

# **Mapping & Assessment of Egyptian Technology & Innovation Infrastructure**

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**December 2005**

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## **ABBREVIATIONS**

AEA = Atomic Energy Authority  
AGERI = Agricultural Genetic Engineering Research Institute  
ARC = Agricultural Research Centre  
ASRT = Egyptian Academy of Scientific Research & Technology  
BMZ = German Federal Ministry for Economic Cooperation and Development  
BRC's = Business Resource Centers  
CDP = Community Development Program  
CIDA = Canadian International Development Agency  
DANIDA = Danish International Development Agency  
DSP = Development Support Program  
DTI = Department of Trade and Industry  
EBTLC = Egyptian Business & Technology Links Centers  
EC = European Commission  
EEAA = Egyptian Environmental Affairs Agency  
EU = European Union  
FEI = Federation of Egyptian Industries  
GDP = Gross Domestic Product  
GOE = Government of Egypt  
GTZ = German Agency for Technical Cooperation  
HRDP = Human Resources Development Program  
IDP = Institutional Development Program  
IDSC = Information and Decision Support Center  
IMC = Industrial Modernization Centre  
IMP = Industrial Modernization Program  
ITC's = Industrial Technology Centers  
MEPI = Middle East Partnership Initiative  
MFTI = Ministry of Foreign Trade and Industry  
MOALR = Ministry of Agriculture and Land Reclamation  
MOHE = Ministry of Higher Education.  
MOIC = Ministry of International Cooperation  
MOSR = Ministry of Scientific Research.  
MOWRI = Ministry of Water Resources and Irrigation  
MEA = Ministry of Environmental Affairs

NGO = Non-Governmental Organization  
NRC = National Research Centre  
NWRC = National Water Research Centre  
OST = Office for Science & Technology  
PRU = Policy Reform Unit  
PWP = Public Work Program  
R&D = Research & Development  
R, D&I = Research, Development and Innovation  
S&T = Science & Technology  
SEDO = Small Enterprise Development Organization  
SFD = Social Fund for Development  
SME's = Small and Medium Enterprises  
SPXs = Subcontracting and Partnership Exchanges  
TBI = Technology and Business Incubators  
TMCO = Technology Management and Commercialization Office  
TSC = Technology Support Center  
UNDAF = United Nations Development Assistance Framework  
UNDP = United Nations Development Program  
UNIDO = United Nations Industrial Development Organization  
USAID = United States Agency for International Development  
VC = Venture Capital

## **EXECUTIVE SUMMARY (ENGLISH)**

The study deals with the mapping and assessment of Egyptian technology and innovation infrastructure. The data was collected on the ministerial as well as the R&D institutional levels. Also data for NGOs and the private sector were taken into consideration as both have the potential to act as intermediaries between R&D institutions and end users particularly industry. The data was divided into governmental and non-governmental sectors, and each sector was further divided into structures with a direct role in R&D and structures with a supporting role in R&D.

The governmental sector contained all ministries with direct R&D capabilities. Four ministries (Higher Education, Scientific Research, Agriculture and Water Resources) have the largest percentage of human resources working in R&D. No information was available for the Ministry of Military Production.

Universities and their affiliated research centres along with specialized research centres affiliated to the Ministry of Scientific Research represent the major players in S&T/R&D related to industry. The Agricultural Research Centre (Ministry of Agriculture and Land Reclamation) and National Water Research Centre (Ministry of Water Resources and Irrigation) represent a further addition to S&T with the advantage over the first top R&D institutions in being tied in with the sectoral policies/strategies of both respective ministries. The following six ministries have a smaller number of R&D institutions; however they are directly linked to their respective ministries.

The non-governmental structures with a direct role in R&D are represented by the private universities and the IMC technology centres. Both are still in their infancy stages where R&D is concerned and an active role will be developed over the coming few years, particularly the IMC technology centres.

Considering the governmental and non-governmental structures with a supporting role in R&D, both sectors have good potentials should a need for R&D arise on behalf of the industry. The governmental structures on the ministerial level are only few in number for example R&D units with marketing capabilities; the Technical and Technological Consulting Studies and Research Fund – MOSR; the ASRT – MOSR; the Technology Management and Commercialization Office – MOALR; and the Social Fund for Development). The non-governmental structures with supporting role in R&D are represented by the Federation of Egyptian Industries, a number of specialized associations, businessmen/women associations, private consulting companies and international donor organizations. The study in its assessment concludes that despite the recent advancements in information technology, yet several ministries do not have adequate and reliable databases. In many cases data collection depends on the attitude of those in charge and on the level of clearance. The absence of S&T indicators is a weak point that should be better developed for policy makers.

Furthermore, the absence of S&T policies/strategies as well as adequate funding also plays a negative role in the lack of innovation in over 90% of R&D institutions. Marketing capabilities also plays an important role. Institutes with marketing capabilities appear to fare better than those lacking it. The role of marketing/intermediary structures should be developed to play a more positive role in the governmental and non-governmental sectors. The positive aspect is that the R&D human resources with a wide scope of specialists and expertise exist, and only need a good management system to make use of them in the presence of appropriate policies/strategies and funding.

**EXECUTIVE SUMMARY  
(ARABIC)**

%

## SOME RELEVANT INDICATORS

Population*	1991	54,080,000
	2004	70,000,000
Annual population growth rates (%)*	1991	2.28
	2004	1.94
<u>Development (2002)*</u>		
Adult literacy rate (% age 15 and above)		55.6
Youth literacy rate (% 15-24)		73.2
Net primary enrolment ratio (%)		90
Net secondary enrolment ratio (%)		81
<u>Economic Performance (2002)*</u>		
GDP (US\$ billions)		89.9
GDP/capita (US\$)		1354
GDP/capita annual growth rate (%) since 1990		2.5
Inflation rate – annual average (%)**	1991/2	21.1
	2004/5	4.7
<u>Information &amp; Communication**</u>		
Main telephone lines	2002	7,430,000
	2004	7,000,000*
Cellular mobile phone subscribers	2002	4,494,700
	2004	4,690,000*
Internet users (estimated)	2002	1,500,000
	2004	1,974,000*
Personal computers	2001	1,120,000
<u>Public Expenditure (as % of GDP)(2004)***</u>		
S&T*		0.2
Education		5.2
Health		1.9
Defense		6.1
Social security benefits		2.5
<u>Science &amp; Technology (rank/120 countries)**</u>		
Subsidies for firm-level R&D (2003)		45
Quality of Scientific research institutions (2003)		60
Availability of scientists & engineers (2003)		57
Utility patents granted (per 1,000,000 inhabitants)(2002)		64
ICT manufactured exports (per capita)(2001)		91
Scientists & engineers in R&D (per 1,000 inhabitants)(2000)		55

Sources:

- \* [www.presidency.gov.eg](http://www.presidency.gov.eg)
- \*\* [pogar.org](http://pogar.org) (pogar = Programme on Governance in the Arab Countries)
- \* Egypt Human Development Report. Choosing Decentralization for Good Governance. UNDP-EGY/01/006 (2004).
- \*\* The Global Information Technology Report-Towards an Equitable Information Society. Oxford University Press, Oxford (2003-2004).
- \*\*\* ESCWA personal information.

## **I- INTRODUCTION**

The Policy Reform Unit (PRU) of the Industrial Modernization Centre (IMC) is planning a number of studies related to the Egyptian industry to help the policy makers understand the obstacles as well as existing potentials. This will help the Ministry of Foreign Trade and Industry (MFTI) in formulating an industrial policy for Egypt. The present study entitled “Mapping and Assessment of Egyptian Technology and Innovation Infrastructure” is one of these studies contracted by IMC.

The objectives of the present study is: a) – A detailed compilation of a registry and mapping of Egyptian Ministries with a role in technology and innovation policy development and implementation, Egyptian Technology Centres, S&T/R&D institutions, Business Associations and consulting companies operating as intermediaries between Academia and Industry in the field of technology and innovation support services and/or providing technical services to help enterprises develop their businesses. b) – An overall assessment of existing R&D organizations, programs and services delivered, infrastructure, other activities and their potentials, all in comparison to best practices in developed and less developed countries.

The methodology followed began by a kick-off meeting with IMC staff and this was followed by the development of a questionnaire, identifying ministries involved in S&T/R&D, R&D institutions, business associations, consulting companies, NGO’s and private sectors as well as international donors involved in R&D. The following step was contacting the different targeted ministries, institutions and organizations through sending or direct contact with an introductory letter from both METTCO Holdings and IMC. This was followed by collection of data from those contacted or through other sources such as reports, booklets, websites...etc. All steps were monitored by regular meetings of the consulting team as well as co-ordination and follow up meetings with IMC.

The report was divided into two major parts (see map on following page):

- 1- Governmental structures with a role in R&D.
- 2- Non-Governmental structures with a role in R&D.

The first part contained the public universities listing natural science faculties and research centres affiliated to them, as well as R&D institutions within the ministries. This part also contained governmental structures with a supporting role in R&D and these included: a) – Marketing units within the ministries and R&D institutions; b) – Egyptian Environmental Affairs Agency; c) – Social Fund for Development; d) – Laboratories; e) – Educational & vocational training; and f) – Information data base centres.

The second part contained the private universities; R&D units of SME’s; specialized NGO’s and private consulting companies. This part also contained the Federation of Egyptian Industry; businessmen/women associations and international organizations. The database was presented as the present hard copy and in an Excel form. Besides the database, the report also contains an assessment and analyses of the data and benchmarking with best practices.

# Egyptian Technology and Innovation Infrastructure

## Governmental Sectors with a Direct Role in R&D

**Public Universities**  
(Ministry of Higher Education)

**Faculties & Faculties Research Centers**  
Engineering – Science – Agriculture – Pharmacy –  
Computer Science – Applied Arts

**Research Centers and Institutes**  
affiliated to the Ministries of: Scientific Research –  
Agriculture – Industry – Communication and  
Information - Housing - Irrigation - Military  
Production – Electricity – Health and Population

## Governmental Sectors with a Supporting Role in R&D (INTERMEDIARIES)

**R&D Units with Marketing Capabilities**  
*(within ministries & R&D centers & institutes)*

**Academy of Scientific Research & Technology**

**Social Fund for Development**

**Ministry of Environment: EEAA**

**Laboratories**

**Education and Vocational Training**

**Information and Database Centers**

## Non-Governmental Sectors with a Direct Role in R&D

**Private Universities**

**IMC Research Centers**

## Non-Governmental Sectors with a Supporting Role in R&D (INTERMEDIARIES)

**Federation of Egyptian Industries**

**Non-governmental Organizations (NGOs)**  
Specialized NGOs - Businessmen/women Associations

**Private Consulting Companies**

**R&D Laboratories of SMEs**

**International Organizations**

## **II – GOVERNMENTAL SECTOR**

### **1- Structures with a Direct Role in R&D.**

#### **1.1- Ministries and Research Institutions.**

The data was designed as an Excel database and to include cross-indexing whenever possible. The database contains three categories, the ministerial level, the Research, Development and Innovation (R, D&I) institutions and the intermediaries. The ministries and research institutions are outlined in the present part. Each ministry is described with addresses and phones. This is followed by human and financial resources, major R&D institutions and marketing (intermediary) facilities.

With regards to the ministries, five have substantial R,D & I capabilities. The first four have the largest numbers of human resources and research facilities in the field of R, D&I in natural sciences and related to industry (see Annex 1). The first two ministries (MOHE & MOSR) are considered in detail where human and financial resources are concerned. For the Ministries of Agriculture and Water Resources (MOALR & MOWRI), only human and financial resources for both their research facilities are mentioned (ARC & NWRC). The five ministries with substantial R,D&I capabilities are:

- Ministry of Higher Education (MOHE).
- Ministry of Scientific Research (MOSR).
- Ministry of Agriculture and Land Reclamation (MOALR).
- Ministry of Water Resources and Irrigation (MOWRI).
- Ministry of Military Production.

