etc)_____

ICT USES WITHIN YOUR COMPANY

Using the following criteria, rate the availability, use and effectiveness of the ICT activities & services that exist in your company under:

Use/Do - *Check one of the 3 choices, noting use/do in the company.*
Who Does – *Check who does indicated task. (may choose >1 answer)*
Importance – *Rate level of activity's importance (1-10)*
Effectiveness – *State if the actual service is sufficient or deficient.*

		HAVE/DO			WHO DOES		IMPORTANCE	EFFECTIVENESS	
		Yes, we have/do	No, (but is required)	No, but not required)	Internal resources	Outside provider	1=no importance. 10=very important	Service is Effective	Service is Deficient
Production	Main manufacturing operations	☐	☐	☐	☐	☐	_____	☐	☐
	Feeding operations	☐	☐	☐	☐	☐	_____	☐	☐
	Support to manufacturing	☐	☐	☐	☐	☐	_____	☐	☐
Management	Financial and administrative activities	☐	☐	☐	☐	☐	_____	☐	☐
	Internal and external communications	☐	☐	☐	☐	☐	_____	☐	☐
	Monitor company progress	☐	☐	☐	☐	☐	_____	☐	☐
	Provide support to company processes and operations	☐	☐	☐	☐	☐	_____	☐	☐
Growth	Strategic planning	☐	☐	☐	☐	☐	_____	☐	☐
	Expand market share and venture into exporting	☐	☐	☐	☐	☐	_____	☐	☐
Tech. Supp	Technical Support to Personnel: use of Computers, Networks, Periferals & Software	☐	☐	☐	☐	☐	_____	☐	☐
	Training and Preventive maintenance	☐	☐	☐	☐	☐	_____	☐	☐
	Systems development	☐	☐	☐	☐	☐	_____	☐	☐

COMPUTERS

Number the kinds of computers used in your company.
☐ Mac ☐ Pentium II ☐ Pentium Pro ☐ Pentium III
☐ 486 ☐ Pentium IV ☐ Others_____

Mark the systems in use in your company.
☐ DOS ☐ Window95 ☐ UNIX ☐ Novell
☐ Windows XP ☐ Windows97 ☐ Other_____

How many computer literate workers?
employees [#] workers [#]

How many computers does company have?
now [#] ideally [#]

How many employees personally use computers?
employees [#] workers [#]

Are your computers sufficient/adequate?
profuse | adequate | deficient

SOFTWARE AND APPLICATIONS

Check what types of software and applications your company uses...

Production
- ☐ Manufacturing
- ☐ CAD-CAM
- ☐ Manufacturing Support
- ☐ Design
- ☐ Others

Management
- ☐ Office Apps.
- ☐ Project Mgmt.
- ☐ Communications
- ☐ Internet

Growth
- ☐ Sales & Marketing
- ☐ Presentations & Multimedia
- ☐ Web (browser)
- ☐ Research

Are your applications/software sufficient?

Profuse | adequate | deficient

What is the company-level knowledge of software in your company?

☐ Very high ☐ High ☐ Normal ☐ Low ☐ Very Low

NETWORK(S)

Do you have computer network(s) in the company?

yes | no, (but is required) | no, (but not required)

Can you access external networks from your office?

yes | no, (but is required) | no, (but is not required)

Do you permit external offices access to internal networks?

yes | no, (but is required) | no, but is not required

If you have network(s), what used for?
- ☐ Applications Client-Server
- ☐ File/Date Sharing
- ☐ Serve Applications
- ☐ Email
- ☐ Internet
- ☐ Share Printers/other Equipment
- ☐ Share Internet Access
- ☐ Share Access to External Networks

Is/Are your Present Computer Network(s) Adequate

Profuse | adequate | deficient

What is your company- level of knowledge about computer networks?

☐ Very High ☐ High ☐ Normal ☐ Low ☐ Very Low

INTERNET & CONNECTIONS

What is company-level knowledge about Internet ?

☐ Very High ☐ High ☐ Normal ☐ Low ☐ Very Low

Indicate how you use, or should use Internet in your business: select one of the three options for each sector item listed below...	Yes	No, (but is required)	No, (but is not required)
Production: We research manufacturing techniques & methods	☐	☐	☐
We explore machinery and new technology	☐	☐	☐
We communicate to improve manufacturing	☐	☐	☐
Management: We do transactions with customers & suppliers	☐	☐	☐
We communicate using e mail, fax & telephone	☐	☐	☐
We do videoconferencing	☐	☐	☐
We permit access to intranet via internet	☐	☐	☐
We exchange data electronically	☐	☐	☐
We sell & purchase on the internet B2B & B2C	☐	☐	☐
Growth: We do internet based research	☐	☐	☐
We subscribe to services via internet	☐	☐	☐
We have a web page or web site	☐	☐	☐
We promote our products & sales over the net	☐	☐	☐
We provide customer services over the net	☐	☐	☐

If you have Internet, what are the characteristics?
- ☐ Network access & dedicated line
- ☐ Modem & tel. Line access...How many (modems/lines)? #
- ☐ Access by DSL or similar
- ☐ Other

If you have Internet connection: what is connection speed?

☐ < 14.4 kbs ☐ 28.8 o 33.6 kbs ☐ > 64kbs (broadband?)
☐ 14.4 kbs ☐ 56-64 kbs ☐ Not sure

How many computers have company Internet access?

Now # Ideally #

How many computers have personal Internet access?

#

How many users have personal Email/Internet accounts?

Now # Ideally #

How much do you spend each month in connection & tel. to access Internet/other networks throughout company?

$

What is the most important feature for company concerning Internet connection? (choose up to 4)

☐ Accessible cost ☐ Connection on 1st try ☐ Installation
☐ Unlimited time ☐ High speed connections ☐ Tech. training
☐ Email ☐ Home Page space ☐ Tech. Support
☐ Access to Exclusive Services ☐ Internet for business (B2C/B2B)
☐ Other

TELEPHONE SYSTEM(S)

How many contracted telephone lines does company have?

Now # Ideally #

How many extensions or phones do you have?

Now # Ideally #

Do you have a telephone system (switchboard, reception, etc.)?

yes | no, (but is required) | no, (but not required)

Do you receive multiple calls w/only one number (PBX)?

yes | no, (but is required) | no, (but not required)

Does company have voice mail system?

yes | no, (but is required) | no, (but is not required)

Do you rent dedicated lines?

yes | no, (but is required) | no, (but is not required)

How is your phone system connected to your computer networks?
- ☐ Access to Internet & other external netwks.
- ☐ Access to internal ntwks. By modem (WAN
- ☐ Fax reception by Computer
- ☐ Fax transmission by Computer
- ☐ Voice mail by Computer
- ☐ Call Handling by Computer
- ☐ Cost Controls of calls and faxes
- ☐ Universal Mailbox (fax, voice, email.)

Is your telephone network sufficient?

adequate | deficient

What is company-level knowledge of telephone systems in your company?

☐ Very High ☐ High ☐ Normal ☐ Low ☐ Very Low

*How do you communicate externally (pls. Note the **number of times p/month)?***

	Local	/ National	/ Intern'l
Calls	#	/ #	/ #
Faxes	#	/ #	/ #
Post Office	#	/ #	/ #
Message Serv.	#	/ #	/ #

PROFILE ON EGYPTIAN PHARMACEUTICAL INDUSTRY[17]

Overview

Egypt is the largest producer and consumer of pharmaceuticals in the region, with 364 companies[18] that produce everything from cotton swabs to hypodermic needles to the 29 drug manufacturers who produce a wide variety of both licensed and non-licensed drugs for national consumption and regional and international export. Approximately 85% of all active principle materials (primary raw materials or finished drugs) are imported for all segments of the industry. The auxiliary principles (secondary raw materials or intermediates), such as sugars, come from both national production and globally-sourced offshore markets.

Pharmaceutical sales in 2001 reached £E 5.4-5.5 billion.[19] The industry's annual growth rate CAGR was 10%, projected to be 7% over the next five years. In 2001 there were 60,000 registered physicians and 20,000 registered pharmacies in the country.

The Egyptian drug industry focuses mainly on drug manufacturing rather than research. During 1998, the value of pharmaceutical the market was estimated to be $1.28 billion. As the largest supplier of pharmaceuticals in the Middle East, Egypt accounts for 30% of the MENA region. Pharmaceutical consumption increased dynamically since the industry was established, with an annual growth rate of 14% throughout the last decade.

A major driver for the growth of the pharmaceutical industry is Egypt's large population of 65+ million, which is growing annually by 2.1%. Approximately 60% of the population is younger than 25 years. This, in combination with Egypt's increasing prosperity, which is linked to rising health awareness, will especially stimulate demand for preventative Over The Counter (OTC) drugs, such as vitamins, which are sold at the highest margins (40%).

The main stimulus for growth in drug consumption is the government's commitment to increase and improve health care services. During 1982-1997, approximately 88 new hospitals were built equivalent to 86 beds per 10 days. Current government spending on health care represents over 5% of the state budget. In addition to normal government spending on health care, a major expansion and rehabilitation program went began, sponsored by USAID in the form of grants and soft loans totaling over $90 million. This program aims to embellish the Government's insurance system, increasing the quality and efficiency of the health care delivery system at the grass roots.

Local production of drugs satisfies 92.5% of local demand based on 85% importation of raw materials. The balance of the remaining 7.5%, valued at $92 million, is in the form of advanced drugs for cancer, cardiovascular and insulin disorders, for which local technology is not available.

[17] InfoAmericas analysis.
[18] Source: International Medical Statistics (Geneva)-IMS Complete list at end of this profile.
[19] Slightly under $US 1 billion at current ROE.

Competitive Analysis of Egyptian Pharmaceutical Drug Manufacturers

The pharmaceutical sector consists of 36 companies: 29 drug producers, complimented by manufacturers of raw materials, - requisite importers and several packing and appliance companies. Two-thirds of products are generic drugs, and replicas of patented drugs with a proven bio-equivalence, produced and marketed after the original patent expires. Holding one-third of the market, patented drugs are mainly produced by subsidiaries of multinational companies and are protected by patents granted to the respective companies that have substantially invested in research and development.

As sales of international pharmaceutical companies have not yet reached a considerable size in Egypt, they are still not eager to establish a direct presence. To date they license their products to local manufacturers, which are required to source raw materials exclusively from their multinational parents at inordinately high prices, making the subsidiaries more profitable to parent companies than to local shareholders.

The Egyptian private sector companies are engaged in the production of a wide range of generic and OTC drugs. In order to acquire technology, know-how and market share, these companies secure agreements with multinationals in return for a royalty fee. Proven profitable, private sector companies' success is attributed to the competitive sourcing of raw material, flexible product mix and access to profitable export markets.

Private sector companies decide their individual product mixes, an option unavailable to either their counterparts in the public sector or to multinational subsidiaries. Furthermore, private companies are free to export their own generics, bypassing restrictive margin ceilings imposed on locally sold products. Consisting mainly of generics and vitamins, exports are directed mainly to the Caucuses, Eastern Europe and some Arab countries.

Public sector companies, eight in total, gradually lost their market share since the 1950s to the private sector and multinational subsidiaries. They continue to do so.

Egypt imports 85% of its raw material, either from their licensors or from multinational companies. Multinational companies of European origin have captured more than 95% of the total market share of pharmaceuticals. France has the largest market share of 18.9% because of its high quality products and competitive prices. Also, European companies offer better marketing services and follow-up on orders. They spend more money on marketing their products by upgrading their customers and educating them about the effectiveness of new raw material. In addition, the majority of European companies are represented locally. In order to compete with India's lower prices, European entities establish plants in Far Eastern countries to benefit from its cheap labor and hence be competitive.

U.S. firms specialize in supplying Egypt with hormonal products and raw material of agricultural nature such as royal-gel, soybean, pollen, wheat germ oil and pepsin. The U.S. has captured 2.8% of the total pharmaceutical market. However, it can increase its market share, if it assigns more commercial agents. Egyptian customers complain that they find it very difficult to reach a U.S. manufacturer of raw material and can only buy

from brokers. This adds to the price of raw material. Egyptian customers, also, prefer to deal with foreign companies represented locally, where the majority of U.S. firms are not represented. In spite of the high quality of U.S. products, the price is considered high for a price-sensitive market like Egypt.

