



Higher Council for Science and Technology

Science & Technology and Innovation Profile of Jordan.

A report for :
**Evaluation of Scientific and Technological Capabilities in Mediterranean Countries
(ESTIME)**

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Summary of contents

- CHAPTER 1. INTRODUCTION TO RESEARCH IN JORDAN 3
- CHAPTER 2. SCIENCE, TECHNOLOGY, AND INNOVATION INSTITUTIONS IN JORDAN 7
- CHAPTER 3. HUMAN RESOURCES DEVOTED TO RESEARCH AND DEVELOPMENT 47
- CHAPTER 4. FINANCIAL RESOURCES DEVOTED TO RESEARCH 58
- CHAPTER 5. INTERNATIONAL COOPERATION IN RESEARCH 65
- CHAPTER 6. GOVERNMENT INITIATIVES IN SUPPORT TO S&T DEVELOPMENT 79
- REFERENCES 96
- DETAILED TABLE OF CONTENTS OF THE REPORT 97

Chapter 1. Introduction to research in Jordan

The Jordanian Government was always aware that S&T is important to socio-economic development of the country. Extraordinary efforts were made in improving the capabilities of human resources and infrastructure needed to harness the benefit of S&T.

In the early sixties Jordan started its search for more efficient utilization of S&T in its development plans, which led to the establishment of the Scientific Research Council in 1961. The objectives of the Council included planning, promoting, and financing research, identifying national research priorities, promotion of scientific research culture, and enhancing S&T cooperation with other countries. In 1977 the Council was replaced by the Directorate of Science and Technology at the Ministry of Planning (called at that time National Planning Council) which was entrusted with preparing the S&T policy, plans, and programmes, in addition to linking scientific activities to developmental objectives.

Jordan's political will in strengthening S&T infrastructure and linking its activities with national objectives of development was reflected and resembled in the holding of "Jordan's Science and Technology Policy Conference" in 1978. The Conference was held under the patronage of HM King Hussein and the chairmanship of HRH Prince El Hassan Bin Talal. This event was a turning point in reviewing the major issues facing the country in organizing and orienting its scientific and technological efforts towards the needs of development.

The Conference recommended that Jordan should endeavour to set up a national organizational structure responsible for planning, coordination, financing and promotion of scientific and technological activities at the national level, either through reconstituting an existing structure or creating a new one.

Based on this recommendation and the need stemmed from the increased scientific activity in Jordan, it was decided to institutionalize science and technology activities under a national umbrella that would set science and technology policy, strategies, plans and programs. A national committee was established, around 20 years ago, and entrusted with a task to develop a framework for a national organization that would cater for S&T activities in Jordan. To this end the Higher Council for Science and Technology was established in 1987 to build a national science and technology base to contribute to the achievement of national developmental objectives

Science and Technology sector in Jordan can be best described by some synthetic indicators. A study conducted by the Higher Council for Science and Technology, during the period 2002 – 2003 "Science and Technology Potential and Requirements Survey" revealed that there were 835 national institutions dealing with S&T activities in 2003 to be compared with 524 in 2006. The total number of employees working in S&T activities in 2003 was 42,151. The number of Engineers & Scientists working in R&D amounted to 1,464 FTE (Full Time Equivalent), equivalent to 2.7 per 10,000 populations. The expenditure on S&T activities in 2003 as a percentage of GDP was as follows:

- **Total S&T expenditures: 7.3%**
of which :
 - **Basic and applied research: 0.34%.**

- *Training and Education*¹: 1.6%.
- *S&T Services*²: 5.4%.

1.1. Social and economic Background

The population of Jordan grew in 2004 at 2.3% compared with 2003. In 2004, the Jordanian economy achieved positive results. GDP recorded a high growth rate of 13.3% doubling its growth rate as compared to 2003. This was achieved despite the regional instability and decline in foreign aid. The GDP per capita grew in 2004 at around 10.8% as compared to 2003. The following table contains some economic indicators for Jordan.

Table 1-1. Some basic economic indicators for Jordan

Economic indicators	2001	2002	2003	2004
Population (millions)	4.94	5.07	5.2	5.32
Nominal GDP (JD millions) at market prices. **	6,363	6,779	7,204	8,164
GDP per capita (JD)	1,288	1,337	1,385	1,534
Exports (F.O.B) – (JD millions)	1,627	1,964	2,185	2,753
Imports (F.O.B) - (JD millions)	3,050	3,191	3,600	5,148
Foreign direct investment (JD millions)*	85.2	45.4	300.7	439.8

Source: The Central Bank of Jordan, Monthly Statistical Bulletin, November 2005.

* Web Site of the Ministry of Planning and International Cooperation.

** one Euro = around 0.86 JD; one JD = 1,1628 Euros.

As can be seen from the above table the trade gap in 2004, has increased by around 69% over its level in 2003. Moreover, the foreign direct investment has increased in 2003 over 2002 by more than six folds and in 2004 by around 46.3% over 2003 figure.

1.2. The institutional framework

Table 1-2. List of research centers

Research center	Total 2006 operations budget ** Thousands JD	Total personnel	Research expenditures (Allocations 2006)***
Higher Council for Science and Technology (HCST) – General Secretariat	1,500	41	--
National Center for Human Resources Development (NCHRD) *	484	39	132
National Center for Diabetes Endocrine and Inherited Diseases (NCDID) *			

¹ All levels above High school, includes Community colleges and Universities .

² Consultancy, Testing services, Quality Control, Official certifications, Quality systems, etc.

National Energy Research Center (NERC) *	436	31	
National Virtual Center for Biotechnology (NVCB) *		4	
Jordan Center for Public Policy Research & Dialogue (JCPPRD) *	100	6	
Jordan Badia Research and Development Center (JBRDC) *	525		91
National Network for Advanced Materials and Nano-Technology (NNAMNT) *	150		
Regional Human Security Center (RHSC) *			
Royal Scientific Society	9,700	668	
National Center for Agricultural Research and Technology Transfer (NCARTT)	3,200	416	1000
Pharmaceuticals Research Unit (PRU)	1,300	53	93

Note: (*): Center affiliated to HCST.

(**): Rounded figures.

(***): Responses to S&T potential study, HCST, 2005. Only those institutions that responded are reported.

Source: HCST, Specific survey.

1.3. Availability of data for this report

As far as information and data availability is concerned, it is worth mentioning that most of the data and information presented in this report were available in different types of reports issued by different national institutions including those that contains the data collected through national surveys (S&T Requirements & Potential Survey conducted regularly by the HCST), data published in the different reports of the higher education institutions (ministry of higher education, and universities) , and data published by the department of Statistics (employment, sectoral economic data, ...etc). Moreover, some of the data presented in this report, particularly those related to individual institutions for the year 2006, were collected based on questionnaires that were specially designed for this purpose. They will be cited in the course of the report.

1.4. Organization of the report

This report contains information which describes the national science and technology and innovation system of Jordan. It starts with listing of key players: The Higher Council for Science and Technology and its affiliated centers, public and private universities, research centers, entrepreneurship support programmes and technology-based business incubators, technical advisory centers, and Professional and Business Associations, and describes the mandate, main activities, and size in terms of budget and number of employees of these

institutions. Then the report goes on and presents some S&T indicators in terms of spending on S&T activities, and people working in these activities. Moreover the report contains detailed information about the main programmes on S&T International Cooperation. The report also describes the S&T policy orientation in Jordan, and finally it describes the national innovation system.

Chapter 2. Science, technology and innovation institutions in Jordan

2.1. The Higher Council for Science and Technology (HCST)

The Higher Council for Science and Technology was established in 1987 by a royal decree under law Nb.30 to build a national science and technology base to contribute to the achievement of national developmental objectives. The Higher Council is presided over by HRH Prince El Hassan Bin Talal, who has been instrumental to the progress of science and technology in Jordan from the very beginning.³

Under the Chairmanship of HRH, the Council is made up of the following: the Minister of Finance, the Minister of Planning and International Cooperation, the Minister of Higher Education and Scientific Research, the Minister of Telecommunications and Information Technology, the Minister of Energy and Mineral Resources, the Minister of Industry and Trade, the Minister of Education, the Minister of Agriculture, the Commander-in-Chief of the Jordanian Armed Forces, the President of the Royal Scientific Society, the President of Amman Chamber of Industry, the President of Amman Chamber of Commerce, the Secretary General of the HCST, and three persons of qualification and experience to be appointed by the president for two-year renewable terms (see Law 30/87).

The HCST is entrusted with several responsibilities that include the following:

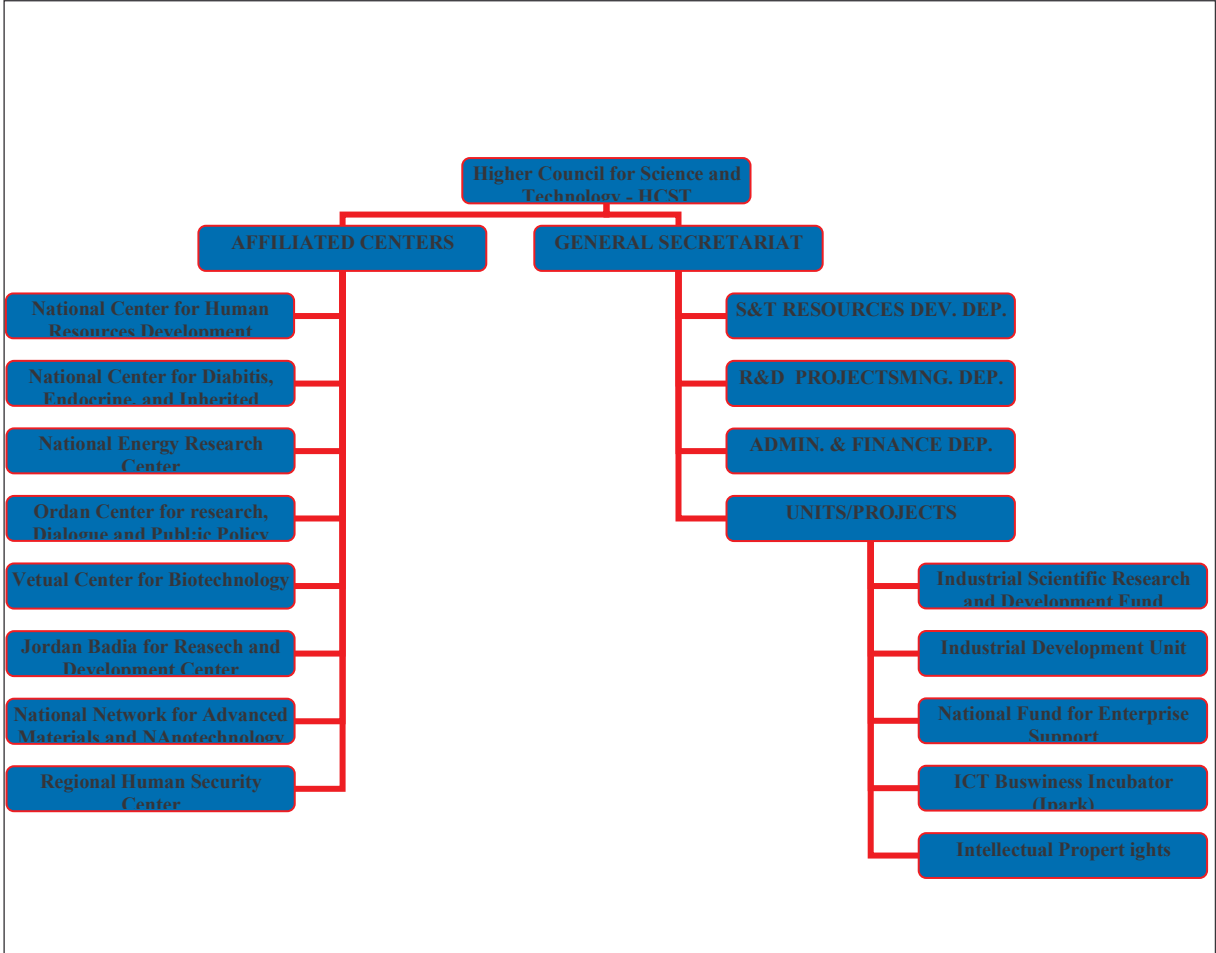
- Ratifying the general policy of science and technology in the Kingdom, defining its priorities, and drawing up the related programs and plans as well as following up on their implementation and evaluation.
- Drawing up the strategies suitable for the development of scientific and technological potential in the Kingdom and providing the scientific environment suitable for this purpose.
- Supporting the institutions and units of scientific and technological research and providing the necessary funding for the support of scientific and technological research as well as scientific and technological services and activities in the kingdom.
- Participating in the supply and training of manpower and technical potential for scientific and technological research institutions.
- Representing the Kingdom before Arab, regional and international institutions and bodies concerned with science and technology.
- Undertaking scientific and technological cooperation and concluding agreements related to scientific and technological research in collaboration with local, Arab, regional and international organizations.
- The Council may establish affiliated specialized centers of scientific and technological research.

The Jordanian Government provides the Higher Council with an independent budget through which the council supports research and development projects and programs. This includes activities that contribute to strengthening channels of communication and increasing

³ Law Nb. 30, 1987, and its amendments, the Higher Council for Science and Technology.

coordination and cooperation between various national institutions, thereby providing the basis for enhancing the role of S&T within comprehensive development.⁴

The organizational structure of the HCST is illustrated in the following flow chart (Figure 1).



The General Secretariat of the Higher Council for Science and Technology follows up on developmental fields through its two main technical departments namely the Science and Technology Resources Development Department (S&TRDD) and Research and Development Projects Management Department (R&DMD), in accordance with the decisions taken by the Higher Council related to all fields of science and technology activity. The General Secretariat also follows up on the implementation and coordination of the activities that assist in enhancing various economic sectors from the scientific and technological angle. Such activities are usually undertaken at the initiative of the Higher Council and its General

Figure 2-1. Flowchart of Higher Council of Science and Technology (HCST)

Secretariat or through the financial support of international institutions.

The Activities of the General Secretariat include :

- science and technology policy and strategy formulation

⁴ HCST Brochure, 2005, the Higher Council for Science and Technology.

- following up the implementation of Research and Development (R&D) Projects financially supported by the HCST.⁵ During the period 1993-2005 the total amount of funding provided to R&D projects by HCST amounted to around 6 million JDs;
- the convening of the Jordan Science Week on annual basis since 1993.
- performing the “National Scientific and Technological Requirements and Potential Surveys”. The first study was undertaken over a two year period (1996-1998). This methodology continues to be instrumental in helping successful planning for the S&T sector in Jordan. The latest study was conducted during the period 2003-2004; following up activities and initiatives on scientific and technological Cooperation.
- supporting inventions and Intellectual Property through the Intellectual Property Rights Unit which manages this activity. Moreover the unit hosts the IP help desk established in close cooperation with the private sector in order to provide advice to researchers on IP related issues.

The Higher Council for Science and Technology places great emphasis on the significance of S&T cooperation due to the beneficial impact that it has on the exchange of information and transfer of knowledge and technology. To this end the Higher Council is signatory to many cooperation agreements with Arab and international bodies. Many of these culminate in joint projects that assist in the development of S&T capacities.⁶

The total number of employees at the General Secretariat (GS) is 41, out of which PhD holders represent around 7.3%, master’s degree holders 19.5%, BA/BSc holders 17.1%, Diploma holders 9.8%, and below diploma 46.3%.

The total budget of the GS for the year 2006 is around 1.5 million JD*, out of which salaries represent around 35.1%, R&D 27.3%, other projects 23.9%, and others 13.7%. The government through HCST provides for 94% of the GS financing, and the rest comes from foreign sources.

2.2. Research centers and units affiliated to the HCST

HCST has eight affiliated research centers.⁷ It also has specific units dedicated to issues such as environmental monitoring, managing the business incubators network, managing intellectual property rights, etc.

2.2.1. The National Center for Human Resources Development (NCHRD)

This center was established in 1989 under the name of the National Center for Educational Research and Development (NCERD). The name of the center was changed in 1995, reflecting the developmental focus on human resources in Jordan. With this came an expanded perspective on the objectives of the Center to encompass, besides the original aim

⁵ More detailed information about this activity together with the revised policy and strategy for the period 2006-2010 is presented in a separate section that will come later in this report.

⁶ More detailed information about the HCST and national S&T international cooperation will follow in a separate section in this report.

⁷ The information used in this part was collected using a specially designed questionnaire adapted according to the type of institution considered (Annex 1).

of educational research, other aspects that fall under the national policy of human resource development.

The Center aims to participate in the enhancement of national human resources capacities through the reform of educational systems in line with developmental requirements.

The responsibilities of the Center include conducting and supporting studies and research related to the various levels and forms of the educational system including higher, vocational and technical education; conducting and supporting studies, and to launch projects, linking the outputs of education and training system with the labor and employment sector, by establishing a human resources development information system; evaluating the elements, components and outputs of the education reform plans; supporting the plans and projects geared towards the education reform plans in the various levels and diversified types of education, including systems, programs, human resources and education and training facilities; offering consultation to organizations at home and abroad on the areas that are relevant to the responsibilities of the center; coordinating with local, regional and international organizations and institutions, to provide assistance deemed necessary to support the reform plans at the various levels and types of the education system.

The total number of employees at the center is 39, out of which PhD holders represent around 10.3%, Masters Degree holders 20.5%, BA/BSc holders 38.5, Diploma holders 7.7%, and below diploma represent 23.1%.

The total budget of the center for the year 2006 is 484.2 thousand JD, out of which salaries represent around 76.4%, R&D 22.4%, and laboratory equipment 1.1%.

The government provides 25% of its funding, self financing is 1%, foreign financing is 73%

2.2.2. The National Center for Diabetes Endocrine and Inherited Diseases (NCDID)

The National Center for Diabetes Endocrine and Inherited Diseases (NCDID) was established in 1996 as one of the centers affiliated to the Higher Council for Science and Technology.

The Center aims at training, qualification and research and development in the fields of diabetes endocrine and inherited diseases.

The responsibilities of the Center include proposing an integrated system for specialized health care for diabetes endocrine and inherited diseases in both the public and private sectors in collaboration with medical institutions in both sectors within the Hashemite Kingdom of Jordan; collaborating with related sectors and bodies to enhance the level of medical care offered to diabetes endocrine and inherited diseases; undertaking scientific research and studies to determine the causes, treatment, and modes of contraction of diabetes endocrine and inherited diseases within the Kingdom with the aim of limiting such diseases and their side effects within a comprehensive national program; cooperation with centers and institutes active in this field to keep abreast of all research and new developments deliberated within the scope of local, Arab and international conferences and seminars; documenting research, studies, data and indicators related to the aims of the NCDID; encouraging continuing medical education for specialists and those employed in this field so as to attain the requisite professional level; and encouraging health education and awareness among patients and their families as well as citizens in general so as to determine the best mode of coping with such illnesses.

2.2.3. National Energy Research Center (NERC)

The National Energy Research Center (NERC) was established in 1998 in accordance with Article 11 of the law of the Higher Council for Science and technology No. 30 for 1987

The center undertakes research, development and training in the field of new and renewable energy and raising the efficiency of energy utilization in the various economic sectors.

The responsibilities of the Center include undertaking studies, research and experimental projects/pilot projects in the fields of local new and renewable energy sources, and in the area of efficient energy use. Managing and operating research laboratories, pilot units and experimental stations to develop local technical capacities, to exploit new and renewable energy resources, sell the power generated from these stations and units to the related institutions; convening training courses, seminars and conferences to develop the local technical capacities and expertise necessary for the exploitation of new and renewable energy including energy conservation; cooperating with local manufacturers and universities to encourage local manufacturing of renewable energy components; and establishing an energy data bank to facilitate research and studies, linking them to the National Information System and other related local or foreign institutions.

The total number of employees at the center is 31, out of which Masters degree holders represent around 16.1%, BA/BSc holders 41.9%, Diploma holders 19.4%, and below diploma represent 22.6%.

The total budget of the center for the year 2006 is around 436 thousand JD, out of which salaries represent around 74.3%, R&D 7.8%, laboratory equipment 9.9%, and others 8%. The government through HCST provides for 35.5%, self financing amounts for 15.4%, other sources amounts for 1.5%, and deficit is 47.5%.

2.2.4. The National Virtual Center for Biotechnology (NVCB)

The National Virtual Center for Biotechnology was established in December 2003 by decree of the Higher Council for science and Technology to which it is currently affiliated.

The main purpose behind the establishment of the Virtual Center for Biotechnology is to stimulate interaction and knowledge sharing between Jordanian and Arab scientists working in the various fields of Biotechnology with the ultimate aim of nurturing cooperation leading to practical results.

The responsibilities of the Center include creating a knowledge map in specific fields; establishing a searchable website database of the expertise available, making it accessible to all participants; organizing meetings of people in a specific field to brainstorm, develop ideas, and stimulate cooperative research; assisting in financing cooperative research and short exchange visits; helping in developing a feasibility study and business plan for a given project; helping in obtaining financing to start an identified feasible project; helping in

obtaining international patents; and helping in strengthening the ties between academic institutions and commercial companies in the country.

The Center has established the Jordan Monoclonal Antibody Company. Several other commercial Biotechnology enterprises are in the pipeline, and several patents in Biotechnology being developed.