Details concerning the Ministry of Military Production were not available for the present study.

A further number of ministries also have R, D&I capabilities, but on a limited scale compared to the five mentioned above and as explained in detail in Annex 1. These are:

- Ministry of Electricity and Energy.
- Ministry of Foreign Trade and Industry.
- Ministry of Housing, Utilities and Urban Communities.
- Ministry of Communications and Information.
- Ministry of Investment.
- Ministry of Health and Population.

#### **1.2- Selected Research Institutions.**

On the level of research institutions, the database (Annex 1) includes all research institutions (centres and institutes) belonging to the ministries mentioned above with R, D&I capabilities related to industry. Research centres affiliated to the universities are outlined in Annex 2. Furthermore, a number of key research organizations directly related to industry were contacted/visited to find out their recent R, D&I activities with industry. These are:

- National Research Centre – Ministry of Scientific Research (MOSR).
- Central Metallurgical Research and Development Institute, MOSR.
- Petroleum Research Institute, MOSR.
- Mubarak City for Scientific Research and Technological Applications, MOSR.
- Agricultural Research Centre (ARC), Ministry of Agriculture and Land Reclamation (MOALR).
- Cotton Research Institute and Food Technology Research Institute, ARC.
- Agricultural Genetic Engineering Research Institute, ARC.
- National Water Research Centre, Ministry of Water Resources and Irrigation.
- Atomic Energy Authority, Ministry of Electricity and Energy.
- Tebbin Institute for Metallurgical Studies, Ministry of Foreign Trade and Industry.
- Food Technology Centre, Ministry of Foreign Trade and Industry.
- Nutrition Institute, Ministry of Health & Population.
- National Telecommunication Institute, Ministry of Communication – Telecommunication Institute.
- Smart Village, Ministry of Communication – Telecommunication Institute.

Details of major achievements of the above mentioned R&D institutions are outlined under each institute in Annex 1 under the relevant ministry.

A number of technical institutes (governmental and private sector) are also mentioned in the database under the Ministry of Higher Education. Although little details concerning their activities are available in the present study, yet these institutes represent the major source for technical degrees that supplement the universities. Furthermore, a number of these technical institutes offer diploma degrees for technicians. Technicians are one of the critical and important working-force in industry (after engineers). Well-educated and trained technicians along with well-trained workers are the major force upon whom any efficient industry depends.

## **2- Structures with a Supporting Role in R&D.**

These are structures which do not conduct research but have and/or could have potentials for playing substantial supportive roles as regards innovation and R&D. As a part of the ministries and research institutions, they act as intermediaries/marketing units to establish links between R&D units and end users at large.

They can be categorized into seven groups according to their activities:

- R&D Units with Marketing capabilities.
- The Egyptian Academy of Scientific Research & Technology (ASRT).
- The Social Fund for Development (SFD).
- Ministry of Environment/EEAA.
- Laboratories and testing structures.
- Education and vocational training structures.
- Information and Database Centres.

## **2.1- R&D Units with Marketing Capabilities.**

### **2.1.1- Within the Ministries.**

Marketing R&D services and establishing links with industry depends mainly on the top management, contacts between ministries and their R&D institutions on one hand and industry as well as personal contacts. Only three ministries have established mechanisms for links with industry and other end users.

#### **Ministry of Higher Education.**

No marketing facilities exist on the ministry level in the form of marketing offices or intermediaries. The minister of higher education appoints head of universities or dean of faculties as members on committees involved with industry (among other areas) or as members of board of directors in organizations that need expertise in different S&T areas. Marketing appears to be more active on the faculty level in the form of the research centres as well as the personal efforts of staff members.

#### **Ministry of Scientific Research.**

This is represented by the Technical and Technological Consulting Studies and Research Fund. The “Fund” is a leading multifaceted consulting institution providing quality technical & technological services backed by the strength of the national S&T system. It acts as a link between the S&T community and its end-users, commercialization of R&D results, technology transfer, feasibility studies, environmental impact assessment & engineering. The ASRT is considered to be an intermediary on a national level and is therefore mentioned as a separate entity under 2.2.

#### **Ministry of Agriculture and Land Reclamation.**

The Technology Management and Commercialization Office (TMCO) was established to assist the Agricultural Research Centre (ARC) in transferring new technologies to its end users and industrial partners through necessary procedures for the marketing, protection and licensing of intellectual properties. The TMCO is planned to consist of a main office and ten satellite offices.

### **2.1.2- Within R&D institutions.**

#### **The National Research Centre.**

The establishment of R&D management offices at the NRC started in the late seventies and developed into the present capabilities. These are the programming, marketing (presently called business liaison office), international relations and information technology offices and recently the patent office.

#### **Other Research Institutions.**

Marketing facilities do not exist and most of the collaboration with end users is carried out through the staff members or top management. It is facilitated through contacts with

companies and organizations interested in R&D. Visits to industrial sectors, inviting interested industrial personnel to visit the R&D institutes, using the mass media, conferences and training courses to market their services as well as personal contacts represent the major tools for marketing within the majority of R&D institutes.

## **2.2- The Egyptian Academy of Scientific Research & Technology (ASRT).**

The ASRT has a number of channels to facilitate contacts between industry and R&D organizations. Three major channels are outlined below:

### **2.2.1- The Specialized Research Councils.**

At present 14 councils exist covering all aspects of natural sciences as well as management, economics and social sciences. The major council involved directly with industry is the specialized industry council. The council encourages research projects leading to new end products, new production lines, introduction of starting materials of Egyptian origin and environmentally friendly products and processes. Projects are announced and peer reviewed. Projects should have feasibility and market studies and the outcome of the results are applied in an industry that took place at the inception of the project. The last five year plan (1997-2002) spent seven million Egyptian pounds on industrial projects.

### **2.2.2- Technological development committee.**

This is an inter-council committee to ensure multi-disciplinary activities related to technology development. Within the five year plan (1997-2002) the committee financed 21 projects in the area of technological development. These include water resources, industrial development, upgrading research results to a semi-industrial level, information technology in industry and policies, strategies and human resource development.

### **2.2.3- The Patent Office.**

Over the last few years, the ASRT has established a number of “Patent Liaison Offices” at selected research centres. The role of these offices is to spread the awareness and the importance of intellectual properties and patent registrations to preserve the knowledge built up by scientists and R&D institutions over the year.

## **2.3- The Social Fund for Development.**

As part of the continuing effort of Egypt to ensure a social safety net associated with economic reform and to compensate its adverse effects, the Social Fund for Development (SFD) was established in 1991 and is financed by the Egyptian Government in cooperation with the World Bank, the European Union (EU), Arab Funds, UNDP and other Donors (<http://www.sfdegypt.org>).

### **2.3.1- Main Functions.**

- Mobilizing national and international resources for investing in human capital.
- Supporting SME's and creating job opportunities
- Combating poverty and reducing unemployment
- Addressing the needs of the target groups

Some of the basic **objectives** of SFD are to :

- Reduce poverty through creating employment opportunities especially for new graduates, unemployed youth and female-headed households.
- Mitigate the adverse effects of structure adjustment on low income population groups.
- Strengthen Egypt's institutional capacity (governmental and nongovernmental) to develop new social programs and upgrading existing ones.

Such objectives of the SFD are achieved primarily by promoting income and employment generation activities, and availing basic social services and awareness through the following five core programs:

- The Community Development Program (CDP).
- Small Enterprise Development Organization (SEDO).
- The Public Work Program (PWP).
- The Human Resources Development Program (HRDP).
- The Institutional Development Program (IDP).

The largest and most relevant SFD program to R, D & I is the Small Enterprise Development Organization which aims at promoting new sustainable jobs and income generation opportunities in the small and macro sector, by encouraging the creation of new small businesses and the expansion of the existing ones. This task can be achieved through the provision of integrated package of soft loans, **technology support and training**. Until October 2000, SFD has funded over 120,000 enterprises, and the industrial SME's represent around 25 % of the total. This may illustrate the size of the technical support needed for these SME's.

### **2.3.2- Technology Support Services provided by SFD.**

The Social Fund for Development (SFD), being the leading organization in Egypt responsible for the promotion , development and support of SME's, is continuously providing an integrated suite of technology support services to the SME's through the following programs/organs:

- Technology & Business Incubators program.
- Egyptian Business & Technology Links program.
- Technology Support Center.

#### **2.3.2.1 – Technology and Business Incubators Program.**

The Technology and Business Incubators (TBI) program in Egypt was launched in 1995. The program's main objective is to provide a supportive environment for the creation and growth of entrepreneurial businesses.

In general, each incubator combines the support services of counseling, training, information, networking in addition to access to finance, with affordable work space and sharing of common facilities.

The TBI program in Egypt includes establishment and deployment of a network of generic business, technology and specialized incubators all over Egypt. The current initial phase established till now nine incubators, three of them are operational while the remaining six are still under construction. These incubators are distributed among different Governorates as follows:

- Tala Generic Business incubator                      Menoufiya governorate.
- Mansoura Generic Business incubator              Dakahliya governorate .
- Assiut Generic Business incubator                  Assiout governorate.

- |  |  |
|--|--|
| - Tebbine Technology incubator             | Metallurgical Institute – Cairo governorate. |
| - Mansoura University Technology incubator | Dakahliya governorate (terminated).          |
| - IT Technology incubator                  | Mubarak City – Alex governorate.             |
| - Biotechnology incubator                  | Mubarak City – Alex governorate.             |
| - Douwaika Virtual incubator               | Cairo governorate.                           |
| - Banha Technology incubator               | Kalyoubia governorate.                       |

The second phase of the program calls for the establishment of **35** incubators during the coming four years covering all governorates of Egypt.

In general, the support services provided by the incubators are categorized as :

- Technology services including consultations given by specialists, products quality control guides, sharing labs and equipment and technical training.
- Administrative services which include business plan preparation, secretarial works, managerial skills training and shared office equipment.
- Financial services including providing SFD soft loans, feasibility studies preparation , and balance sheets preparation.
- Marketing services including participation in exhibitions and advertisement.

#### **2.3.2.2 – The Egyptian Business & Technology Links Centers.**

The initial pilot phase of this program is well advanced with the establishment of four EBTL generic centers located in Damietta, Mahalla, Beni Suef and Assiut. In addition, a Sector-Specific Technology Link center specializing in the furniture industry is being established in the 10<sup>th</sup> of Ramadan industrial city.

**Footwear & Leather Industry Service Center (FLISC)** is the second such example. It was established by the joint funding between the SFD and the Swiss government, and inaugurated late in 2000. It is managed jointly by the SFD and the UNIDO. All staff training and equipment has been provided through specialized European institutes. The main goal of FLISC is to support SMEs working in the leather industry and improve their competitiveness (locally and worldwide) and to create new job opportunities. This is accomplished by transferring advanced technologies to SMEs, improving their productivity and quality and creating export opportunities for footwear and leather products manufacturers.

The second phase of the program is the establishment of the ***Center for Egyptian Business & Technology Development*** to co-ordinate the EBTL's network all over Egypt.

***Generic Business Support:*** This is a network of some 50 EBTL generic support centers offering a comprehensive range of business and technology support delivered by competent personnel, trained to world class standards. The services available from these links will include general business information and advice, guidance on all aspects of starting business, including business planning, raising finance and financial control systems, advice on export and international trade, procurement sourcing, training and skills development and the application and acquisition of technology.