Challenges Facing the Egyptian Pharmaceutical Drug Manufacturers

The most salient internal industry challenges are:

- Regulatory frame work (pricing)
- Quality assurance tests
- Research and development
- Health insurance coverage
- Production contracts

The immediate and crucial external challenge facing the pharmaceutical industry is the application of the GATT and TRIPS accords and conditions.

Egypt is due to implement a fully operable IPR system under the WTO Trade Related International Property Rights (TRIPs) agreement in the year 2005. The Ministry of Justice has ratified a draft intellectual property rights law, which extends the term of patent protection from 10 to 20 years in line with TRIPs requirements. As a result, implementation of TRIPs will first and foremost affect the production of generics. It will force pharmaceutical companies, mainly public sector to cease manufacturing generics of drugs still under patent. TRIP's will also entitle patent holders to take legal action against the production of generics whose formulas are still patent-protected. This will pave the way for international patent holders to gain exclusive distribution of their products, pushing out local players. As imitation based production gives way to patent based production, local firms will lose their share in total sales, which will be captured as increased market share by foreign firms.

The principal challenges revolve around the following disadvantages found within the Egyptian pharmaceutical industry:

1. The industry is imitation- based rather than patent- based and the production market will be limited to non-patent products only.
2. Market access through exporting is less costly than infrastructure investment, leading to neglecting internal capacity for R&D and development of an optimized industry production capacity.
3. Prices will escalate.

On the flip side, there are advantages that will come with the GATT and TRIPS agreements:

- Egypt is a signatory of the International Property Rights (IPR). This protection will encourage local and international companies operating in Egypt to invest in research and development (R&D).

- Foreign direct investment is expected to increase due to stricter standard of IPR, leading to a higher level of technology transfer, know-how and commitment through partnerships (alliances and JVs).

The GATT agreement is expected to bring about a fundamental reshaping of the pharmaceutical industry. The main outcomes expected:

- Restructuring of existing companies.
- Merger of similar companies.
- Alliance with other companies.
- Creation of R & D centers.
- Arab common markets.
- Enhancement of the regulatory framework (grant incentives for exporting; pricing flexibilities).
- Improvement of quality standards.
- Encouraging foreign direct investment (sets of investment incentives).
- Enhancing health insurance coverage.
- Specialization in phyto pharmaceutical markets.

The Egyptian drug manufacturing industry is characterized by a segmentation of public and private manufacturers, the latter being populated by eight foreign firms. This is shown in the table below.

Pharmaceutical Industry Segmentation[20]

Public		Private	
Holding Company for Pharmaceuticals, Chemicals and Medical Appliances (12)	ACDIMA Group (7)	Local (10)	Foreign (8)
Production	**Production**	**Production**	**Production**
Nile	EIPICO	Pharco	BMS
Cid	SEDICO	Amriya	GSK
Misr	MUP	Amoun	Novartis
Kahira	MEPACO	Acapy	Aventis
Alexandria		T3A	Pfizer
Arab Drug	**Packaging**	October Pharma	Servier
Memphis Chemicals	Flexipack	Rameda	Eli-Lilly
El-Nasr Chemicals	Arab Glass	Mina Pharma	Arab Otsuka
Distribution	Arab Gelatin	Alkan	
Egydrug		**Distribution**	
Trade		United Co. for Distribution	
El-Gomhoreya			
Packaging			
Drug Packaging			
2001 MARKET SHARE			
50%	16%	35%	

Source: Economic Research Forum, May 2003

[20] Ministry of Health & Population

TWENTY LEADING EGYPTIAN PHARMACEUTICAL COMPANIES[21]	
Company	2001 Revenue (£Emm)*
Glaxo (GSK)	374
Novartis	301
EIPICO	274
BMS	273
Aventis	233
Pharco	221
Pfizer	176
MUP	170
Amoun	166
El Amiria	157
Cid	151
El Nile	147
El Kahira	134
Servier	128
SEDICO	121
October Pharma	115
Memphis	97
Alexandria	88
Johnson	85
MSD	75
*Total revenue £Emm 3.436 billion = approximately 79% total 2001 pharmaceutical market	

Public sector companies are required to distribute a high percentage of their products through the public sector distributing company Egydrug and other private companies contracted to distribute their products through Egydrug and other private distributors.

Public Sector Drug Manufacturers Profile

The Holding Company for Pharmaceuticals, Chemicals and Medical Appliances

Public sector pharmaceuticals manufacturers are an affiliation of eleven (11) companies under The Holding Company for Pharmaceuticals, Chemicals and Medical Appliances. The Holding Company is an Egyptian stock holding company established in 1991, according to Article Two of Law 203. The Company, through its affiliated companies, allocates their investments and capital in manufacturing, importing, exporting,

[21] IMS Q/V2001

distribution and trade of pharmaceuticals, chemicals, medical appliances and equipment. They own various investments, in addition to the activities of its affiliated companies.

The Holding Company's affiliates produce: human pharmaceutical products, veterinary products, cosmetics, natural products, medical herbs, pesticides, surgical apparatus, medical appliances and equipment, paramedical supplies and packaging material. MISR is the largest producer of non-licensed drugs in The Holding Company. They produce 175 different medicines, and another five which are considered outsourced.

THE HOLDING COMPANY FOR PHARMACEUTICALS, CHEMICALS & MEDICAL APPLIANCES BY 2001 REVENUE	
The Holding Company	**2001 Revenue (£Emm)[22]**
1. CID	151
2. Nile	147
3. Cairo (El Kahera)	134
4. Memphis	97
5. Alexandria	88
6. Misr	75
7. Arab Drug	47
8. El Nasr	28
Total Revenue	767 (£Emm)

Private Sector Drug Manufacturers Profile

The ACDIMA Group

The Egyptian International Pharmaceutical Industries Company (EIPICO) was established in 1982 as a private company according to investment Law by a consortium consisting of The Holding Company (local public sector companies) and ACDIMA (Arab Company for Drug Industries and Medical Appliances).

ACDIMA Company	**2001 Revenue (£Emm)[23]**
EIPICO	274
MUP	170
MUP vet	24
SEDICO	121
October Pharma	115
MEPACO	18.7
ACDIMA Affiliates: Pharmaceutical Packaging Companies	

[22] IMS Data Q/V2001
[23] IMS Data, Q/V2001

Arab Caps Co.	20
Arab Glass Co.	59
Flexi Pack Co.	82
Medical Appliances Affiliates	
ACMA for X-Ray films	
Arab Company for Precise Instruments	
Export & Trading Affiliates	
ACDIMA for Trading	

EIPICO is the largest revenue producer in the ACDIMA Group and, as such, provides a good snapshot profile of the Group's activities. At the same time, it provides a good benchmark of this segment of Egypt's private sector pharmaceuticals market. Unfortunately, the latest financial figures were not available at the time this document was prepared. Nonetheless, the purpose is to present EIPICO's profile and trends, as an industry benchmark, and the financial figures available allow us to do this.

From the beginning, EIPICO was planned to formulate dosage forms of generic drugs from local and imported intermediates, applying the latest GMP regulations throughout the operational or line departments, beginning with evaluation of raw materials, calibration of equipment and control, holding and distribution of finished products to assure quality, effectiveness and safety. EIPICO built up a place among multinationals and private companies to become the largest private, non-foreign pharmaceutical company in Egypt, commanding 8% of local market share and nearly 25% of the drug export market.
The design of EIPICO's manufacturing facilities is considered the latest in pharmaceutical industry. The U- Shape design of the plant minimizes mix-up / contamination by providing a single direction of materials flow. Each pharmaceutical process has enough space to be carried out separately, to avoid mix-up and /or cross contamination. EIPICO erected three sterile areas, the largest in the MENA Region. They have 1SO-9001 certification and 1SO-14001 certification for implementing environmental friendly practices.

In conformity with the regulation to distribute a high percentage of their products through the public sector distributing company Egydrug and other private companies contracted to distribute private sector products through Egydrug and other private distributors, EIPICO's distinguishes itself by direct selling-"spot delivery"- through a large integrated distribution network. In doing so, they reduce the reliance on public and private distribution to the minimum possible level. They have 200 vans and trucks that cover over 85% of EIPICO's local market distribution, giving the company the ability to generate wholesale margins and maximizing profits.

Distribution channels represent one of the biggest barriers in the Egyptian pharmaceuticals markets, so this integrated network constitutes one of EIPICO's biggest market advantages.

EIPICO, like all the other Egyptian pharmaceuticals who sell on the national market, operate in a price-restricted environment. They rely on 1) increasing exports, 2) enlarging their generic medicines portfolio, 3) increasing their distribution capacity and 4) producing new higher-margin drugs to improve their economy of scale. They continually invest in future development projects.

Exports reliance represents a most crucial and strategic importance for the company to avoid government-imposed profit margin caps, which are subjected to government regulation. Exports are competitive due to the low production costs in Egypt.

EIPICO's export production started up two years after they began creation and represents a significant growth portfolio for the company. Exports in 1987 reached US$0.24 million (1.8% of total sales), and in 1998 were at US$15 million (15.7% of total sales).[24]

EIPICO sells mainly to East Europe, Arab states, Asia and Africa. The corporate strategy is to increase exports share to 25-30% of EIPICO total non-licensed product billings by the start of 2001. Their priority is to meet importation needs and hedge against foreign currency fluctuations.

EIPICO exports some 190 products and further registration of products is taking place in the same markets and other countries for future activities.

The above two examples operate in a pharmaceuticals industry which historically has been one of the most competitive and profitable sectors of Egyptian manufacturing. The startup of the industry in the 1940s saw 50 relatively small national producers of drugs. The local industry was nationalized in the 1960s, with a major process of mergers. Three foreign firms formed joint venture operations - Hoechst, Pfizer and Swiss Pharma. By 1970, the market had grown to eleven local producers who contributed 90 percent of the domestic market drug consumption.

With the Open Door policy, the Egyptian market was opened up to foreign and domestic new-comers and by 1996 the industry numbered 9 multinationals, 8 private and 11 public sector companies, employing some 60 thousand persons. Today, 40 percent of domestic production is provided by public firms, down from the 80 percent production they held in the mid-1980s.

By 1995, pharmaceutical sales reached more than $US1 billion, making Egypt the largest market in the Middle East, accounting for about 20 percent market share. The 2001 sales were approximately the same at £E 5.5 billion[25], this actually showing a solid growth rate taking into account the devaluation of the Egyptian pound since the mid-1990s.[26]

Per capita consumption of drugs is still low. Depending on the information source, consumption per annum ranges from $US16 to 45 per annum, up from $US1 in 1986. International comparisons would need to adjust for the significantly lower drugs prices

[24] Latest figures published by EIPICO
[25] IMS Data Q/V 2001. Using 06/02 ROE £E 5.9/US$1
[26] 1995 approximately £E 3.4/US$1.

which prevail on the local Egyptian market. Nonetheless, the increase is significant. The drugs which have the largest sales on the market are shown on the next page.

FIVE LEADING MANUFACTURERS' SALES -2001				
Leading Five Corporate Groups				
Company Rank		**Sales (£E)mn**[27]	**Growth (%)**	**MS (%)**
1.	GSK	374	11	8.5
2.	Novartis	301	7	7.3
3.	BMS	264	0.6	6.1
4.	Aventis	234	(0.9)	5.4
5.	EIPICO	209	14.9	4.8
TOTALS		**4,335**	**8.4**	**100**

20 Leading Products

Product (Brand)	**Company**	**Sales (£E)mn**	**Product (Brand)**	**Company**	**Sales (£E)mn**
Flumox	EIPICO	50	Flurest	Glaxo	27
Duricef	BMS	47	Olfen	Mepha	25
Velosef	BMS	47	Supravit	Glaxo	24
Diamicron	Servier	42	Felden	Pfizer	24
Cataflam	Novartis	39	Ketofan	El Amiria	23
Voltaren	Novartis	36	Fawar Fruit	Pharco	22
Zantac	GSK	32	Theragran (H)	BMS	21
Ceporex	GSK	32	Insulin Mixtard	Novo	21
Novalgin	Aventis	31	Brufen	Knoll	20
Unasyn	Pfizer	28	Amaryl	Aventis	20
			TOTAL		**583***

*Approx. 12% of total 2001 pharmaceutical market

InfoAmericas Research; IMS Q/V2001

Exports

Egyptian drug export performance has been modest, at $30 million in 1995, increasing to slightly over $US100 million in 2001,[28] mostly in generic products. However, the growth rate is dynamic: drug exports grew from 1.7 to 5.3 percent of total manufacturing output between 1980 and 1993, and has had a steady rise for most companies up through 2001.
In 1995, imports consisted of finished drugs at $57.5 million and another $221 million in intermediates used by the industry. The overall trade deficit of the pharmaceutical sector is thus very large and offers good opportunity for import substitution and increased exports.