The total number of employees at the center is 4, out of which PhD holders represent around 25%, Diploma holders 50%, and below diploma represent 25%

The total budget of the center for the year 2006 is 140 thousand JD, out of which salaries represent around 23.6%, R&D 42.9%, other projects 17.9%, and others 15.7%. The government through HCST provides for 100% of the center's budget. It is expected that this funding will decrease over the years so that the center becomes self financed.

2.2.5. Jordan Center for Public Policy Research & Dialogue (JCPPRD)

The Jordan Center for Public Policy Research and Dialogue was established in 2004 by a decision of the Higher Council for Science and Technology.

The Objective of the center is to enhance the participation of civic society in matters of public nature through conducting scientific analysis on issues and policies of concern.

The responsibilities of the Center include conducting specialized research and studies including those related to future visions needed for formulating new policies or modifying existing ones based on national priorities; organizing events for dialogue on national policies, and on issues of particular concern to the Center, with the participation of local and international experts concerned; coordination with national, Arab, and international institutions concerned with the research and dialogue activities of the center. The Center may make contractual agreements with these institutions in order to achieve its objectives; organizing training courses in the area of policy research and dialogue, and alternative future scenarios with the objective of encouraging future generations to focus attention on public issues, increasing their loyalty to their country; and providing consultancies in areas related to its purpose and concern.

The total number of employees at the center is 6, out of which PhD holders represent around 16.7%, Masters Degree holders 16.7%, BA/BSc degree holders 16.7%, and below diploma represent 50%.

The total budget of the center for the year 2006 is 100 thousand JD, out of which salaries represent around 45%, R&D 40%, and others 15.0%. The government through HCST provides for 90% of the center's funding, and foreign funding accounts for 10%.

2.2.6. Jordan Badia Research and Development Center (JBRDC)

The Badia Research and Development Center was established as a programme in 1992. A memorandum of understanding was signed between the Higher Council for Science and

Technology (HCST) and the British Royal Geographic (RGS) Society in a joint R&D initiative in the north-eastern Badia of Jordan. This is in collaboration with the Center for Overseas Research and Development (CORD) of Durham University, which acted as the implementing arm of the RGS. This program was converted into a center in 2004.

The objective of the Center (BRDC) is to contribute to the sustainable development of the Jordanian Badia, through the optimal exploitation of available resources, linking the economy of the Badia region directly to the national development process. The center aims to enhance the quality of life for the Badia's inhabitants without changing their traditional ways of life.

The responsibilities of the Center include conducting research and studies related to utilizing resources and gearing the research to social, economical and cultural development in the Badia and providing needed planning and consultancies; supporting scientific cooperation at national, regional and international levels in arid and desert lands through joint initiatives; developing human resources in the Badia region through providing education opportunities, training courses and specialized capacity building programs for researchers, staff at the center and indigenous people in arid and semi-arid regions; convening conferences, symposiums, scientific seminars and participating in scientific conferences at both national and international levels; publishing and documenting studies, research papers and information and data related to BRDC activities. Issuing newsletters, scientific periodicals, and other scientific materials upon need; creating successful pioneer developmental models and programs; establishing assemblies and committees to serve the center's purposes; facilitate funds and technical assistance from national and international organizations for R&D activities and developmental models; contributing in drafting national policies and strategies; and transferring technology and know-how that suits Badia development.

The total number of employees at the center is 60, out of which PhD holders represent around 6.7%, Masters Degree holders 11.7%, BA/BSc degree holders 30 Diploma holders 5%, and below diploma represent 46.7%.

The total budget of the center for the year 2006 is 525 thousand JD, out of which salaries represent around 41.9%, R&D 40%, R&D projects 9.5%, and others 48.6%. The government through HCST provides for 80% of the centers financing, and foreign financing accounts for 20%.

2.2.7. National Network for Advanced Materials and Nano-Technology (NNAMNT)

This network was established in 2004 by a decision of the Higher Council for Science and Technology based on recommendation suggested during the tenth Jordanian Science Week.

The objective of the network is to introduce and develop advanced technologies. The responsibilities of the Network include identifying national skills in the area of advanced material and nano-technology; identifying specific research areas; allocating necessary financing for implementing network's activities; enhancing local capabilities of researchers in the field; and utilizing and improving research facilities and equipment.

The Network is currently being run by the General Secretariat, four research initiatives have already started including, bio-nano applications in water contamination, nano applications in medicine, nano applications in solar energy, and preparations of nano-materials.

The 2006 budget of the Network is around 150 thousand JDs. This budget is fully provided by the HCST.

2.2.8. Regional Human Security Center (RHSC)

The Regional Human Security was established in July 2000 with support from the Canadian Department of Foreign Affairs and International Trade and was officially inaugurated in May 2001 at the building of the Jordan Institute of Diplomacy. It is the first centre of its kind in the world, and seeks to promote awareness of human security issues in the countries of the Middle East and North Africa. More specifically, it seeks to identify common issues, which are threatening the human security of people in the Middle East and North Africa; it functions as a forum where practitioners, experts, and academics can discuss and propose working solutions for human security threats; it submits relevant recommendations and solutions to policy makers; it raises the level of awareness of human security issues among practitioners and policy makers through various mechanisms like organizing workshops and conferences; it establishes regional and international networks dealing with Human Security aspects; it serves as a source of information on human security issues in the Middle East; and it conducts full-scale studies on human security issues.

2.2.9. The Environment Monitoring & Research Central Unit (ENMARCU)

The Unit was established in 2004 by the HCST at the Royal Scientific society, in cooperation with Japan International Cooperation Agency JICA, with the objective of collecting data and information on water quality that can impact and assist the decision making process in water sector. The HCST took upon itself this task of introducing novel techniques of environmental protection. To achieve this, the HCST, through a grant by JICA, established a state of the art real time monitoring system for water. The HCST set up the monitoring unit at RSS to ensure smooth and efficient utilization of the grant.

2.3. Other research centres

The following paragraphs provide some information about some of the research institutions available in Jordan and not affiliated to the HCST. These research centers are considered among the most distinguished ones in Jordan.⁸

2.3.1. The Royal Scientific Society

⁸ The information used in this part was collected using a specially designed questionnaire adapted to research centers (RSS and NCARTT) (Annex 1).

The Royal Scientific Society was established in 1970. Its objectives include the following:

- To conduct applied research and studies.
- To enhance scientific and technological cooperation with local, regional and international institutions.
- To carry out joint contract research and other projects with national international partners.
- To conduct tests on materials, and finished and intermediate goods to offer relevant technical consultations.
- To provide specialized technical consultations and services to the public and private sectors.

The RSS has the following research/technical centers/Departments: Information Technology Center; Electronic Services and Training Center; Mechanical Design and Technology Center; Building Research Center; Environment Research Center; Quality Assurance Department; Marketing, information and International Relations Department; Technology Transfer Center; and Enterprise Support & Conformity Assessment Department.

The total number of employees at RSS is 668, out of which PhD holders represent around 8.2%, Master Degree holders 13.3%, High Diploma holders 1.05%, BA/BSc holders 39.1 and below diploma represent 25.3%

The total budget of RSS for the year 2006 is around 9.7 million JD, out of which salaries represent around 45.8%, R&D 24.7%, other projects 11.3%, and others 17.7%. RSS is a private institution. Most of its financing (97.5%) is self financing, the rest (2.5%) comes from the government.

2.3.2. National Center for Agricultural Research and Technology Transfer (NCARTT)

The Center was established in 1951. It is affiliated to the Ministry of Agriculture. The objective of the Center include: Utilization of the agricultural research results for the purpose of increasing agricultural production (both plants, and animals); increasing the efficiency of plants production; sustaining natural agricultural products and utilizing them optimally; servicing agricultural development; and sustaining environmental balance. The Center has seven branches in seven different areas all over Jordan.

The total number of employees at NCARTT is 416, out of which PhD holders represent around 10.6%, Master Degree holders 17.5%, High Diploma holders 1.2%, BA/BSc holders 24%, Diploma holders 6%, and below diploma represent 40.6%.

The total budget of NCARTT for the year 2006 is around 3.2 million JD , out of which salaries represent around 64.7%, R&D 3.5%, laboratory equipment 2.1%, and others 9.8%. Most of the financing of NCARTT (95%) comes from the government; the rest comes from foreign sources.

2.3.3. Pharmaceuticals Research Unit (PRU)

The PRU was established in 1993, with the objective of conducting Research and studies of drugs for human use. The PRU has the following facilities: analytical facilities; Clinical facility; and Product safety research laboratory. The PRU has also conducts collaborative research with various universities.

The total number of employees at PRU is 53, out of which PhD holders represent around 9.4%, Master Degree holders 11.3%, BA/BSc holders 66%, Diploma holders 7.5%, and below diploma represent 5.7%

The total budget of PRU for the year 2006 is around 1.3 million JD, out of which salaries represent around 15.9%, R&D 5.9%, and laboratory equipment 78.1%. Most of the financing of PRU comes from the self financing.

2.4. Jordanian public universities

In Jordan there are 24 universities, out of which 10 are public universities and 14 are private. The information compiled in this report is about 22 universities only.⁹

2.4.1. The University of Jordan

The university was established in September 1962. The University of Jordan's educational mission is based on the following pillars:

- The provision of quality education at both the undergraduate and graduate levels. The adoption of the principle of democracy in the education and decision-making processes.
- Interaction among students, with the local community, and at the international level.
- Support of goal-oriented research, particularly research activities which are in line with the national development plans.

In the area of R&D the University's programs are emphasizing the need for applied scientific research in Agriculture, Economics, Administration and Industry. In this vein, the University has equipped its laboratories with needed equipment to provide an atmosphere conducive to research that is immediately linked with societal needs and developmental goals. The university has the following faculties:

- Faculty of Arts;
- Faculty of Business Administration;
- Faculty of Science;
- Faculty of Sharia (Islamic Studies);
- Faculty of Medicine;
- Faculty of Nursing; Faculty of Agriculture;
- Faculty of Educational Sciences;
- Faculty of Engineering and Technology;
- Faculty of Law;
- Faculty of Physical Education;
- Faculty of Pharmacy; Faculty of Dentistry;

⁹ The information used in this part was collected using a specially designed questionnaire sent to universities. (Annex 1)..

- Faculty of Graduate Studies;
- Faculty of Humanities and Social Sciences;
- Faculty of Rehabilitation Sciences;
- King Abdullah II for Information Technology; and
- Faculty of Arts and Design.

Moreover, the university has following centers:

- Center for Documents and Manuscripts;
- Computer Center;
- Language Center;
- Center for Consultation, Technical Services, and Studies;
- Water and Environment Research and Study Center;
- Islamic Cultural Center for Educational Development;
- Center for Strategic Studies;
- Center for Phonetics Research;
- Hamdi Mango Center for Academic Research;
- Global Development Learning Network Center (Atheer);
- Center for Educational Development.

The total number of employees at the university is 2231, out of which PhD holders represent around 43.3%, Masters Degree holders 8.8%, high diploma holders 1.6%, BA/BSc holders 23.6%, Diploma holders 19.6%, and below diploma represent 3.1%.

The total budget of the university for the year 2006 is around 78 million JD , out of which salaries represent around 75.9%, R&D 6.8%, other projects 11.6%, laboratory equipment 4.9%, and others 0.8%. The sources of funding at the university are distributed as follows: 8.7% comes from the government, 74.8% self financing, foreign financing 16.2% and 0.3% comes from other sources.

2.4.2. Jordan University for Science and Technology (JUST)

JUST which has its roots at Yarmouk University was established on in 1986 as an autonomous national institute of higher learning. In consequence five faculties were detached from Yarmouk to form an integral part of the University and instruction began in September 1986. Since its foundation the University has witnessed rapid expansion: for the number of faculties rose from the five faculties to become eleven including (55) academic departments offering (52) undergraduate programs and (95) graduate programs.

The students' numbers rose from (2300) students in the year 86/87 to more than (16500) undergraduate and graduate students in the academic year 2004/2005 instructed by (630) faculty members compared with (110) in the year when the University was founded. The University has become a "home away from home" for students from (41) foreign and Arab countries, all of which contribute to the varied cultural life on the University

The total number of employees at the university is 1316, out of which PhD holders represent around 45.9%, Masters Degree holders 7.8%, high diploma holders 0.3%, BA/BSc holders 19.0%, Diploma holders 11.5%, and below diploma represent 15.5%.

The total budget of the university for the year 2006 is around 49.7 million JD , out of which salaries represent around 59.2%, R&D 5.6%, other projects 16.4%, laboratory equipment 6.4%, and others 12.4%. The sources of funding at the university are distributed as follows: 14.74% comes from the government, 74.93% self financing, foreign financing 10.33%.

2.4.3. Yarmuk University

Founded in 1976 by a Royal Decree and it is a governmental institution that enjoys a considerable degree of autonomy.

The University's mission comprises three components. The first is to provide quality education to its students in the various fields of specialization and at different levels of achievements ranging from the undergraduate levels to the M. Sc. and Ph. D. levels. The second component is to engage its faculty and students in relevant and timely research programs that would be needed to fuel economic growth and development of the country, and that would also contribute to human welfare and prosperity in its wider context. The third is to render public service at the local, national, and international levels through fostering a dynamic environment of cultural enrichment, and the provision of educational and training opportunities to non-student groups.

Most students, or nearly 90%, are enrolled in undergraduate programs distributed among 11 faculties and 49 departments and 2 deanships. Graduate programs at the M. Sc. level were offered in 59 areas of specialization; and at the Ph. D. level in 15 areas. The faculties comprise the Faculty of arts; Faculty of Science; Faculty of Education; Faculty of Physical Education; Faculty of Fine Arts; Faculty of Economics and Administrative Sciences; Hijjawi Faculty For Engineering Technology; Faculty of Law; Faculty of Shari'a and Islamic studies; Faculty of Archeology and Anthropology; Faculty of Information Technology; Deanship of Scientific Research and Graduate Studies; and Deanship of Student Affairs.

In addition, there are seven research centers and one institute: The Institute of Archeology and Anthropology; Computer and Information Center; Center of Theoretical and Applied Physics; The Educational Research and Development Center; Jordanian Studies Center; Consultation and Community Service Center; Languages Center; Aqaba Marine Science Center; Refugees , Displaced Persons And Forced Migration Studies Center; and Speech and Hearing Center. The total number of employees at the university is 2247, out of which PhD holders represent around 26.8%, Masters Degree holders 9.4%, high diploma holders 1.9%, BA/BSc holders 18.4%, Diploma holders 15.8%, and below diploma represent 27.7%.

The total budget of the university for the year 2006 is around 43.6 million JD, out of which salaries represent around 52.2%, R&D 0.7%, laboratory equipment 4%, and others 43.1%. The sources of funding at the university are distributed as follows: 19.5% comes from the government, 56.7% self financing and 23.8% comes from other sources.

2.4.4. Mu'tah University

The university was founded in 1981 by a Royal Decree as a national institution for civil and military higher education. The University started functioning in its military wing in the year 1984 on its permanent site at Mu'tah in the Karak governorate, 135 km South of Amman. It is only 12 km away from the Karak Castle, a rich historical and archaeological treasure in the south.

On February 2, 1985, His Majesty King Hussien Bin Talal inaugurated the University of

Mu'tah on the site of Mu'tah, the land of rich history and great sacrifices, to add to the sources that provide the nation with highly qualified graduates in various areas of specializations.

The university constitute of the Faculty of Arts; Faculty of Sciences; Faculty of Engineering; Faculty of Shariah; Faculty of Business Administration; Faculty of Law; Faculty of Agriculture; Faculty of Sports Sciences; Faculty of Nursing; Faculty of Medicine; Faculty of Social Sciences; Faculty of Educational Sciences; Deanship of Students Affairs; and Deanship of Scientific Research; Deanship of Graduate Studies.

In addition to these colleges the university has the following centers: Computer Center; Prince Faisal Center for Dead Sea Studies; Academic Staff Development Center; Water and Environment Research Center; and South Center for Training and Consultation.

The total number of employees at the university is 3121, out of which PhD holders represent around 15.2%, Masters Degree holders 5.1%, high diploma holders 1%, BA/BSc holders 13.4%, Diploma holders 9.5%, and below diploma represent 56%.

The total budget of the University for the Year 2006 is around 42 million JD, out of which salaries represent around 65.4%, R&D 3.1%, other projects 4.5%, and others 26.3%. The sources of funding at the university are distributed as follows: 23.9% comes from the government, 75.8% self financing and 0.3% comes from other sources.

2.4.5. Hashemite University

The Hashemite University was established in 1995. The University has the following colleges: Faculty of Economics and Administrative Sciences; Faculty of Sciences; Faculty of Arts; Faculty of Engineering; Prince Al Hussien Bin Talal II Faculty of Information Technology; faculty of allied Health Sciences; faculty of Educational Science; Faculty of Physical Educational and Sport Sciences; faculty of Nursing; Deanship of Research and Graduate Studies; faculty of natural Resources and Environment; Queen Rania Faculty for Childhood; and Queen Rania Institute for Tourism and Heritage. Moreover the University has the following Centers: Center for Studies, Consultations, and Community Service; Academic Quality Assurance Center; Center for Environmental Studies; Center for Non-Destructive Testing; Computer Center; and Language Center.

The total number of employees at the university is 1239, out of which PhD holders represent around 28.2%, Masters Degree holders 11.3%, high diploma holders 1.2%, BA/BSc holders 26.7%, and Diploma and below diploma holders 32.5%.

The total budget of the university for the year 2006 is around 27.1 million JD, out of which salaries represent around 39.9%, R&D 9.7%, other projects 9.7%, laboratory equipment 9.5%, and others 4.5%.

The sources of funding at the university are distributed as follows: 13.2% comes from the government, and the rest is self financing and other sources.

2.4.6. Al Al Bayt University

Al al-Bayt University is located on the outskirts of the city of_Mafraq, 65 Kilometers to the north-east (about 45 minutes drive) of the capital Amman - Jordan.

The university has integrated academic facilities, student housing, and social services on one site, extending over an area of 7539 dunums (dunum=1000 square meters).

On August 17, 1992 (18 Safar 1413 H), a Royal Decree was issued ordaining the establishment of Al al-Bayt University. The University is also intended to uphold the principles of freedom, justice, tolerance, and respect of other people's beliefs and faiths, and co-existence.

After completing its infrastructure, recruiting distinguished faculty members, and defining its courses and programs, the University was ready to receive its first group of students on October 1, 1994.

Under the patronage of His Majesty King Hussein, and the presence of His Royal Highness Crown Prince El Hassan, Al al-Bayt University was officially inaugurated on March 6, 1995 (6 Ramadan 1415 H).

The university has the following colleges: College of Islamic Jurisprudence and Law; Prince Hussein bin Abdullah Information Technology College; College of Sciences; College of Arts; College of Economics and Administrative Sciences; College of Nursing. In addition to that the university also has the following institutes and centers: The Institute of Earth and Environment; The Institute of Architecture and Islamic Arts; The Institute of Bayt al- Hikmah; Omani studies Unit; Language Center; The consulting, Technical and Community Services Center.

The total number of employees at the university is 1130, out of which PhD holders represent around 16.3%, Masters Degree holders 8.1%, high diploma holders 0.4%, BA/BSc holders 14.5%, Diploma holders 9.0%, and below diploma represent 51%.

The total budget of the university for the year 2006 is around 19 million JD, out of which salaries represent around 52.6%, R&D 10.5%, laboratory equipment 5.3%, and others 31.6%. The sources of funding at the university are distributed as follows: 26% comes from the government, 73% self financing and 1% comes from other sources.

2.4.7. Al Hussien Bin Talal University

Al-Hussein Bin Talal University was established by a Royal Decree in April 1999. It is located in the southern part of Jordan, where almost all educational disciplines are needed, particularly Tourism, Hotel Management, Science, Computer Engineering, Education, and Mining Engineering.

The University's main campus is located 7 Km to the west of the city of Ma'an (southern Jordan).

The University has the following colleges: Educational Sciences; Arts ; Library Sciences/Information Technology; Science ; Mining and Environmental Engineering; Computer Engineering and Information Technology; Business Administration and Economy; Marketing; Insurance and Risk Management; Accountancy ; Accountancy/Information, Technology; Banking and Finance; and Archaeology, Tourism and Hotel Management in addition to that the university has three centers namely Nabatean Studies Center; Faculty Members Development Center; and Badia Research and Development Center.

The total number of employees at the university is 728, out of which PhD holders represent 12.23%, Masters degree holders 3.02%, high diploma holders 1.1%, BA/BSc holders 25.82%, Diploma holders 13.05%, and below diploma represent 44.78%.

The total budget of the university for the year 2006 is around 22 million JD , out of which salaries represent around 23.5%, R&D 8.8%, other projects 28% laboratory equipment 10.8%, and others 28.9%.

The sources of funding at the university are distributed as follows: 11% comes from the government, 22% self financing, and 10% comes from other sources. The deficit is 57%.

2.4.8. AlBalqa Applied University

Al-Balqa' Applied University was established under the Act No. (13) For the year 1997. The University aims to serve the Jordanian Community in particular and the Arab community in general. The University has the following colleges: Prince Abdullah Bin Ghazi Faculty of Science and Information Technology; Faculty of Graduate Studies & Scientific Research; Faculty of Engineering; Faculty of Planning and Management; Faculty of Agricultural Technology; Faculty of Traditional Islamic Arts; Faculty of Technological Engineering; Faculty of Sharia; Princess Rama college; Princess Alia College; Ajloun college; Al Aqaba college; Irbid College; Zerqa College; Salt college, Al Karak college; Shoubak college; and Ma'an college.