***Technology Specific Support:*** These centers will develop expertise in particular technologies, markets or sectors. These links will deliver sector specific support on a national basis alongside generic business support on a regional basis. Other Technology-Specific Centers

will be established , focusing on sectors such as textiles , agriculture, leather, packaging and electronics and IT.

### **2.3.2.3 – Technology Support Center.**

The Technology Support Center (TSC) was established in 1999 as one of SFD units. Its main objective is *to provide technological support services* to SME's funded by SFD in order to improve their productivity and competitiveness. These services include technology information dissemination, training, commercialization of appropriate technologies, matching business partners , needs assessment, projects pre-feasibility studies, counseling, sectors development studies and SME's technological audit.

The basic objectives of TSC are to:

- Provide technology support services to SME's funded by SFD.
- Facilitate commercialization of appropriate technologies.
- Encourage SME's involvement in advance knowledge-based sectors (e.g. IT, Electronics, Petrochemicals...etc).
- Support SME's use of E-commerce.
- Establish a comprehensive technological database.
- Cooperate with similar International and National Institutions and Networks.
- Match business partners and find new business opportunities.
- Encourage innovative initiatives to improve SME's productivity.
- Perform projects pre-feasibility studies, need assessment, sector development studies and SME's technological audit.

Additional services:

- To establish national standards that will become a benchmark for quality throughout the EBTL's network.
- To oversee and manage the roll out and integration of the EBTL's network.
- To co-operate with private sector bodies such as Chambers of Commerce, Business and Trade Associations and NGOs to increase the support services to their members and target clients.
- To facilitate the training and personal development of all EBTL staff, ensuring professional and consistent standards are maintained.
- To interface with the international agencies to promote the network as a focused channel through which to deliver their respective SME's support and interventions.
- To design and implement common client management systems, impact assessment tools and reporting structures to provide appropriate, common and focused management information.
- To interface with, and develop, international relationships with other SME's network throughout the world.

### **2.4- Ministry of Environmental Affairs/EEAA.**

The Egyptian Environmental Affairs Agency (EEAA) is the major implementing organization affiliated to the Ministry of State for Environmental Affairs (MEA). Although EEAA is not involved in R&D activities, yet its role in setting environmental standards can act as a base upon which industry is required to use R&D as a tool to correct any deficiencies in environmental standards that exist. The major functions of MEA/EEAA are summarized below:

- Preparing environmental studies and formulating national environmental protection plans.
- Preparing legislation and decrees related to the national environmental plans.
- Setting environmental standards for construction projects, limits of pollution in factories and procedures for mandatory environmental impact assessment.
- Promotion of environmental relations with other countries as well as regional and international organizations.

## **2.5- Laboratories.**

While laboratories, as facilities, can be of value in supporting R&D, yet their present role is not practically perceived and is not that efficiently utilized.

University and research centers' laboratories, mainly active as specialized service units are the only facilities that could be partially of use. Other governmental laboratories are conceptually different and can hardly serve their purposes being in the field of quality control and testing.

One organization needed to be explored which is the **Chemistry Administration**.

The Chemistry Administration is a governmental organization that was established in 1898 as the main central laboratory to test governmental procurements. Since then, it passed through several developments till its affiliation to the Ministry of Industry that was established in 1956. Today it is one of the basic structures of the Ministry of Foreign Trade and Industry. It expanded to seven facilities (geographically distributed) with equipped laboratories to run various chemical and material tests.

It has well established laboratories (twenty types of specialized analysis labs) and chemical analysts (about 250 chemists) and can therefore perform a wide range of sophisticated chemical analysis that would be of support to the industry in the development of new products. Moreover it provides technical assistance and training to the working staff in the industry in the fields of chemical analysis, whenever needed.

## **2.6- Education and Vocational Training.**

Education and vocational training to serve R&D, should develop with the ongoing technology development, and establish a close link between industry and vocational training centers. All vocational training centers are governmental, large general sector industrial complexes or foreign funded projects.

Vocational training received great support from international organizations, which once established a strong and efficient training base for the industry. An example is the UNIDO program for vocational training established in 1986 in cooperation with the Ministry of Industry. That program established the "**Center for Industrial Development**" with a staff of 500, mostly technical and experts in design and technical training. It had four sub-units in Cairo, Alexandria and Ismailia.

However matching activities with industry needs, especially SMEs, was not practically conceptualized because of the complexity of SMEs which lowered their benefit from national vocational training programs. They tended to return to the normal apprenticeship process. The Moubarak-Kohl program was established to address this problem. Regardless of the controversy in its value and implementation, it is irrelevant to R&D needs as it emphasizes mainly on apprenticeship training.

Another entity is the training center affiliated to the Ministry of Foreign Trade and Industry, the **Staff Training Institute**. The institute aims at helping the industrial enterprises by developing the skills of their human resources. It focuses on training technicians, trainers and supervisors on technical as well as social and personal skills.

## **2.7- Information and Database Centers.**

The most important governmental information center is the Information and Decision Support Center of the Cabinet. It provides valuable information, in the form of reports and studies that cover a wide range of industries. R, D and I studies are also provided that were prepared by distinguished experts in various research centers, institutes and ministries. The information is available on the IDSC website, [www.idsc.gov.eg](http://www.idsc.gov.eg). On the other hand, accurate and full fledged information and databases of organization involved in Innovation and R,D & Innovation are not satisfactorily available for the industrial enterprises.

# **III- NON-GOVERNMENTAL SECTOR.**

## **1- Structures with a Direct Role in R&D.**

### **1.1- Private universities.**

Although all private universities have natural science faculties, yet R&D capabilities are not well established within these universities with the exception of the American University (Faculty of Science and Engineering). Misr University for Science and Technology has established a R&D centre, however it is still at the beginning and presently offers analytical services for the industrial community in the 6<sup>th</sup> of October City.

### **1.2- Technology Centres.**

These are TECHNOLOGY CENTERS affiliated to the Ministry of Foreign Trade and Industry (MFTI). The MFTI took the strategic initiative to establish Industrial Technology Centers (ITC's) for all industrial activities in the form of Joint Venture Companies. These Technology Centers will serve the industry by transferring Know-How & Technology in technical Consultancy, Management, Marketing, Training, and Information Technology from Technology Providers to Technology users of the Industrial Community in Egypt. The Industrial Technology Centers together with the Business Resource Centers (BRC's) will be the implementation tools for the Industrial Modernization Centre in Egypt. The foreign partners may have a role in the management &/or a capital share.

Following the Industry Federation's list of Industrial Chambers, the Technology Centers that are planned to be established for all industrial sectors, are as follows:

- 1- Textile Industries.
- 2- Food Industries.
- 3- Grains and products Industry.
- 4- Chemical Industries.
- 5- Engineering Industries.
- 6- Metallurgical Industries.

- 7- Building Materials Industries.
- 8- Mining Industries.
- 9- Printing Industries.
- 10- Wood Industries.
- 11- Leather & Tanning Industries.
- 12- Cinema Industries.
- 13- Pharmaceuticals .Cosmetics and Medical Supply Industries.
- 14- Traditional Industries.
- 15- Programming and Information Technology Industries.
- 16- Cleaner Products Industries.
- 17- Health Care Service Providers (recently established).

**Food Technology Centre.** This is one of the first such centres that has been established and is presently housed in the Agriculture Research Centre and planned to move to its new site in Kom Ushim on the Cairo-Fayoum road. Among its first achievements are:

- 1- Establishment of: a) laboratory services in areas of chemical & micro-organisms, microbiology, environment, packaging as well as sensory evaluation of food products. b) Research and technological development department. c) Information technology department; and d) Marketing department.
- 2- Development of a number of new local food products.

## **2- Structures with a Supporting Role in R&D.**

For the purpose of the survey, “intermediaries” are understood to be entities that assume intermediate roles between dedicated R,D & I entities and the end user, especially industry. Their roles can be either direct or supportive roles.

“Direct roles” are those efforts devoted to link industry to dedicated and concerned entities for developing Innovation or applied R&D, while “supportive” roles are those that help the implementation of the main R&D activities. Supportive roles include among others, measurements and testing (through laboratories), training, consultancy, information and databases.

### **2.1- Federation of Egyptian Industries.**

Enterprising businessmen established The Federation of Egyptian Industries in 1922 calling themselves the Association of Industries in Egypt. The Association thrived, and in 1958 an industry-organizing law converted it and the chambers of industry to public associations. To update and revitalize, a ministerial decree renamed the Association in 1974, to the Federation of Egyptian Industries (FEI), and in 1981 a presidential decree called for the regulation of elections. FEI’s Board of Directors has 21 members. The General Assembly elects two-thirds of the Board members and the Minister of Industry appoints the remaining one-third. Membership terms last for three years and are renewable.

#### **2.1.1- FEI Mission.**

Its mission is to enhance the competitiveness of members by effectively advocating their common interests vis-à-vis the government, particularly with regard to industrial policy; providing them with the tools and knowledge to compete in the global marketplace, and promoting national and direct Arab and foreign investment in Egypt in order to enhance the socio-economic development.

### **2.1.2- FEI Departments.**

- The Department of chambers Affairs.
- The Department of Governmental Relations, public Affairs, International Cooperation and Conferences.
- Information Services Department.
- The Department of Technical Affairs and Training Environment, Quality and Technology Services.
- The Financial and Administrative Affairs Department.
- The Economic Studies Department.
- The Department of Export, Foreign Direct Investment and Exhibitions Services.

Recently, a ‘*Committee of Research and Development and Technology Transfer*’ was formed by members from both, the National Research Centre (NRC) and the Federation of Egyptian Industries to act as an intermediary structure between the industrial chambers of the FEI and the respective industrial research divisions at NRC. NRC will provide scientific and technical assistance, consultations, training and testing to the Federation’s 14 Chambers in order to increase productivity of the industrial sector and the ability to manufacture high – quality products at competitive prices.

### **2.2- Non-Governmental Organizations (NGOs).**

The number of NGOs in Egypt is growing, and has reached the number of 14,000. Several are concerned with supporting industrial activities and are varied in their activities. Among their varied activities, few serve or affect Innovation and R&D. The first step of the mapping was to select NGOs that could have an intermediary role (direct or supportive) in supporting R, D&I. Those NGOs were mainly business related associations, serving the industry to a different extent and working in different fields.

Some NGOs have tried to play an intermediary role between governmental organizations that assume supportive roles to R, D&I, trying to model and shape their services to the industry and SMEs needs. These supportive roles as surveyed are:

laboratory needs<sup>1</sup>, vocational training<sup>2</sup> and data and information supply. However the outcome was not tangible. To map such organizations in a way to be able to extract a clear

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<sup>1</sup> NGOs’ intermediate role between national laboratories and the industry was not practically perceived.

A unique example was the “Association for Small Industries – 6 October” that tried to play an intermediate role between the “Chemistry Administration” and the industrial companies in the city. It established at its premises a limited suitable lab for the “Administration” to run and perform local analysis for samples for the companies. While this is considered a good role, it is of no relevance to R&D.

<sup>2</sup> Industry and SMEs in particular lack the vision, means and resources to plan or support vocational and technical training. A large gap was formed between industry and vocational training entities. The Mubarak-Kohl program was established to address that problem to some extent. Regardless to the controversy in its value and implementation, it is irrelevant to R&D needs as it emphasizes mainly on apprenticeship training.