[27] Pharmacy sales only. Hospitals sales for same period were £E 665 mn and "others" £E 500 mn.
[28] IMS Q/V2001

Low wages are often mentioned by manufacturers as one of the strengths of pharmaceuticals production in Egypt, which is essentially a labor and technology intensive industry. A major asset in pharmaceuticals is the large pool of highly trained Egyptian doctors, pharmacists, engineers and skilled technicians whose reputation for competence and quality have given the Egyptian pharmaceuticals a distinguished reputation in the entire region. Exports are strengthened by Egypt's highly competitive prices, by international standards, which has led to multinationals using the Egyptian producers as a trampoline to the regional Arab markets.

Multinationals have significant investments in Egypt's pharmaceutical industry. The most recent newcomer to the market, GlaxoSmithKline (GSK), had a 2001 growth rate of 11%, the highest in the multinationals industry. EIPICO, the largest national producer, realized a growth rate of 14.9% for the same period.

Egypt currently exports pharmaceuticals to a number of countries: Saudi Arabia, Yemen, Kuwait, UAE, Iraq, Sudan, Nigeria, Zambia, the Philippines, Korea, Sri Lanka and the EU.

If an Egyptian-manufactured product is under license to a foreign company, they cannot export their product to any market without home office permission. They can freely market their non-licensed production.

On May 29, 2001, Egypt's first independent Intellectual Property Rights law passed the People's Assembly with a large majority. The law's stated aim is keeping Egypt in tandem with the world's tremendous international technological developments and its membership commitments to the World Trade Organisation (WTO), especially where the Trade Related Intellectual Property rights (TRIPs) agreement is concerned. The German-Arab Chamber of Industry and Commerce, along with other trade associations and chambers in Egypt, emphasize the importance of an efficient legal protection for intellectual property rights in order to pump more foreign direct investments into the country. The passing of the Intellectual Property Rights is an important step towards encouraging foreign investment.

The importance of the concerns is appreciated when looking at the total market of pharmaceuticals sales: £E 5.422 billion[29] in 2002, up from some £E 4.334 billion in 2001.[30]

According to the TRIPS Agreement, Egypt must reform its legal framework governing Intellectual Property Rights (IPRs), especially in the area of patent protection. The needed reforms involve the following provisions:

[29] Dr. Mohamed-Hossam Loutfi, "Egypt's Roadmap for Compliance with the TRIPS / GATT", 2/2002.

[30] IMS Data Q/V 2001 reports £E 5.500 mm in 2001 sales. This kind of statistical variance is frequently found when researching data in Egyptian industries.

1. Patents shall be available for any inventions, whether products or processes, in all fields of technology. Hence, no distinction shall be made between products and process or between one field of technology and another.

2. The criteria for patentability are: novelty, inventive step, and capability of industrial application. Such novelty is not relative but absolute, i.e. the product or the process has to be new from a worldwide perspective.

3. Two prohibitions have been adopted to avoid any discrimination towards the place of invention, i.e. whether the product is imported or locally produced, and discrimination as to the field of technology, as referred to above.

However, Egypt may exclude from patentability two categories of inventions: first, inventions, where the prevention of the commercial exploitation of which is necessary to protect public order or morality including to protect human, animal or plant life or health or to avoid serious prejudice to the environment. This is however subject to the condition that this exclusion is not made merely because the exploitation is prohibited by domestic law for the sake of convenience. Secondly, inventions of diagnostic, therapeutic and surgical methods for the treatment of humans or animals, may also be excluded from patentability.

However, this does not include instruments or machines used for diagnosis, therapy or surgery.

Furthermore, plants and animals other than micro-organisms and essentially biological processes for the production of plants or animals other than non-biological and micro-biological processes, may also be excluded from patentability. Such exclusion however, does not affect the obligations of Egypt to protect plant varieties. In this regard, a choice is granted to Egypt between three methods of protection: patent protection, or an effective *sui generis* system, or a combination thereof. This particular requirement is still subject to review at the WTO.

When Egypt requires, as a condition of approving the marketing of pharmaceutical or of agricultural chemical products, which utilize new chemical entities, the submission of undisclosed test or other data, the origination of which involves a considerable effort, shall protect such data against unfair commercial use. In addition, it is required to protect such data against disclosure, except where necessary to protect the public, or unless steps are taken to ensure that the data are protected against unfair commercial use.

The exceptions involved in this regard are that this data must concern only pharmaceutical or chemical products involving "new chemical entities". Also, this condition does not apply in situations involving the public interest.[31]

[31] Prime Ministerial Decree No. 2211, year 2000.

As Egypt is considered a developing country, it benefits from a transitional period up to December 31, 2004, where the application of the vast majority of the TRIPS Agreement provisions, including those pertaining to the patenting of pharmaceutical products, is postponed. While awaiting the expiration of this "grace period", Egypt is however under the obligation, since January 1, 1995, to establish a special protection system for pharmaceutical and agricultural chemical products. Under this system, Egypt is obliged to make available pipeline protection, known as the "mail box system" by which applications for patents for such inventions can be filed as of January 1, 1995.

The fulfillment of certain conditions enables "the applicant" to benefit from Exclusive Marketing Rights (EMR's) in the interim under the following conditions:

- A patent application has been held after January 1,1995 in Egypt.
- A patent is granted for that product in another member of the WTO.
- A marketing approval is obtained in such other member country.
- Marketing approval is obtained in Egypt for that product.

There are, nonetheless, certain limitations to the exclusive rights enjoyed by patentees. Primarily, limited exceptions are allowed to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner. In all cases the legislator has to take account of the legitimate interests of third parties. This usually includes uses of a non-commercial nature including research purposes.

Secondly, the government may allow the "compulsory licensing" of a given patent to a third party (or for its own purposes, in this case known as "government use") subject to stringent criteria, including the prior attempt to negotiate a "voluntary license" from the right holder, the payment of adequate compensation to the owner.

However, some of these conditions can be waived in situations of public non-commercial use of the patent, or in situations necessary to deal with anti-competitive practices of the patent owner.

Moreover, parallel importation is allowed as an application of the principle of the "international exhaustion of rights". That is, any product may be imported from any country where a license was lawfully granted to manufacture it. Thus the consumer has the right to benefit from the low price of the original product by importing it from abroad, provided that the manufacturing of such product is under license from the patentee in the country of importation.

In conclusion, Egypt must be keen to ensure the efficiency of the legal protection for pharmaceutical chemical products in order to maintain its status in the Arab region.

Regional Markets Changes

While Egypt's pharmaceutical industry is traditionally well positioned in the region, Egypt has some significant competition in the region, Jordan being an interesting market to watch, since Jordanian pharmaceutical firms are considered some of the most advanced in the Arab World.

Recent market developments: In 2001, Egypt allowed Saudi pharmaceutical products into the market, creating more room for competition, with more still expected with the arrival of Jordanian products which, in mid-June 2002 were given the green light by the Egyptian government to allow the entrance of the Kingdom of Jordan's pharmaceutical products. The Government of Egypt has promised to allow Jordanian companies to market their products in Egypt by the first quarter of 2003.

Around 120 Egyptian pharmaceutical products have been registered in Jordan for up to 20 years. Local companies export 80 per cent of their output, and maintain a 40 per cent share in the local market.

Jordanian pharmaceutical exports are a major foreign currency earner in Jordan. Exports in 2001 totaled $US200 million, while local sales rose to $40 million from $35 million in 2000. Exports also grew by JD3 million in the first quarter of 2002 to $36 million, compared to the same period last year.[32]

The growth in Jordanian exports was attributed to the commitment of the Jordanian pharmaceutical industry to develop the sector by exploring new export markets, especially in Europe and the US.

For example, in early 2002 Jordan Pharmaceuticals Manufacturer (JPM) signed a strategic partnership agreement with Egypt's Trance pharmaceuticals company with a registered capital of $40 million. The agreement comes in line with a recent trend aimed at creating an Arab media group owned by the Arab private sector, which depends on research on absorbing changes caused by joining the World Trade Organization (WTO).[33] The agreement will unify the two firms in the local market and coordinate their research programs according to each country's expertise.

The JPM, with 250 employees on its payroll, is expected to sign similar agreements with companies from the United Arab Emirates and Tunisia. With 17 offices around the Arab World and several others in Europe, JPM are working on a project which includes eight Arab pharmaceutical companies. It aims at creating a distribution and marketing firm to deal with East African markets, taking into consideration the financial difficulties of each African nation.

The Jordanians are positioning to meet the perceived threats coming from Jordan's entry to the WTO, which many in Jordan (and in Egypt) may open the floodgates to a host of foreign products no longer restrained by tariff and non-tariff barriers that exist in the two

[32] Jordan Times, June 25, 2002
[33] Jordan Times, January 31, 2000

countries at this time. The Jordanian firms believe that new products entering their market will financially threaten certain national pharmaceuticals companies and pose such firms with the need to downsize. They see a high risk to local industry, which will have to improve its products to survive WTO membership. One of the Jordanian trends pre-WTO is to sign strategic and merger agreements with Arab and international firms.

Market Access

Custom duties on raw material for the pharmaceutical industry and final pharmaceuticals are considerably low, between 5-10 percent, depending on the importance of the drug. However, sales tax is only one percent on raw material and 5.2% for final drugs. To date, the government controls the pricing of medicine. However, private entities confirm that the government allows them a fair profit margin of eight to ten percent.

Foreign firms wishing to export their pharmaceuticals to Egypt are advised to appoint an Egyptian agent, who would take care of registration and start a scientific office for their company in Egypt. In case the foreign firm wishes to manufacture under-license in Egypt, the local producer will arrange legal registration. To register a new pharmaceutical product, there must be less than four identical products sold on the market. However, if the manufacturer succeeds in changing one of the compositions of the new drug, the drug is accepted. On the other hand, competing brands of foreign drugs are imported to ensure that the lowest possible prices are obtained for consumers. The Supreme Committee for Registration determines which drugs are safe and appropriate for local consumption. All imported and locally manufactured pharmaceuticals must be tested at Egyptian government laboratories and approved by this committee before they may be distributed for sale to the public. The Egyptian authorities take into consideration information available from the U.S. Food and Drug Administration, other foreign governmental agencies, independent labs, and pharmaceutical firms when determining the acceptability of drugs which have been proposed for distribution in Egypt. Finally there is a pricing committee which determines what prices are appropriate for imported and locally produced drugs. If the price is considered high for the Egyptian market, permission is not granted by this department.

Egyptian law requires all foreign companies to retain an Egyptian commercial agent to submit bids on public tenders (except USAID and military procurement). Foreign firms are not required to have an agent when dealing with the private sector. However, most foreign firms have found it advantageous to engage a local agent who could deal with problems related to communications, bureaucratic procedures, local business practices, and marketing. A firm can appoint multiple agents on a geographical or product basis.

Opening letters of credit through anyone of 100 certified Egyptian bank finances imports. Pharmaceutical raw materials can be imported through USAID's Commodity Import Program. Industrial parastatal companies in Egypt required by law to purchase their equipment through calls for tenders.
Although agent commissions vary with services provided and the amount of individual contracts, agents generally charge a commission of 5% for initiative, 2% for opening credits and 1% for clearing goods through customs.

Parastatal companies purchase their material by calling for international tenders. In many cases, large tenders call for the supply of a wide variety of commodities, all of which single U.S. firms might not be able to provide. A consortium of U.S. companies, however, can offer a bid package. The Italians, Germans and Japanese have successfully used this technique in Egypt. Egyptian buyers prefer a single bid for an entire tender rather than having to piece together bids for each component.

Public sector companies, many of which are now being offered for sale to the private sector under the country's privatization program, may request credit in their tenders for procurement of major capital equipment items as well as other commodities. While suppliers offering credit will certainly have a better chance of winning bids, sales without credit are sometimes made since other factors such as price, quality, and delivery schedule may be of greater importance.