The total number of employees at the university is 3052, out of which PhD holders represent 12.4%, Masters degree holders 12.6%, high diploma holders 7.2%, BA/BSc holders 23.7%, Diploma holders 13.4%, and below diploma represent 37.2%.

The total budget of the university for the year 2006 is around 33.6 million JD , out of which salaries represent around 69.6%, R&D 3.8%, other projects 22.5%, and laboratory equipment 4%.

The sources of funding at the university are distributed as follows: 17% comes from the government, 53% self financing, 14% foreign financing, and 16% comes from other sources.

2.4.9. Tafila Technical University

Al-Balqa' Applied University was established under the Act No. (13) For the year 1997. The University aims to serve the Jordanian Community in particular and the Arab community in general. The University has the following colleges: Prince Abdullah Bin Ghazi Faculty of Science and Information Technology; Faculty of Graduate Studies & Scientific Research; Faculty of Engineering; Faculty of Planning and Management; Faculty of Agricultural Technology; Faculty of Traditional Islamic Arts; Faculty of Technological Engineering; Faculty of Sharia; Princess Rama college; Princess Alia College; Ajloun college; Al Aqaba college; Irbid College; Zerqa College; Salt college, Al Karak college; Shoubak college; and Ma'an college.

The total number of employees at the university is 3052, out of which PhD holders represent 12.4%, Masters degree holders 12.6%, high diploma holders 7.2%, BA/BSc holders 23.7%, Diploma holders 13.4%, and below diploma represent 37.2%.

The total budget of the university for the year 2006 is around 33.6 million JD , out of which salaries represent around 69.6%, R&D 3.8%, other projects 22.5%, and laboratory equipment 4%.

The sources of funding at the university are distributed as follows: 17% comes from the government, 53% self financing, 14% foreign financing, and 16% comes from other sources.

2.4.10. The German-Jordanian University

The University was established by a Royal Decree in 2005, in accordance with a Memorandum of Understanding signed between the Ministry of Higher Education and

Scientific Research, of Jordan, and the Federal Minister of Education and Research of the Federal Republic of Germany.

The University, though categorized as public, will have its special and unique nature, entity, and character. In that, the university will implement the Fachhochschule model (university of applied sciences) adopted in the Federal Republic of Germany, and will, thus, be devoted merely and entirely to applied research and practical training. As this nomination indicates, the University will offer applied science degree programs of study with direct bearing on the industry, the business world, and the market place. Laboratory work, practical training, field research, on-campus industrial incubators and direct links and interaction with the industry will go hand-in-hand with students' teaching/learning process, and will form an integral part of their study plans. Special emphasis will be placed on the integration of Information and Communication Technologies (ICT) in academic and administrative activities.

It is anticipated and aspired that graduates of this university will render efficient services to the local and regional communities, and will be distinguished in terms of their education, skills, personal attributes, and competence.

The University has the five colleges and two centers: the School of Technological Sciences; the School of Natural Applied Sciences; School of Medical sciences; School of Management & Humanity Sciences; School of Informatics & Computing; Center for Information System and Technology; and German Multicultural Center.

The total number of employees at the university is 52 people. Out of this PhD holders represent around 42.3%, Masters degree holders around 22.2%, BA/BSc holders 17.3%, Diploma holders 9.6%, and below diploma 9.6%.

The total budget of the university for the year 2006 is around 6.3 million JD, out of which salaries represent around 6.5%, Projects other than R&D 5.6%, and others 89.4%.

68% of the university's financing comes from the government, 29% self financing, and others 3%.

2.5. Jordanian private universities

2.5.1. University of Petra

University of Petra was established in 1991. UOP offers the Bachelor's Degree in the in the Faculty of Information Technology; Faculty of Art ; Faculty of Architecture & Arts; Faculty of Science; Faculty of Administrative & Financial Sciences; Faculty of Pharmacy & Medical Sciences.

University of Petra places great emphasis on research activities, and for that purpose, the Deanship of Research was established in 1991. Its functions include the promotion and support of research projects initiated by the various faculties of the university. It also tries to seek financial support resources in the form of contract research, thereby extending its reach to the private and public sectors. This is in addition to its own budget allocated yearly for general purposes.

The total number of employees at the university is 447 people. Out of this PhD holders represent around 29.8%, Masters degree holders around 13.6%, High Diploma holders 0.45%, BA/BSc holders 21.3%, Diploma holders 7.4%, and below diploma 27.5%.

The total budget of the university for the year 2006 is around 6.6 million JD, out of which salaries represent around 73.5%, R&D projects 3.9%, other projects 14.6%, laboratory equipment 2.7%, and others 5.8%. The university financing is 100% self financing.

2.5.2. Al Ahliyya Amman University

Amman University is the first private University to be established in Jordan, dating back to 1990. Amman University follows the credit-hour system. In this system, the yearly instruction takes place for the duration of two semesters, 16 weeks each, and one optional summer semester of 8 weeks in duration. Through five academic faculties now in full operation, AU offers the Bachelor's Degree in the fields of Engineering ; Pharmacy and Medical Sciences; Information Technology Sciences; Human Sciences and Art; Law; and Finance and Administrative Sciences.

2.5.3. Princess Sumaya University for Technology

The Princess Sumaya University for Technology (PSUT) is a non- profit private specialized Jordanian University owned by the leading applied research centre in Jordan, the Royal Scientific Society (RSS). Its area of specialization is IT, Communications and Electronics. Being non- profit, and owned by a non- profit public institution, PSUT partakes of both worlds, public and private. It is more akin to public universities in mission, but more so to the private sector in drive and spirit. Right from the start, PSUT has accommodated itself to both local development and modernization plans and global developments.

PSUT was established in 1991 as a specialized IT university. Currently, it confers a B.Sc. degree in the Computer Science; Electronics Engineering; and Computer Engineering. The university award B.Sc. degrees in the following majors: Computer Science; Electronics Engineering; Computer Engineering; Communications Engineering; Computer Graphics and Animation, and Management Information Systems.

The university adopted an Entrepreneurship Initiative that simulates the MIT model, this initiative is composed of: Technology Commercialization Program; PSNEC (Business Plan Competition); Connect program that links capital with human resources; Incubation in cooperation with Higher Council for Science and Technology.

The total number of employees at the university is 135, out of which PhD holders represent 25.2%, Masters degree holders 8.9%, high diploma holders 0.7%, BA/BSc holders 30.4%, Diploma holders 11.1%, and below diploma represent 23.7%.

The total budget of the university for the year 2006 is around 3.35 million JD, out of which salaries represent around 50.6%, R&D 4.5%, other projects 19.5%, laboratory equipment 4.2%, and others 21.1%.

The sources of funding at the university are distributed as follows: 18% comes from the government, 77.6% self financing, and 4.4% comes from foreign sources.

2.5.4. Jarash Private University

The university was established in 1993. Currently it has the following faculties: Sciences and Agriculture; Literature; Sharia; Economics; and Law.

The total number of employees at the university is 426, out of which PhD holders represent 26.8%, Masters Degree holders 13.1%, high diploma holders 0.2%, BA/BSc holders 16.2%, Diploma holders 6.3%, and below diploma represent 37.3%.

The total budget of the university for the year 2006 is around 4.1 million JD, out of which salaries represent around 71.7%, R&D 6.1%, other projects 4.3%, laboratory equipment 12%, and others 5.1%.

The sources of funding at the university is 100% self financing.

2.5.5. Irbid National University

Although the Higher Education Council took a resolution number 601 dated 19/8/1991 to establish the university, it started its operations in 1994. Currently it has the following colleges: Sharia & Law; Literature; Administrative Sciences; and Science and information Technology. It also has the Center of Consulting and Continuing Education

The total number of employees at the university is 302, out of which PhD holders represent around 31.8%, Masters Degree holders 10.3%, high diploma holders 0.7%, BA/BSc holders 12.3%, Diploma holders 19.9%, and below diploma represent 25.2%.

The total budget of the university for the year 2006 is around 6.2 million JD, out of which salaries represent around 40%, R&D 2.7%, laboratory equipment 3.2%, and others 23.8%. The source of funding at the university is 100% self financing.

2.5.6. Zerqa Private University

The philosophy of the university emanates from the tolerant Islamic faith and the distinguished Arabic Islamic civilization, combined with a reasonable balance in the upbringing of a true believing and enlightened individual and a strongly coherent society. It also springs from an outstanding of a combination of deep-rooted thought and culture of Islam, and an awareness of present-day issues, besides stressing scientific methodology in behavior, science, and action. The university has the following colleges: Sharia (Islamic Studies); Arts; Science & Information Technology; Economics & Administration Sciences; Educational Sciences; Law; Allied Medical Sciences; Deanship of Scientific Research & Graduate Studies; and Deanship of Evening Studies.

In addition to that the university has the following centers: Islamic cultural center; Center for studies, research & Consultations; Computer Center; Translation Center; Continuous Teaching & Community Service Center; Arabic Language Center for None-Native Speakers; and Environmental Studies Center.

The total number of employees at the university is 478 people. Out of this PhD holders represent around 24.9%, Masters degree holders 10.7%, Higher diploma 2.9%, BA/BSc holders 19%, Diploma holders 10%, and below diploma 32.4%.

The total budget of the University for the Year 2006 is around 3.4 million JD, out of which salaries represent around 100%. The source of funding at the university is almost 100% self financing.

2.5.7. Al Isra'a Private University

Al Isra University is a private institution of higher education in Jordan. Its owner, Al Isra University Company, obtained its founding license from the Council of Higher Education in Jordan by the latter's Decree No 357 of 12 August 1989, and started its first academic year in

1991 – 1992. The university campus lies on a lot of 300,000 square meters that is located on Queen Alia International Airport, some 15km from Amman on the highway leading to the southern part of the country.

The university has the following colleges: Faculty of Arts; Faculty of Education; Faculty of Administration and Finance; Faculty of Law; Faculty of Engineering; Faculty of Pharmacy; Faculty of Science and Information Technology.

The total number of employees at the university is 679 people. Out of this PhD holders represent around 26.4%, Masters degree holders 11.9%, Higher diploma 0.4%, BA/BSc holders 17.8%, Diploma holders 7.2%, and below diploma 36.2%.

The total budget of the University for the Year 2006 is around 8.2 million JD, out of which salaries represent around 74.1%, R&D projects 1.9%, other projects 2.6%, laboratory equipment 3.1%, and other activities 18.4%. The university is self financed.

2.5.8. Applied Science Private University

The university was established in 1989 under the law of higher education for private universities. It has the following faculties: Arts; Law; Sciences; Computer Science and Information Technologies; Engineering; Pharmacy; Economics and Administration Sciences; and Allied Health Sciences.

The total number of employees at the university is 488 people. Out of this PhD holders represent around 52.9%, Masters Degree holders 13.3%, BA/BSc holders 22.3%, Diploma holders 5.5%, and below diploma 5.9%.

The total budget of the university for the year 2006 is around 8.3 million JD, out of which salaries represent around 87.2, R&D 4.1%, laboratory equipment 2.2%, and others 6.7%. The source of funding at the university is almost 100% self financing.

2.5.9. Al-Zaytoonah University

Al-Zaytoonah University of Jordan received its license and general accreditation by Decision No. 848 on September 6, 1993. Instruction began on September 6, 1993. Since then, the University has witnessed considerable development; it now includes six faculties having 19 specializations. The University has received general and subject accreditations.

The university has the following colleges: Science and Information Technology; Economics and Administration Sciences; Pharmacy; Nursing; Arts; and Law.

The total number of employees at the university is 750 people. Out of this PhD holders represent 28.1%, Masters degree holders 9.3%, Higher diploma 0.8%, BA/BSc holders 21.1%, Diploma holders 7.3%, and below diploma 33.7%.

The total budget of the university for the year 2006 is around 9.9 million JD, out of which salaries represent around 82.1%, R&D 5.8%, laboratory equipment 0.7%, and others 11.1%. The source of funding at the university is 100% self financing.

2.5.10. Amman Arab University For Graduate Studies

This is the only university in Jordan dedicated for post-graduate studies. It was established in 1999. The colleges of this university are as follows: Computer Studies; Educational Studies; Management and Financial Studies; and Law. Moreover, the University has the following Centers: Language Center; Arab Center for Studies and Consultation; and Arab Center for Educational Testing Service.

The total number of employees at the university is 255 people. Out of this PhD holders represent 44.7%, Masters degree holders 5.5%, Higher diploma 0.4%, BA/BSc holders 23.1%, Diploma holders 6.7%, and below diploma 19.6%.

The total budget of the University for the Year 2006 is around 3.4 million JD, out of which salaries represent around 64.6%, R&D 29.4%, laboratory equipment 1.5%, and others 4%. The source of funding at the university is 100% self financing.

2.5.11. Philadelphia University

The University was established in 1989. It has the following colleges: Arts, Science, Engineering, Law, Pharmacy, Nursing, IT; Financial sciences; and Graduate studies.

The total number of employees at the university is 611 people. Out of this PhD holders represent around 33.8%, Masters degree holders 13.7%, Higher diploma 0.3%, BA/BSc holders 22.9%, Diploma holders 0.16%, and below diploma around 29%.

The total budget of the university for the year 2006 is around 13.9 million JD, out of which salaries represent around 53.6%, R&D 2.2%, other projects 1.4%, laboratory equipment 0.7%, and others is around 28.8%. Finally the source of funding at the university is 100% self financing.

2.5.12. Jordan Applied University College of Hospitality & Tourism

This institute was established as a Community College in 1980, then as a University College in 2003. The university has the following facilities: Computer and IT Laboratory; Language Laboratory; Front Office Simulator Laboratory; House Keeping Simulator Laboratory; Module Food Production Training Kitchen; Restaurant Training Laboratory; Auditorium Demonstration Theatre.

The total number of employees at the university is 29 people. Out of this PhD holders represent around 17.2%, Masters Degree holders around 17.2%, High Diploma holders 27.6%, BA/BSc holders 20.7%, Diploma holders 17.2%.

The total budget of the university for the year 2006 is around 0.5 million JD, out of which salaries represent around 48%, R&D 10%, other projects 8%, laboratory equipment 12%, and others 22%.

50% of the university's financing comes from the government, 20% self financing, 10% foreign financing, and others 20%.

2.6. Technical Advisory Centers (TAC)

TACs exist in almost all universities, both public and private, they are established in order to provide consultancy services, training, and sometimes testing services. The information on these TACs were collected using a questionnaire specially designed for this purpose. More than 50% of all TACs responded, however, all TACs do similar work, therefore the information presented here is sufficient to give a clear idea about the functions and activities of all TACs.

2.6.1. Center for Consultations, Technical Services and Studies (CCTSS) / University of Jordan

The Center was established in 1981. Its Mission is to provide competitive and high quality services in the form of consultation, technical services, and studies and extended continuous education, through highly qualified experts and faculty members to enhance the economic and competitiveness of businesses and industries in Jordan and the Arab region.

The center provides a wide scope of services in various fields which include:

Training and Continuous Education

The Center offers about 500 training courses annually, covering a wide spectrum of subjects needed by the community in Jordan, the Arab world, and the Middle East in general. The following are some of the fields of these courses:

- Administrative Sciences (Business Administration, Marketing, Finance, Management Information Systems, Accounting, Public Administration)
- Arts (Languages and Social Sciences)
- Sciences (Natural and Biological Sciences, Geology and Geophysics, Metallurgy and Computer Sciences)
- Social and Human Sciences (Economics, Philosophy, History, Sociology, Geography, Political Sciences)
- Medical Sciences (Basic, and Ancillary Medical Studies)
- Agricultural Sciences (Various Agriculture Sciences)
- Educational Sciences (Curricula and Principles of Education, Psychology, and Educational Consulting)
- Engineering and Technology (Civil, Electrical, Architecture, Mechanical Industrial, Chemical,
- Mechatronics and Computer Engineering)
- Legal Sciences (Private and Public Law)
- Physical Education
- Fine Arts
- Nursing & Rehabilitation Sciences
- Religious Sciences.

Consultation and Studies

The Center:

- Carries out studies and research concerning the development of public and private institutions connected with administrative, educational and legal activities and similar fields of endeavor.
- Provides technical consultation and expertise to the various institutions according to their needs.
- Prepares designs in all fields of engineering (civil, electric, architectural, mechanical, industrial, chemical, and computing services.), and prepares architectural plans and other designs for public or private housing projects.
- Provides scientific expertise in developing medical professions, and technical consultation in hospital administration and organization.
- Provides technical consultation and expertise and carries out studies and research, as well as technical services in all fields of agriculture sciences.
- Prepares feasibility studies on economic and investment projects for the government and private institutions.
- Prepares draft laws and auditing systems for public and private institutions and provides technical consultation for putting them into effect.
- Designs information systems and internal control procedures for public and private institutions.
- Develops curricula for public and private schools as well as for higher educational institutions.

Technical Services:

The Center performs a large variety of technical services mainly as follows:

- Conducting laboratory analyses (wide variety of samples and types of tests): to serve different factories, companies, consultation firms, industrial manufactures, governmental departments and individuals.
- Maintaining and testing for variety of instruments and specialized equipment, including neutron probe instrument electronic equipment, colored slides, special laboratory equipment, and glass work.

The center has 22 employees, out of which PhD holders represent around 9.1%, Masters Degree holders 9.1%, Ba/BSc. Holders 45.5%, Diploma holders 18.2%, and below diploma holders 18.2%.

The yearly budget of the Center is around 107 thousand JDs, which goes for salaries. The Center finances it self fully.

2.6.2. Consultative Center for Science and Technology (CCST) / Jordan University of science and Technology (JUST)

This Center was established in 1996. It has the following objectives:

- Provision of consultation and studies.
- Conduct laboratory testing and analysis.
- Provision of continuing education programs (workshops, short courses,...etc).

- Establishing links with industry.
- Contributing to technological investment.
- Providing services related to Total Quality Management (TQM).

The Center has a council, which directs and supervises its activities. The council members were selected from highly qualified persons from various sectors: the University, the Government, and the private sector.

The Center consists of the following Departments:

- Department of Consultation and Technical Services.
- Department of Linking With Industry.
- Department of Continuing Education.

The CCST is able to provide consultations and studies for public and private sectors related to the following areas:

Total quality management/ time and value management/ presentation and communication skills/ computer programming and engineering/ internet/ information technology/ value engineering/ marketing ...etc./ constructions / dams/ roads/ sewage and solid waste treatments/ medical waste disposal management/ air conditioning/ central heating/ pumps and hydraulic turbines/ air pollution/ water desalination/ heat exchangers/ compositions/ CAD CAM/ molding/ feasibility studies and programming for different projects/ housing projects/ humanitarian studies (social and psychological) for architectural environment/ designing and planning places (landscape)/ designing different types of buildings/ testing and measurements using (Thermal Analyzer, Atomic Absorption, GC, HPLC)/ stabilizing colloidal solutions/ paper recycling/ waste water treatment/ solar energy/ drying technology of foods/ petrochemical industries/ polymer industries/ detergent industries/ corrosion and electroplating/ irrigation systems/ underground water projects/ different testing and measurement analysis for soil and water/ electrical and electronics circuit/ digital and analog communications/ controls/ computer and microprocessors/ printed circuit board/ chemistry and food analysis.

The center has 13 employees, out of which PhD holders represent around 15.4%, Masters Degree holders 7.7%, Ba/BSc. Holders 53.8%, and below diploma holders 23.1%.

The yearly budget of the Center is around 6.6 thousand JDs, which goes for salaries. Moreover, the Center's revenues amount to around 1 million JDs. The Center finances it self fully.

2.6.3. Center for Studies, Consultations, and Community Services (CSCCS)/Hashemite University

The Center was established in 1997. it performs several activities that include consultations service to the community; planning, development and implementation of the university's training programs; conducting specialized workshops in different areas; planning, development and implementation of the local community's training programs; and cooperation and coordinating with public and private bodies in conducting their training programs;

The center has 15 employees, out of which PhD holders represent around 13.3%, Masters Degree holders 6.7%, Ba/BSc. Holders 40%, diploma holders 13.3%, and below diploma holders 26.7%.

The budget of the Center for 2006 is 194 thousand JDs, out of which salaries represent around 30.9%, laboratory equipment represent around 8.8%, and others 60.3%. The Center finances it self fully.

2.6.4. Center for Consultations, Technical Services & developing community/Al al-Bayt University

The Center was established in 1996. The aim of the center is to offer consultation, technical services and studies to the local community in the governance of al-Mafraq and to the public and private sectors inside and outside the Hashemite Kingdom of Jordan.

The Center performs several duties that include offering consultation, technical services and studies to the public and private sectors; Preparing feasibility studies on economic and investment projects for the government and private institutions; Provision of Data analysis for student researches in different subjects; and Offering many training courses which cover a wide rang of subjects needed by the community in Jordan including Managerial studies, Marketing and Accounting, Public relation, Languages (English, French, German and other modern languages), Computer Sciences, and translation .

The center has 8 employees, out of which PhD holders represent around 12.5%, Masters Degree holders 25%, Ba/BSc. Holders 25%, diploma holders 12.5%, and below diploma holders 25%.