Businessmen associations’ intermediary roles are exemplified in forwarding vocational and apprenticeship training to industries, through available programs as the Mubarak-Kohl program, by encouraging the companies to participate in the program, or through more active roles, either administrative or even by managing training facilities. An active example is the Sadat city Investor’s Association which is running two schools through the Mubarak-Kohl apprenticeship/technical training program for the city, (although the the number of companies is rather small to assimilate such an outcome). The “Tenth of Ramadan” businessmen association is also running a school in that same program frame. However that same example is not duplicated in the 6 October city, as an example, where no businessmen association is actively supporting the role of the local Mubarak-Kohl schools, most probably due to a lack of need.

view of their activities and reach a possible outcome, it was necessary to categorize them in groups with almost similar patterns, and to assess a representative sample of each category.

After an initial survey, two main and different categories were defined:

- Specialized industrial associations, and
- Businessmen/women associations.

### **2.2.1- Specialized Industrial Associations.**

This category of associations shows a different pattern as they try to aggregate a concerned community in a specific field of application (*sometimes called clusters*). This community, in an ideal pattern, would encompass among others, academics, researchers, technicians, students, industry people, merchants and traders.

All the community is aggregated around a specialized field or application, each with a particular interest but all exchanging profits and services.

Such comprehensive grouping would be more efficient for technical development and eventually R&D as their matching efforts would be most appropriate to launch, develop and support R,D & I.

Twenty seven associations have been mapped, covering 18 industrial activities. Five have been excluded as providing non-technical services only (management training and consultancy, HR, marketing). Seven have been surveyed. These are: The Egyptian Packaging Development association, the Egyptian Automobile Manufacturer's Association, the Egyptian Incubators' Association, the Egyptian Association for Science and Technology Services, the Egyptian Agribusiness Association and the Union for SMEs.

While working in specialized industrial field, and formed and managed by prominent members of concerned communities, they do not, and cannot venture into R&D projects or in direct partnership with their respective industries. They also lack the means to do so. They rely mostly on universities and governmental research centers to provide technical help to any company that shows up. Their administrations always use their personal and previous relations in the field of work, with the persons in charge in the research centers or the national authorities. They mainly relay the possible services from the academic community in their industry specialization, and devote most of their activities in the fields of consultation and sometimes theoretical training and education.

None of the specialized associations surveyed could provide tangible results of R&D projects that had been establish between the academic/scientific research entities and the end user (industry) in their fields of expertise. The only possible outcome could be establishing contacts between potential partners in their communities, and that could eventually lead to starting a development process through those associations (see Annex 3).

### **2.2.2- Businessmen/women Associations.**

The survey emphasized mainly on businessmen associations oriented to support the technological base in industrial companies. However, during the survey some showed less or no interest neither in promoting technical capabilities nor in R,D & I. They were targeting other fields (more trade oriented) to support their members.

“Sectoral associations” work on geographic areas, either covering governorates or industrial cities within a governorate. That means their activities are limited to the industry within their

geographic coverage. This is thought to be more effective especially for SMEs whose capabilities and means are limited. Moreover, those associations tend to better understand their specific regional logistic and managerial problems and hence are more capable to deal with them, in their regions of operation.

From the “R,D and Innovation” perspective, this geographic boundary constrains the means to local R&D capabilities (within governorates or new cities) to some extent, unless a defined mechanism is functional and effective in delivering national services to distributed industry locations.

Few businessmen associations (6 out of 22 mapped), extend their services to the entire territory (“territorial associations”). Their target is much general in scope than sectoral (regional) associations. They generally try to organize and orient the effort of businessmen to gain support and improve the industry’s conditions at large. They are more inclined to advocating for improving industrial and trade conditions, while devoting less effort to specific technical support. Most of those territorial associations are centralized and located in Cairo and do not have extension offices. To a certain degree, this constrains the expansion of their activities outside Cairo and can limit the participation of dispersed industries in those activities.

Twenty two Businessmen Associations have been mapped. Sixteen are regional associations, and six extend their activities over the whole territory. Six associations have been primarily surveyed and assessed. These are: Sadat City Investors’ Association, Tenth of Ramadan Investors’ Association, Six of October Investors’ Association, Association for Small Industries at 6<sup>th</sup> of October, the Businesswomen 21 Association and the Junior Businessmen Association. Four of them are regional and concerned about new industrial cities. But in general the objectives of all of them are very similar. They emphasize mainly on the support and development of industry and related business.

However some associations assume additional roles related to developing the local community (especially those that work and cover new industrial cities). This role can be considered an objective that supports the industrial companies as well, as a large extent of the local communities in new industrialized cities are working in the industrial sector or in services for it. However this role consumes a large part of the limited effort of those organizations.

None of the six organizations assessed had in their stated objectives any role in regard to innovation or R&D. Moreover their working staff is limited (in number and specialization) to administrative personnel and hence deemed incapable of managing or dealing with technology related projects.

A common point is that all associations are established under the law of NGOs under the authority of the Ministry of Social Affairs, which assumes the responsibility of controlling the associations (both administratively and financially and their activities) and misses any technical supervision aspect (regarding R&D issue).

An off-beat case was a remarkable role of the Small and Medium Business Support Project in Dakahlia through its “Pilot Business Support Unit” that plays a successful intermediate consultancy and R&D role for SMEs. (*discussed in detail in the “consultants” part*)(also see Annex 4).

### **2.3- Private Consulting Companies.**

Consultants and consulting companies are registered under the syndicates. This can be considered the main official and reliable listing source. Two lists for consultant offices were surveyed. The first is the consultants' list of the IMC that is on its website. It counts about two thousand consultants and consulting offices, but has no classification. It is also an open list that includes Egyptian and foreign consultants and consulting companies. Moreover it is not searchable, and it is not clear whether the data has been checked or not, hence of low credibility. It was difficult to extract data about relevant consultants and activities.

The second list is that of the syndicate of engineers. It lists the certified consultants according to the criteria of the syndicate that ensures the previous experience of the applicant in the field of expertise mentioned. However that list is also not categorized and is only available as a hard copy (not on a data base), and hence very difficult to search. But being very short, its survey was relatively simple. It was deceiving to find only 194 engineering consultant offices recorded in the syndicate. The listing itself was very superficial as to the definition of the fields of activities and expertise. Most of the consultant offices were working in the construction and civil work and only nine out of 194 could be found to deliver consultancy in some fields that could be more or less close to supporting R&D activities (see Annex 5).

Four private consultant companies (offices) were located and surveyed as samples. None could be identified as R&D consultants, but rather qualified as designers and technical consultants, that can provide support services and mainly system design and integration, and training :

- 1- ProSys Consultants - Dr. Tariq M. A. Saleh.
- 2- Chimie Group for Scientific and Technical Consultancy and Trade - Mr Taher Mahareek, Prof.Dr. Abdel-Wahab Sayed Ahmed.
- 3- Al Shourouq International for Trade and Industry - Eng. Ayman Abdel Aziz.
- 4- Engineering System Technology (SysTech) - Dr. Houssam Abdel Fattah Mohamed.

### **2.4- Private Sector Laboratories of SMEs.**

The Small and Medium Enterprises are requested by law to establish R&D units. The main function of these units is that they act as laboratories for quality control of products as well as measuring and testing processes but rarely extend to more than that.

### **2.5- International Organizations.**

The Ministry of International Cooperation (MOIC) is the entity responsible for promoting economic and technical cooperation with various countries, international and regional organizations to enhance Egypt's development and economic growth in accordance with national development strategies. The Official Development Assistance (ODA) provided by donor countries and organizations has been a major contributor in the development of the Egyptian economy and raising human development standards.

(MOIC) is mandated to achieve the optimum utilization of foreign assistance, which was expressed in a number of priority areas as follows:

- Supporting educational programs that encourage creativity and develop human skills to meet market needs such as technical and vocational training programs.
- Expanding information technology provision to all academic institutions.
- The ministry is establishing a fund to support the creation of technology colleges.
- Supporting institutional upgrades for governmental bodies, especially those dealing with investment promotion, small- and medium-enterprises (SMEs) development, and industrial modernization.
- Providing capacity building and technical assistance to upgrade legislative and judiciary institutions.
- Increasing debt swap programmes and promoting private sector participation in the implementation of development projects.
- Supporting environmental sustainability projects, especially those generating renewable energy.
- Continuing the modernization of Egyptian industry, with special emphasis on the textile, spinning, and weaving sectors.
- Upgrading and expanding international airports and major port facilities to support industries, trade and tourism.

Though it seems that the donor assistance in recent years shows signs of being increasingly based on local needs and priorities as determined by the recipient donor, and is shifting towards building effective partnerships with governments, civil society and other stakeholders to achieve progress in the following main areas: economic well being, social development, environmental sustainability. In addition to the qualitative indicators for these goals – in line with those of the Millennium Development Goals (MDG) – the Donor Assistance Group (DAG) is stressing on the importance of qualitative factors: *“these include capacity development for effective, democratic and accountable governance, the protection of human rights, and respect for the rule of law.”*

Accordingly it is expected, though not clearly indicated, that some international donor organizations have dedicated activities (programs) that could constitute or support some important elements of the national Innovation and R&D network, the ones dedicated to SMEs and environmental sustainability in particular. Their common goal is to enhance industrial development, improve its capabilities and adapt to regional or international norms and values. They provide assistance for definite periods of time to improve industry and economy which should have the ability to self sustain and develop on its own.

Those programs have helped many industrial sectors and individual companies that could abide by their regulations. Their support covered different activities covering from soft support and consultancy to financial and hardware support.

Software support covered:

The following is a brief summary of the major donors, their priorities and most important programs/activities:

### **2.5.1- United States Agency for International Development (USAID).**

The segment of the USAID supporting technology development is rather low compared to other areas of support that have higher priorities in the US-Egypt bilateral relationship. The

strategy's primary focus is on accelerating economic growth - essential to strengthening Egypt as a stable and prosperous U.S. ally. The program covers six main objectives:

Two objectives emphasize the creation of private sector jobs:

- strengthening the trade and investment environment; and
- increasing access to sustainable utility services.

Four objectives target the social infrastructure and enhancement of the human and natural resource base:

- improving basic education,
- strengthening governance and participation,
- providing health services and
- upgrading natural resource management.

A part of the program helps developing technology transfer through the support devoted to SMEs. In support of the Middle East Partnership Initiative (MEPI) objective, USAID will expand the small and medium enterprise program and may create an enterprise fund; focus Development Support Program (DSP) II (cash transfer) funds on financial sector reform; and provide funding for trade and customs reform Technical Assistance programs only after committing to achieving specific outcomes within agreed timeframes with the Government of Egypt (GOE).

Explicit support of R,D & I is very limited, and more oriented toward the private sector. It amounted to \$1,5 million in 2004 for funding cooperative scientific research with private sector in agreed upon research areas and increased to \$ 5 million for 2005.

The USAID, indirectly supports Research, Development and Innovation through the Ministry of International Cooperation, as the Egyptian contribution in the bilateral Science and Technology Agreement, which is a replacement of the previous S&T Program sponsored by the USAID and was managed by the Egyptian ASRT from the early seventies until early in the nineties. The Joint Fund was established under the U.S. - Egypt Science & Technology Cooperative Agreement first signed in 1995, and then renewed in 2001 by the United States and the Arab Republic of Egypt. The Joint Fund receives \$3 million per year to be distributed equally between Egyptian and American scientists working together on Joint Fund activities. The goals of the Science and Technology Agreement are to strengthen the scientific and technological capabilities of the United States and Egypt, to broaden and expand relations between the extensive scientific and technological communities in both countries, and to promote science and technology cooperation in areas of mutual benefit for peaceful purposes. The activities of the Agreement are supported by a Joint Fund of \$3 million a year, which is distributed equally between the U.S. and Egypt.