Public sector companies generally require a performance bond equal to 10% of the contract, which should be released on completion of the contract. To avoid delays in obtaining release of the performance bond, the contract must be formally amended if the buyer requests any change in delivery terms or specifications.

364 Egyptian Pharmaceutical Companies Registered in 2003[34]

ABBOTT
ACCUCAPS
ADCO
ADVANCED NUTRITION
ADWIA
ADWIK
AGOUZA
AKZO
AL HIKMA
ALEXANDRIA
ALEXANDRIA KNOLL
ALISTAN
ALKAN
ALLERGAN
ALPHA MEDICINE
ALPHACHEM
AMERICA BEST NUTR.
AMERICAN HEALTH
AMERICAN HOME PROD
AMERICAN HOSP.SUPP
AMERICAN NUTRITION
AMOUN PHARM.CO.
AMRIYA PHARMACEUT.
ANBEN PHARMA
ANGELINI
APEX PHARMA
APOTEX
AQUAGEN INTER.
ARAB CO PHA MED PL
ARAB MED.FOOD COMP
ARCOPHARMA SA
ARKO PHARMA
ARON
ASTA MEDICA
ASTA WERKE
ASTRAZENECA
ATRAL
AVC
AVENTIS
B.O.I
BANCHARA
BANDO. INT. CO.
BAUSCH&LOMB
BAYER
BEE HEALTH
BEHIVE BOTANICALS
BEIJING UNION PH.
BERLIN-CHEM/MENARI
BERNA
BERRIGO ALLEGEN
BETA PH.
BIO PRODUCTS LAB
BIO STRATH
BIOENERGY NUTRIENT
BIOGAL
BIOMAL PHARMA
BIONORICA
BIORGA LAB
BIOSYNTH
BIOTHERAX
BIOTRON
BOEHRINGER I
BOUCHARD
BRAUN AND HERBERG

[34] IMS Q/V2001

BRISTOL MYERS SQUI
BRITISH COD LIVER
CARLSON
CAROLINE CHEMICALS
CEC
CEFAK KG
CEVAN INT TIBA PH.
CHAUVIN BLACHE
CHEMICAL WORKS
CHEMINOVA INTERNAT
CHIESI
CHINOIN
CID
CIPAN CARREGADO
CLINTEC
CMO
COLAY
COSDAM SIMCO MPANI
CUSI
D.D.D.
DABUR
DANSK DROGE
DAVID BULL
DEBAT
DELANO
DELTA
DERMA
DIADAL
DIAFORM
DOLORGIET
DOMACO
DR WILLMAR
DR.FALK
DU PONT
DUMEX
EBEWE
ECKHART CORP.
EGIS PH
EGYMED
EGYPHAR
EGYPTIAN INT MED.C
EGYPTIAN PHARM CO
EGYPTIAN SPANISH
EGYT PHARM WORKS
EIPICO
EL NOURAN
ELDER
ELERTE
ELI LILLY
EMA PHARMA
EMRIO INT.
ENERGEN PROD
ESPICO
EURO.EGY.PH.
EVA
EVANS
EZ PAC
FERMION
FERRING
FLOGNY LAB
FOOD CO.
FRESENIUS AG
FRIESLAND
FUTURE SCIENCE
FUTUREBIOTICS
GALACTINA
GAMAX LEADER
GEDEON RICHTER
GEISTLICH
GEROT
GIST BROCADES

GLAXOSMITHKLINE
GLOBAL NAPI
GOLDEN POWER
GRUNENTHAL
GUANGZHOU
GUERBET
H&P INTERNATIONAL
HANIL
HARVEY SCRUTON
HEALTH LINE
HEALTH PRODS CORP.
HELP
HERMAL CHEMIE
HI PHARM
HIMALAYA DRUG CO.
HIPP
HOLISTICA
I.C.N.
IBI
IBSA
IMMUNO
INES FOOD
INNOTHERA
INT.DRUG AGENCIES
INTERHEALTH AB
IPSEN BEAUFOUR
ITALFARMACO
IVC
JOHNSON E JOHNSON
JOTIS
JULPHAR
KABI
KAHIRA
KAHIRA BIOCHEMIE
KAL INC
KINGSHOLLAND
KONSYL PHARMA
KOR BABY FOOD
KOREA GREEN CROSS
KRKA
KRUGER
LAB. AGUETTANT
LADY VIT CO
LANCEL
LEIRAS
LEK
LEO
LEURQUIN
LIDANO
LIFE SERVICE
LIFE TIME
LIJEMPF
LINZ
LIPHA
LIPTIS
LISAPHARMA
LUITPOLD
LUNDBECK
M.RAI
M.S.D.
MACK
MADAUS
MAJESTIC POWER
MAMISCH
MANAYER EG MEDICAL
MANN
MARCYRL
MARLYN
MAYOLY SPINDLER
MEDEXPORT
MEDI SERVE

MEDICAL UNION PHAR
MEDICATOR
MEDIMPEX
MEIJI MILK PRODUCT
MELBROSIN INTERN.
MEMPHIS
MENARINI
MENTHOLATUM
MEPACO
MEPHA
MERCK AG
MERZ
MINAPHARM
MINNESOTA
MISR
MODERN PHARMACEUT.
MONTANA
MUCOS
MULTIPHARMA
MUNDIPHARMA
NASR
NATIONAL DIAGN.PRO
NATROL INC.
NATURAL PHARMACEUT
NATURALLY
NATURES BOUNTY
NATURES LIFE
NEFERTARY
NESTLE
NEW LIFE
NEWPORT
NILE
NIPPON KAYAKU
NORTON
NORTON NORWICH
NOVARTIS
NOVO NORDISK
NOVO PHARM
NOVOLAC NUT.PROD.
NOVOSAN
NUTRICIA
NUTRISOURCE
NUTRITION MEDICAL
NYCOMED PHARMA
NYEGAARD
OCT.PHARMYGIENE
OCTOBER PHARMA
OM
ORTIS
OSPAPHARM
OTSUKA
OXO CHEMIE
PAN LAB
PAXILLE
PERMAMED
PFIZER
PHARAONIA PH.
PHARCO
PHARMA BIOLOGICA
PHARMA COSMOS
PHARMA DASS
PHARMACIA
PHARMASCIENCE
PHARMAX
PHARMNATURAL
PIERRE FABRE
PIETTE INTERN.LAB
POHL BOSKAMP
POLLEN
PRODES
PROTEINA

PURDUE FREDERICK
QUEEN
RAMEDA
RANBAXY
RAVIZZA (ADCO)
RECORDATI
REGINA
REMANS
RHODIA
RICHELET
ROCHE
ROEMMERS
ROQUES
ROSCREA
ROWA WAGNER
ROYAL
SAB LAB INT.
SAM AMERICAN
SANACARE
SANAFARM
SANKYO
SANOFI-SYNTHELABO.
SANTE NATURAL
SCAT
SCHERING AG
SCHERING PLOUGH
SCHWABE
SCHWARZ PHARMA
SEARLE
SEDICO
SEKEM CO
SELF CARE
SERONO
SERUM INT
SERVIER
SETON HEALTH CARE
SEVEN SEAS
SIEGFRIED
SIGMA
SIGMA ROYAL
SINOCHEM NINGBO
SI-SI INTER.
SISU ENTERPRISES
SMITH NEPHEW
SOLCO
SOLCO BASLE
SOLVAY
SPIMACO
STADA
STAFFORD MILLER
STERLING DRUG
STIEFEL
SUMMERTIME
SUN NATURALS
SWANCO
SWANCO NATURAL
SYNTEX
SYRIAN NUT
T3A
TAVA
TETRAPHARMA
THEA
THILO
TIBA PHARM
TISHCON
TOP PHARMA
TRI MEDICA
U.C.B.
UGINE KULMANN
ULTRA CARE USA
ULTRAPHARMACIA

UNIDENT.MANUFACT.
UPSA
V.P.C.
VARTA
VENO STAR
VITA VIGOR
VITABIOTICS
WALDEMAR WEIMER
WASSEN INT LTD
WEISERS LAB
WELLNESS WORLD
WEST COAST LAB.
WHITE PEARLS
WHITEHALL
WOCKHART
ZOJA

Excel Chart next page: TOP 26 REVENUE EARNERS IN EGYPT-2001
Contribution to total pharmaceutical production = >65%

Manufacturers' GROWTH & REVENUE		1999			2000			2001	
Company (Alpha List)	Revenue in EGP	% Growth Rate	% of Total Industry (Int'l)	Revenue in EGP	% Growth Rate	% of Total Industry (Int'l)	Revenue in EGP	% Growth Rate	% of Total Industry (Int'l)
ALEXANDRIA	57,771.2	4.7	1.5	50,511.5	-12.6	1.3	48,725.9	-3.5	1.1
AMOUN PHARM.CO.	47,853.8	88.9	1.2	72,764.2	52.1	1.8	116,278.4	59.8	2.7
AMRIYA PHARMACEUT.	130,430.2	17.9	3.4	128,746.3	-1.3	3.2	124,245.0	-3.5	2.9
APEX PHARMA	6,276.2	2,798.9	0.2	9,849.8	56.9	0.2	12,267.6	24.5	0.3
AVENTIS	231,915.9	8.0	6.0	235,976.7	1.8	5.9	233,939.2	-0.9	5.4
BRISTOL MYERS SQUI BB	274,065.6	14.7	7.1	262,010.8	-4.4	6.6	263,472.9	0.6	6.1
CID	65,714.2	-3.4	1.7	64,739.2	-1.5	1.6	68,578.9	5.9	1.6
EIPICO	188,347.6	6.8	4.9	182,227.6	-3.2	4.6	209,453.1	14.9	4.8
ELI LILLY	26,079.9	27.5	0.7	21,591.3	-17.2	0.5	15,662.6	-27.5	0.4
GLAXOSMITHKLINE	320,666.1	-6.4	8.3	337,488.5	5.2	8.5	374,508.7	11.0	8.6
KAHIRA	58,874.4	5.6	1.5	53,849.7	-8.5	1.3	59,205.4	9.9	1.4
MEDICAL UNION PHAR	56,551.4	28.0	1.5	63,945.5	13.1	1.6	75,016.1	17.3	1.7
MEMPHIS	49,132.2	5.8	1.3	49,998.4	1.8	1.3	44,368.8	-11.3	1.0
MEPACO	18,248.8	13.5	0.5	17,149.3	-6.0	0.4	18,292.6	6.7	0.4
MINAPHARM	7,810.0	41.4	0.2	6,782.2	-13.2	0.2	7,000.4	3.2	0.2
MISR	61,863.6	-1.6	1.6	54,733.3	-11.5	1.4	62,452.4	14.1	1.4
NASR	25,187.1	6.2	0.7	21,052.7	-16.4	0.5	27,755.8	31.8	0.6

NILE	69,085.8	9.0	1.8	71,355.6	3.3	1.8	77,432.3	8.5	1.8
NOVARTIS	270,599.4	10.6	7.0	280,659.5	3.7	7.0	301,178.6	7.3	6.9
OCTOBER PHARMA	10,122.4	55.2	0.3	14,087.6	39.2	0.4	16,878.2	19.8	0.4
PFIZER	146,375.4	4.8	3.8	176,981.3	20.9	4.4	182,177.7	2.9	4.2
PHARCO	134,431.3	10.0	3.5	143,467.1	6.7	3.6	162,791.9	13.5	3.8
RAMEDA	9,959.8	7.8	0.3	11,276.9	13.2	0.3	15,673.1	39.0	0.4
SEDICO	78,585.5	17.5	2.0	80,409.1	2.3	2.0	82,918.0	3.1	1.9
SERVIER	88,149.3	22.7	2.3	110,470.9	25.3	2.8	128,491.9	16.3	3.0
T3A	16,945.9	19.6	0.4	14,058.7	-17.0	0.4	17,208.8	22.4	0.4
Total	**2,451,043.0**		**63.6**	**2,536,183.7**		**63.5**	**2,745,974.3**		**63.3**
Total Drug Manufacturer Industry	3854824.3			3991271.8			4334723		

Source: IMS Data, Q/V 2001

PROFILE ON READY-MADE GARMENTS INDUSTRY[xxxv]

Market Profile

Egyptian apparel has a well-deserved reputation of quality and competitive price. Accordingly, a growing number of international fashion designers and department stores in the U.S. and the European Union make use of production facilities located in Egypt, placing orders for quality private label products designed for export markets.