The budget of the Center for 2006 is 61 thousand JDs, out of which salaries represent around 59%, R&D 32.8%, and laboratory equipment represent around 8.2%. The Center finances itself fully

2.6.5. Consultations, Studies & Training Center (CSTC)/Al Balqa Apllied University

The Center was established in 2003. The center's Perform consultations, studies, technical problem solving and design for various productive sectors; participates in upgrading level of professions in different applied and humanitarian sciences' fields; conducts required technical studies; and conducts courses and training workshops for the concerned beneficiaries in ministries, government departments and institutions as well as companies in the private sector.

The Center has 10 employees, out of which PhD holders represent around 10%, Ba/BSc. Holders 70%, diploma holders 10%, and below diploma holders 10%.

The budget of the Center for 2006 is 75 thousand JDs, out of which salaries represent around 66.7%, equipment represent around 18%, and others 15.3%. The Center finances itself fully.

2.6.6. Center for Studies, Consultations, and Community Service/AI Zaytoonah Private University

The Center was established in 2000. It provides several types of services that include the provision of consultations in areas of pharmacy, nursing, legal, social, and IT; provision of technical services to both private and public sectors; and provision of training services in areas of management, inventory management, feasibility studies, marketing studies, hospitals and health centers management, and vocational and professional rehabilitation.

The center has 5 employees, out of which MSc. Degree holders represent 40%, Ba/BSc. holders 40%, and below diploma holders 20%.

The budget of the Center for 2006 is 41 thousand JDs, out of which salaries represent around 61%, projects other than R&D 24.4%, laboratory equipment represent around 12.2%, and others 2.2%. The Center finances itself fully.

2.6.7. Center for Continuous Education and Community Service/Zerqa Private University

The Center was established in 1995, with the aim of organizing training courses for students, university employees, governmental employees, and local community.

The center has 4 employees, out of which PhD holders represent 25%, BA/BSC 50 %, and below diploma 25%.

The total budget of the Center is 8.4 thousand JDs, out of which lab equipment represent 35.7%, projects 17.9%, and other budget items 46.4%. The Center finances it self from the revenues of training programmes it conducts.

2.6.8. Center for Studies, Consultations, and Community Service/ Al Isra Private University

The Center was established in the year 2000. The mandate of the Center include the provision of consultation to both governmental and private sectors in different areas; Preparing studies for both governmental and private sectors; Providing technical services to both governmental and private sectors; Enhancing the working level in our institutions; Transferring technology, scientific knowledge, and modern application to institutions; Providing trainees with real life cases and materials; Creating a positive interaction atmosphere between the trainers knowledge and the trainees experience; Assuring the continuous education philosophy through preparing seminars and workshops; and Interact with specialized training centers.

The main activities of the center include: designing organization structures; designing information systems to organizations; assessing the manpower needs in organizations; designing the training plans; managing warehouses and; designing administrative, financial, and accounting systems; conducting feasibility studies for investment projects; conducting market research studies; provision of technical consultations to organizations.

The center has 5 employees, out of which Masters Degree holders represent 40%, BA/BSC 40 %, and below diploma 20%.

The total budget of the Center is 41 thousand JDs, out of which salaries account for about 61%, projects other than R&D 24.4%, lab equipment represent 12.2%, and other budget items 2.4%. The Center finances it self fully.

2.7. Entrepreneurship support programs and Technology Business Incubators

2.7.1. The National Consortium for Technology and Incubation of Business (NACTIB)

The National Consortium for Technology and Business Incubation (NACTIB) was established by the Higher Council for Science and Technology, the Royal Scientific Society, Princess Sumaya University for Technology, and the University of Jordan, with the aim of identifying the need for improving success opportunities of start-up companies and assisting Jordanian entrepreneurs through incubation and provision of technical, economic, administrative, and legal support services, to enable them to develop their ideas into successful businesses that maximizes their contribution to the national economy and assists the government in its endeavours to create job opportunities in the Kingdom.

The establishment of NACTIB came as a recognition of the need for an orchestrated effort to enhance the indigenous Research and Technological Development (RTD) capacity and credibility, through the establishment of a network to harness and optimize the use of existing RTD centres' resources, in order to create an environment conducive to the development and growth of knowledge-based enterprises and promote RTD activities in the private sector in Jordan.

NACTIB will cater for a set of functions including but not limited to the following:

1. Diagnosis of entrepreneurs and start-up companies requirements;
2. Incubation of start-up technology companies and entrepreneurs;
3. Collaborative and Contractual RTD with producers of goods and services;
4. Technical services;
5. Management support services;
6. Consulting services in business related disciplines;
7. Linking entrepreneurs and start-up companies to financing;
8. Access to proprietary technology and intellectual property;
9. Internships and co-op arrangements;
10. Customized training and education;
11. Links to other scientific institutions.

NACTIB is governed by a managing board consisting of the heads of the members' institutions. The Managing Board works out details of undertakings and agreements among the members, formulates NACTIB's policies, set its plans, and oversee the operations of its management. Each member voluntarily commits resources for the annual work-plan and budget of NACTIB.

2.7.2. Information & Communication Technology Business Incubator (ipark)

In 2003 the Higher Council established the ipark which provides an appropriate environment for entrepreneurs to enable them develop their ideas into commercial businesses. The incubator provides entrepreneurs with the technical and management services needed for developing their ideas, in addition to access to financing. The establishment of the incubator at the premises of the RSS was mainly sponsored by the HCST

The ipark incubated 16 start-ups, 5 of which graduated, and the rest are still incubated. All companies are working in the area of Information and communication technologies. The total number of ipark management staff is five, out of which 1 has a Master degree (the Manager), 1 with BA/BSc degree, 2 have Diploma, and 1 below diploma.

The budget of the incubator for 2006 is 66 thousand JD, out of which 24.2% goes to salaries, and the rest goes for serviced rent.

As for the sources of funding, 5% comes from the government, 75% self financing, and 20% from other sources.

2.7.3. Jordan Innovation Centre for Engineers and Industrial Enterprises at Royal Scientific Society

This incubator was established in 2005 as a Joint venture sponsored by Royal Scientific Society (RSS), Jordan Engineer Association (JEA), Amman Chamber of Industry (ACI), and Euro Jordan Action for Enterprise Development (EJADA). The aim of this incubator is to foster start-up technology based industrial engineering projects and provide them with the needed support to bring them to commercialization stage. Currently there are five projects being developed at the incubator, these projects are: Educational Toys; Anti Snoring; Building Insulation; Ubiquitous Computing; and Financial Analysis.

The total number of employees at the incubator is 2, one is holding a Masters Degree in engineering (the Manager of the incubator), and the other is a BA degree Administrative Assistant.

The yearly budget (2006) of the incubator is 26250 JD out of which salaries represents around 72%, and the rest is allocated for training and awareness activities for the incubator and its tenants. The sources of funding of this incubator are mainly the private sector represented by the RSS, Jordan Engineers Association, and Amman Chamber of Industry. In addition to that, EJADA supported this initiative through the provision of technical consultant, soft equipment, and training for the core staff of the incubator.

2.7.4. Agro-industries Business Incubator (Jordan Innovation Center)

This incubator was established in 2005 as a Joint venture sponsored by the university of Jordan and EJADA. The aim of this incubator is to foster start-up technology based agro-industrial projects and provide them with the needed support to bring them to commercialization stage. Currently there are four projects being developed at the incubator, these projects are Nontraditional Bee Products; Black Iris Propagation by Tissue Culture;

Production of Natural Cosmeceuticals; and Production of Meals for People with Special Dietary Needs.

The total number of employees at the incubator is 2, one is holding a PhD Degree in Agro-Engineering (the Manager of the incubator works as a volunteer), and the other is a BA degree Administrative Assistant.

The total budget of the incubator for 2006 is around 10 thousand JDs, out of which around 50% goes for salaries, and 50% for other expenses.

The sources of funding of this incubator are mainly the University of Jordan, the rents of tenants; in addition to that, EJADA supported this initiative through the provision of technical consultant, soft equipment, and training for the core staff of the incubator.

2.8. Other entrepreneurship support initiatives

There are currently in Jordan several active entrepreneurs support programs that provide different types of support to enterprises (both existing and startups). Some of these programs are targeting entrepreneurs and focusing on creating business through supporting ideas creation and generation, incubation and finance. Some of these programs are supported by national initiatives; others are supported by international donors. These programs include:

2.8.1. The Intellectual Property Rights unit of HCST

This Unit is one of the departments recently established at the General Secretariat of the HCST. It is entrusted with the following tasks:

- Coordinating of the intellectual property rights evaluation process among the different scientific centres.
- Assisting in registering the intellectual property rights at the local and international levels.
- Organizing awareness campaigns to encourage Jordanian researchers to register the intellectual property rights before any scientific publication.
- Contributing to the development of the legislations related to registering the intellectual property rights.
- Following-up on issues related to the intellectual property rights, and coordination with the concerned authorities, and with the science and technology resources development directorate, as well as the management of research and development projects directorate, and the Information and Communications Technology Business Incubator, at the general secretariat of the Higher Council.
- Registering the intellectual property rights resulting from the scientific research projects resulting from the scientific research projects financially supported by the Higher Council, and those related to the scientific activities of the scientific centres affiliated to the Higher Council for Science and Technology.
- Marketing and commercialization of the industrial property rights inside Jordan and abroad.
- Offering financial support to Jordanian inventors and entrepreneurs.

The unit also established an Intellectual Property Help desk, (IP Help desk), to provide legal, administrative, and technical assistance in this field.

2.8.2. The Industrial Scientific Research and Development Fund (ISRDF)

The ISRDF, established by the Higher Council in 1994, aims at the following:

Supporting Jordanian industries in investing in S&T so as to achieve qualitative developments in industrial processes and management, quality of products, and improve their competitive capacity/edge.

Encouraging national industries to support R&D and derive optimal benefits from its results.

Creating appropriate opportunities for universities, scientific research centers, and consultative bodies to link their research and consultative activities to the requirements of the industrial sector and to the developmental process in general.

Identifying the problems faced by various industries and offering guidance on problem solving.

Funding is given to research, scientific and training activities including the development of industrial products; improving the quality of industrial products; increasing the efficiency of industrial production processes; enhancing the competitive edge of Jordanian industry; manpower development; developing indigenous technology; improving the efficiency of industrial management and maintenance.

The fund is financed by HCST, Ministry of Planning, Industrial Development Bank, and some large companies. The managing board is chaired by the minister of planning, and projects are evaluated and selected by a technical committee. The funding provided to industrial R&D projects during the period 1994-2005 amounted to about 2.3 million JDs.

The Fund has 2 employees, one of them holds a Master Degree, and the other holds a diploma degree.

The 2006 budget of the Fund is 116 thousand JDs, out of which salaries accounts for 13.8%, and the rest goes for supporting R&D projects.

Around 80% of the Funds financing comes from the government, and the rest comes from the private sector.

2.8.3. National Fund for Enterprises Support (NAFES)

This fund was established in 2001 as one of the components of the Jordan-Japan industrial development program, under the umbrella of the Higher Council. The Fund aims at the following:

Supporting small and medium enterprises in the use of S&T and research services so as to achieve qualitative operational improvements (increased productivity, competitive edge).

Increasing awareness of the significance of using scientific methods in decision making.

Enhancing and developing the consultative and advisory capacities of local business support organizations (BSO $\text{\$}$) that offer their services to small and medium enterprises (SME).

The Fund is financed by the return on investment of ten million JD's of a Jordan-Japan Counterpart Fund. The managing board is chaired by the SG of HCST and consists of representatives from both public and private sectors. The funding provided to SMEs during the period 2001-2005 amounted to around 1.3 million JDs.

The total number of employees at the center is 8, out of which Masters degree holders represent around 37.5%, BA/BSc holders 25%, Diploma holders 25%, and below diploma represent 12.5%.

The total budget of the center for the year 2006 is 550 thousand JD, out of which salaries represent around 20.5%, other projects 65.5% (Grant Aid to SMEs against consultancy services), and others (training to SMEs) 14%.

The government through HCST provides for 100% of the financing needed by NAFES.

2.8.4. Enterprise Productivity Centers (EPCs) IRADA

A network of EPCs was established under the umbrella of the Enhanced Productivity Program (EPP) and is currently being operated by the Ministry of Planning and International Cooperation. A total of 22 centers for EPCs have been established to cover all 12 Jordanian governorates, and a Central Support Unit has also been established to offer specialist technical and financial advice, as well as provide guidance on accessing financial support. The plan envisages supporting the development of 400 new and existing SMEs. An evaluation of IRADA's performance was undergone in 2003. The evaluation revealed that the program, through the services it offers, actively contributed to the establishment/ expansion of almost 312 projects (51%), which helped provide 750 employment opportunities, while the remaining 289 projects benefited from other services that did not bare a direct effect on their establishment/ expansion. Finally, the evaluation also indicated that almost 93% of the projects have the ability to sustain their operations.

2.8.5. Jordan Upgrading and Modernization Programme (JUMP)

The Jordan Upgrading and Modernization Programme (JUMP) was very recently introduced in response to the various challenges facing the Jordanian economy particularly SMEs. The war in Iraq alone, severely affected around 400 Jordanian enterprises that were dependant on the Iraqi market. Furthermore, existing programmes such as EJADA, JUSBP and NAFES, while very beneficial, will simply not cover 2,500 companies that need upgrading over the next 5 years, not neglecting the fact that existing programmes will expire within a relatively short time scale thereby exacerbating the problem of insufficient and unstable flow of funding and available technical assistance.

JUMP aims to enhance the competitiveness of Jordanian industries both locally and internationally through targeting industrial upgrading. This is to be accomplished by adopting a long-term strategic approach on a scale not envisaged before in Jordan. In this regard, JUMP is to handle the entire upgrading process for any given company as one whole package. This entails assessing the client company to determine its needs and identify the obstacles it faces,

and subsequently construct a real diagnostic and upgrading plan. JUMP will then proceed with the implementation of the plan while also partially covering the costs involved.

It is worth mentioning here that the extent of cost coverage by JUMP may vary according to whether or not the client company is located within or outside greater Amman. Furthermore, to fulfill its aim, JUMP focuses on outsourcing while giving priority to national expertise when available, and unlike other donor incentives, JUMP allows support for the purchase of fixed assets necessary for expansion or equipment technology upgrading.

2.8.6. Cooperation with the Private Sector; University of Jordan – Faculty of Engineering and Technology

In addition to addressing entrepreneurship, other initiatives such as the University of Jordan's Faculty of Engineering and Technology have worked to create programs that bring together participants from the industry with university representatives.¹⁰

The Faculty aims to strengthen academic-industrial linkages through:

- **The Engineering Partnership Council with Industry:** The goal of establishing this partnership council is to bridge the gap between the expectations of industry and the academic sector. The council attracts 15 members from private sector enterprises to brainstorm ideas, proposals and new joint research projects.
- **Faculty-for-Factory Program:** This program is in its fourth year of operation. The goal of this program is to enable university professors/researchers to assist SMEs by solving their technical and managerial problems. The program provides incentives to attract leading practitioners to develop and support such enterprises. The researchers are expected to develop, define and conduct recognized practical projects that have development potential related to the needs of these enterprises. Fortunately, this program is widespread over all universities and departments and has become a national project in which many Jordanian universities are now participating.
- **Innovation Groups Project:** This project is a first step in a long journey to establishing an academic culture that supports innovation. The project is based on collecting a group of faculty members and students from different disciplines to work on designing and manufacturing a device, machine, product, or equipment for industry that serves as a good learning experience for all participants as well as helping to satisfy the needs of Jordanian companies. This form of cooperation is an outstanding opportunity for academia to collaborate with industry on issues related to engineering projects and help make systemic changes in the field of engineering education.

¹⁰ See MED BEST Process in Jordan, Country Report, Competitiveness Unit, Ministry of Planning and International Cooperation, May 2004.

2.8.7. Other programmes supporting enterprises

There are **other programmes**¹¹ currently running in Jordan, brief information about them is summarized in the following table:

Table 2-1. Entrepreneurs Support Programs

Program	Objective	Counterpart Institution	Funding	
			Jordan	Foreign
Euro-Jordanian Action for the Development of Enterprises (EJADA).	Developing the competitiveness of Industries.	Ministry of Planning.	1.6 million Euros.	45 million Euros., funded by the EU.
Achievement of Market Friendly Initiative and Results Program	Promoting economic growth and prosperity via the development of a more favorable business environment.			70 million \$US, funded by USAID
Jordan United States Business Partnership (JUSBP)	Enhancing the competitiveness of Enterprises.	Ministry of Industry and Trade.		27 million \$US, funded by the USAID
King Abdullah the II for Development (KAJD)	Providing Jordanians with new and innovative opportunities.	Ministry of Planning.		
Investment Promotion Unit (IPU)	Enabling entrepreneurs to procure assets needed for their operations.	Jordan Investment Board.		8 million Euros, funded by UNIDO and the Italian Government.

2.9. Professional associations

2.9.1. Agricultural Engineers Association (AEA)

Agricultural Engineers Association (AEA) had been established since 1966. It is supervised by an elected Board Council for a 3-years period. AEA is committed to fulfil the following objectives:

- Organizing the career through promoting its scientific and professional levels as well as supporting the scientific and research activities and innovations.
- Contribution of planning as well as developing teaching and training programs of all levels.
- Participation of an agricultural policy making and implementation.
- Sponsoring the Association' concerns and protecting members' rights.
- Participation in providing support for agricultural scientific societies.
- Protecting member's future and providing them better living conditions.
- To cooperate with Arabs Agricultural Engineers Union in terms of improving careers' conditions.

¹¹ Internal study of GS of HCST and NAFES.

The AEA has the following six divisions namely Plant Production; Plant Protection; Animal Production; Nutrition and Food Processing; Agricultural Economics & Extension; and Water Resources and Environment

The above six divisions are supervised by an elected committee consist of five members. The working period for this committee is usually extended up to three years. Its responsibilities can be summarized as follow:

- To examine membership applications at each division area and to present its recommendations up to the Council.
- To organize the Division's scientific and professional affairs by studying any submitted case and to present it's relative recommendations or suggestions up to the Council.
- To implement any resolutions made by the General Assembly in respect of the Division.
- To implement any other commitments determined by the Council.

At the beginning of each working period, the Council forms specific committees to supervise the implementation of procedures and activities considered to achieve the AEA objectives. Participation is usually opened for all members at the beginning of each council period. Any participant wish to have a membership has to attend at least three successive meetings in the capacity of an observer. The following are the committees included within the AEA:

- **The Scientific & Technical Committee:** aims to communicate with other academic & research institutions, providing members by knowledge & scientific technologies and encouraging research, innovation and scientific publications. This committee may fulfil the above goals through organizing specific seminars, workshops, forums as well as the Agricultural Contests.
- **Cultural & Media Committee:** aims to develop the scientific and cultural levels of the different agricultural sciences as well as covering the news and activities prepared by the Association. This committee may achieve the above mentioned goals through issuing two publications: '*The Agricultural Engineer Journal*' and '*Naqabatuna*'.
- **New-members Committee:** is interested in establishing communications with the new members and providing them by the needed information, extension or advisory. The committee may also share with the Council solving problems that face new members.
- **The National Committee:** aims to hold the national and Islamic anniversaries and increasing awareness among members in respect of risks related to the Normalization with Zionism entity and their attempts to accede Arab Markets.
- **Women Affairs Committee:** takes care with issues and concerns of female members through creating a number of activities and exhibitions to market their own products and through organizing the Annual Campaign of Charity (*Hamlatul Khair*)
- **Sport and Social Committee:** aims to support the social relationships among members through internal and external tours, Umrah "pilgrimage to Mecca and Medina-minor hajj", sports and holding religious anniversaries.
- **Internal and External Affairs:** aims to develop and fortify the relationship among the Association branches all over the country, the relationship with

expatriate members and the relationships with other Arab and international agencies.

- **Library committee:** aims to supervise the library which is considered to be a scientific source for members. It works to collect scientific journals and periodicals as well as monitoring the borrowing system.
- **Environment Committee:** aims to spread the environmental awareness among Agricultural engineers, cooperation with other governmental and non-governmental agencies responsible for environment protection participating in combating desertification and providing solutions for pollution caused by agricultural practices.
- **Exhibition Committee:** this committee meets the exploration and participation goals in agricultural exhibitions locally, regionally and internationally. This committee is also responsible for preparation of the periodic exhibitions held by the Association.

Beside the main office in Amman, AEA has other (14) fourteen branches distributed in 14 main cities all over Jordan.

The AEA provides members with many voluntary services such as:

- Medical insurance program.
- Collaborative mutual fund.
- Non-profitable loan fund (*alqardh alhassan*).
- Housing society.
- Cell phones offers program.

In addition, the Association has established a wide range of specialized groups and projects that may improve services provided to members such as: The Technical and Scientific Unit. This unit has been established in order to improve the scientific and technical levels of members through activities provided by the following departments:

- New Members Training Program
- Continuous Training Centre.
- The Department of Employment.
- Department of Agricultural studies and advisory.
- “Itqan” society for members.
- Electronic Gate (the official website).

The total number of employees at the AEA is 24, out of which 4.2% are PhD holders, 8.3% are Masters degree holders, 37.5% are BA/BSc holders, 29.2% are diploma holders, and 20.8% are below diploma.

The total budget, which self financed, of the AEA for 2006 is around 116 thousand JDs, most of it goes to salaries.