This is at present the only grant that is clearly and entirely addressing R&D in the form of supporting Joint Research Grants, Junior Scientist Development Visit Grants, and Workshops that bring together U.S. and Egyptian Scientists.

The Board sponsors two annual competitive grant programs: Joint Research Grant and Junior Scientist Development Visit Grant. 1) The Joint Research Grant supports add-on costs of international collaboration between U.S. and Egyptian scientists from universities, government laboratories, and the private sector. The maximum grant award is \$60,000, to be shared between the U.S. and Egyptian partners, over a period of one to three years. 2) The

Junior Scientist Development Visit Grant supports short-term (maximum 6 months) practical training of Egyptian or U.S. junior scientist to visit host country institutions. A Junior Scientist is defined as an Egyptian or U.S. applicant who received a PhD within the past 10 years. In addition, U.S. applicants with a Master's degree or actively enrolled in a PhD program are also eligible to apply. The maximum grant amount is \$15,000.

It is worth mentioning that in Egypt, the Ministry of Scientific Research coordinates the Joint Board activities involving Egyptian government and university research institutions, while the U.S. Department of State coordinates the work of the U.S. Joint Board. The U.S. members represent the Department of Health and Human Services, Department of Agriculture, Department of Energy, the Environmental Protection Agency, the National Institute of Standards and Technology, and the National Science Foundation. The National Institutes of Health, Fogarty International Center serves as the HHS technical agency for grant proposals in health biotechnology.

### **2.5.2- European Commission (EC)**

The major objectives of European aid for the period 2002 – 2006 are:

The first objective is:

Successful implementation of the EU-Egypt Association Agreement, which entails the improvement of trade conditions through the adoption of necessary institutional building, custom and legislative reforms, and effective trade promotion means. The Industrial Modernization Program (IMP) is a major component in this regard. Equally important is the restructuring of strategic sectors susceptible to technological improvements and global competition.

Specifically the *EURO-MED* Partnership program can be mentioned as the only aid program that defined in the National Indicative Program the “Development of Research and Innovation”, as one of three elements in “Support to the process of economic transition”. That addition to the initial program, comes in the second priority in its second phase. This sub-element has been added to the NIP only after 2004, and hence comes in the 2006 commitment, with a budget of 11 million Euro.

The second objective is:

Supporting the process of economic transition, through human resource development, and financial and investment sector reform. Furthermore, the insertion of an “innovation culture” is aimed at as a means to improving competitiveness of Egyptian goods and services. This objective could include a component that adds to Innovation and R&D funding.

The third objective is:

Promoting stable, balanced, and sustainable socioeconomic development, which would be achieved through the adoption of decentralized and integrated local development mechanisms, promotion of social development, development of civil society structures, and protection of Egypt’s land and marine environment through appropriate measures.

### **EU's Framework Programme for Research and Technological Development (FP6/FP7)**

The overall budget covering the four-year period of FP6 (2003 – 2006) amounts to €17.5 billion. Seven key areas for the advancement of knowledge and technological progress within FP6 were chosen: genomics and biotechnology for health; information society technologies; nanotechnologies and nanosciences; aeronautics and space; food safety; sustainable development; and economic and social sciences.

In view of the fact that support is given to the whole range of research activities carried out in transnational cooperation for both the FP6 and FP7, from collaborative projects and networks to the coordination of research programmes; this programme could be an excellent source for funding international collaborative joint projects in S&T for Egypt.

The seventh framework programme (FP7) of the European Community for research, technological development and demonstration activities (2007-2013) has been identified to involve nine themes outlined for the “Cooperation” part and which are:

- Health;
- Food, Agriculture and Biotechnology;
- Information and Communication Technologies;
- Nanosciences, Nanotechnologies, Materials and new Production Technologies;
- Energy;
- Environment (including Climate Change);
- Transport (including Aeronautics);
- Socio-economic Sciences and the Humanities;
- Security and Space.

### **2.5.3- The German Aid.**

With its strategic location in the Middle East, Egypt has become one of the main partner countries of German and international Development Cooperation. Since 1956 GTZ has been implementing many different projects in all parts of the country on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ).

Following the agreement between the German and Egyptian governments, GTZ now operates 18 projects, concentrating on three priority areas:

#### **2.5.3.1- Development of social market economy (economic reforms)**

Since the early nineties, Germany collaborates with the Small Enterprise Development Organization of the Social Fund for Development (SFD) by providing 29 M Euros for supporting and improving the small and medium enterprises. Eventually, these types of projects should trigger the private sector’s role in poverty alleviation, employment generation, and promotion of faster economic development.

- Programme for the introduction of a cooperative (dual) technical education and vocational training system in Egypt (Mubarak-Kohl-Initiative).
- Promotion of the instructional media development initiative for the technical education and vocational training system in Egypt.
- Programme of qualifying the technicians and technical trainers.
- Training of power station personnel.
- Improvement of the framework conditions for small and medium-sized enterprises (SMEs).
- Promotion of agricultural cooperative services.

#### **2.5.3.2- Environmental resource conservation.**

- National programme for the privatisation of solid waste management.

#### **2.5.3.3- Agricultural irrigation and waste water disposal.**

- Strategic advisory services to the Ministry of Water Resources and Irrigation
- Water management in Egyptian irrigation agriculture.
- Adapted waste water disposal schemes in the Governorate of Kafr El Sheikh.

#### **2.5.3.4- Other ongoing projects.**

- Participation-oriented development programme in densely populated urban areas.
- Improvement of citrus production.
- Cotton sector promotion programme.
- Seed certification.

Of importance to mention in this context is the collaborative scientific activities between the German Ministry of Education and Scientific Research, the International Bureau in Juelich, with Egyptian scientific centers and institutes. This cooperation started nearly twenty years ago with the AEA, and was extended to other institutions in 1995 in the form of bilateral research projects that are financed by both partners, the German and the Egyptian. The projects are competitive and of distinguished scientific level but do not usually include industrial partners.

#### **2.5.4- United Nations Industrial Development Organization (UNIDO).**

The mission of UNIDO is to help developing countries and countries with economies in transition in their fight against marginalization in today's global world. It mobilizes knowledge, skills, information and technology to promote productive employment, a competitive economy and a sound environment. The Organization is a specialized United Nations agency that focuses its efforts on relieving poverty by fostering productivity growth.

It is worth mentioning that in previous years UNIDO started a program entitled Transfer of Knowledge Through Ex-Nationals (TOKTEN) in Egypt. This program is hosted by the Academy of Scientific Research and Technology (ASRT). The program was first financed totally by the UNIDO, then co-financed by the ASRT and is presently completely run by the ASRT.

At present we can enumerate the most important mechanisms and major Programs of UNIDO as follows:

**2.5.4.1- Establishing and operating "Subcontracting and Partnership Exchanges" (SPXs)** to provide technical assistance to developing countries. It assists in setting up a roster of subcontractors, suppliers and main-contractors. The SPXs act as centres for technical information, match-making and promotion as well as clearing-houses for industrial subcontracting and partnership between main-contractors, suppliers and subcontractors, aiming at the optimal utilization (the most complete, rational and productive) of the manufacturing capacities of the affiliated industries. SPXs are non-profit industrial associations run by qualified entrepreneurs. In effect, the Exchanges appear not only as the meeting points and the instruments of regulation between the supply and the demand of industrial subcontracting orders, but also as instruments of assistance to both partners, and particularly the small and medium supplier or subcontracting enterprises. One of their core functions includes the collection, analysis, storage and organization for rapid retrieval of information and data on the existing production capacities and capabilities of industries, especially SMEs. The new generation of SPXs act as centres of multidisciplinary assistance and information for subcontractors and suppliers, in fields such as:

- Technical support (product design, technology, equipment, innovation);
- Quality management, standards and certification;
- Marketing strategies and analysis (including participation in international fairs and business promotion forums);

- Access to credit, financial facilities and incentives;
- Management (rehabilitation, financial management, stock control);
- Legal advice (legal contracts, codes of conduct, reconciliation or settlement of disputes);
- Human resource management (training).

This assistance and information is provided either directly by the SPX in the form of surveys, advice, training, awareness seminars and industrial fairs, or by referring the enterprises to the relevant specialized institutes.

The *SPX development and Networking* contributes to develop and improve the efficiency of the global outsourcing and suppliers network through the development of more than 56 SPXs based in over 30 countries. This unique UNIDO methodology and the well-established global network have now emerged as a vital support mechanism for industrial subcontracting and partnership promotion. In the last 20 years, some 65 SPXs have been established of which 56 are still operating on an auto-financed basis.

The objective of this UNIDO programme is to reinforce the capacity of SMEs in developing countries, as well as countries with economies in transition, to increase their production and employment, to upgrade their manufacturing processes and products, to improve their productivity and international competitiveness, to encourage import substitution and to promote the export of manufactures products from the SME sector. The programme also contributes to the optimal allocation of industrial resources and thus to national industrial growth and integration. At the same time, it contributes to the international redeployment of manufacturing facilities and the transfer of industrial technology and know-how to the SME sector in developing countries.

In Egypt there exist four associate SPX members (Annex 6):

1. UNIDO Investment and Technology Promotion Service.
2. UNIDO Italian Investment Promotion Unit (IIPU).
3. Social Fund for Development.
4. Egyptian Businessmen's Association.

**2.5.4.2-** Another Program is the UNIDO **Subcontracting System (UNIDOSS)** and **OUTSOURCING 2002** Software. UNIDO is presently developing a new version of the coherent computer software called **OUTSOURCING 2002**, which will be available in English, French and Spanish. The software is protected by a license agreement which is granted free of charge to SPXs established by UNIDO in the context of a TA project.

The basic functions of the **OUTSOURCING 2002** software are:

- The registration of manufacturing capacities and capabilities of industrial companies based on detailed questionnaires and surveys;
- The classification of these companies according to a set of given industrial [nomenclatures](#), such as products, sectors, manufacturing processes and equipment; and
- A search of subcontracting and supplying enterprises according to a very large set of criteria (including an exhaustive analysis of the registered machinery and its technical characteristics) to match them with inquiries from buyers and contractors.

**OUTSOURCING 2002** software also includes an SPX accounting and an SPX agenda facility, and it enables printing of targeted mailing and facilitates an organized follow-up of inquiries. In addition, it allows economic analyses to be carried out on specific subsectors and

areas, on enterprise deficiencies and required remedies, on technological and quality assessments and on investment and marketing strategies.

It is written in MS Access, is user friendly, fast, reliable, and has a powerful and comprehensive search engine. It will also allow to export part of the company data (non-confidential) on UNIDO-Exchange and any other Internet server.

#### **2.5.4.3- Industrial Linkages and Partnerships.**

The various linkages that the small and medium enterprises (SMEs) can establish among themselves and with large and State-owned enterprises, are essential factors for their growth and competitiveness. The organization of these linkages is crucial both up-stream with the suppliers and sub-contractors, and down-stream with the distribution and marketing channels. Industrial subcontracting and out-sourcing are modern and efficient ways to organize industrial production. New forms of industrial subcontracting, called "industrial partnerships", are based on the complementarity between the large contracting and assembling enterprises and the various specialized subcontractors and suppliers, and on the necessity of involving them from the very early stages of the production cycle (design, testing and prototype). Moreover, SMEs frequently cooperate closely with each other in order to complement their activities within the production cycle, by entering into production associations or clusters and increasingly, through networking arrangements. These new forms tend to become more stable, more lasting with a more equitable distribution of responsibilities (risks and profits) between the various partners. In fact, such subcontracting and partnership linkages enable the SMEs to focus on their field of specialization.