The textile industry in Egypt covers the entire spectrum of cotton processing operations, including spinning, weaving, converting, knitting, and garment manufacture. It is growing at an average rate of 6.5% annually and is considered of paramount importance to the Egyptian economy. It employs more than half a million Egyptians and is a crucial foreign exchange earner. The government of Egypt (GOE) hopes to see the annual growth rate increase to 12% in order to match countries in Southeast Asia. Special emphasis is on the quality of production necessary to compete effectively in export markets.

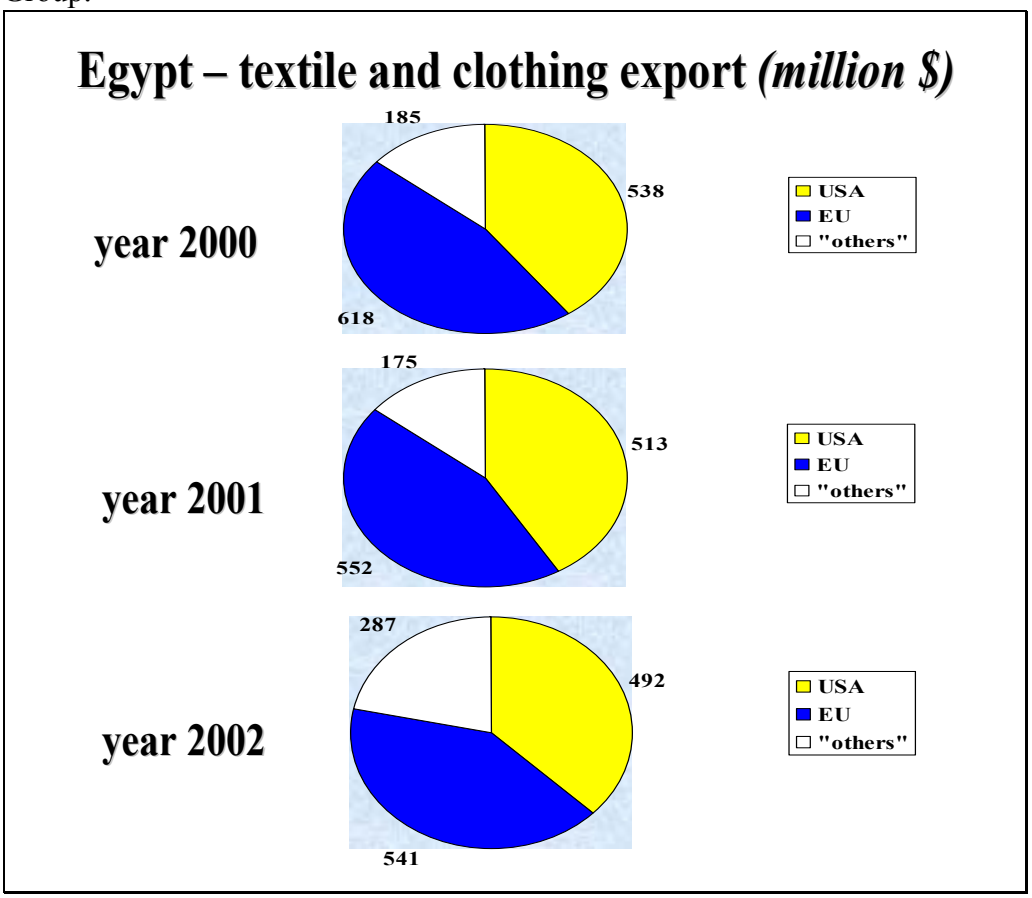
The Egyptian apparel industry is one of the most dynamic industrial sectors in Egypt. It comprises some 1500 private sector apparel and intermediate manufacturers, the majority of which are equipped with state-of-the-art machinery. Of the 1500 companies mentioned, some 500 are specifically dedicated to ready-made garments manufacturing, and about half of those are exporters. The latest technologies are adopted in all phases of production: pattern making, spreading, cutting, sewing, and packaging. Apparel manufacturers also apply the latest technical innovations such as Electronic Data Interchange (EDI), Supply Chain Management (SCM), and Product Data Management (PDM).

Total apparel production output is approximately USD 3 billion per year, representing 3.5% of Egypt's total GDP. The investment cost to create one job in this industry is about $US2000 compared to $US150,000 in other industries. The Egyptian market offers a complete range of products from simple T-shirts to tailored suits. In 1999, apparel exports to U.S. and EU markets totaled 68,000 metric tons, valued at some $700 million. According to export figures, 50% of 1999 exports were destined to the U.S., 35% to the EU, and the balance to regional markets in the Middle East.

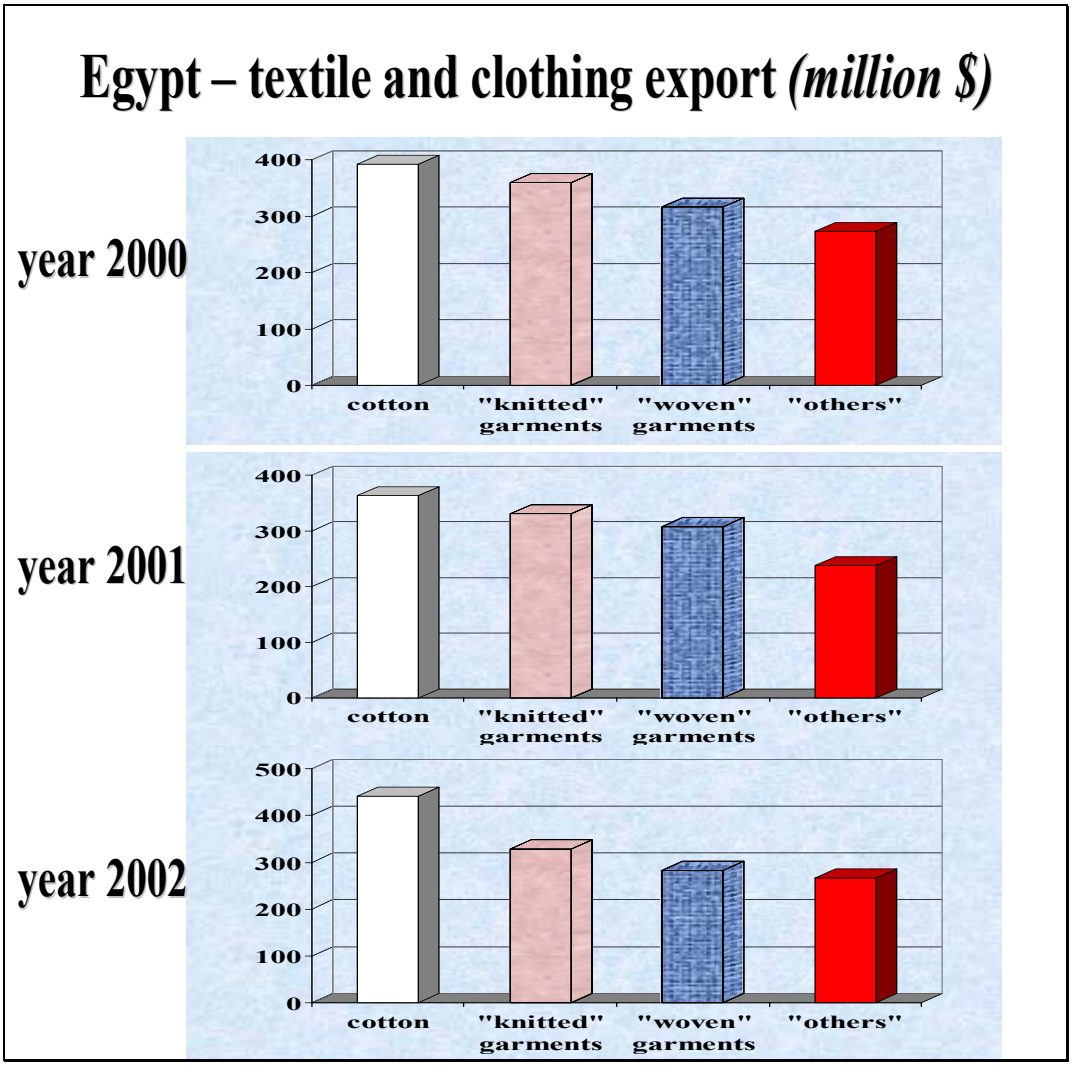
The charts shown on the following three pages show current statistics for the Egyptian ready-made garments industry. The information in the first two slides was presented by A-Arafa Group during a presentation for the Egypt Investment Conference, in London

[xxxv] InfoAmericas research. Sources: A-Arafa Group-"Egyptian textile and clothing Industry", presentation London, July 03, 2003; Sahara Group-"Investment in Egyptian Textile and Apparel Industry", presentation London, July 03, 2003; Egyptian Garments Exporters Association-EGEA, July 2003.

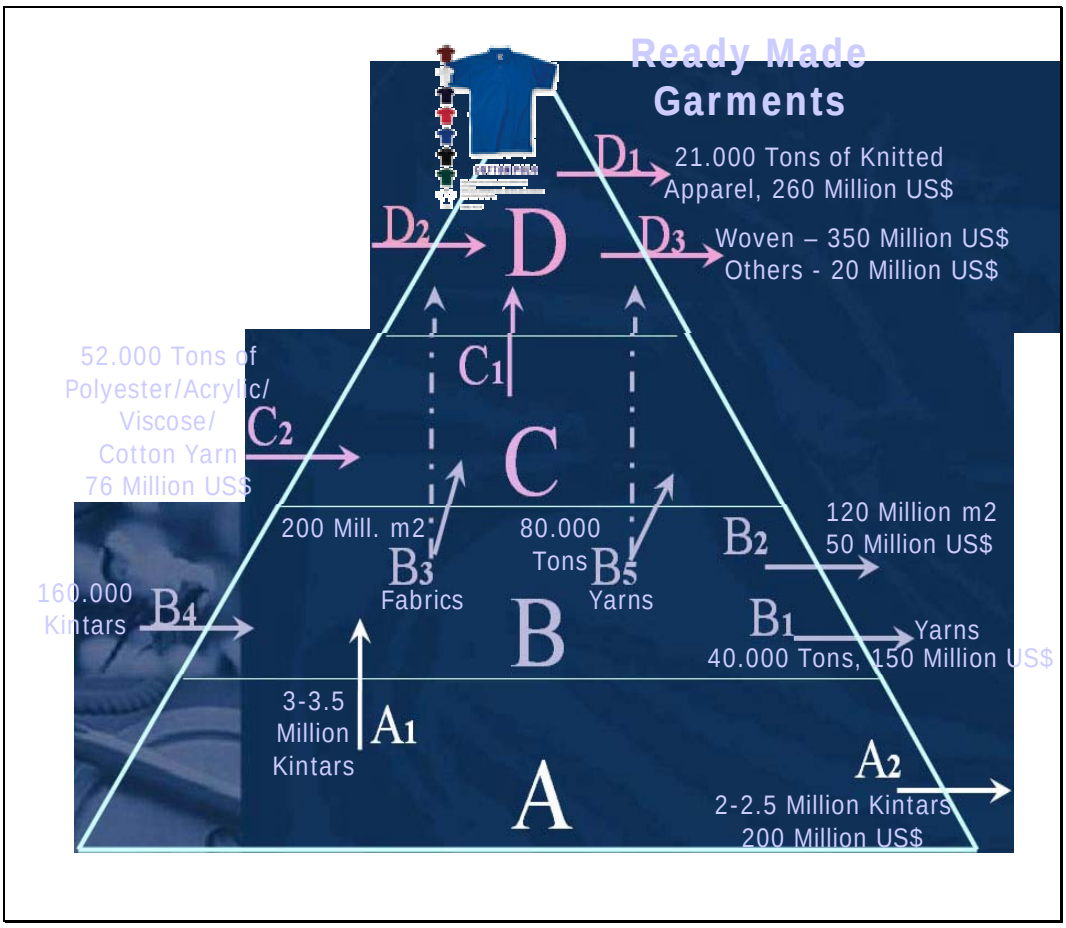
July 03, 2003. The third slide was presented in the same Conference by The Sahara Group.