2.9.2. Jordanian Geologists Association (JGA)

The Jordanian Geologist Association was established in 1972 by law issued in July 1972. The association aims at achieving the following goals:

- Raising the rank of geology career, protect the geologists rights and welfare, promotes the soul of brotherhood and cooperation between geologists. In addition to ameliorate the scientific and financial concerns by using all the legal routes.
 - Preparation of geological research studies that associated with the development of hydrological, mineralogical and oil resources. In addition to civil constructions (i.e. dams, roads, airports, buildings and tunnels).
 - Encouraging the geological research in Jordan and propagate the geological culture using all the available facilities.
 - Consolidation of the cooperation between the trade unions in Jordan and geological societies in Arabic world and foreign countries to exchange the experience that will improve the career.
 - The association conducts regular conferences, seminars and workshops to keep its members up to date with new development in the area of geology and related fields.

The total number of employees of the association is 6. Two of them are holding BA/BSc degrees, two holding diploma, and two are below diploma.

The 2006 budget of the association is 49840 JD, out of which around 20% goes for salaries and the rest goes for the awareness activities mentioned above. Self financing is main source of funding of the Association.

2.9.3. Jordan Medical Association (JMA)

The Jordan Medical Association was established in 1954. The mandate of the Association is to promote the medical and health care as well as scientific and social objectives in promoting the medical affairs for all members inside and outside Jordan. The Association has five working committees including the Scientific Committee, The Social Committee, Media and Al Sama'a Journal Committee, Medical Fees Committee, and Ministry of Health Doctors Committee.

The Association employs 40 persons, out of which PhD holders represent 5%, Masters Degree holders 5%, Ba/BSc 30%, Diploma Holders 47.5%, and Below Diploma 12.5%. The Association finances itself form the fees of its members.

2.9.4. Jordan Pharmaceutical Association (JPA)

The Jordan Pharmaceutical Association was established in 1957. The mandate of the Association is to protect the rights of the profession and organizing it; cooperation with the Ministry of Health, and all concerned parties in order to leverage pharmaceuticals and drugs services and make them available to the public; and encouraging scientific research in general and in drugs development in particular.

The Association invests in its members in terms of capacity building programmes, and in finding employment for unemployed pharmacists. The association formed several committees that cater for the different requirements of the association and its members. These committees include: Committee of female pharmacists affairs, Scientific Committee, Drug stores owners Committee, and Medical Committee. Most of these Committees are also formed in different Governorates of the country.

The Association employs 26 persons, out of which BA/BSc Degree Holders represent 50%, Diploma degree holders represent around 34.6%, and below diploma 15.4%. The Association finances itself fully.

2.9.5. Jordan Dental Association (JDA)

The Jordan Dental Association was established in 1953. The mandate of the Association is to protect the rights of the profession and organizing it. The association formed several committees that cater for the different requirements of the association and its members. These Committees include: Scientific and continuous education Committee, Profession's Committee, and Female Dentists affairs Committee. Most of these Committees are also formed in different Governorates of the country.

The Association employs 16 persons, out of which BA/BSc Degree Holders represent around 31.3%, Diploma degree holders represent around 37.5%, and below diploma 31.3%.

The total Budget of the Association is 290 thousand JD, out of which salaries account for around 20.7%, projects other than R&D 51.7%, and other activities 27.6%. The Association finances itself fully.

2.9.6. Jordan Engineers Association (JEA)

The Jordan Engineers Association was established in 1953 under the name Jordan Engineers Society. The Association shall exercise its activities aiming at the realization of its objectives that include:

- To organize the practicing of the profession with a view to elevation of its scientific and professional levels and the exploiting thereof for the benefit of economic, civilized and national mobilization.
- To elevate the engineers scientific and professional level and to stimulate and support the engineering scientific research.
- To contribute to the planning and development of the engineering education and training, industrial and professional programs, and to endeavor to elevate the efficiency of those working in the engineering field.
- To cooperate and coordinate with the official entities with Kingdom in the capacity of the Association as a consultative body in its field of specialization.

The JEA is a main Partner in JIC (Jordan innovation Centre for Engineers & Industrial Enterprises - a business incubator located at the Royal Scientific Society premises). Moreover, JEA supports engineers who submit papers in conferences outside and inside Jordan. JEA also

participates in providing Awards for engineering graduating students for the best graduation projects at engineering colleges.

The engineers Training Center (ETC) at Jordan Engineers Association (JEA) was established on the first of January 1997 to assume the role of serving the JEA objectives in the fields of continuing education and professional development of Jordanian engineers in an institutionalized form. Training courses can be classified under two main categories:

- Specialized courses in the fields of: Civil Engineering, Architectural Engineering, Electrical Engineering, Mechanical Engineering, Chemical Engineering and Metallurgy and Mining.
- General Courses in Quality Management and Specifications, Marketing, Technical Writing, English Language, Engineering Management and Computing.

JEA Council formed about 33 committees working in JEA to assist them to serve engineers in engineering sciences, and social aspects for engineers. Around 1000 engineers are working as volunteers in these committees. These committees include: Engineering Practice, Training & Employment, New Technology, Information Technology, Energy, Environment, Degrees Accreditation, Engineering Magazine (Al-Muhandis AL urduni), Water, and National Industry support committee. These committees usually organize activities that include specialized engineering conferences, specialized scientific days & seminars, exhibitions, and site visits.

The total number of employees of the association is 201, out of which around 2% are Masters Degree holders, 51.7% are holding BA/BSc degrees, 17.9% are holding diploma, and 28.4% are with qualifications below diploma.

The 2006 budget of the association is 1.09 million JD, out of which around 91.7% goes for salaries, 4.6% for R&D, and the rest goes to other projects and laboratory equipment. The Association finances it self fully.

2.10. Business associations

The government has been strongly encouraging and supporting the founding of business associations as official bodies representing and lobbying for the interests of SMEs in various sectors. Today, there are many business associations in Jordan. Among them are the:

2.10.1. Amman Chamber of Industry (ACI)

ACI was established in 1962 by law No. 41/1949. The objective of ACI is to provide its members with trade services including the issuance of certificates of origin, services related to improvement of the capabilities of industries including up to date information on international industrial development, and representing their members in inside and outside the country. The main activities of the ACI include the examination of laws and regulations pertaining to industrial activity to ensure fair and active legal representation for industry, continuous improvement of the management capabilities of middle and senior industrial managers with the aim of improving the performance of their industries (this is done through Euro Jordanian Advanced Business Institute EJABI which was recently established in cooperation with Euro-

Jordan Action for the Development of Enterprises – EJADA), cooperating with the government in enacting laws, regulations and procedures pertaining to the economy as a whole and specifically to the industrial sector, organizing and sponsoring workshops, lectures, seminars, conferences and training programs on economic issues and topics of practical relevance to industrialists, and organizing business delegations abroad aiming at strengthening international cooperation, promoting investment and trade, locating markets for Jordanian products and encouraging joint ventures.

The total number of employees of the ACI is 42, out of which Masters Degree holders represent around 4.8%, BA/BSc 38.1%, Diploma holders 26.2%, and below diploma 31%. The ACI finances itself fully.

2.10.2. Irbid Chamber of Industry.

Irbid Chamber of Industry was established in 1998. It is governed by industrial Chambers law. The Chamber mandate is to serve the interest of investors & industrialists in Irbid governorate in the northern of Jordan. This is accomplished through the different committees of the Chamber and through activities which cover training courses for human resources development, organizing exhibitions, and facilitating the participation of local industries in international fairs.

The number of employees of the Chamber is 16, out of which Masters degree holders represent around 19%, BA/BSc holders 12.5%, Diploma holders 37.5%, and below diploma 31.3%. The Chamber finances itself fully.

2.10.3. Zerqa Chamber of Industry.

Zerqa Chamber of Industry was established in 1998 according to Industrial Chambers Law No. 41/1949. The main activities of the Chamber include, lobbying on behalf of chamber's members interests; enhancing competitiveness of member companies; provision of export support services; developing relationships with other business associations and chambers; provision of networking and partnering services to members at national level; and attracting investment opportunity in Zerqa and Mafraq areas (eastern Jordan).

The total number of employees at the Chamber is 18, out of which BA/BSc Holders represent 38.9%, Diploma Holders 22.2%, and below diploma 38.9%. The Chamber finances it self fully.

2.10.4. Other business associations

Jordanian American Business Association (JABA), which fosters business relationships between Jordan and the USA.

Jordan Association for Pharmaceuticals Manufacturers (JAPM) is a voluntary non-profit association dedicated to develop Jordanian pharmaceutical industry into world class competitive standards. It strives to develop affordable pharmaceutical care solutions and enable Jordanian pharmaceutical companies to be global players.

Int@j is a voluntary non-profit, private organization whose mission is to effectively represent, promote and advance the Jordanian software and IT services industry in the global market- the association is a strong lobbying voice for the industry, and the government has reacted positively allowing plenty of opportunity for change in legislation and marketing policies.

JOSTONE is committed towards ensuring an ethical lucrative and sustainable Stone Industry. It recommends methods of successful export markets entry and assist in this process. It aims to accomplish significant and sustainable number of exports, launch and establish JOSTONE as a healthy and a strong association supports Jordanian Stone and Marble firms to enhance their readiness to export, and identify new market opportunities.¹²

The government works closely with many of the associations on increasing their sectors/members competitiveness to enhance the growth performance of the Jordanian economy.

2.11. Jordan's Annual Science Weeks

Jordan's *Annual Science Week* is a forum for dialogue and participation in the deliberation of national developmental issues and the development of the national S&T base. The week therefore enjoys broad-based participation from both the public and private sectors of the Jordanian science and technology community.

The following table shows some information about the last three Science weeks with the main theme and the executive programmes came out from each of them.

Table 2-2. Last three Science Weeks

SCIENCE WEEK	THEME	EXECUTIVE PROGRAM
9th/2003	The Role of Biotechnology in the Jordanian Economy	National Virtual Center for Biotechnology.
10th/2004	Horizons of Advanced Materials and Technologies	National Network for Advanced Materials and Nano-Technology.
11th/2005	Revitalization of National Innovation System	National Networks: Oil Shale, Water and Energy Conservation.

It is a successful and influential outreach activity managed by the HCST's General Secretariat.

The Jordan Science Week is organized each year with the aim of giving the chance to all concerned institutions and individuals to discuss important developmental issues with reference to the role of science and technology in contributing to the proper implementation of projects and initiatives stemming out of these developmental issues.

¹² All references in this section on other business associations comes from MED BEST Process in Jordan, Country report, Competitiveness Unit, Ministry of Planning and International Cooperation, May 2004.

Therefore, this activity can be looked at as a brainstorming forum in which extensive and specialized discussions take place and which comes up with a set of working programs for the benefit of economic development in Jordan.

The following table gives more detailed information about each of the science weeks organized so far.

Table 2-3. Jordanian Science Weeks

	Date	Title	Participants
First Week	1993	Science and Technology in the Service of Development: Towards more Self-Dependency	256
Second Week	1994	National Science and Technology Policy and the Role of Defence Resources in the Service of Development	350
Third Week	1995	Earth Resources- Towards Optimal Utilization	400
Fourth Week	1996	Man & Earth “Human Resources Towards Balance “Earth Resources Towards Integration”	30 Institutions
Fifth Week	1997	Developing Competitive Capability in Jordan (Quality, Productivity, Transparency & Accountability)	Around 200
Sixth Week	1998	National Human Resources Strategy	Around 200 from 90 institutions
Seventh Week	2001	Science and Technology: A means for investment incentives and sustainability	
Eighth Week	2002	Role of entrepreneurship in development.	
Ninth Week	2003	The role of biotechnology in development.	
Tenth Week	2004	The role of advanced materials in the Jordanian economy.	
Eleventh Week	2005	of the National Innovation System: Towards Enhancing the Competitiveness of the Jordanian Economy.	

According to the General Secretariat, these gatherings have had a real impact on S&T in Jordan. For example, the output of the Third Week, dealing with the utilization of earth resources, helped the Higher Council orient its 1996 program of research support towards Earth Resources and the Sixth Week made significant inputs into the National Human Resource Strategy which was ultimately adopted by the Cabinet as official government policy.

Rather surprisingly, there is no web site carrying information on these important events.

Chapter 3. Human resources devoted to research and development

3.1. Introduction

For the purposes of this study, statistical data on human resources devoted to research and development in Jordan was collected from relevant national institutions. The following studies, annual reports, and yearbooks issued by such institutions formed the data base covered in this chapter:

- a. National Scientific and Technological Requirements and Potential Study/ Second Stage-S&T Potential Study issued by the General Secretariat of the Higher Council for Science and Technology (HCST), May 2005.
- b. Statistical Yearbook for the Year 2004, issued by Department of Statistics, 2005.
- c. The Annual Statistical Report on Higher Education in Jordan for the year 2003/2004. Report issued by Statistics Section – Directorate of Studies and Planning/ Ministry of Higher Education and Scientific Research, 2005.

It should be noted that data contained within above reports is based on questionnaires conducted especially for relevant purposes during the time duration of 2003 to 2004.

3.2. Human Resources in S&T Activities

The study of national R&D potential conducted by HCST (item 1/a above) covered (1583) scientific and technological units¹³ in Jordan that are situated within (681) national institutions including both private and public sectors such as governmental and private universities, scientific centers, governmental ministries and institutions , and private institutions (companies, factories, consultation officesetc).

Scientific and technological activities covered by the above study include the following:

- a. Basic research
- b. Applied research and technological development
- c. Education and training
- d. Scientific and technological services such as information and documentation, laboratory testing, standards and specifications, quality control, maintenance and spare parts, technical and management consultations, national and international accreditations, patenting,...etc.

¹³ A scientific and technological unit is defined as the smallest part of an institution that can conduct integrally scientific and technological activities. See: National Scientific and Technological Requirements and Potential Study/ Second Stage-S&T Potential Study issued by the General Secretariat of the Higher Council for Science and Technology (HCST), May 2005.

3.2.1. Categories of S & T Human Resources.

The study classified human resources working in the above defined scientific and technological activities into four categories: scientists & engineers, technicians, technical staff, and management staff¹⁴. Data given in Table (1) indicate that 42 thousand persons worked in scientific and technological activities in 2003, out of which 15,800 were scientists & engineers. Technical staff and technicians reached nearly 20,000 persons.

Table 3-1
Human Resources Working in Scientific and Technological Activities
(Public & Private Sectors 2003/2004)

Human Resources Category	Numbers	%
Scientists & Engineers	15799	37.6
Technicians <small>(see note 14)</small>	6352	15.1
Technical Staff	12970	30.8
Management Staff	6940	16.5
Total	42061	100.0

Source: S & T Potential Study, Higher Council for Science and Technology, 2005.

3.2.2. Distribution According to Economic Activity

Moreover, Table (2) shows the distribution of the 42 thousand of persons according to the major economic activity of the institutions, which the scientific and technological units belong to. The highest percentage is located in the manufacturing sector (37%), followed by the education sector (28%). Public administration accounted for 7.2% and all other services occupied 8,500 persons (20%).

3.3. Distribution of Researchers

For the purposes of this study, scientists and engineers that are working in the scientific and technological activities were considered as “researchers”. As given in Table (2), the total number of researchers who work in both private and public sectors is almost 15,800, out of which 48% are working in public institutions.

Table 3-2
Categories of Human Resources: Distribution by Major Economic Activity
(Public & Private Sectors 2003/2004)

Major Economic Activity of Institution	Numbers of Human Resources Categories in S&T				Total	%
	Scientists & Engineers	Technicians	Technical Staff	Management Staff		
Manufacturing	1937	2540	9263	1665	15405	36.6
Wholesale & Retail Trade	396	462	532	583	1966	4.7
Financial Intermediation	507	183	39	187	916	2.2
Real Estate ,Renting & Business Activities	1993	413	475	455	3336	7.9

¹⁴ In Jordan “technicians” refers to Personnel with High School degree in vocational areas, or Three year diploma in a vocational training institution. “Technical staff” refers to personnel with a Community college or equivalent degree in any field of knowledge.

Public Adm.,Defence &Compulsory Social Security	1471	681	406	493	3049	7.2
Education	7621	958	685	2549	11813	28.1
Health &Social Work	546	372	81	178	1177	2.8
Other Community, Social & Personal Service Activities	273	121	356	361	1111	2.6
Other Economic Activities	1055	622	1142	469	3286	7.8
Total	15799	6352	12970	6940	42061	100.0
%	37.6	15.1	30.8	16.5	100.0	

Source: S & T Potential Study, Higher Council for Science and Technology, 2005.

3.3.1. Researchers According to Economic Activity

The distribution of researchers, according to the major economic activity of the institutions they are working in, is given in Table (3). Most researchers work in education; manufacturing occupies only 12% of the researchers. All services occupy 3,717 researchers (48.5%), while public administration occupies 1,469 researchers (9%).

Table 3-3
Distribution of Researchers in Public & Private Sectors According to Major Economic Activity

Major Economic Activity of Institution	Numbers	%
Manufacturing	1937	12.3
Wholesale &Retail Trade	398	2.5
Financial Intermediation	507	3.2
Real Estate ,Renting &Business Activities	1993	12.6
Public Adm.,Defence &Compulsory Social Security	1469	9.3
Education	7621	48.2
Health &Social Work	546	3.5
Other Community, Social & Personal Service Activities	273	1.7
Other Economic Activities	1055	6.7
Total	15799	100.0

Source: S & T Potential Study, Higher Council for Science and Technology, 2005.

In the public sector, the percentage of researchers working in the education sector is the highest, as it reached (62%), followed by those working in public administration (19%). All service sectors occupy 12% of public sector researchers. (Table 4)

Table 3-4
Distribution of Researchers in Public Sector According to Major Economic Activity

Major Economic Activity of Institution	Numbers	%
Manufacturing	53	0.7
Wholesale &Retail Trade	87	1.1
Financial Intermediation	65	0.9

Real Estate ,Renting &Business Activities	493	6.4
Public Adm.,Defence &Compulsory Social Security	1469	19.2
Education	4715	61.7
Health &Social Work	65	0.9
Other Community, Social & Personal Service Activities	213	2.8
Other Economic Activities	479	6.3
Total	7639	100.0

Source: S & T Potential Study, Higher Council for Science and Technology, 2005.

3.3.2. Researchers According to Field of Study

Table (5) shows the distribution of total researchers, in public and private sectors, according to the field of study. Around one third (33%) of researchers acquired their degrees in the field of engineering sciences, followed by 13% in the field of mathematics and computer sciences, 10% in the field of medicine sciences, 9% in the field of commercial and business administration, 8% in the field of natural sciences, and 7% in the field of humanities and religious sciences.

Table 3-5
Distribution of Researchers in Public & Private Sectors According to Field of Study

Field of Study of Researchers	Numbers	%
Education Science	566	3.6
Humanities, Religion Science	1156	7.3
Social & Behavioral Science	799	5.1
Commercial and Business Administration	1346	8.5
Natural Sciences	1193	7.6
Mathematics & Computer	2122	13.4
Medicine Science	1589	10.0
Engineering Science	5160	32.7
Agriculture Science	836	5.3
Others *	1032	6.5
Total	15799	100.0

*Others include Law, Fine and Applied Arts, Mass Communication &Doc. ,Pharmacy ,Physical Education, Dentistry, Architecture &Town Planning, Applied Engineering , and Veterinary M.

Source: Annual Statistical Report on Higher Education in Jordan (2003/2004), Ministry of Higher Education & Scientific Research , 2005.

Table (6) indicates that around on quarter of public sector researchers acquired their degrees in the field of engineering sciences, 13% in the field of mathematics and computer, and around 9% in each of the fields of humanities & religious sciences, medicine sciences, and agriculture sciences.

Table 3-6
Distribution of Researchers in Public Sector According to Field of Study

Field of Study of Researchers	Numbers	%
Education Science	425	5.6
Humanities, Religion Science	704	9.2
Social & Behavioral Science	554	7.3
Commercial and Business Administration	459	6.0
Natural Sciences	612	8.0

Mathematics & Computer	977	12.8
Medicine Science	678	8.9
Engineering Science	1943	25.4
Agriculture Science	667	8.7
Others *	620	8.1
Total	7639	100.0
*Others include Law, Fine and Applied Arts, Mass Communication &Doc. ,Pharmacy ,Physical Education, Dentistry, Architecture &Town Planning, Applied Engineering , and Veterinary M.		

Source: Annual Statistical Report on Higher Education in Jordan (2003/2004), Ministry of Higher Education & Scientific Research, 2005.

3.4. Academic Staff and Enrolled Students in Universities.

The Annual Statistical Report on Higher Education in Jordan (2003/2004) issued by Ministry of Higher Education and Scientific Research¹⁵ covered twenty governmental and private Jordanian universities. The following paragraphs will highlight some statistics about the academic staff and enrolled students in the Jordanian universities, and their distribution according to universities, sex, academic rank, and field of acquired degrees.

3.4.1. Academic Population According to Universities and Sex

All academic ranks of academic staff are covered in table (3-7) including full professor, associate professor, instructor, lecturer, and teaching & research assistant. Enrolled students of all degrees are covered in table (3-7) including B.A/ B.Sc, higher diploma, M.A/M.Sc., and ph.D.