In order to increase the chances of success, these linkages often call for other complementary forms of linkages, such as provision by the main-contractor of special raw materials, specialized equipment, moulds, technical assistance, training, know-how and license agreements; and even in some cases equity participation or joint investments. Here the traditional subcontracting relationship has become a full-fledged partnership.

While large enterprises are geared by their managerial and marketing strategies and mechanisms towards all forms of industrial collaboration with other enterprises, small and medium enterprises are not equipped to promote such collaboration and thus deserve special attention and assistance in this area. It is evident that SMEs, particularly in the prevailing context of global sourcing, are most in need of support services given their limited expertise in the matter of foreign markets and their generally higher risk-aversion compared to large transnational corporations. Institutional support mechanisms are thus needed that will help them to acquire the necessary information on, and access to, upgraded technology, sources of finance, new markets, foreign licenses etc. and to establish long-term industrial cooperation agreements. It is also SMEs which attach particular value to the neutrality of the UNIDO as an impartial adviser and intermediary. By contributing to the development of the SME sector, such assistance will also further the overall industrialization process.

#### **2.5.5- UNESCO, ESCWA and ALECSO**

The UNESCO-Cairo office has established what is known as the UNITWIN/UNESCO chairs programme. Its main objective is to strengthen international co-operation between higher education institutions and programmes through twinning and other networking arrangements and to foster academic solidarity in favour of developing countries. Several Arab research

organisations and universities have taken part in this programme including Egypt. ([www.unesco.org/education/educprog/unitwin/index.html](http://www.unesco.org/education/educprog/unitwin/index.html)).

Motivated by accumulated experience at the UNESCO-Cairo Office (UCO) through the original USEE (Upgrading Science and Engineering Education) programme and taking into account the priorities of member states as well as new and emerging technologies. An integrated set of activities grouped within four core modules are being executed so that they collectively form the proposed framework for education (TEAM, Education Framework - where TEAM stands for TEchnology Assisted and Mediated). The TEAM comprehensive framework is based on a vision of education as being a process of knowledge transfer. The first module addresses *strategies, IT policies in education and the general area of indicators and evaluation methods*. Guided by the outcome of the first module, the second module *Infrastructure and Access to Information* plans for infrastructure buildup are to be crafted to enhance member states' access to information through ensuring the availability of state-of-the-art networks. The third module *Capacity Building and Human Resource Development* addresses the crucial area related to the IT skills of education professionals. All three modules, I through III, represent the necessary foundation upon which the ultimate goal is achieved. That goal involves the *effective utilization of ICT in education* through well-designed applications of ICT in the learning processes. The TEAM Framework is an *interdisciplinary framework*, which effectively integrates the expertise of the Science, Communication, and Information, and Education Sectors of UNESCO to help enable a technology-mediated education system.

The UNESCO-Cairo office has established the Science & Technology Management Arab Region Network (STEMARN). Links with industry in the Arab countries as pointed out by the STEMARN are based on : a) direct contractual arrangements, b) contracts and grants funded by governments or other agencies, or c) co-operative partnership (e.g. joint ventures) between both sectors. These links are gaining strength, but still need to be better developed. Development will only come through strengthening research links with industry, formulating policies and strategies, restructuring and redirecting research organisations, arranging appropriate funding and several other aspects.

Finally, the Economic and Social Commission for Western Asia (ESCWA) has been advocating the importance of S&T policies and strategies as a starting point in the advancement of S&T in the Arab countries. It has held numerous expert meetings on subjects such as S&T policies, SMEs, ICT, specific industrial sectors, environment, poverty alleviation through S&T among other areas. Similar activities have also been carried out by the Arab League Educational, Cultural and Scientific Organisation (ALECSO) in the same direction. All these organisations (UNESCO-Cairo office, ESCWA and ALECSO) have enriched the scientific communities with the badly needed management side of S&T which should be better developed at all levels to attain a comprehensive overall management system for Science, Technology and Innovation.

#### **2.5.6- United Nations Development Assistance Framework (UNDAF).**

The involvement of the UN system in Egypt has an overarching goal which is to promote more people-centered development based on the rational and efficient use of the national institutional capabilities, natural resources, and human assets. None of the UN activities include Innovation and R&D as a major component.

### **2.5.7- World Bank.**

The two major areas of focus of the World Bank are poverty reduction and unemployment. In 1996 a study was conducted for the development of the Ministry of Scientific Research and its affiliated research institutes through the World Bank. This was followed a year later by a visit by the World Bank to discuss the next step. Discussions concentrated on the development of Higher Education and the part concerned with Scientific Research never materialized. The component for the development of higher education however was further developed through a entitled “Higher Education Enhancement Project” and one of its major components is “Quality Assurances & Accreditation Project”. This component will enforce among other components, good governance. Implementation of this project is planned to take part within three years, and if taken seriously could enhance the role of higher education in catching up with universities in developed countries.

### **2.5.8- African Development Bank.**

The Bank’s support has a general theme, mainly focusing on governance in addition to its main area of intervention at the regional level, namely, economic integration and cooperation, as well as the issues of gender and environment. (see Annex 6 for donor countries and organizations).

## **IV- ASSESSMENT AND BENCHMARKING.**

### **1- The Database.**

It is clear as previously mentioned that the first five ministries (MOHE, MOSR, MOALR, MOWRI & MOMP) have the largest number of human resources involved in R&D. The universities have established a number of research centres which are planned to serve the community at large, including industry. Details of all ministries and affiliated R&D institutions are outlined under Annex 1. A complete list of universities research centres are outlined under Annex 2. However only those that appear to be playing a direct role with industry are mentioned under universities in Annex 1. Not all university research centres have well defined objectives and some do not even mention their achievements. It is clear that university research centres are not making the utmost use of their websites. Furthermore, all the university research centres are involved in consultations and to a lesser degree in development of products and industrial processes. Very little, if nothing, is mentioned concerning innovation. Non-university Research centres and institutes affiliated to the Ministry of Scientific Research appear to play a more positive role with industry. This is due to the fact that in both cases the research centres/institutes were established to serve predefined areas of industry. Yet similar to the universities, the majority of contracts and research are still dealing with consultations and services. The developmental side of research in research institutions is only slightly higher than universities and although innovation is also a rarity, yet there is an increase in the number of patents registered over the last few years, e.g. the NRC has registered 31 patents in 2004 as opposed to 30 during the period of 1980-2000. Similarly, the research centres affiliated to both the Ministries of Agriculture and Land Reclamation and Water Resources and Irrigation play a more applied role in both fields, being tied in with sectoral policies and strategies of both ministries. One should point out that in the absence of national S&T policies/strategies, R&D activities are not demand driven and research is directed towards publications and theses for promotion rather than for

development or innovation. This is apparent in the modest achievements outlined in Annex 1 (whenever available) and the meagre number of patents outlined below under “measuring innovation”. Neither the achievements nor the number of patents correlate with the size or objectives of neither the research institutes, nor the number of R&D personnel present.

Finally, the quality of the database, whether on the ministerial or institutional level, is below the standard if we consider the history of these institutions. Databases are non existing in many institutions, and data present in several cases needs to be updated, despite the existence of information centres in nearly all of the institutions visited or contacted. In several cases conflicting data is given, and clearances are time consuming, personal contacts have to be relied upon, and in a few cases access was denied for security or unclear reasons. This was not the case in a few efficient research institutions such as the Supreme Council for Universities, the National Research Centre, the Central Metallurgical Research and Development Institute, the Agricultural Genetic Engineering Research Institute, and the National Water Research Centre.

## **2- Policies and Strategies.**

S&T policies in Egypt have been the subject of several conferences and studies carried out in the late seventies and eighties. These studies were never transformed into any action plan. In 1996 a study was conducted for the development of the Ministry of Scientific Research and its affiliated research institutes through the World Bank. This was followed a year later by a visit by the World Bank to discuss the next step. Discussions concentrated on the development of Higher Education while the part concerned with Scientific Research never materialized. On the 28-29<sup>th</sup> May 2005 a national conference entitled “National Conference on Scientific Research and Technological Development in Egypt” was attended by R&D academia and different ministries related to S&T. Several aspects related to scientific research were discussed and a number of research programs based on national priorities and needs were approved. The Ministry of Scientific Research has since initiated a number of working groups to outline steps to be taken in relation to S&T policies and strategies, restructuring of scientific research in Egypt among other priority areas. We hope that these initiatives are given the full blessing of the top policy makers, and that it does not end being filed along the studies previously carried in the late seventies, mid-eighties and early nineties.

To a certain extent, R&D activities within the Ministry of Agriculture and Land Reclamation and Ministry of Water Resources and Irrigation are tied in with the general country’s needs for agriculture and water resources. However, this does not reach the level of the national plan for S&T needed, and make full use of R&D capabilities in the universities and other research centres through coordination on a national level.

Industry in Egypt is based mainly on primary manufacturing products rather than high, medium or low technologies. Furthermore, there is an inadequacy of financing of a science and technology system to serve the industry. This further confirms the need for a national STI policy for Egypt. If we are considering policies related to industry, then a number of issues should also be taken into consideration particularly where privatization is concerned and its effect on R&D:

1- The pharmaceutical industry in Egypt is one of the clear examples, especially that it is considered to be one of the very few high technology production sectors in Egypt. Egyptian companies constituted in the year 1975 more than 65% of the total pharmaceutical market.

The late seventies marked the beginning of the governmental policy of privatization, which left room for multinational companies to build their own factories. At present and according to the International Monetary System (IMS), the share of products owned by Egyptian companies declined to around 30% of the total pharmaceutical market and is still declining. This came about as a result of acquisition of some Egyptian companies by multinationals and the tendency of private Egyptian companies to produce products of foreign origin under license rather than developing their own products through reverse engineering or R, D&I. All of this led to the shrinkage of R&D activity (if not non-existing) despite the growth of the market size. Innovative research in the industry is very limited, and the government has not decided on any incentives to encourage investment in R&D so far.

2- The government has started a process of privatization of State Owned industrial companies other than the pharmaceutical industry. So far only successful companies have been sold, and are presently owned by foreign operators either exclusively or as major shareholders. The result is that the local market represented by R&D institutions, consultation offices, agents for equipment and spare parts and many other areas have lost their share in these activities which have been totally taken over by foreign agencies or companies. The effect on training specialists and manpower, generating local employment and creating spin-off industries is highly doubtful. The cement industry is only one example of the take-over of multinational companies and which led to the rise in cement prices to close to four folds over the last year and a half.

3- Reforms related to privatisation of state owned industry should take into account the lessons offered by the Latin American experience, as they have been similarly affected by privatisation. One suggestion is to retain 51% of the shares with nationals or nationals and government, to avoid foreign companies from owning major shares. This would also allow these companies to be run by a more efficient and less bureaucratic management system and more likely by the private sector. Recent selling of the telecommunication 20% shares is only an indication of the eagerness of people to take part in such ownerships.

4- Prioritization areas of foreign funds allocation do not include S&T as a sector. R&D and Innovation might receive grants included as part of other sectors and allocated to SME development. However this is seldom the case.

In comparison, all the industrial developed countries have well defined national S&T policies established and periodically revised through the application of planning tools such as the "Delphi system" or "Foresight". Recently, several developed countries have established what is known as "National Innovation Systems". The idea is to have innovation as the primary target and thus keep all R&D institutions focused on innovation. An integrated S&T system is present in every single developed country. A variety of systems exist but ultimately leading to a national S&T (or innovation) system. The British system is based on the Department of Trade and Industry (DTI). Its responsibilities are focused on: regional development, local investments, emerging exports, competitive privatisation, innovation & technology, small companies, industrial relationships and consumer's affairs. Under this ministry (DTI) the Office for Science & Technology (OST) has the responsibility of S&T funding, research councils, co-ordination between ministries and government developmental policies related to science, engineering and technology.