Source: A-Arafa Group



Source: A-Arafa Group



Source: the Sahara Group

One of the important characteristics of the textile/garment industry is that it is one of the very few manufacturing processes in Egypt that is handled completely in-country. It also has the highest value added: the export value of one metric ton of raw lint cotton ranges between $US2000-2300 while the value added of one ton of textile exports averages $US 6500.

While the following data is outdated, it nonetheless provides a profile of the sector's growth trends.

TEXTILE/GARMENT INDUSTRY

Statistical data: (USD MILLIONS)

	1999	2000	2001 (est)	Projected avg. growth rate for next three years
Import market	300	300	300	0
Local Production	3000	36000	4320	20
Exports	700	980	1370	40
Total Domestic Market	2600	2920	3250	12

Sources: InfoAmericas analysis from: Egyptian Garment Exporters Association, American Chamber of Commerce, leading private sector manufacturers.

At present, the most attractive market opportunity for U.S. companies in Egypt is believed to be the sourcing of OEM products. Egyptian apparel has a well-deserved reputation of quality and competitive price. Accordingly, a growing number of international fashion designers and department stores in the U.S. and in Europe use production facilities located in Egypt, placing orders for quality private label products designed for export markets.

Competitive Analysis

Thirty-one large public entities account for 100% of spinning, 70% of weaving, 40% of knitting, and 30% of the garment manufacturing industry. In the mid-70's through early 80's, the GOE began to modernize the textile industry. To date, it has invested more than $US2 billion in new equipment; the money coming in part from outside sources such as the U.S. Agency for International Development (USAID), international banks, and Arab funds. Egypt's exports of textiles are estimated at $US1.3 billion per year, accounting for 25% of total Egyptian exports. The GOE hopes to see this figure grow to $US3 billion per year within the next five to seven years. The textile industry also absorbs some 80% of domestic cotton production.

Although government-owned companies have traditionally dominated the industry, due to poor management and other reasons, many have recently suffered from losses. The public sector is by far the main supplier for many textile products such as lint, yarn, and fabrics. On the other hand, textile exports with higher value added, such as ready-made garments and clothing dominated by the private sector, have expanded successfully.

This confirms the importance of pursuing the privatization of the large public sector operations; the private sector has proved its ability to innovate and penetrate export markets. Specifically, privatization is now viewed as key to countering competition from China and other producers in Asia.

Egypt has had bans on clothing imports. The most recent ban was lifted in January 2002, and it may in the long run prove beneficial to the garments and clothing industry as increased competition and the ability to operate in freer markets generally has a positive impact. A ban on imports of textiles was lifted on January 1, 1998, and contrary to expectations, imports have actually decreased. This was widely believed to have been the result of a non-tariff barrier requirement imposed by the GOE specifying the weaving of the importer's name into the imported fabric.

Another key problem threatening the textile and ready-made garments industry is the large amount of such products "smuggled" into Egypt with unpaid customs and taxes. The value of such products is estimated at $US300 million annually, and the practice has a number of negative impacts on the industry. A drawback system is employed in Egypt, whereby custom duties are paid on the imported material by the manufacturer, and provided the final product is re-exported within one year, the manufacture has the right to reclaim the already-paid duties in full. In the past, this was often considered de facto smuggling, but used appropriately, the drawback system is an efficient mechanism enabling textile and clothing exporters to use less expensive, imported raw material for re-exportation. Textile and clothing exporters can import cotton yarn for $US2.75/kg from India and Pakistan, while local cotton yarn is sold for $US4.50/kg.

At the present moment, Egypt is exporting a large portion of their domestic cotton production to generate foreign reserves. Many companies are feeling the crunch because of this. Several have turned to now importing cotton from India and Turkey to make up for the loss of available domestic cotton. All manufacturers spoken with stated that this is a short-sighted government policy which could lead the industry into deep problems if not redressed.

OVERVIEW OF WORK METHODOLOGY

The analysis methodology is *subjective*, in that it conforms to the two main parameters of the Project activity:

1. analyze from two to three Egyptian exporting industries and
2. analyze up to 45 companies in those industries.

The analysis methodology is *objective* in as much as it sets forth the steps one could use for undertaking any similar industry analysis, particularly in the case where one must start from a large possible selection of possible industries and narrow down the selection for which industry or industries to analyze according to logical and objective selection criteria, or "filters". The filters are objectively identified in order to take one from several initial alternatives down to limited alternatives which meet the objectives and parameters set forth by the client.

Specifically: the analysis methodology is a multi-tier approach for selecting two or three Egyptian industries, from among the 21 which are officially identified by the Government of Egypt, and for analyzing how those selected industries are using ICT products and services, as well as what the ICT needs are in those same industries.

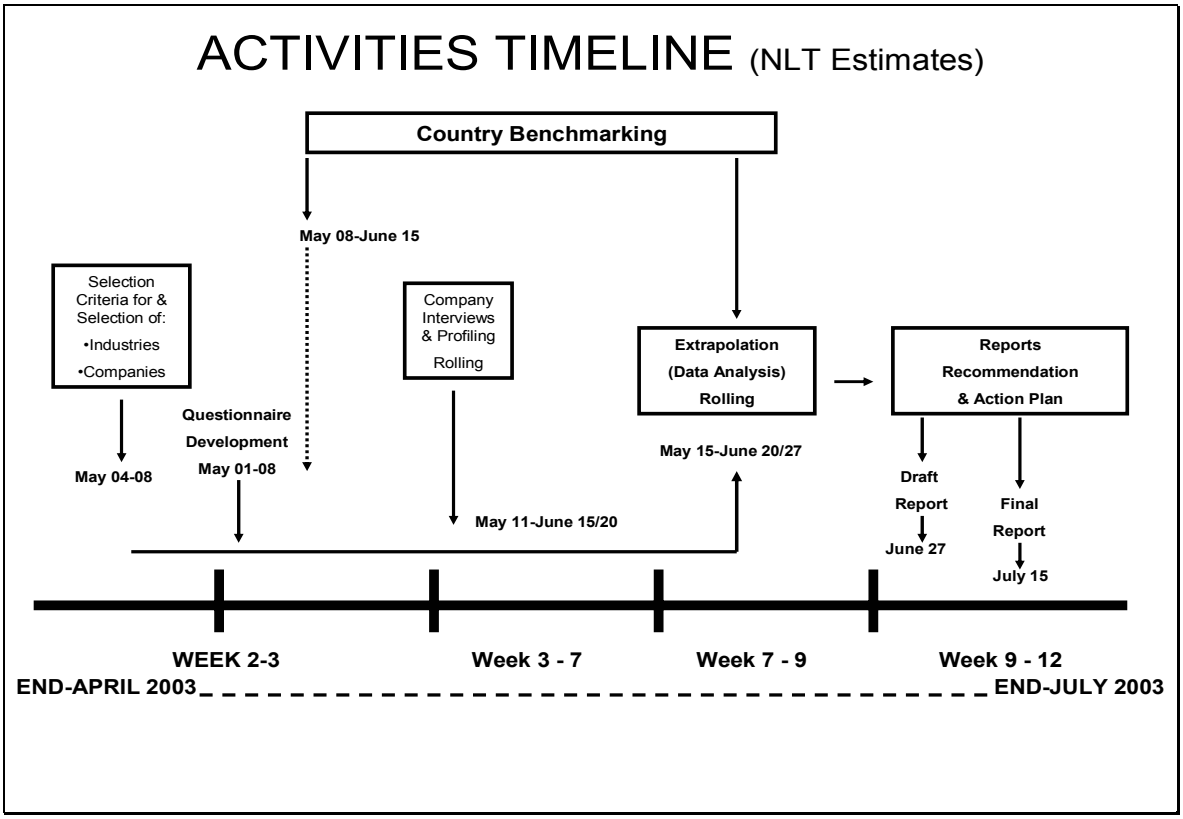
The end purpose of designing and applying a technically-solid approach for selecting a few industries and sample companies that represent them, is to describe as objectively as possible what (if any) the business case is for developing ICT services and products in any/all of the industries studied and if, by so doing, how the industry would most likely improve their export capability and market competitiveness.

There is another important aspect to the question of work methodology. Namely, the planning methodology used for executing the industries analysis. This document discusses both "levels" of methodology because they are mutually supportive. For example, a good technical industry analysis methodology without a solid planning methodology for carrying it out will likely be compromised.

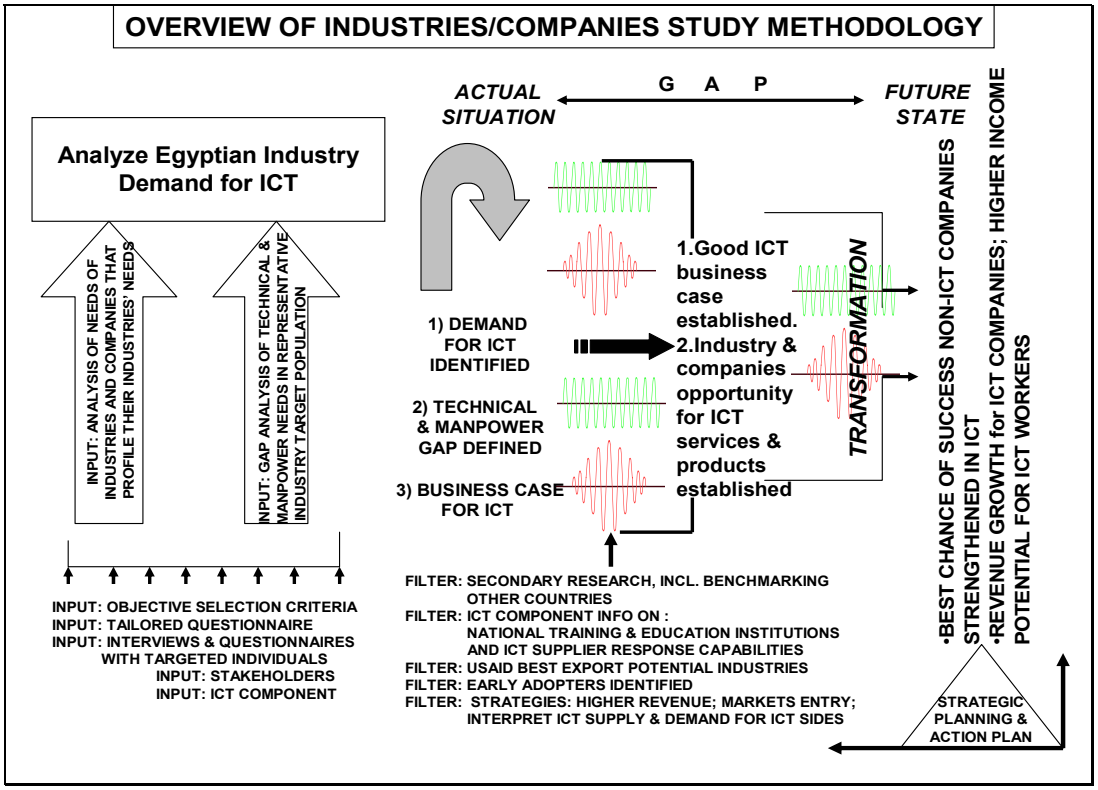
The three slides which follow here show how we intersected the technical analysis methodology and the planning methodology. The slides show:

1. a macro of the methodologies;
2. a broad-brush strategic roadmap intersecting the technical methodology design with its implementation, outputs and expected outcome.
3. a bulleted chart that describes the activities under four main components of the work; and

MACRO OF GAP ANALYSIS OF IT PENETRATION IN EGYPTIAN INDUSTRIES*



Strategic Roadmap: Intersection of Industry Analysis Methodology with Goal-Directed Milestone Planning (GDMP) Methodology for the Gap Analysis of IT Penetration in Egyptian Industries



FOUR MAIN ACTIVITY PHASES AND GENERAL CONTENT

1. Design	Objective selection criteria developed for choosing sectors and companies. Presentation of same to MCIT, PfCE. Acknowledgement & approval (buy-in). Development of matrix for profiling industry groups. Development of matrix for identifying where industry groups meet our selection criteria. Interviews with various associations. Opinions from industry business/industry sectors (vetting of methodology and selections). Develop company questionnaires (vetting of same by Project members).
2. Preliminary local data collection	Gather sector-specific data for filling in information in profiles matrix. Internet-based information gathering. Texts & studies known by project members, etc. Lists of Industry Chambers for setting up interviews (Federation of Egyptian Industries). Gather specific sector information for profiling sectors and for identifying companies within sectors. Continue interviews w/key institutions: MCIT E-readiness team; Ministry of Industry, others. Create lists of companies in industry sectors. Identify CVs of research assistant candidates. Interview and hire.
3. Primary & secondary data collection	Consolidation of industry sector information in matrices. Brief text notes on sector information (capture pertinent interviews information, international experience concerning ICT impact in sectors, etc). Select sectors or sub-sectors for ICT penetration analysis. (Vetting by experts). Lists of sector target companies. Filter using company selection criteria. Use telephone contact for first filter if required. (Vetting by industry experts). Research assistant identified by now and working in these activities. Identify companies for interview in each industry sector (45 total). Rolling basis. Create interview agenda. Aim: 2-3 visits/day/person. Off-shore country benchmarking initiated, according to approved industries selection.
4. Interviews; data gathering & analysis; findings, conclusions and recommendations	In-house assistant sets up interview program Contractor and Project reps (as possible) conduct 2-tiered interviews: upper management and IT-specific personnel. Write-ups of interview information, rolling basis. 45 interviews completed NLT end-June. Reserve 3 interviews for customs and freight forwarders as per client request (reality check on inbound and outbound logistics). On-going feedback to corporate for offshore countries benchmarking. Design of Excel-based data collection/analysis tool. Dump interview questionnaires information into Excel, run results, identify trends, figures, findings, etc. Interpret data. Run micro & macro figures. Comparative results among the 3 industries results. Comparative results with offshore benchmark countries. Design the presentation of conclusions and recommendations. Design a half-day conference for presentation of findings and recommendations to industry interviewees and Project principles (conference on July 21st). Final report to client NLT end-July.