Table 3-7
Distribution of Academic Staff and Enrolled Students in the Jordanian Universities (Female & Total) for the Academic Year 2003-2004

University	Academic Staff			Enrolled Students		
	Female	Total	%	Female	Total	%
Jordan University	173	1008	17.7	18837	32317	18.2
Yarmouk University	87	721	12.7	11084	19896	11.2
Science & Technology University	106	626	11.0	6880	15330	8.6
Mutah University	65	580	10.2	10391	17237	9.7
Al-al Bayt University	19	187	3.3	7524	13670	7.7
The Hashemite University	82	357	6.3	8249	14393	8.1
Al- Balqa Applied University	25	258	4.5	7003	13195	7.4
Al-Hussaen Bin Talal University	8	78	1.4	2326	3561	2.0
Amman Private University	29	189	3.3	1455	5131	2.9
Philladelphia University	63	319	5.6	1448	7307	4.1
Al-Isra University	34	195	3.4	1586	5314	3.0
Applied Science University	40	273	4.8	1757	6173	3.5
Jerash Private University	16	160	2.8	1741	4242	2.4
Al-Zaytoonah University	51	217	3.8	1866	7012	4.0
Irbid National University	15	99	1.7	1353	3918	2.2

¹⁵ The Annual Statistical Report on Higher Education in Jordan for the year 2003/2004. Report issued by Statistics Section – Directorate of Studies and Planning/ Ministry of Higher Education and Scientific Research, 2005.

Zarka Private University	17	150	2.6	2040	4222	2.4
University of Petra	72	191	3.3	1395	3172	1.8
Princess Sumaya University	2	50	0.9	242	889	0.5
Jordanian Academy of Music	3	17	0.3	15	31	0.1
Educational Science Faculty	5	21	0.4	357	501	0.3
Total	912	5696	100.0	87549	177511	100.0
%	16%		100%	49.3		100%

Source: Annual Statistical Report on Higher Education in Jordan (2003/2004), Ministry of Higher Education & Scientific Research , 2005.

Total number of academic staff including all academic ranks in public and private Jordanian universities is 5,696, out of which 16% are females.

Jordan University has the larger academic staff (18% of total), followed by Yarmouk University (13%), Science and Technology University (11%), and Mo`tah University (10%). Academic staff in other universities range between 6% and 0.3% of national academic staff.¹⁶

Total number of all enrolled students including all degrees is 177,511 students, out of which around 49% are females.

Jordan University represents the largest percentage of enrolled students (18%) followed by Yarmouk University (11%) and Mo`tah University (10%). Four universities represent between 8% and 7% of the student population. (Jordan Science and Technology University, Al Al-Bayet University, the Hashemite University, and Al Balqa Applied University). All other universities have much smaller student populations.

3.4.2. Academic Population According to Field of Study

Table (8) shows the distribution of academic staff of all academic ranks according to the field of their acquired studies (according to department), and enrolled students of all degrees according to the field of study. Moreover, the table gives also the ratio of students to academic staff in each field..

Table 3-8
Distribution of Academic Staff & Enrolled Students in Universities by Field of Study

Field of Study		Academic Staff	Students	Students / Academic Staff
Education Science	Nbr.	321	26891	84:1
	%	5.6	15.1	
Humanities, Religion	Nbr.	1008	28928	29:1
	%	17.7	16.3	
Law	Nbr.	165	6432	39:1
	%	2.9	3.6	
Social & Behavioral Science	Nbr.	285	6971	24:1
	%	5.0	3.9	
Commercial and Business Administration	Nbr.	626	30183	48:1
	%	11.0	17.0	
Natural Sciences	Nbr.	566	8826	16:1

¹⁶ The Statistics cited above contain more indicators regarding percentage of female academic staff in each university out of all universities, and out of all staff within that university.

	%	9.9	5.0	
Mathematics & Computer	Nbr.	715	22228	31:1
	%	12.6	12.5	
Medicine	Nbr.	274	3256	12:1
	%	4.8	1.8	
Pharmacy	Nbr.	183	5050	28:1
	%	3.2	2.8	
Para- Medical Science	Nbr.	257	7352	29:1
	%	4.5	4.0	
Engineering	Nbr.	690	19828	28:1
	%	12.1	11.2	
Agriculture	Nbr.	192	3367	18:1
	%	3.4	1.9	
Others *	Nbr.	414	8745	21:1
	%	7.3	4.9	
Total	Nbr.	5696	177511	31:1
	%	100.0	100.0	
*Others include Fine and Applied Arts, Mass Communication &Doc., Physical Education, Dentistry ,Architecture &Town Planning, Applied Engineering ,and Veterinary M.				

Source: Annual Statistical Report on Higher Education in Jordan (2003/2004), Ministry of Higher Education & Scientific Research , 2005.

a. Academic staff is mainly located in humanities and religion (18%), followed by the fields of mathematics & computer sciences (13%), engineering (12%), and commercial and business administration (11%).

b. Students are mainly studying in the field of commercial and business administration (17%), humanities and religion (16%), education sciences (15%) mathematics & computer (13%), and engineering (11%).

c. Ratio of students to academic staff is 84 to one in the field of education sciences, followed by a ratio of 48 to one in the field of commercial and business administration, law (39:1). Humanities & religion (29:1), para-medical sciences (29:1), engineering and pharmacy (both 28:1) have similar ratio of students to academic staff.

3.4.3. Academic Staff by Ranks of Staff and Fields of Study

The distribution of the different academic ranks of academic staff in the Jordanian universities according to field of study is shown in Table (3-9).

Table 3-9

Distribution of Academic Staff in the Jordanian Universities for the Year 2004

Field of Study	Full Prof.	Associate Prof.	Assistant Prof.	Instructor	Lecturer	Teaching & Research assistant	Total
Education	Nbr. 60	68	130	36	25	2	321

Science	%	18,7%	21,2%	40,5%	11,2%	7,8%	0,6%	5,6%
Humanities, Religion	Nbr.	175	167	440	120	68	38	1008
	%	17,4%	16,6%	43,7%	11,9%	6,7%	3,8%	17,7%
Social & Behavioral Science	Nbr.	59	74	87	32	25	8	285
	%	20,7%	26,0%	30,5%	11,2%	8,8%	2,8%	5,0%
Commercial and Business Administration	Nbr.	52	140	264	109	41	20	626
	%	8,3%	22,4%	42,2%	17,4%	6,5%	3,2%	11,0%
Natural Sciences	Nbr.	146	110	156	29	37	88	566
	%	17,4	10,3	7,0	4,1	7,8	22,3	9,9%
Mathematics & Computer	Nbr.	35	95	284	163	49	89	715
	%	4,9%	13,3%	39,7%	22,8%	6,9%	12,4%	12,6%
Medicine	Nbr.	64	55	125	2	19	9	274
	%	23,4%	20,1%	45,6%	0,7%	6,9%	3,3%	4,8%
Pharmacy	Nbr.	26	32	68	23	12	22	183
	%	14,2%	17,5%	37,2%	12,6%	6,6%	12,0%	3,2%
Para-Medical Science	Nbr.	12	13	75	46	82	29	257
	%	4,7%	5,1%	29,2%	17,9%	31,9%	11,3%	4,5%
Engineering	Nbr.	94	154	290	57	54	41	690
	%	13,6%	22,3%	42,0%	8,3%	7,8%	5,9%	12,1%
Agriculture	Nbr.	56	51	61	7	6	11	192
	%	29,2%	26,6%	31,8%	3,6%	3,1%	5,7%	3,4%
Others*	Nbr.	60	108	237	79	57	38	579
	%	10,4%	18,7%	40,9%	13,6%	9,8%	6,6%	10,2%
Total	Nbr.	839	1067	2217	703	475	395	5696
	%	14,7%	18,7%	38,9%	12,3%	8,3%	6,9%	100.0
	%	14.7	18.7	38.9	12.4	8.4	6.9	100.0

*Others include Law, Fine and Applied Arts, Mass Communication & Doc., Physical Education, Dentistry, Architecture & Town Planning, Applied Engineering, and Veterinary M. Percentages represent the percentage of the academic rank inside each discipline.

Source: Annual Statistical Report on Higher Education in Jordan (2003/2004), Ministry of Higher Education & Scientific Research, 2005.

Assistant professors constitute the main body of the academic staff in Jordanian universities (39%), followed by associate professors (19%), and full professors (15%).

The fields of Agricultural sciences, Medicine and Social & Behavioral sciences have the highest percentage of full professors (29%, 23% and 20% respectively). The lowest percentage of full professors is in the fields of para-medics, Math & Computer sciences, and Business Administration (4,7%, 4,9% and 8,3%).

All ranks below associate professor can represent a substantially high percentage of the academic staff. This is the case of Para-medics (around 90% of the academic staff in the field),

Computer Sciences (around 80%). This percentage, which can be taken as an indicator of the share of the youngest population among the academic staff, is in the middle levels in business administration, pharmacy, engineering, literature & religion, education sciences. It is the lowest in Agricultural sciences (44% of the academic staff is below associate professor), natural sciences (55%), medicine (57%) and social and behavioural sciences (53%).

3.5. Employment in Public and Private Sectors

This part covers data based on the Statistical Yearbook 2004 issued by the Department of Statistics. The data presents the results of the 2003 Employment Survey carried out on a sample from all establishments of the public and private sectors except those working in the agricultural sector, armed forces, public security and civil defense. Distribution of employees by sex, educational level, and major economic activity is shown in the following paragraphs.

3.5.1. Distribution According to Major Economic Activity

Numbers of employees, both females and total, in the public and private sectors establishments in Jordan are given in Table (10), in addition to their distribution according to major economic activity. Total number of employees in public and private sectors is around 761,000, out of which around 21% are females.

Table 10
Distribution of Employees in Public & Private Sectors Establishments According to Major Economic Activity, 2003.

Major Economic Activity of Establishment		Female	Male	Total
Mining & Quarrying	Nbr.	234	6856	7090
	%	0.1	1.1	0.9
Manufacturing	Nbr.	17057	121696	138753
	%	10.9	20.2	18.2
Electricity, Gas & Water	Nbr.	722	13362	14084
	%	0.5	2.2	1.9
Constructions	Nbr.	668	20457	21125
	%	0.4	3.4	2.8
Wholesale & Retail Trade, Repair Of Motor Vehicles, Motorcycles, Personal & Household Goods	Nbr.	9384	164547	173931
	%	6.0	27.2	22.9
Hotels & Restaurants	Nbr.	1206	30279	31485
	%	0.8	5.0	4.1
Transport, Storage & Communications	Nbr.	2626	24044	26670
	%	1.7	4.0	3.5
Financial Intermediation	Nbr.	5246	12820	18066
	%	3.3	2.1	2.4
Real Estate, Renting & Business Activities	Nbr.	7210	28714	35924
	%	4.6	4.8	4.7
Public Adm., Defense & Compulsory Social Security	Nbr.	11173	71183	82356
	%	7.1	11.8	10.8
Education	Nbr.	72988	67395	140383
	%	46.5	11.2	18.5
Health & Social Work	Nbr.	21846	24871	46717
	%	13.9	4.1	6.1

Other community, Social & Personal Service Activities	Nbr. %	6673 4.2	17706 2.9	24379 3.2
Total	Nbr. %	157033 100.0	603930 100.0	760963 100.0
%		20.6	79.4	100.0

Source: Statistical Yearbook 2004 /Department of Statistic, 2005.

a. The highest percentage of employees, are working in wholesale & retail trade (23%), education (19%), and manufacturing activities (18%). All services sectors excepting education and public administration represent 46.9% of the total employment.

b. The highest percentage of female employees (47%) are working in the education sector, followed by around (14) in the health & social work sector, while the highest percentage of male employees (27%) are working in the sector of wholesale & retail trade, followed by manufacturing (20%). 54,191 females work in all service sectors (excepting education and public administration) (34,5% of total employed females) against 303,000 male workers (50% of total employed males).

3.5.2. Public Employment According to Educational Level

Numbers of employees in the public sector in Jordan, and their distribution according to their educational level, are given in Table (11).

The total employment in the public sector is around 253 thousand people, out of which 30% are female employees.

Around 80% of female employees have an education higher than “General Secondary” level, while this percentage drops down to (46%) for male employees.

The highest percentage of female employees (44%) has a B.A/B.Sc. degree, followed by 30% with Intermediate Diploma. On the other hand, the highest percentage of male employees 37% has an education less than General Secondary, followed by around (26%) with a B.A/B.Sc. degree.

Table 11
Distribution of Employees in Public Sector Establishments According to Educational Level and Sex, 2003

Educational Level		Female	Male	Total
Illiterate/ Read and write	.Nbr	1204	6896	8100
	%	1.6	3.9	3.2
Less than Secondary	.Nbr	6710	64902	71612
	%	8.7	36.8	28.3
Vocational Apprenticeship	.Nbr	118	2497	2615
	%	0.1	1.4	1.0
General Secondary	.Nbr	7682	20253	27935
	%	10.0	11.5	11.0
Intermediate Diploma	.Nbr	22603	22652	45255
	%	29.4	12.8	17.9
B.A/ BSc.	.Nbr	34098	45635	79733
	%	44.4	25.9	31.5
Higher than B.A / BSc.	.Nbr	4311	13559	17870

	%	5.6	7.7	7.1
Total	.Nbr	76726	176394	253120
	%	100.0	100.0	100.0
%		30.3	69.7	100.0

Source: Statistical Yearbook 2004 /Department of Statistic, 2005

Chapter 4. Financial resources devoted to research

4.1. Introduction

As mentioned previously in chapter 3, the national R&D potential study conducted by HCST covered 1,583 scientific and technological units in Jordan including public and private sectors. These units conducted scientific and technological activities within four main categories: basic research, applied research and technological development, education & training, and scientific and technological services.

The expenditures of the units on scientific and technological activities in Jordan are shown in Table (12). Total expenditures were around 500 million J.D, out of which around 23 million J.D goes to research and development (4.6% of total expenditure on S&T).

Table 12

Expenditure of S&T Units in Jordan According to Type of S&T Activities (2003-2004)

Scientific & Technological Activities	Expenditure (Thousand J.D)	%
Basic Research (1)	883	0.2
Applied Research and Technological Development (2)	21995	4.4
Research and Development (1+2)	22878	4.6
Education and Training	105903	21.3
S&T Services	367829	74.1
Total	496660	100.0

Source: S & T Potential Study, Higher Council for Science and Technology, 2005.

4.2. Expenditure on Basic and Applied R&D

The distribution of expenditure on R&D activities (basic & applied) according to major economic activity of institutions is shown in Table (13).

Expenditure on R&D activities is around 23 million J.D, out of which 4% only goes to basic research, while most (96%) goes to applied research and technological development. It is the

public administration & defense sector that is responsible for most expenses, largely ahead with almost 7,3 thousands J.D. (32% of R&D expenses), followed by the manufacturing sector with 5,4 millions J.D (24%) and business services with 3.9 millions J.D. (17.3%)¹⁷. Education spends 3.3 millions J.D. and other social services account for more than 2.9 millions J.D. (about 12.8% of R&D expenditures).

Basic research is mainly executed by institutions in education, mainly universities (92% of basic research). All other sectors (mainly business activities and manufacture) spend around (8%). Remarkably, public administration and other sectors do not declare any basic research (but see institutions in Universities that have developed strong linkages between University sector and other economic activities in chapter 2, section 2.6).

On the other hand, 7.2 million J.D. is spent by institutions in public administration on applied research and technological development (33% of that type of expenses) The manufacturing sector represents 25% of applied research and technological development (while representing only 1% of basic research expenses), followed the business services activities (around 12% of applied research and technological development), and education (11%).

Table 3-13
Distribution of R&D Expenditure in Jordan According Major Economic Activity (2003-2004)

Major Economic Activity of Institution	Basic Research %	Applied Research %	Total	
			Value (Thousand JDs)	%
Manufacturing	1.0	24.6	5417	23.7
Financial Intermediation	-	5.9	1288	5.6
Real Estate ,Renting &Business Activities	6.9	11.8	2659	11.6
Public Adm, Defense &Compulsory Social Security	-	33.0	7268	31.8
Education	92.1	11.4	3325	14.5
Health & Social Work	-	2.4	518	2.3
Other community, Social & Personal Service Activities	-	2.9	634	2.8
Other Economic Activities	-	8.0	1769	7.7
Total	883	21995	22878	100.0
%	3.9	96.1	100.0	

Source: S & T Potential Study, Higher Council for Science and Technology, 2005

4.3. R&D Expenditure of Private & Public Sectors

Expenditure on R & D (both basic and applied)according to major economic activity of private and public institutions is shown in Table (14).

¹⁷ Business sectors sums real estate, renting & business activities and financial activities.

Table 14
Distribution of Expenditure on R&D Activities in Jordan by Different Sectors According to
Major Economic Activity(2003-2004)
(Thousand JDs)

Major Economic Activity of Institution	Public		Private		Others		Total	
	Value	%	Value	%	Value	%	Value	%
Manufacturing	7	0.1	5149	62.0	261	19.9	5417	23.7
Financial Intermediation	272	2.0	911	11.0	105	8.0	1288	5.6
Real Estate ,Renting &Business Activities	2009	15.1	520	6.2	130	9.9	2659	11.6
Public Adm, Defense &Compulsory Social Security	7268	54.8	-	-	-	-	7268	31.8
Education	2251	17.0	1043	12.5	31	2.4	3325	14.5
Health &Social Work	220	1.7	298	3.6	-	-	518	2.3
Other community, Social & Personal Service Activities	438	3.3	196	2.4	-	-	634	2.8
Other Economic Activities	795	6.0	191	2.3	783	59.8	1769	7.7
Total	13260	100.0	8308	100.0	1310	100.0	22878	100.0
%	58.0		36.3		5.7		100.0	

Source: S & T Potential Study, Higher Council for Science and Technology, 2005

The public sector has the highest percentage of expenditure (58%) as compared to around 36% by the private sector.

Public adm. defense & compulsory social security is mainly responsible for expenss in the public sector (55%), followed by education (17%), and business services activities (around 17%).

Within the private sector, manufacturing activities are responsible for most expenditures on R&D (62%), followed by private education (around 13%), and business services (17.2%).

Institutions, other than public or private, have the highest expenditures on R&D in manufacturing activities (around 20%), followed by business service activities (around 18%).

4.4. R&D Expenditure of Universities

Expenditure on R&D activities by Jordanian universities during 2002 is given in Table (15). It should be noted that not all universities are included in the table, but only those which responded to the questionnaire prepared for this purpose during the survey conducted by HCST for the S&T potential study.

Table 15
Expenditure on R&D Activities in Universities (Thousand JDs) During 2002.

University	Basic Research	Applied Research	Total	%
The Hashemite University.	20	110	130	4.4

Jordan University	150	355	505	17.2
Amman Arab University for Graduate Studies	0	22	22	0.7
Amman Private University.	50	100	150	5.1
Irbid Private University.	0	13	13	0.4
Al-Isra University	0	94	94	3.2
Al- Balqa' Applied University	15	90	105	3.6
Al-Zarqa' Private University	0	30	30	1.0
Mu'tah University	64	65	129	4.4
Al-AlBayet University	0	31	31	1.1
University of Perta	20	40	60	2.0
Al-Hussein Bin Talal University	0	9	9	0.3
Al-Zaytoonah University	0	76	76	2.6
Science and Technology University	405	443	848	28.8
Yarmouk University	78	56	134	4.6
Jarash Private University	0	11	11	0.4
Philadelphia University	0	330	330	11.2
Princess Sumaya University	0	31	31	1.1
Applied Science University	11	222	233	7.9
Total	813	2128	2941	100.0
%	27.6	72.4	100.0	

Source: S & T Potential Study, Higher Council for Science and Technology, 2005.

Expenditure on both basic and applied research reaches an amount of three millions J.D, where around (72%) of it goes to applied research and technological development.

Jordan Science and Technology University (JUST) has the highest percentage of expenditure on both basic and applied research (30% of total expenditure by universities). It has also the more balanced expenditures between basic and applied research. It is followed by Jordan University (17%). Philadelphia University is the only University showing very high levels of expenditure on R&D (11% of total) but spends nothing on basic research. Yarmouk University on the contrary, has a more even distribution of funds between basic and applied but still spends only 134 thousand J.D. on R&D activities (4.6%).

4.5. R&D Expenditure of Scientific Research Centers

Expenditure on R&D activities carried out by scientific centers in Jordan during 2002 is given in Table (16). Only those institutions that responded the HCST survey are reported here. as in section 4.4 above.

Table 16
Expenditure on R&D Activities in Scientific Centers (2002).
(Thousand JDs)

Scientific Centers	Basic Research	Applied Research	Total	%
Royal Scientific Society	0	728	728	35.5
The National Center for Human Resources Development	0	132	132	6.4

The National Center for Agricultural Research and Technology Transfer	0	1000	1000	48.8
Jordan Institute of Diplomacy	0	5	5	0.2
Jordan Badia Research and Development Center	0	91	91	4.4
Pharmaceutical Research Unit	31	62	93	4.5
Total	31	2018	2049	100.0
%	1.5	98.5	100.0	

Source: S & T Potential Study, Higher Council for Science and Technology, 2005.

Expenditure on both basic and applied research by scientific centers reached an amount of two millions J.D. Basic research represents only 1.5%, while applied research and technological development consumed the large portion of total expenditure (98.5%). Among public research centers, it was only the Pharmaceutical Research Unit that reported expenses in basic research.

The National Center for Agricultural Research and Technology Transfer is by far the largest center (one million J.D.), which accounts for nearly 49% of total, followed by the Royal Scientific Society for 700 thousand J.D. (36%).