In the USA the S&T system is built around a number of structures which co-ordinate and implement the USA S&T policies and strategies. The first is the National Science and

Technology Council headed by the President of the USA. Among members of the council are heads of the National Science Foundation and NASA. Other players within the system are the National Academy of Sciences, National Academy of Engineering, Institute of Medicine and National Research Council. (source: Science and Engineering Indicators, vol.1, NSF, USA, 2004).

The German S&T system is a complex, but efficient one with a variety of structures. At the top, the Federal Government is represented by a S&T minister and at the same time each state (Länder) has a S&T minister. The Federal Government and the state governments have developed the instruments required for this purpose. The Federal/Länder Commission for Educational Planning and Research Promotion (BLK) provides a permanent forum for discussion and coordinating all research promotion issues that affect the Federal Government and the Länder governments. Public institutions, for instance, are partially financed from third-party funds provided by German industry, while private research institutions, on the other hand, also receive public funding. Many of the key players in Germany's research landscape – such as the Deutsche Forschungsgemeinschaft (DFG), the Centres of the Hermann von Helmholtz Association (HGF), the Max Planck Society (MPG), the Fraunhofer Society (FnG), and the “Blue List” institutions that have joined the Gottfried Wilhelm Leibniz Science Association (WGL) – are jointly funded by the Federal Government and the Länder governments. The business enterprise sector is the most important source of funding for German research. Two-thirds of the money paid by business enterprises for R&D to third parties remains within German industry, while one-sixth is paid to scientific institutions. In addition, R&D contracts awarded to, and co-operative ventures concluded with, partners abroad have increased considerably. Subsidiaries of foreign companies today account for roughly one-sixth of the total R&D expenditure of industry. Hence, it is hard to imagine the German research landscape without foreign companies as a source of funding for research in Germany.

(Source: BMBF – Report of the Federal Government on Research, 2000).

It is clear that no innovation will be achieved in the absence of national S&T policies/strategies, absence of industrial policies, lack of adequate funding and inadequate marketing capabilities to tie R&D institutions with industry based on local, regional and international market demands. *A national STI policy and strategy as well as a national policy for industry should be one of the top priorities if Egypt is considering any modernization and further development of innovation in industry.*

### **3- Funding.**

Funding of R, D&I in Egypt is one of the crucial and yet weak points within the R&D community. According to previous reports (see Table 1 below), Egypt spent around 0.4% of its GDP on S&T. The present figures indicate a lower percentage of around 0.2%. This percentage is too low compared to the average of developing countries (see Table 2 below). On the other hand, developed countries spend up to 2,5% and more of their GDP, of which 50-75% is spent by industry. This means that the government's share should reach around 1% at least, particularly in the absence of any contribution from industry. Recently, and during the “National Conference on Scientific Research and Technological Development in Egypt” it was mentioned that funding of S&T reached 1% of the GDP. This figure is definitely exaggerated and does not reflect the actual percentage spent for the reasons given below.

**Table 1. Funding of S&T in Arab Countries**

**Percent R&D Expenditure/ GDP and its distribution by four categories in 1996**

<b>Percent R&amp;D Expenditure/ GDP</b>	<b>Status</b>
Above 0.3	Egypt (0.36), Jordan (0.31)
0.2 to 0.3	Mauritania (0.29), Kuwait (0.24), Morocco (0.22), Yemen (0.22), Sudan (0.21)
0.1 to 1.9	Syria (0.16), Saudi Arabia (0.15), Average Arab States (0.15), Tunisia (0.14)
Below 0.1	Algeria (0.08), Oman (0.08), Bahrain (0.07), Qatar (0.07), Lebanon (0.06), Libya (0.05), Iraq (0.04), IAE (0.03)

Source: Qasem, 1998b

**Table 2. Expenditure on R and D as a percentage of GDP in selected regions**

	<b>1980</b>	<b>1985</b>	<b>1990</b>
<b>Percentage of GRP</b>			
<i>World total</i>	1.85	2.22	2.55
Developed countries	2.22	2.62	2.92
Developing countries	0.52	0.54	0.64
Latin America & Caribbean	10.44	0.43	0.40
Africa	0.28	0.25	0.25
Other	0.65	0.68	0.85

Source: UNESCO statistical Yearbook, 1994

In the present report, total funds available for the first four ministries appears to be substantial, yet the following points should be taken into consideration:

1- Total funds mentioned for the first four ministries are divided into wages, constructions, equipment, running costs etc. Wages account for around 60-70% of nearly all the budgets. Annual increases reflect the increase in manpower wages rather than an increase in spending on S&T which minimal. Furthermore, some R&D institutions have had budget cuts rather than an increase and an example is the Atomic Energy Authority (AEA) which had a cut in its budget from 177MEP in 2004 to 153MEP in 2005.

2- The percentage spent on R, D&I in universities is very poor. This percentage is relatively better in full-time research oriented institutions other than universities but still remains far below the developing countries average (0.64).

3- Not a single institute could give any accurate amounts for funds spent on development and/or innovation.

4- Not a single institute could give any estimate as to the exact outcome of their R, D&I activities with industry in terms of added value. Several positive examples were given or mentioned; however the benefits could not be quantified in many cases and only rare estimates were mentioned.

5- The establishment of specialized units and research funds in universities and non-university research institutions has not improved the situation of R, D&I. Although these units have slightly better non-bureaucratic regulations, yet 50-60% of their income goes towards wages and incentives and can be raised to 75% in case of consultations. Not enough funds remain to pay for running costs or equipment replacement, and hence they are not self-sufficient as first planned at the inception of these units.

6- It is suggested that “specialized units” and “research funds” should be reviewed and designed to be more dynamic and independent. The idea of venture capital (VC) should also be considered, as it has only been applied in business management and Not S&T. The idea of tax exemptions for the industrial sector for R, D&I activities in industry must be considered, particularly if they share in establishing research funds. It is worth mentioning that India has 13 kinds of tax exemptions for taking part in R&D activities.

#### **4- Measuring Innovation.**

This was the most difficult question encountered whenever innovation came up. Researchers talking about development and innovation concentrated on “better products”, “new products” and “new processes”, but non of them were actually registered as so in the form of a patent. The fact of the matter is that what are called contracts or projects with industry should be classified as consultations and/or services. Whatever “masked development or innovation” exists could not be measured through the researchers. *It would be worth finding out if a given industry has applied for the registration of new products, new processes, new trademarks etc.* This is in view that a number of private offices presently exist under the titles “patents, trademarks, copyrights and intellectual properties”. It would also be interesting to find out if these registrations were based on R&D or innovation.

In recent years, there has been an increasing awareness for the role of intellectual property rights and patents. Egypt’s Intellectual Property Law was issued in June 2002. (see: [www.egypo.gov.eg](http://www.egypo.gov.eg)). Furthermore, the ASRT has established several patent liaison offices in a number of key R&D institutions as mentioned above. This has resulted in a slight increase in the number of patent applications on behalf of these institutions (see NRC achievements under the Ministry of Scientific Research – Annex 1). Below (Table 3) are patents applied for and granted in a number of Arab Countries.

**Table 3. Patent Applications Filed and Patents granted in Arab Countries during 1994-1998**

Country	Year	Applications for patents filed			Grants of patents		
		Residents	Non-residents	Total	Residents	Non-residents	Total
Algeria	1995*	28	114	142	--	--	--
	1996*			200	--	--	--
	1997**	34	206	240	125	738	863
	1998**	42	264	306	--	--	--
Egypt	1998*	494	1139	1633	16	102	118
Jordan	1997**	--	--	--	44	14	58
Morocco	1994*	107	253	360	--	--	--
	1995*	89	292	381	--	--	--
Saudi Arabia	1997**	57	1001	1058	--	2	2
	1998**	45	1286	1331	2	1	3
Sudan	1997**	--	49920	49920	--	37	37
	1998**	6	67713	67719	--	64	64
Tunisia	1994*	38	106	144	--	--	--
	1995*	31	115	146	--	--	--
UAE	1998**	--	8	8	--	--	--

Source: \* Djeflat, A. (1999)

\*\* World Intellectual Property Organization ([www.wipo.org](http://www.wipo.org))

In Egypt, the number of patents registered at the ASRT do not exceed 500-600/year. Patent applications for the year 2004 amounted to 545 of which 325 of them were granted.(see: [www.egypo.gov.eg](http://www.egypo.gov.eg)). This is well below the world average which reaches hundreds of thousands/year for developed countries. Additionally, the number of patents registered at the US patent office for Arab Countries (Egypt included) are even less than those registered at their homelands (see Table 4 below). Furthermore, it would be interesting to study the patterns of patents registered by Egyptian individuals or R&D institutions and universities at the ASRT patent office, European and US patent offices over the last ten years.

**Table 4. Number of US Patents registered by Arab Countries**

Country	1986-1990	1991-1995	1996-2000	Total
Algeria	1	3	6	10
Bahrain	0	1	5	6
Egypt	14	23	49	86
Iraq	5	0	0	5
Jordan	2	2	19	23
Kuwait	17	7	43	67
Lebanon	0	0	0	0
Libya	0	1	3	4
Mauritania	0	1	0	1
Morocco	14	8	20	42
Oman	0	1	4	5
Qatar	0	0	1	1
Saudi Arabia	33	47	119	199
Sudan	1	0	0	1
Syria	3	2	9	14
Tunisia	4	5	4	13
UAE	5	9	23	37
Yemen	0	1	2	3
Total Arab Countries	99	111	307	517
Chile	21	47	92	160
China	217	357	1422	1996
Israel	1476	2072	5637	9185
Korea	9	12	12	33

Source: uspto.gov

## 5- Statistics and Indicators.

A weak point encountered during the present study is the lack of sufficient databases in ministries and research institutions related to science and technology. The basic data is there, such as general budgets and human resources. However, detailed breakdowns and other data related to S&T statistics and indicators are lacking. Only a few institutions appear to have some databases, however they do not reach the level capable of giving answers on the spot. Major information is concentrated on the ministerial level, and in many cases requires clearances, and is not directly available. In an age of information technology, and with the advancements recently made in Egypt within the last few years, the use of websites has definitely made more information available on the Internet. However, most of the information is descriptive with little quantitative data, and in many cases needs updating and several sites need to be reviewed linguistically. The culture of setting up solid and high quality statistics is something that needs to be institutionalized within the S&T community. Statistics and indicators are one of the major tools used to measure strong and weak points. It makes it easier for the policy makers to take the right decision and plan for future action on a solid base. The presence of statistics and indicators for S&T should be a part of the managerial setup of every research institute, as well as being a part of the top management and policy makers on the ministerial level. This is one of the reasons for the establishment of the Cabinet's Information and Decision Support Center (IDSC) as the official

governmental structure responsible for the development and dissemination of appropriate integrated information. The available data on the IDSC website cannot be of possible assistance to any industrial enterprise. In accordance, the industrial community tends to find their research partners easier from outside Egypt. Below is an outline of major S&T/R&D indicators that need to be established within the S&T community.