VISITS TO COMPANIES, ORGANIZATIONS, ASSOCIATIONS, ETC

Farm Frites	SEDICO Pharmaceutical	Egyptian Federation of Industries
Amoun Pharmaceutical	Sherief Clothing	ALEB-Agriculture-Led Export Business
Baby Coca Textile	Royal Herbs	Ministry of Health-Health Policy Reform Program
Harvest Foods	EIPICO	Economic Research Forum
Aventis	BTM	Market Insights
Egyptian Linen Company	Katilo	Nathan Associates
Sekem	Europe Freight	EgyTex/Sahara Group
Pfizer Misr	Geen Company for Manufacturing and Trading	Deloitte & Touche
TIC Textile Company	National Foods	ExpoLink
Cold Alex	Nile Tricot Textile	ISG
Alexandria Pharmaceutical	Agro-Misr	LADIS
JET for Textile	Fine Textile Company	USAID-Economic Growth Office
Faragalla	El Salheya Olive Company	MEGACOM
Aventis	Kabo Textile	Feedback Market Research
Bella Donna	Juhayna	Pan Arab Research Center
Best Foods	Charipak Food Company(CHAER Group)	MCIT
PHARCO Pharmaceutical	East International Freight	Medressa II Conference
Level Collection for Textile	Misr Pharmaceutical	Directions Marketing Research & Services
Daltex Imbasco	Customs Office-Heliopolis	Ministry of Foreign Affairs
Mina Pharmaceutical	Ain Shams	Federation of Engineering Industries
Hesni Group for Textile	Nile Textile	Privatization Implementation Project
WADI Group	IBM	Rabco Trading
GlaxcoSmithKline	American Chamber of Commerce	ITG
Alkan Group	Chamber of Food Industries	Egyptian Chamber of Textiles Industries
Mass Foods	Ministry of Industry	Egyptian Garments Exporters Association
		Allocation Network GmbH

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WEB SITES AND WEB LINKS

Sources researched for obtaining data on Egyptian industries

April-July 2003

Web address	Organization	Notes
http://www.ipanet.net		Various articles
http://www.mpe.gov.eg	Ministry of Public Enterprises	
http://www.telefax.com.eg	Yellow pages for Egypt business categories	Listings, not data.
http://www.health.egnet.net	Egypt health sector	Some information. Scarce. Includes private orgs.
http://www.tradepartners.gov.uk		UK-based, w/good resources in general
http://www.mcit.gov.eg	Ministry of Communications & Information Technology-Egypt	
http://www.idsc.gov.eg	Egyptian Cabinet Information & Decision Support Center	
http://www.alhokoma.gov.eg	Government on Line	Arabic language
http://www.sis.gov.eg	Egypt's State Information Service	Yearbooks 2001 & 2002: informative gov. briefings & data on economic sectors
http://www.gtpne-e.com	Global Trade Point Network	
http://www.tpegypt.gov.eg	Egyptian International Trade Point	Also links to CAPMAS-Central Agency For Public Mobilization And Statistics
http://www.capmas.gov.eg	Central Agency for Public Mobilization & Statistics	Equivalent ot the National Census Bureau
http://www.wto.org	World Trade Organization	
http://www.worldbank.org	World Bank	Various country profiles
http://www.oecd.org	Organization for Economic Cooperation & Development	
http://www.imf.org	International Monetary Fund	Statistical review on Egypt 2001
http://www.moft.gov.eg	Ministry of Foreign Trade	Stats for exports, +
http://www.economy.gov.eg	MOFT	
http://www.ditnet.co.ae/arabic		Economic data on Egypt (telecom & ICT focus)
http://www.commerce.net		Economic data on Egypt
http://www.usaid.gov		Links to Egypt programs & other sites: US Dpt of Commerce; CIA, etc

http://www.usaid.gov/eg/		USAID stats-Egypt
http://www.egypt-ec.egnet/statisti.htm		Statistics on Egypt
http://data-egypt.org	USAID DATA-Data Access and Transmission Activity Project	Sector data, up to date & useful. Publish monthly updates on economic data.
http://www.fei.org.eg	Federation of Egyptian Industries	List seems partial. Most Industries listed do not have web sites
http://www.eba.org.eg	Egyptian Businessmen Association	Too generic to be useful
http://www.mpe-egypt.com	Ministry of Public Enterprises	
http://www.expolink.com	Egyptian Exporters Association (EEA)-ExpoLink	Exporters in 6 industries
www.researchandmarkets.com/reports	Dun & Bradstreet	Needs membership. Could be useful for getting any company's profile if they are registered with D&B
http://www.eces.org	Egyptian Center for Economic Studies	Business barometer & economic studies
http://www.palecon.org.		Various studies, incl. PIP
http://www.Egytex.com http://www.saharagroup.com	Egypt Textiles, Portal for Egyptian Textiles Industry 02-7365311	Mr. Ibraham Moustafa. Important access to company listings by sub-sector.
www.amcham.org.eg	American Chamber of Commerce 02-338-1050	Online listing of companies by sector, only those registered w/AmCham. Carries short description on companies.
www.telezoneegypt.com	TeleZone Egypt	Large data base on companies by sector.
www.egtrade.com	Egyptian Trading Directory	Large data base on Egyptian Factories , import and export companies, agents, banks, hotels, insurance and maritime companies in Egypt.

www.ibm-e.com	On-Line Business Directory of Egypt	Small on-line business sector data base by sector categories. Detailed info on the few companies they do have
www.infoexport.gc.ca	The Canadian Trade Commissioner Service	Good Links. Good info on Egypt-specific studies, restricted to Canadian citizens
www.egydir.soficom.com.eg	Egyptian directory, listed as a prime link in the Canadian site above	Lists of other links for Egypt Info
www.wfta.org/tradelinks	Links to Egyptian directories	
www.ArabDataNet.com	Maintained by National US-Arab Chamber of Commerce	Not very useful, except for a reasonable number of US companies listed. AmCham is better list
www.infoprod.co.il	Info-Prod Research (Middle East), Ltd.	Studies, newsletters, etc.
www.esomar.org		Links to market research companies worldwide.
http://www.trade-links.org/Healthcare		Health Care Industry
http://www2.sn.apc.org		General ICT needs for industries in Egypt.
http://www.arab-trade.com		
http://www.oilegypt.com		Oil & Gas market news – up-to-date market info concerning oil prices
http://www.sdrta	San Diego Regional Technical Alliance	Industry Clustering Technology and Methodology
http://www.statsoftinc.com		Clustering analysis
http://www.espicom.com	Medistat-Espicom Business Intelligence	Health Statistics-Egypt
http://www.securities.com/cgi.bin/		World Economic News: Egypt banking sector article
http://www.economist.com	The Economist	Economic Intelligence Unit
http://www.merrill-lynch.com	Merrill Lynch	Banking report-Egypt, April 2002
http://www.mecommunications.com	Middle East Communications	Reports in general
http://www.sigma-cap.com	Sigma Securities Research	Brokerage firm. Statistics on Egypt
	HC Brokerages	Egypt Equity Research.

		Country Report WTC, Cairo. 02-578-1841
http://www.cbm-egypt.com	Chamber of building materials	
http://www.strategis.ic.gc.ca	Egyptian Architectural, Construction materials, equipment	
http://www.dmoz.org/regional/africa	Regional African Egypt Health companies	
http://www.erf.org.eg	Egyptian Economic Forum	
http://www.ilo.org/public	Legislative & Administrative Institute	
http://www.ita.doc.gov/td/industry/otea	Office of Trade and Economic Analysis	
http://www.trade.go.sk	Garments industry	
http://www.ismaliatp.gov.eg	Ismaliya Trade Point	
http://www.tcfegypt.gov.eg	Egypt Free Zone Exporters	
http://www.tpegypt..gov.eg	Alexandria Exporters	
http://www.fibre2fashion.com/trade-directory	Textiles	Search engine, over 397K companies listed
http://www.fas.usda.gov/hotpages http://www.fas.usda.gov/agexport	Egyptian F&B and US ag exporters support	
http://www.usda.gov/nass	National agricultural statistical services	
http://www.IPAnet.net/infores	List search on Egypt	
http://www.leather-egypt.com		
http://www.mwe.com	Progress of FDA regulations	
http://www.restaurant.org	Food imports to USA	
http://www.eipico.com.eg	Company site	
http://www.sekem.com	Company site	
http://www.listsareus.com/business-sic-codes-a.htm	Standard Industrial Classification Codes	
http://www.textiles.tradeworlds.com/us	Textiles portal	
http://www.culpepper.com	Company survey for Job titles and families	
http://www.rccnet.net	Mid East portal for construction and construction materials	
http://www.economic.idsc.gov.eg	Egypt economic bulletin	
http://www.uneca.org	Economic Commission for Egypt	
http://www.us-egypt.org	US Egypt Business Council	
http://www.fas.usda.gov/agexport	Web service for exporters	
http://www.arabicnews.com	Articles	
http://www.nfcegypt.com	National Food Company (Kato	

	Group)	
http://www.weekly.ahram.org.eg	articles	
http://www.health.egnet.net/cgi-win/pharm2.exe	Pharmaceutical companies in Egypt	
http://www.jordanembassyus.org	Articles	
http://www.biopharmlink.com/companies	Egyptian pharma companies	
http://www.metimes.com	Articles-Middle East Times	
http://www.ahkmena.com	Articles-	
http://www.al-shams-group.com.eg	Company site	
http://www.tradelinks.org		
http://www.infoexport.gc.ca	Canadian Trade Commission Service	
http://www.heia.org	Horticulture Export Improvement Association	
http://www.aleb.org	Agricultural-Led Export Businesses	
http://www.harvestfoodsegypt.com	Company site	
http://www.mwe.org	McDermott, Will & Emery	Washington DC legal & research firm specialized in food and beverages
http://www.restaurant.org	Food industry research	
http://www.itmf.org	International Textile Manufacturing Federation	
http://www.wernertex.com	Werner International, Management Consultants	Specialists in textiles industry
http://www.culpepper.com	Job clusters	
http://www.ciaa.be	Conféderation des Industries Agro-Alimentaires de l' UE	Comparitive data on food and beverages industries, focus = EU

Links Listed by Data Access & Transmission Activity (Data) Project - USAID

Useful Links

- Egyptian Government
- International Organizations
- Relevant US Government Sites
- Non Governmental Organizations

Egyptian Government

- Ministry of Education
- Ministry of Foreign Affairs
- Ministry of Manpower and Emigration
- Ministry of State for Environmental Affairs
- Ministry of Tourism
- Ministry of Economy
- Egyptian International Trade Point (EITP)
- Alhokoma, Egyptian government portal
- US-Egypt President's Council
- Egypt's Information Highway

International Organizations

- United Nations Commission on International Trade Law (UNCITRAL)
- World Trade Organization
- World Intellectual Property Organization
- The World Bank
- International Monetary Fund
- European Delegation in Cairo
- Center for the Promotion of Imports from Developing Countries (CBI)

Relevant US Government Sites

- The Office of Electronic Government, US General Service Administration
- United States Government Electronic Commerce Policy
- US Government Portal - FirstGov.gov
- USAID Egypt

Non-Governmental Organizations

- Federation of Egyptian Industries
- Egyptian Businessmen Association
- Alexandria Businessmen Association
- Expolink
- American Chamber of Commerce in Egypt

Expolink Business Links to Egyptian Businesses

- AL-Ahram Newspaper
- Egypt Investment Profile (Ernst & Young)
- Country Information
- Links to Egypt
- Egypt.com Directory
- About Egypt - Interactive Fact Finder -ABC World Fact Book
- Egypt on the Arabnet
- Egypt and the USAID
- Egypt on the World Atlas
- Information Technology Solutions
- Technology Development Program
- MisrNet
- Misr Company for Sound and Light
- Information Society of Promotion Office (ISPO) Export Market
- Information Center (EMIC)
- DEPRA Project
- Economic Research Forum
- The Egyptian Center for Economic Studies
- Egyptian Exporters Association
- Egyptian Universities Network
- The American University in Cairo
- Cairo and Alexandria Stock Exchanges
- Egyptian Stock Market
- Arab Trade Finance Program
- Links to other UN and related Organizations
- Suez Industrial Development Company

Expolink Business Links to Egyptian Government Sites Etc.