4.6. R&D Budget (2006) of Universities

During the first quarter of 2006 HCST distributed a short questionnaire prepared for the purpose of this study, to universities, scientific centers, and some other relevant national institutions. The questionnaire covered 2006 R&D budget as a main section under which items such as salaries & wages, R&D projects, other projects (mainly construction projects), and laboratory equipment are included. In this chapter, although the budget allocated for R&D projects will be our main concern, other items (salaries, equipment, and facilities) are also shown. Table (17) reports these figures on budgets

Direct R&D budget (including R&D projects and laboratory equipment) of all universities totaled around forty million J.D., out of which 55% is allocated for R&D projects, and 45% for lab. equipment.

Jordan University still spends the highest budget on R&D direct spending (more than 5 million J.D.) followed by JUST (nearly 2.8 millions J.D.) and the Hashemite University (2.6 millions J.D.). Six universities have declared spending in R&D between 1 to 2 millions J.D.¹⁸ and other universities ranged below half million J.D.

Table 17
Research and Development Budget Indicators of Universities for the Year (2006)
(Thousand J.D)

	Direct R&D Budget Indicators	Other R&D Budget Indicators
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¹⁸ Al-al Bayt University; Al-Hussein Bin Talal University; Mutah University; Tafila Technical University; Al Balqa Applied University; Amman Arab University for Graduated Studies.

University	R&D projects	Lab. Equip.	Total	%	Salaries	Other Projects
Jordan University	5295	3838	9133	23.2	59158	9021
Yarmouk University	300	1733	2033	5.2	22782	-
Science & technology University	2780	3165	5945	15.1	29410	8165
Mutah University	1332	294	1626	4.1	27564	1855
Al-al Bayt University	2000	1000	3000	7.6	10000	
The Hashemite University	2640	2566	5206	13.2	10830	9854
Al Balqa Applied University	1262	1339	2601	6.6	23407	7563
Al-Hussein Bin Talal University	1921	-	1921	4.9	5105	6100
Amman Arab University for Graduated Studies	1000	50	1050	2.7	2195	-
Applied Science University	343	183	526	1.3	7244	-
Al-Isra University	153	254	407	1.0	6077	215
Jerash Private University	250	493	743	1.9	2941	175
Al-Zaytoonah University	574	72	646	1.6	8126	
Irbid National University	168	200	368	0.9	2481	1872
Zarka Private University	81	150	231	0.6	3398	-
University of Petra	260	176	436	1.1	4850	965
Princess Sumaya University	150	142	292	0.7	1696	654
Tafila Technical University	1295	1990	3285	8.3	2995	2020
Total	21804	17645	39449	100.0		
%	55.3	44.7		100.0	230259	48459

Source: Questionnaire conducted by HCST, 2006.

Total allocated salaries (year 2006) of all universities reached an amount of nearly 230 million J.D., where Jordan University constituted nearly one fourth, followed by Jordan Science and Technology University, and Mo`tah University, and together almost formed the one fourth of the total salaries in Universities reporting here.

Other budget items covered mainly new construction projects such as colleges, laboratories, scientific and consultation centers, libraries ...etc. with a budget summing up to 49 million J.D. Detail in the table shows intense construction and supporting expenses activity in some universities with high budgets on this item.

4.7. R&D Budget (2006) of Scientific Research Centers

Research and development budget for the year 2006 of scientific centers in Jordan is shown in Table (18), gathered through a specific questionnaire that covered 2006 R&D budgets, including salaries & wages, R&D projects, other projects, and laboratory equipment as in table 17 above. Table 18 includes all centers either affiliated to HCST or not. Contrary to Universities figures of the 2006 budget are consistent with the 2002 figures reported in table (16).

Table 18
Research and Development Budget Indicators of Scientific Centers (2006)

(Thousand J.D)

Scientific Center	Direct R&D Budget Indicators				Other R&D Budget Indicators	
	R&D Projects	Lab. equip.	Total	%	Salaries	Other Projects
Royal Scientific Society	2391	-	2391	59.9	4437	1106
National Center for Human Resources Development	109	6	115	2.9	370	-
National Center for Agricultural Research and Technology Transfer	112	68	180	4.5	2071	-
Jordan Badia Research and Development Center	50	-	50	1.3	220	-
National Biotechnology Center	60	-	60	1.5	33	25
National Energy Research Center	34	43	77	1.9	324	-
Jordan Center for Public Policy Research & Dialogue	40	-	40	1.0	45	-
Pharmaceutical Research Unit	76	1000	1076	27.0	204	-
Total	2872	1117	3989			
%	72.0	28.0	100.0	100.0	7704	1131

Source: Questionnaire conducted by HCST, 2006.

Direct R&D budget (including R&D projects and lab . equipment) of all scientific centers is around four million J.D, out of which (72%) is allocated to fund R&D projects , and (28%) for lab. equipment.

The Royal Scientific Society is by far the largest centre (60% of total direct R&D budget), followed by the Pharmaceutical Research Unit with a percentage of 27%.

Total allocated budget for salaries is around seven million J.D, out of which around (58%) is allocated by The Royal Scientific Society, and (27%) by the National Center for Agricultural Research and Technology Transfer.

Only the RSS and the National Biotechnology Center that was newly created report construction projects for more than one million J.D.

Chapter 5. International cooperation in research

This section of the report covers international science and technology cooperation activities in Jordan. The first part includes information about S&T Agreements, Memorandums of Understanding (MOU), Programmes/Projects for which arrangements were done at the national level via the Ministry of Planning and International Cooperation.¹⁹ The second part covers some of the HCST and research centers international S&T cooperation activities. The third part focuses on universities, both public and private.²⁰

5.1. S&T cooperation under Ministry of Planning and International Cooperation

The Ministry of planning was established by law in 1984 as a substitute body for the national Council for Planning. Its mandate includes increasing the Gross Domestic Product growth rate; reducing the rate of poverty and unemployment; attaining development equilibrium among various districts and governorates; and developing efficiency and effectiveness in public sector performance. Table (3) shows the international S&T agreements/MoUs/Programmes/projects that Jordan is engaged in through the Ministry of Planning and International Cooperation.

Table 5-1. International S&T Cooperation via the Ministry of Planning and International Cooperation (MoPIC)

Initiative	Foreign Party	Jordanian Counterpart	Starting Date	Duration	Areas of Cooperation	Budget
Trans-European Mobility Scheme for University Students (TEMPUS)	EU	Ministry of Higher Education (EMPUS National Office)	2003	5 Years	Higher Education	6 Million Euro
MoU on S&T Cooperation	Pakistan	HCST	2001	5 Years	S&T Fields across the board	NA
Agreement on Cultural and Technical Cooperation	Italy	MoPIC	1999	Open	Enhancing Education and S&T	NA
Agreement on S&T Cooperation	Croatia	MoPIC	2004	5 Years	S&T Fields across the board	NA

¹⁹ A specific questionnaire was designed (Annex I) to collect this information.

²⁰ Information collected directly from relevant institutions.

Agreement on S&T Cooperation	Congo	MoPIC	2002	5 Years	S&T Fields across the board	NA
Grant Agreement to establish IT Incubator in Jordan	USA	HCST	2006		IT and SMEs Development	256,000 \$US

5.2. Cooperation under the Higher Council of Science and Technology

The Higher Council for Science and Technology places great emphasis on the significance of S&T cooperation due to the beneficial impact that has on the exchange of information and transfer of knowledge and technology. To this end the Higher Council is signatory to many cooperation agreements with Arab and international bodies. Many of these culminate in joint projects that assist in the development of S&T capacities.

The HCST places great emphasis on S&T cooperation due to the impact it has on the exchange of information and transfer of knowledge and technology. To this end the HCST is signatory of many cooperation agreements and memorandums of understanding with Arab and international bodies. Many of these culminate in joint projects that assist in developing national S&T capabilities.

5.2.1. Cooperation with Germany

Cooperation with DFG cover a wide spectrum of scientific collaboration along the areas of Joint R&D projects, exchange of researchers and scientists, organization of joint specialized seminars and workshops, and sabbatical leaves

Several activities were carried on (summarized in Annex to this Chapter):

- Visits of German Scientists to Jordan
- Visits of Jordanian Scientists to Germany
- Joint R&D Projects
- Specialized workshops
- Sabbatical leaves.

Visits of German Scientists to Jordan

Type of the activity	Jordanian Institution	Number of activities
Preparatory research visits	Yarmuk University	1
	Jordan University for Science and Technology	1
	Al Balqa Applied University	1

Conference	The Hashemite University	3
	Al Balqa Applied University	1
	University of Jordan	1
Specialized workshops	Yarmuk University	2
	Natural Resources Authority	1
Consultative research visit	University of Jordan	1

Visits of Jordanian Scientists to Germany

Type of the activity	Jordanian Institution	Number of activities
Preparatory research visit	Yarmuk University	3
	Jordan University for Science and Technology	3
	Al Balqa Applied University	1
	Al Albayt University	1
	University of Jordan	3
	National Center for Agricultural Research & Technology Transfer	4
	Royal Scientific Society	4
	Princess Sumaya University for Technology	2
	National Energy Research Center	1
	Hashemite University	3
Consultative research visit	University of Jordan	10
	Jordan University for Science and Technology	1
	Mutah University	1
	Yarmuk University	1
	Al Balqa Applied University	8
	Hashemite University	1
	Jerash Private University	1
Attending a conference	Yarmuk University	1

Joint R&D Projects

Jordanian Institution	German Institution	Number of projects
Al Balqa Applied University	Technische Universitat Hamburg-Hamburg	1
Al al-Bayt University	Gottingen University	1
Hashemite University	Franfurt University	1
University of Jordan	Orient-Abteilung: Deutsches Archaelogisches Institut	1
Jordan University for Science and Technology	Munchen University	1
National Energy Research Center	University of Stuttgart	1

Specialized workshops

Type of the activity	Jordanian Institution	Number of activities
Specialized workshops		
	Natural Resources Authority	1
	Yarmuk University	2

Sabbatical Leaves

Jordanian Institution	German Institution	Number of activities
Yarmuk University	Tuebingen University Friberg University	2
Hashemite University	Tuebingen University	1
Al-alBayt University	University of Stuttgart	1
Al Balqa Applied University	- Technical University of Darmstadt - University of Erlangen	1

5.2.2. Cooperation with the European Union

In 2005, the cooperation with the European Union varied to include S&T association agreement, capacity building project and participation in Euro-Mediterranean projects. The following summarizes what have been done so far in this cooperation:

- S&T Association Agreement with the European Union

It was agreed with the European commission on the content of the S&T agreement. Once the agreement is signed, Jordan will be treated as a European member state, in terms of benefiting from scientific and technological programs funded by the European Commission. The agreement itself is to be signed by the end of 2006.

- Support to Research & Technological Development and Innovation Initiatives and Strategies in Jordan

This project aims at supporting research & technological development and innovation initiatives and strategies in Jordan. The indicative budget for this program is 5 million JDs over 3 years. The General Secretariat participated in 2005 in several activities aimed at designing project implementation document. It is expected to start working in this project at the end of 2006.

- EuroMEDANet Project (Opening up the European Research Area to the Mediterranean Countries) – Completed in April 2006.

This project aimed at establishing information points in the Mediterranean countries with structure similar to that of the National Contact Points (NCPs) established in the European member states. The main objective of these points is to increase the researchers' awareness in the Mediterranean countries about European R&D programs and enhancing their participation

in the EU funded activities. Concerning Jordan, achievements of the project can be summarized as follows:

- Establishing Jordan's Information Point (InP) and announcing it in local websites
- Constructing Jordan's InP website with information about European RTD programs and continuous updating of the open calls for proposals
- Publishing monthly electronic newsletters discussing RTD programs funded by the European Commission.
- Matching Jordanian researchers with the European counterparts to prepare joint research projects to be submitted to the commission for funding
- Responding to queries from Jordanian researchers on the European R&D programs
- Starting to prepare a comprehensive database about the Jordanian researchers through designing a particular membership form
- Attended the third semester meeting of the project on Nov. 30 and Dec.1, 2005 in Athens
- The project was completed on April, 2006.

- SCOPE 2015 – Completed in early 2006.

Scope2015 aimed at preparing future RTD scenarios in the Mediterranean countries to enable the European Commission identify the future RTD prospects in these countries till 2015. The following activities were carried out in 2005:

- Preparing a detailed analytical report about S&T status in Jordan
- Organizing the participation of the Jordanian S&T experts in online workshops and aiming at discussing S&T status, recommendations and future plans for S&T in Jordan
- Participating in a workshop in Brussels on 7/11/2005 discussing the most significant project scenarios
- The project was completed in the end of 2005

- ESTIME Project (Evaluation of Scientific and Technological Capabilities in Mediterranean Countries)

This project aims at analyzing S&T status in the Mediterranean countries and providing suggestions for improving science, technology and innovation taking social aspects into consideration. It was agreed with the project coordinator/ France to prepare a detailed study about S&T and innovation system in Jordan as a part of the project. The study is expected to be completed by the end of 2006.

- ASBIMED Project (Assessment of the Bilateral Scientific Cooperation between the European Union Member States(MS), the Accession Countries and the Associated Countries and the Mediterranean Partner Countries (MP))

This project aims at specifying and evaluating bilateral S&T cooperation between the Mediterranean and European countries. The first period of the project was completed and the results were presented in the MoCo meeting which took place in Amman in March 2005.

- ProMEDAccess Project (Promotion of the Participation of Researchers from Mediterranean Partner Countries (MPC) To European Research and Mobility Program) – Not started yet.

This project aims at encouraging the researchers in the Mediterranean countries to benefit from the funded European R&D and higher education programs. The project is expected to start on 2007 and will focus on conducting awareness workshops for the researchers in the Mediterranean countries. It was agreed with the project coordinator in Brussels to conduct a workshop in the University of Jordan.

- SYNOPSS Project (Synergies between Policies and Structures Supporting EU-MED RTD) – Not started yet.

This project aims at creating and contributing to synergies between the European and Mediterranean countries about R&D fund policies adopted by the European Commission. It is expected to start working in this project at the end of 2006.

- MED 7 Project – Completed in 2006.

This project aimed at specifying the Mediterranean research needs within the Seventh Framework Program (FP7). The project contains 8 workshops and a conference. All workshops were conducted and a report was prepared about research needs in the fields of innovation, preservation of archaeology, food industries, information technology, transport, economic and social development and public health. Jordanian researchers from different national institutions participated in this project.

- MED-MOB – Not started yet.

This project aims at developing a guide for researchers' mobility from Mediterranean countries and enabling them benefit from the European Commission human resources development programs. It is implemented to start working in this project in 2006.

- FOOD-N-CO

This project aims at establishing a cooperative network between the European and Mediterranean researchers interested in food quality and safety fields. It is expected to start in February, 2006. The project kick off event will be on 2-7/4/2006.

5.2.3. Cooperation with Tunisia

Cooperation with Tunisia covers collaboration in joint research projects, joint preparatory and consultative research visits, exchange of researchers and experts, organization of specialized seminars, workshops and scientific exhibitions.

:

Cooperation with Tunisia First cycle: 2004-2006		
Project	Tunisian institution	Jordanian Institution
Improvement of Olive Oil Quality: Examination and	National Institute of Applied Science and Technology (INASAT)	Hashemite University/ College of Sciences and Arts-Biological Sciences

Modeling of the Oxidative and Flavor Stability of Olive Oil		Department.
Treatment Wastewater Management for Irrigation and Aquifer Recharge	National Institute of Science and Technical Research.	Royal Scientific Society/ Environment Research Center.
Testing and Modeling Chloride Ingress Into Concrete Marine Structures	ENIT	-Royal Scientific Society/ Mechanical Design & Technology Center. -Al Esra University/ Engineering Department.

Cooperation with Tunisia, second cycle: Joint RND Projects / 2007 – 2008.

Call for proposals initiated in April 2006. Areas of Cooperation include Nanotechnology, Biotechnology, Agriculture, Health, and Renewable Energy.

5.2.4. Cooperation with Arab Scientific Research Councils

The HCST is a member of this council, and cooperation covers a wide spectrum of collaboration that include exchange of information on scientific research, publications, and expertise through the convening of training workshops, seminars, and through the scientific visits of researchers.

The activities that are carried out during the cooperation with the Federation of Arab Scientific Research Councils in 2004&2005

Type of the activity	Jordanian Institution	Number of activities
Seminar	Yarmouk University	2
	Muta'a University	1
	Jerash Private University	1
Training course	Al-Balqa' Applied University	2
Conference	Jordan University of Science & Technology (JUST)	2
	Al Balqa Applied University	1
Fifth exceptional cycle meeting on the status of the Federation of Arab Scientific Research Councils	-Federation of Arab Scientific Research Councils -The General Secretariat of HCST	1
Regular meeting	The General Secretariat of HCST	2
Second meeting of the biotechnology	National Virtual Center for	1

research centers networks	Biotechnology	
Study Circle	Hashemite University	1
Exploratory visit	Muta'a University	1
	Badia Research and Development Center	4
Book review	National Energy Research Center	1

5.2.5. Cooperation with Mubarak City for Scientific Research and Technology Applications MuCSAT (Egypt)

Cooperation with MuCSAT covers mainly collaboration in joint research projects. The outline of the cooperation was designed and a Jordanian-Egyptian research groups were formed to prepare proposals in the following areas:

- New materials
- Bio-Nanotechnology
- Wool and feather
- Virtual Reality

5.2.6. Cooperation with the National Science Foundation (USA)

In its efforts to network with international science foundations and agencies, the HCST has recently established contacts with the National Science Foundation (NSF) of the United States with the objective of enabling Jordanian researchers to benefit from the different NSF international support schemes.

For this purpose, the HCST agreed with the NSF to disseminate the information about NSF and its support programs.

5.2.7. Cooperation with ESCWA

By the end of year 2005, The HCST and ESCWA agreed on a program of cooperation in science and technology and innovation. Two activities are currently under planning namely:

- S&T OBSERVATORY
- R&D Networks

5.3. Cooperation under universities and research centers

The international science and technology cooperation at the Jordanian Universities and Research Centers is summarized in the following table, it is worth noting here that information presented in the table is only a general summary of the international S&T cooperation activities of the institutions. Some of the institutions did not respond to our questionnaire, however the information collected gives comprehensive idea about international S&T cooperation of universities and research centers in Jordan.