### **Box 1. Some major S&T indicators**

#### **National S&T policy/strategic plans**

- Existence of bodies engaged in S&T planning and assessment at national/sectoral levels
- Planning and management methodologies relevant to national S&T policies
- Major components, areas of focus, short-, medium- and long-term objectives
- Targets and dates set in relation to resource allocations from GDP
- National legislative and regulatory framework for R&D institutions/activities

#### **S&T Institutions**

- Productive sectors with R&D
- Higher Education sector
- Governmental Service sectors
  - Research Institutions (autonomous & ministry governed)
  - Service sectors
- Non-Governmental sectors
  - NGO's
  - Private sector

#### **Human Resources**

- Number of scientists & engineers involved in R&D
- Number of technicians involved in R&D
- Number of auxiliary personnel involved in R&D
- Total number of personnel involved in R&D by sector
- Percentage of FTE\* researchers (M.Sc. & Ph.D.) in above classes and sectors  
(FTE = full-time equivalent)

#### **Financial Inputs**

- R&D Expenditure (%GDP)
- Sources of Funding
  - Governmental
  - Productive enterprises
  - Foreign
  - Other sources

#### **R&D Outputs (Quantitative Attributes)**

- Number of patents registered and applied for, across fields of R&D and areas of application
- Number of published papers in peer reviewed journals
  - Across R&D fields
  - The use of citation indexes
  - Co-authorship with international schools
- Consultancy contracts (ongoing and completed)
- International & regional co-operation (projects, scientific meetings & published papers)
- S&T meetings and training activities organized and attended

## **6- Linkages of R, D&I institutions with industry.**

In the present study, one of the important factors is the linkages between R&D institutions and industry. A number of mechanisms for such linkages exist: 1- Marketing capabilities (intermediaries) within the R&D institutions (including the ministries); and 2- Marketing capabilities (intermediaries) not linked to the R&D institutions or ministries.

### **6.1. Marketing capabilities within the R&D institutions (including the ministries).**

Only a few such establishments exist, mainly in the Ministry of Scientific Research. These are in the form of: a- The Specialized Research Councils; b- Technological development committee; c- Patent Office; and d- The Technical and Technological Consulting Studies and Research Fund. The first three are affiliated to the Egyptian Academy of Scientific Research & Technology (ASRT), while the fourth is affiliated directly to the ministry. (see under Ministry of Scientific Research-Annex 1). The Ministry of Agriculture and Land Reclamation has recently established the Technology Management and Commercialization Office (see under Ministry of Agriculture and Land Reclamation-Annex 1). All the remaining ministries have not developed such capabilities as of yet. On the level of Research Centres and Institutes, again only a few have established such capabilities. One of the first to establish such capabilities is the NRC which started through marketing committees and later developed into a number of R&D management offices. These are the programming, marketing (renamed businessmen office), international relations and information technology offices and recently the patent liaison office. Similarly, the Agricultural Genetic Engineering Research Institute (AGERI) affiliated to the Agricultural Research Centre developed the office for technology transfer and intellectual property a few years back.

Furthermore, the majority of linkages are carried out on a number of levels. Ad-hock committees formed to solve a given problem on a ministerial level, industries requesting the help of ministries or R&D organizations to solve a given problem; and the most common linkage is the personal contacts between academicians in universities or scientists in research centres and their counter partners in industry.

### **Other Governmental Intermediaries.**

The Social Fund for Development (SFD) in Egypt is continuously providing a comprehensive range of technology support services for SME's to improve their productivity and competitiveness. These services are provided through the Technology & Business Incubators (TBI) program, Egyptian Business & Technology Links (EBTL) program and the Technology Support Center (TSC)., This EBTL's network of **50 centers** will be coordinated by the Center for Egyptian Business & Technology Development. This substantial size of integrated technology support services are definitely a support for the Egyptian SME's development, enhance their sustainability and improve their competitiveness. Yet, there is no mention to linkages of any of these centers to Research Centers nor Faculties. In addition, the 'consultancies' offered in these centers, is mainly for business support rather than for innovation and/or R&D activities.

The same applies for the Chemistry Administration (CA). its has well established laboratories (twenty specialized analysis labs) and chemical analysts (about 250 chemists) and can therefore perform a wide range of sophisticated chemical analysis that would be of support to the industry in the development of new products, especially if laboratories would be

established within the industrial cities. And yet, it is ineffective in its support to the industrial enterprises. This is proven by the example, where the Chemistry Administration was envisaged to play a role in the enhancement of R&D from within the agreement with the “Association for Small Industries – 6 October”. Both, the CA and the Association tried to fulfill an intermediary role for the industrial companies in the 6<sup>th</sup> of October City as regards R&D. This was by providing the Organization with suitable facilities to establish and run a local analysis laboratory in the city to serve the industrial companies. Unfortunately, the CA could not be considered supportive to R&D and should be considered as a consultation and service provider.

Vocational training: Industry and SMEs in particular lack the view, means and resources to support vocational or technical training. At the same time, a large gap exists between industry and vocational training entities, who implement their programs according to their own and/or the donors’ mandates and priorities.

## **6.2. Marketing capabilities not linked to the R&D institutions or ministries.**

These include all those entities mentioned under intermediaries as NGO’s or private sector, in addition to funding or donor international organizations financing cooperation (see Annex 6 for list of donor countries and organizations). Although these organizations have a variety and a wide range of possibilities, however several are willing to finance projects and programmes with industry particularly those involving environmentally friendly technologies. Unfortunately, most of these organizations are phasing-out donations due to the lack of solid S&T or environmental national policies (e.g. DANIDA of Denmark & CIDA of Canada).

### **Specialized Associations**

They are generally marked by a poor aggregation of the relevant communities, and have almost no room for new and young generations. In addition and combined with their lack of resources, they limit most of their effort to trade and business aspects, giving little interest to direct R&D activities if any.

However, there were examples that could be promising from the R&D perspective. The idea of the “clusters” is largely similar, and if some proved to be successful it was mainly due to the ability of the creation of better and more comprehensive integrated community. The general assessment is that the eventual role of specialized associations, as intermediates, in promoting R&D is not, but could be substantial and effective. The concept of funding R&D effort is hardly accepted by the industry (and much less by SMEs) and considered as a risky venture. Moreover, a common or combined R&D effort is highly unacceptable, due to the fact that an R&D structure is neither organized nor legalized and fully left to individual efforts.

It is worth noting that all NGOs are established and work under the supervision of the Ministry of Social Affairs, which is not constructive towards building a strong and modern industry, and less conducive to devoting enough effort to R&D. This is due to the large burden of controlling such a large number of differently oriented organizations (estimated around 14 thousand).

## **Businessmen Associations**

Businessmen Associations try to deliver services and assistance to the industrial facilities, within their geographic areas of operation. But their role is limited to what national facilities or foreign or donor programs can offer.

Sectoral associations, did not, in general, constrain their connections with other supporting entities within their local geographic areas. Some examples proved that their geographic aggregation (especially new industrial cities) was a driving force to centralized R&D entities to orient their effort toward those agglomerations. (An example is the case of the “Dakahleya” NGO that worked with the “Tibin” institute for the design and prototype of a furniture paint booth).

They have not proved to have any influence or role in designing or orienting national R&D programs. Even their role in assimilating and interacting with some national programs is limited. Their resources are generally limited and tied to donations offered by supporters. Hence their employed staffs are generally of moderate capabilities and efficiency, unless supported through definite donor programs. Even in such cases the presence of a professional staff or knowledgeable experts is limited by the duration of the program, and most programs lack capabilities for self sustainability.

It is clear from their mandate, (all the business associations surveyed) that supporting innovation and R&D is not a part of their vision and none mentioned it explicitly in their objectives. This lack of vision limits their effort to search for such programs. On the other hand, this doesn't contradict their eventual participation in programs related to R&D whenever the right environment shows up.

The lack of financial and human resources is generally a great limitation to supporting ventures in R&D activities. The variety of the industrial fields they have to cover, as they deal with the industry at large, practically poses a great challenge to their limited capabilities, unless they can identify a suitable niche they can serve. They can hardly manage the effective coordination with the research entities for some kind of support to the common technical problems, like the compliance with quality or environment protection regulations.

Training as a supportive role to R&D is available in some associations. They play an intermediate role between national training programs (e.g. the Mubarak-Kohl program), and their local companies.

## **Consultants**

Private consulting companies working solely in the R&D are almost non-existing in the present market. It was evident that most of them work in the civil engineering and construction fields, and some advisory services, somewhat very far from R&D.<sup>3</sup>

A general feature is that most experts and academics working as consultants with the industry do that in an undeclared way (probably for a lack of constitutional or legal approval). A major problem that also constraints R&D in the industry is the lack of information, vision and

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<sup>3</sup> Even mapping those consultant offices and companies proved to be very difficult. Information was scarce and classification of the consultants as to their specialisation was unavailable, even on the listing of consultants in the syndicate.

adequate R&D consultancy. Search for consultancy is practically difficult. These factors severely cut user demand for R&D, and limit the consultants' role for technical supporting services to a minimum level, apart from the construction and civil engineering sectors.

## **IV- CONCLUSIONS**

Egypt has a solid base of scientists and engineers working in the field of R&D. This represents the first starting point for the establishment of an innovation system upon which industry could depend. In order to make use of this wealth in human resources, a number of steps must be taken:

1- The importance of scientific research should be emphasized for industrial development, as well as for the economic growth in general.

2- Formulation of a national science, technology and innovation policy and strategies. In parallel, restructuring of the R&D community should take place to target innovation as its main goal. Financing S&T should take priority and increase amounts spent to reach at least 1-1.5 % of the GDP. ICT should be optimized within R&D communities to assure a wealth in reliable information and a streamlining of their outputs.

3- Formulation of a national policy for industry taking into account the lessons learnt by other developing countries concerning privatization of industry. The export/import ratios, the percentages of production of high, medium and low technologies as compared to primary manufacturing production, quality assurance and quality production should represent their main target which should also end with high quality products "made in Egypt".

4- If industry is expected to become competitive on a global level, then more efforts must be introduced to link R&D capabilities with industry, taking into account the three points mentioned above. Setting up a network of linkages between industry and R,D&I organizations should make use of all governmental, NGOs and private sector intermediaries. Research-industry linkages should play the major role in any future industrial developmental policies. Building up confidence between the R&D community and industry should be a major target for marketing and intermediaries at large. R&D activity should be demand driven through priorities set by the industry.

5- The separation of the ministry of industry into the Ministry of Foreign Trade & Industry and Ministry of Investment should be reconsidered. No industrial policy or modernization of industry will be effective unless it applies to both governmental and private industry. Privatization should also be reconsidered, taking into account that "Egyptian industry" should remain a national asset. One suggestion is to retain 51% of the shares with nationals or nationals and government, to avoid foreign companies from owning major shares. The government could also retain the majority of shares including the "Golden Share".



- **Break-down of Industry Services and Support (%)**
  - R&D**
  - Testing**
  - Training**
  - Consulting**
  - Others**
- **Industrial Sectors benefiting from services and support**
- **Examples of partners and Clients** (if applicable)
- **Financing of services and support to industry (%)**
  - Industry**
  - State**
  - Donors**
  - Other**
- **List the 3 most important research initiatives and/or achievements** within the last 3 years

**Title of research initiative no. 1**

**Type of activity**

- R&D**
- Testing**
- Training**
- Consulting**
- Other**

**Local industry partners (yes/no)**

**International partners (yes/no)**

**Dissemination initiatives (yes/no)**

**Total budget (M EGP)**

**Title of research initiative no. 2**

**Type of activity**

- R&D**
- Testing**

**Training**

**Consulting**

**Other**

**Local industry partners (yes/no)**

**International partners (yes/no)**

**Dissemination initiatives (yes/no)**

**Total budget (M EGP)**

**Title of research initiative no. 3**

**Type of activity**

**R&D**

**Testing**

**Training**

**Consulting**

**Other**

**Local industry partners (yes/no)**

**International partners (yes/no)**

**Dissemination initiatives (yes/no)**

**Total budget (M EGP)**

- **Comments**

**Thank You for Your Co-operation**