Government Sites.

- The Egyptian Presidency
- People's Assembly
- Ministry of Manpower and Emigration
- Ministry of Economy
- Ministry of foreign affairs
- Egyptian Armed Forces
- Egypt Tourism Net
- Egypt State Information Service
- Egyptian Geological Survey and Mining Authority
- Egypt Information Highway
- Egyptian Economic Bulletin
- Central Agency for Public Mobilization and Statistics (CAPMAS).
- Egyptian Cultural and Educational Bureau Washington DC,USA

Business Directories.

- Telefax Egypt

Economic Analysis sites.

- Egyptian Center for Economic Studies
- DEPRA Project
- Egyptinc

The Stock Market.

- Egyptian Stock Market

Donors' Programs in Egypt.

- United States Agency for International Development
- European Information Correspondance Centre, EICC - Egypt
- Private Sector Development Programme, PSDP - Egypt

Trade Organizations.

- Egyptian International Trade Point
- American Chamber of Commerce

Links from the Canadian Trade Commission Service
With recognition to World Federation of Trading House Associations (WFTA)

Egypt Directories

- Afrika.no - Egypt
  The Norwegian Council on Africa listing of links and resources for Egypt.
- *http://afrika.no/links/Countries/Egypt/index.html*
- Egyptian Trading Directory
  Directory of Factories, Import and Export Companies, Agents, Banks, Hotels, Insurance Companies, and Maritime Companies in Egypt
- *http://www.egtrade.com/*
- Internet Business Mall Egypt
  Egypt business directory
- *http://www.ibm-e.com/*
- USATRADE.gov - Country Commercial Guide - Egypt
  USATRADE.gov's Country Commercial Guides (CCG) are prepared by US Embassy Staff in Egypt once a year and contain information on the business and economic situation and the political climate as it affects U.S. business. CCG contains topics such as marketing, trade regulations, investment climate, and business travel.
- *http://www.usatrade.gov/website/CCG.nsf/ShowCCG?OpenForm&Country=EGYPT*
- World Bank Group's Country Pages - Egypt
  The World Bank's information page for Egypt providing general information about the economy of Egypt, statistics and overviews of World Bank activities in the country.
- *http://lnweb18.worldbank.org/mna/mena.nsf/baf1817f911da24b852567d600653bd8/217fc1e83c33163d852567ee0068d619?OpenDocument*

Middle East Directories

- Bahrain Directories
- Egypt Directories
- Iran Directories
- Iraq
- Israel Directories
- Jordan Directories
- Kuwait
- Lebanon Directories
- Oman Directories
- Palestine Directories
- Qatar Directories
- Saudi Arabia Directories

- Syria
- United Arab Emirates Directories
- Yemen

Search engine for Web sites in or about the Arab world

- *http://www.1001sites.com/*
- AME Middle East Business Information
  Database of Middle East business resources. Directory and Web links for Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates (UAE) and Yemen
- *http://www.ameinfo.com/*
- Arab Business Network
  Directory of businesses in Jordan, Amman, Palestine, Syria, Lebanon, Beirut, UAE, Emirates, Gulf, Kuwait, Saudi Arabia, Yemen, Iraq, Qatar, Bahrain, Sudan, Morocco, Egypt, Cairo, Algeria, Tunisia, Mauritania and Libya.
- *http://www.arab-business.net/sectors.html*
- Arab Trade
  Lists of Gulf Chambers of Commerce, businesses and other Middle East business resources
- *http://www.arab-trade.com/*
- Arab World Online - Commercial Directory
  Listings of member companies of the National U.S.-Arab Chamber of Commerce and other resources for business with the Arab world
- *http://www.awo.net/commerce/*
- ArabDataNet.com
  Website, established and maintained by the National US.-Arab Chamber of Commerce, providing country economic information, news, events and a directory of Arab companies in the Middle East and Africa.
- *http://www.ArabDataNet.com/*
- ArabDataNet.com - Company Database
  Directory providing a listing of over 1,500 companies doing business in the U.S. and in the Middle East provided by the National US Arab Chamber of Commerce.
- *http://www.ArabDataNet.Com/directory/*
- ARABIA ONLINE
  News and Other Arab World Resources
- *http://www.arabia.com/*
- Arabia.com
  Internet portal for Arabia offering links to businesses.
- *http://www.arabia.com/english/*
- ArabNet
  Comprehensive online resource on the Arab world, primarily dealing with countries in the Middle East and North Africa. Covers Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon,

Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen

- *http://www.arab.net/*
- Business Patrol - Mediterranean World
  BusinessPatrol.com's information page for the Middle East providing a variety of information and resources including links, facts, and guides. Covers the entire Middle East as well as North Africa and Turkey.
- *http://www.businesspatrol.com/businesspatrol_links.php3?topic=Mediterranean%20World*
- KU IBRC Resources - Middle East
  University of Kansas International Business Resource Center's links to business and other information on the Middle East.
- *http://www.ibrc.bschool.ukans.edu/country/middleE/middlee.htm*
- MENA - Information Exchange Network
  An interactive information exchange network with up-to-date information on conducting business in the Middle East and North Africa Region.
- *http://mena.us.ittn.org/cgi-bin/ittn*
- MEnow

Directories for Egypt, United Arab Emirates and Kuwait

- *http://menow.com/*
- Middle East Directory
  Descriptions of over 1500 web sites in 16 Middle East Countries- Bahrain, Cyprus, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates and Yemen.
- *http://www.MiddleEastDirectory.com/*
- Middle East Internet Directory
  Directory of Web sites throughout the Middle East. Covers Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen
- *http://www.arab.net/meid/*
- Middle East Internet Pages
  Links to Web sites from Bahrain, Egypt, Iran, Iraq , Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, United Arab Emirates (UAE)
- *http://www.middle-east-pages.com/*
- Middle East Studies Internet Resources
  Compilation of electronic bibliographic resources and research materials on the Middle East and North Africa available on the global Internet, created under the purview of the Middle East Studies Department of Columbia University Libraries. Electronic resources from the Middle East are organized by region, country and subject.
- *http://www.columbia.edu/cu/lweb/indiv/mideast/cuvlm/*

- MidEast Business
  Weekly English language digest of business news. Information is a selection of business news from local business and industry sources.
- *http://www.infoprod.co.il/MEB/meb1.htm*
- MidEast Net - The Arab & Middle East Business Gateway
  Business listings and search engine for companies, products and business opportunities in the Middle East
- *http://www.mideastnet.com/*
- Online Intelligence Project - Middle East
  The Online Intelligence Project is oriented towards individuals and professionals with an interest in international news, commerce, and references for the Middle East.
- *http://www.icg.org/mideast.html*
- World Bank Group - Middle East and North Africa
  Regional information and news on the Middle East and North Africa provided by the World Bank Group.
- *http://wbln0018.worldbank.org/mna/mena.nsf*
- Zawya.com
  Arab world's first business and finance portal. Business news and information from the Middle East.
- *http://www.zawya.com*

Ministry of Foreign Trade Links

LINKS LISTED ON MOFT SITE

- AL-Ahram Newspaper
- Egypt Investment Profile (Ernst & Young)
- Country Information
- Links to Egypt
- Egypt.com Directory
- About Egypt - Interactive Fact Finder -ABC World Fact Book
- Egypt on the Arabnet
- Egypt and the USAID
- Egypt on the World Atlas
- Information Technology Solutions
- Technology Development Program
- MisrNet
- Misr Company for Sound and Light
- Information Society of Promotion Office (ISPO) Export Market
- Information Center (EMIC)
- DEPRA Project
- Economic Research Forum
- The Egyptian Center for Economic Studies
- Egyptian Exporters Association
- Egyptian Universities Network
- The American University in Cairo
- Cairo and Alexandria Stock Exchanges
- Egyptian Stock Market
- Arab Trade Finance Program

Sample Publications Listings from The Web Sites

These lists of documents are available from: www.ipanet.net

Principio del formulario

16. Privatisation of Food Industries - Egypt
Links to food processing companies which are up for privatization
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 11/20/2002

17. Privatisation of Companies in Agriculture and Textiles - Egypt
Links to companies in the cotton and agriculture sectors earmarked for privatization
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 11/15/2002

18. Country Fact Sheets on Foreign Direct Investment: Egypt
Foreign direct investment data of selected years (1985~2001) from the World Investment Report, 2002 (pdf file)
Source: United Nations Conference on Trade and Development (UNCTAD)
Subject: Markets: FDI news & trends
Last Update: 11/14/2002

19. Privatisation in the Pharmaceutical Sector - Egypt
Companies to be privatized in the pharmaceutical sector, Egypt.
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 11/12/2002

20. Privatisation of Spinning and Weaving Companies - Egypt
Links to companies in the spinning and weaving subsector earmarked for privatization
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 11/11/2002

21. Privatization in the Building and Construction Sector - Egypt
List of Egyptian companies in the building and construction sector earmarked for privatization
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 11/01/2002

22. Privatization in the Chemicals Industry - Egypt
List of companies, with links to company profiles, within the chemicals industry earmarked for privatization
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 10/31/2002

23. Privatisation of the Maritime Transport Sector - Egypt
List of affiliated companies in the maritime transport sector, currently offered for privatization
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 10/24/2002

24. Privatisation in the Tourism and Property Sector - Egypt
Privatization in hotels and property sub-sectors
Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 10/24/2002

25. Privatisation of Engineering Companies - Egypt
Links to profiles of state-owned engineering companies offered for sale

Source: German Arab Chamber of Industry and Commerce
Subject: Opportunities: Privatization
Last Update: 10/24/2002

26. 2002 CIA World Factbook: Egypt
Country Overview
Source: United States Central Intelligence Agency
Subject: Business: Country overview
Last Update: 10/21/2002

27. Private Participation in Mediterranean Infrastructure News (August-September 2002)
This issue of monthly newsletter on private participation in infrastructure (PPI, contains an article on enabling environment for PPI. (in pdf)
Source: Programme on Private Participation in Mediterranean Infrastructure-World Bank/EC
Subject: Markets: Market research
Last Update: 10/07/2002

28. Benchmarking Regulators - Making Telecom Regulators More Effective in the Middle East
Analytical review of the telecommunication reforms implemented in Egypt, Jordan, Morocco and Saudi Arabia. Published in June 2002 in pdf
Source: The World Bank - Rapid Response Service
Subject: Legal: Sectoral laws
Last Update: 09/26/2002

29. Statistical Data on Privatization Transactions - Egypt
Statistical data on the privatization process in Egypt, up to March 2002.
Source: The International Investment Advisor
Subject: Business: Privatization statistical data
Last Update: 09/23/2002

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