Table 5-2. International S&T cooperation at Jordanian Universities & Research Centers

University and cooperating institution	Areas of Cooperation	Notes
1. Public Universities		
1.1 AlBalqa Applied University		
<ul style="list-style-type: none"> • Arab Countries (UAE, Oman, Egypt, Palestinian Authority, Kuwait). • Other Countries (UK, France, The Netherland, Canada, Russian Federation, USA, Spain, and Switzerland). 	Mutual exchange of expertise and students, training, and joint conferences and workshops.	Cooperation is governed by agreements and MoUs. Some of them expire by 2010, and some by 2015.
1.2 Yarmuk University		
<ul style="list-style-type: none"> • Arab Countries & Iran (Algeria, Bahrain, Egypt, Iran, Iraq, Kuwait, Oman, Palestine, Saudi Arabia, Sudan, Syria, Tunisia, and UAE). • Other Countries (Australia, Brunai, Malyasi, Belgium, France, Germany, Italy, Netherlands, Russia, Spain, Turkey, U.K, Canada, and USA). 	Exchange of faculty and students, Joint research programmes, Joint Masters programmes, training activities, Joint publications, and joint workshops and conferences.	Cooperation is governed by agreements and MoUs. Most of them are with unlimited validity.
1.3 Muta'h University		
<ul style="list-style-type: none"> • Cooperation with the Northern Consortium (Liverpool University, Leeds, Huddersfield, Bradford, Manchester, Salford, and Sheffield). • Cooperation with Wales University. • Cooperation with the University of Birmingham. • Cooperation with Carlton University/Canada. • Cooperation with International Islamic University/Malaysia 	<p>MBA, and 2+2 programme (2 years in Muta'h, and 2 years in Huddesfield University for example)</p> <p>Joint research, and faculty and students exchange.</p> <p>Joint research, and faculty and students exchange.</p> <p>Joint research, and faculty and students exchange.</p> <p>Joint research, and faculty and students exchange.</p>	<p>MoU</p> <p>Agreement.</p> <p>MoU.</p> <p>Agreement</p> <p>MoU</p>
1.4 Tafila Technical University		
Cooperation with Technische Universitat Chemnitz (Germany), Bridgewater State College (USA), Nutingham University (UK).	Development of teaching programmes, exchange of faculty and students, joint research projects.	3 MoUs, one with each university.
1.5 Al Hussein Bin Tala University		
<ul style="list-style-type: none"> • Cooperation with universities in Arab Countries (Tunisia, Syria and Iraq) • Cooperation with universities in (UK, USA, Australia, Switzerland, Canada, Spain, and France) 	Exchange of faculty and students, enrollment of the university students into Masters and PhD programmes in Foreign universities,.	Agreements
1.6 University of Jordan		

University and cooperating institution	Areas of Cooperation	Notes
<ul style="list-style-type: none"> • Cooperation with : • Gottenburg University in Sweden • Indiana University, Purdue • University of British Colombia School of Nursing, • International Research Center for renewable Energy/Germany • Charles University in Australia • Western Reserve University Cleveland • University of Chile • Instituto Superior de Ciencias do Trabalho e da Empresa/Portugal • University of Montesquieu-Brodeaux IV/France • Kabardino-Balkaria State University/Russia • Academy of Fine Arts/Poland • University of Granada/Spain • School of Business and management/France • Group ESC Clermont Ferrand/France • University of Durham/UK • Middle East University/Turkey. 	Exchange of faculty members and students, conducting collaborative research, conducting lectures, joint supervision of graduate students, joint publications, and organizing symposia.	MoUs
<ul style="list-style-type: none"> • Cooperation with LG/Korea • Ryoichi Sasakawa Young Leaders Fellowship Fund/Japan 	Mobility of researchers (marketing and engineering/LG), (non-degree and research/Japan).	MoU
<ul style="list-style-type: none"> • Cooperation with the University of Studies of Perugia/Italy 	Olive Growing.	Agreement
<ul style="list-style-type: none"> • Cooperation with FAO 	Use of experts at the University of Jordan for benefiting from their expertise in implementing some of the FAO activities.	Agreement
<ul style="list-style-type: none"> • Cooperation with the EU 	Water, Irrigation, Agriculture, and Cultural Heritage.	Projects
<ul style="list-style-type: none"> • Cooperation with Arizona University/USA 	Agriculture	Projects
<ul style="list-style-type: none"> • Cooperation with CONRAD Institution/USA 	Biotechnology	Project
<ul style="list-style-type: none"> • Cooperation with the Organization of the prohibition of Chemical Weapons 	Nerve-gas outbreaks in Jordan valley	Project
<ul style="list-style-type: none"> • Cooperation with the World Bank 	Hepatitis C	Project
<ul style="list-style-type: none"> • Cooperation with DFG (German Research Agency) 	Water Quality	Project
1.7 Princes Sumaya University for Technology		
<ul style="list-style-type: none"> • Cooperation with (University of Central Florida, University of Illinois, 	Faculty and students exchange	Agreements
<ul style="list-style-type: none"> • Cooperation with SMEs in Jordan 	Training, donation of materials to the University, and financial support for students	Agreements

University and cooperating institution	Areas of Cooperation	Notes
1.8 Jordan University for Science and Technology		
Cooperation with Louisiana University/USA, University of Illinois/USA, University of Arizona/USA, University of Nebrasks/USA, University of Al Najah/Palestine, Free University/Tunisia, Aden University/Yemen, Allepo University/Syria, Muta'h University/Jordan, Technical Education Agency/Iraq, Oldenburg University/Germany University of Malaysia/Malaysia, Notingham University/ UK, Politiecico Torino/Italy, University of Western Australia, National College for Telecommunications /France, Toronto University/Canada	Academic Cooperation (exchange of faculty and students, joint R&D and publications, and joint conferences and symposia)	Agreements
<ul style="list-style-type: none"> Cooperation with the National Center for School and University Services. 	Scholarship Programme.	Agreement
<ul style="list-style-type: none"> Cooperation with Japan International Cooperation Agency (JICA). 	Water, Food, Health and Environmental Industry.	Agreement
<ul style="list-style-type: none"> Cooperation with the French International Center for Educational Sciences. 	Evaluation of Engineering Education.	
1.9 Al al-Bayt University		
<ul style="list-style-type: none"> Agreements with Spain, France, China, Turkey and Bulgaria. 	Agreements for the provision of teachers and cooperation in the teaching of foreign languages at Al al-Bayt university.	Agreements
<ul style="list-style-type: none"> Cooperation with University of Goettingen/Germany, Geologists Union/Iraq, Damascus University/Syria, MEDA Water project/EU, University of Central Florida/U.S.A, Liverpool John Moores University/U.K Coventry University/U.K, Granada University/Spain, CISCO Networking Academy. 	Cooperation in cultural, scientific and artistic exchange through the exchange of students, professors and scientists. Certain areas of focus include; earth sciences, environment, management of waist water, joint research, direct data and communications links, joint publications and collaborative work.	Agreements

2. Private Universities

2.1 Irbid National University

<ul style="list-style-type: none"> Cooperation with Al BA'ath University in Syria Cooperation with the University of Damascus in Syria. Cooperation with Karbula University in Iraq 	Exchange of faculty and students, joint R&D, exchange of information, and joint training programmes	Agreements
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University and cooperating institution		Areas of Cooperation	Notes
2.2	Al-Ahliyya Amman University		
	<ul style="list-style-type: none"> • Cooperation with • Al Khawarizmi International College/United Arab Emirates • Medical research institute- Alexandria/Egypt • Al Zahra College for women/Oman • Kingdom University/Bahrain • Coventry university/UK • Cranfield University/UK • University of Sunderland/UK • University of Georgia/USA). 	Exchange of researchers and students,	Agreements
2.3	Amman Arab University for Graduate Studies		
	<ul style="list-style-type: none"> • Cooperation with Missouri State University/U.S.A 	Cooperation and exchange of mutually beneficial information in teaching, scientific research, publishing, conferences, and cultural exchange for students and professors.	Agreement
	<ul style="list-style-type: none"> • Cooperation with the Educational Testing Services/Netherlands 	Establishment of a regional instructional center for testing, educational and psychological measurement for improving educational performance in the Arab world.	Agreement
2.4	University of Petra		
	<ul style="list-style-type: none"> • Cooperation with University of Sunderland/Britain 	Postgraduate degrees in Pharmacy and English language	Agreement
	<ul style="list-style-type: none"> • Cooperation with University of Bonn/Germany 	Postgraduate Pharmaceutical Sciences	MoU
2.5	Philadelphia University		
	<ul style="list-style-type: none"> • Cooperation with Charles University/Australia • Chechen State University • Grozny, California State University, Los Angeles • Coventry University/UK • University of Florida/USA. 	Graduate and postgraduate educational programmes, exchange of faculty and students, joint publications, and exchange of information.	MoUs
	<ul style="list-style-type: none"> • Cooperation with Aspen University/USA 	Offering Aspen degree programmes (MBA, Masters in IT, Masters in Management of IT).	MoU
2.6	Applied Science Private University		
	<ul style="list-style-type: none"> • Cooperation with Al Muntansiryya University/Iraq • Al Mansoor University College/Iraq • Mosul University/Iraq • Hawai University/Lebanon • Salahuddin University of Kurdistan/Iraq • University of Technology/Iraq • Helwan University/Egypt. 	Exchange of faculty and students, joint research, exchange of expertise in curricula development, joint publishing, and creating opportunities for students training.	Agreements

University and cooperating institution	Areas of Cooperation	Notes
<ul style="list-style-type: none"> Cooperation with Applied Science Private University/Kingdom of Bahrain. 	Developing curricula, and performance.	Agreement

3. Research Centers

3.1 Royal Scientific Society

<ul style="list-style-type: none"> German Accreditation System for Testing 	Assessment, accreditation and surveillance of a testing laboratory	Contract/2006
<ul style="list-style-type: none"> GTZ 	Project of " Use reclaimed water for irrigation in the Jordan Valley in accordance with environmental and public health regulations"	Contract for local consulting service/2006.
<ul style="list-style-type: none"> Jordan Enterprise Development Corporation - JEDCO 	Technical Assistance Services & Conformity Assessment	MoU/2006
<ul style="list-style-type: none"> Indian National Science Academy 	fostering links between individual researchers/scientists and their institutions wish to enter into an accord of cooperation	MoU/2006
<ul style="list-style-type: none"> Lund University, Sweden/SIDA 	Defining means and criteria for improving thermal performance and minimizing energy consumption in buildings in Jordan	MoU/2005

3.2 National Energy Research Center

The Center is currently cooperating with several national regional and international institutions including those located in Italy, Turkey, Lebanon, Morocco, Germany, Spain, France, Algeria, Tunisia, and Greece.	The cooperation is mainly through the participation in EC sponsored projects in the area of energy, particularly solar powered desalination and pumping, cost efficient and reliable rural electrification schemes, and self sufficient renewable energy air conditioning systems.	Projects
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3.3 National Center for Agricultural Research and Technology Transfer

<ul style="list-style-type: none"> Cooperation with EU (INCO-MED). 	Water irrigation management, water saving in med agriculture, and mapping adaptation of barley to drought environment.	Projects
<ul style="list-style-type: none"> Cooperation with USAID. 	Treatment and reuse of wastewater in agricultural production, Irrigation management information system, and efficiency of bees.	Project
<ul style="list-style-type: none"> Cooperation with Denmark. 	Agriculture	Project
<ul style="list-style-type: none"> Cooperation with the International Center for Biosaline agriculture. 	Expanding date palm cultivation under saline conditions.	Project
<ul style="list-style-type: none"> Cooperation with the World Bank. 	Horticulture export promotion.	Project
<ul style="list-style-type: none"> Cooperation with Germany (DFG, GTZ). 	Honey Bee	Projects
<ul style="list-style-type: none"> Cooperation with Global Environmental Facility (GEF). 	Biodiversity	Project
<ul style="list-style-type: none"> Cooperation with Arab Organization for Agricultural Development. 	DNA Finger printing of olive trees.	Project
<ul style="list-style-type: none"> Cooperation with IDRC (Canada). 	Barley Breeding	Project

3.4 Badia Research and Development

University and cooperating institution	Areas of Cooperation	Notes
Center		
	<ul style="list-style-type: none"> Cooperation with University of Durham – Centre of Overseas Research and Development (CORD) 	Exchange of staff and training, joint research proposals,
	<ul style="list-style-type: none"> Cooperation with Global Environment Fund (GEF) and United State Department of Agriculture (USDA) 	Water harvesting, and plantation.
	<ul style="list-style-type: none"> Cooperation with International Arid Land Consortium (IALC). 	Environmental Awareness Centre
3.5	Jordan Center for Public Policy Research & Dialogue (JCPP)	
	<ul style="list-style-type: none"> Actively cooperating with the Economic Research Forum/Egypt, The Global Development Network/India, The Egyptian Center for Economic Studies/Egypt, ESCWA/Lebanon, The United nations Committee of Experts on Public Administration, UNCTAD/Switzerland, The Center for Arab Unity Studies/Lebanon. 	Active cooperation in the fields of policy research, economic relations and recommendations, development issues, and administration development.

Note: Information is directly collected from concerned institutions. Detailed information is available at HCST.

Chapter 6. Government initiatives in support to S&T development

Science and technology has advanced to unprecedented limits in various areas like biotechnology, information and communication technology, and makes substantial contributions to economic growth. However, the impact of S&T on society has not been uniformly beneficial and the technological divide is being increasingly felt especially in the developing countries. Jordan is one of the developing countries that realized the pivotal role of science and technology in the advancement of the economy. Since its independence Jordan catered for employing science and technology to serve its economy and to improve the standards of livings of its people. To that end, consecutive governments have taken many initiatives and established special vehicles to fulfil that goal.

6.1. Legislative framework

Jordan has been always keen on exploring ways and means to link its scientific and technological efforts to the overall socio-economic development plans. Intensive efforts have been made in developing the domestic Science and Technology (S&T) capabilities.

Socio-economic development plans have aimed at integrating and upgrading the national scientific and technological capacity, along with improving the competitiveness of the services and commodity producing sectors.

Jordan's political will in strengthening S&T infrastructures and linking its activities with the national objectives of development was reflected in the laws, by-laws, regulations, and decision by the council of ministers pertaining S&T. Such legislations paved the way towards the establishment of a number of institutions entrusted with missions and goals in the different fields of S&T.

The National Charter, which was adopted in 1991, outlines general guidelines for constructive dialogue between the executive and legislative organs, as well as between decision-makers and political and intellectual elites concerning questions of authority, rights and responsibility. The National Charter, along with the Jordanian Constitution, provides a compass for the national debate on fundamental issues.

In various articles of the Charter, the role of science and technology was emphasized. Article seventeen states that:

“Jordanian universities are an important part of the country's fabric. They ought to function as beacons of intellectual enlightenment and scientific progress. To achieve this, the universities must be provided with the requisites and guarantees of academic freedom. They must be provided with the means to develop their curricula, keep abreast of knowledge, develop their capacity for scientific research and enhance their role in developing Jordanian society and meeting its needs. They must have the capacity to help build the country's institutions, provide good instruction and qualify the country's youth to solve problems and meet the challenges of the future”.

Also the charter states that :

“Optimal use must be made of all available resources, coupled with the utilisation of appropriate scientific and technological means for improving productivity in a manner that would meet the needs of the citizens, provide employment opportunities, improve and diversify income and raise the standard of living”, and that “Copyright must be respected. Legislation protecting copyright and patents must be updated”.

The third part of the charter was titled: *Science and Technology* under which the following requisites for an effective contribution by science and technology were highlighted²¹:

1. A clear political decision and national will must exist to acquire, transfer, develop and utilise technology to meet the country's needs on the basis of careful planning which relies on indigenous institutions and on an advanced system of education.
2. The scientific method must govern the people's way of thinking. It must be utilised for solving problems and enhancing the ability of Jordanian society to transform raw data into a system of knowledge which can be applied in various fields. National data banks must be established for this purpose.
3. Special emphasis must be placed on the teaching of science and mathematics, with due attention to their application, at all levels and in all types of educational institutions.
4. Society as a whole must acquire the culture of science and technology in order to be able to interact in an effective and rational manner with advanced technological processes.
5. A climate of academic freedom must be provided, together with the resources for advanced scientific research. Also, research must be geared towards meeting the developmental needs of Jordan in all areas. Arabic must be the medium of research and development activities as well as a vehicle for innovation and publication.
6. Jordan's natural resources must be developed, whilst guarding against the negative effects of technology, preserving the ecological balance and protecting the living environment from pollution.

To address new technologies the charter gave special attention to information technology in its fourth part which was titled: “Information and Communications”, and it stated that “Rapidly accelerating advances in science and technology, coupled with the effects of the communications revolution, have given communications and the mass media a principal role in shaping knowledge, convictions and attitudes. The mass media also play an important role in strengthening the democratic process”.

The charter listed the following as requisites in this field:

1. Freedom of thought and expression, and access to information must be viewed as a right of every citizen, as well as of the press and other mass media. It is a right enshrined in the Constitution and should under no circumstances be abridged or violated.

²¹ <http://www.kinghussein.gov.jo>

2. Official and popular institutions must contribute to the training of personnel in the information field with a view to enabling them to perform their tasks objectively and impartially.
3. Citizens must have access to facts and information from legitimate transmission and publication sources within Jordan and abroad. Censorship of classified material should not prevent the citizens from exercising this right.
4. Information and communications media must serve as channels of conveying the country's image, culture and achievements to the world, and as a means of transferring new knowledge and cultural and scientific advances to the citizens. This requires an enhancement of national capabilities and recourse to expert services.
5. General policies of the information media in Jordan must strengthen respect for the human mind and intelligence and for the individual's right to freedom of expression. They must provide an appropriate climate to encourage creativity and innovation.
6. The circulation of news and data must be regarded as an indivisible part of the freedom of the press and information. The state must guarantee free access to information to the extent that it does not jeopardise national security or the national interest. It must enact legislation to protect journalists and other information personnel in the fulfilment of their duties and to provide them with material and psychological security.

6.2. Science and technology policy²²

The following describes briefly several government tools established in the past few years to strengthen the stand of Jordan in S&T, it gives a short description of the vehicle and its mission. Most of these initiatives were taken by the Higher Council for Science and Technology, a public autonomous institution entrusted with strengthening the Jordanian S&T base (see chapter 2).

As a policy making body, the Higher Council for Science and Technology (HCST) developed several policy tools specifically oriented toward the strengthening of the national system of innovation. The previous sections of this profile identified some of these tools and highlighted the role of each one of them. Such policy tools include: The National Biotechnology Centre, and its spin-off Jordan Company for Antibody Production (MonoJo), the Industrial Scientific Research and Development Fund, National Fund for Enterprises Support (NAFES), ICT Incubator (iPARK). Other initiatives are the creation of an intellectual property unit within HCST; the creation of an Environment Monitoring & Research Central Unit (EMARCU), dedicated at introducing new techniques of environmental protection; the participation to a National Consortium for Technology and Business Incubation (NACTIB) in order to create an environment conducive to the development and growth of knowledge-based enterprises and promote RTD activities in the private sector in Jordan.

6.3. Statement of the Science and Technology policy

Production of goods and services became less dependent on natural resources, and more dependent on the utilization of S&T and the qualified human resources. Jordan's future will highly depend on what could be accomplished through the proper application of science and

²² The Higher Council for Science and Technology, **Science and Technology Policy, Strategy and its Executive Plan 2006-2010**, Amman, January 2006.

technology, and innovation in the productive sectors (production of goods and services). It is now apparent that the ability to systematically identify, generate, acquire, diffuse and capture the benefits of knowledge can provide a substantial strategic advantage. It is also becoming more apparent that government needs to work at creating an environment that is supportive of creativity and innovation; such environment is based on sustainable social, legal, and economic structures.

S&T are becoming more and more essential components of the government's strategy for creating the modern Jordan. HCST is concerned with supporting and promoting the attainment of national development plans objectives by the creative use of S&T outputs. Development of innovative ideas, products, and processes will enable Jordan to address more effectively the needs and aspirations of its people, which is particularly important within the context of global economic competitiveness demands.

As mentioned in previous sections the Higher Council for Science and Technology (HCST) is entrusted with the mission of setting up the national science and technology policy. Stemming from this mandate the Council establishes policies that contribute to building a national scientific and technological base, as well as catering for its development in efforts aimed at transforming the acquired technological expertise into an effective tool in stimulating the social and economic development in the country. It is trying to link S&T activities effectively to other areas of social and economic activities.

Since its establishment and, through its general secretariat, the Council worked towards formulating a national science and technology policy with the participation of a wide spectrum of society members and institutions, expressed in a formula coherent with and responsive to the needs of the developmental sectors included in the national socio-economic development plans. The first national science and technology policy was adopted in 1995. At that time the policy revolved around four themes: **information, human resources, technology transfer, and research and development.**

6.4. Science and technology strategy for 2006-2010²³

The policy for the next five years (2006-2010) is aimed at establishing a system of innovation whereby production and services sectors are further developed. The policy has three main pillars: **information, human resources, scientific research and technology transfer** (see box below). Such pillars are supported by the establishment, financing and management of frontier technology networks connecting researchers on the one hand, and institutions on the other. This process of networking is aimed at increasing the effective mass of scientists and researchers. As far as institutions are concerned the networking efforts include developmental sectors institutions, universities, research and development centres. HCST decides on modalities, and field of specialty of the networks it supports. It also bears the responsibility of connecting them to other similar international networks. This policy seeks to harness the diverse aspects of S&T through various institutions, where they are being developed, practiced, and utilized.

We present here the overall strategy outlined in the Executive plan for 2006-2010, the strategic goals, and general programmes designed for implementation of the policy.

²³ *Ibid*

The three main pillars of Jordan's S&T policy

1. Information

The establishment and development of proper channels that facilitate the flow of scientific and technological information from international sources into the scientific and technological institutions in Jordan, and through local sources to the developmental sectors' institutions.

2. Human Resources

As a country known of not being endowed with many natural resources, it is known that people are Jordan's major asset. To this end the policy considers the highly qualified and trained human resources as a corner stone in the developmental process. Working on the continuous development of human resources to meet the needs of the developmental sectors, as well as securing the essential means to develop the skills and capabilities of researchers working in R&D are deemed necessary.

3. Scientific research and technology transfer

The strategy aims at strengthening scientific research, and setting up its national priorities to address the needs of the overall national development process. It also works on identifying certain cutting edge technologies, as well as establishing the required mechanisms for technology transfer.

6.4.1. Strategy

- Endorsing S&T as one main input into all national development plans and programmes.
- The optimal and sustainable use of the natural resources in sectors considered vital to development (water, energy, agriculture, health, environment), and others where Jordan possesses competitive advantage (pharmaceuticals, mineral resources, tourism) through proper applications of advanced technologies).
- Enhancing partnership and synergies between S&T community and stakeholders in the public and private sectors.
- Employing suitable national resources towards the achievement of the goals of the national science and technology policy.

The vision of the science and technology plan for Jordan

Achievement of internationally reputable capacity in frontier sciences and technologies, and maximizing benefits of their applications for the sustainable socio- economic development of Jordan.

6.4.2. Strategic goals 2006- 2010

- Building a distinctive scientific and technological base.
- Applications of advanced technologies.
- Transforming novel creative ideas as well as the outcomes of research and development into commodities and business enterprises.

The following obstacles challenge fulfilling the above-mentioned goals:

- Human capital related issues such as the capabilities of people to transform novel creative ideas and inventions into innovation.
- The enabling frontier technologies mentioned in the strategy require the utilization of interdisciplinary approach, most of the time when it comes to implementation such approach is lacking.
- The rapid and continuous development of markets and goods, resulting from the continuous change in the needs as well as consumers' conduct.
- Reaching out and cooperation between science and technology community (represented by the universities and research centers) on the one hand, and production and services institutions on the other.
- The way government institutions perceive the role of science and technology in development. Sometimes this role is ambiguous, and therefore it is not taken seriously.
- Needs to employ ways and means taking into account the characteristics of the national economy.

To be able to deal with such challenges, HCST believes that it is imperative to set the right environment, which would lead to the advancement of science and technology in Jordan, and maximizing its share in the economy. To this end, the HCST will adopt the following approaches:

- Participation of all stakeholders at the universities and research centers to establish the required environment.
- Forming multidisciplinary, and interdisciplinary research teams, and task forces.
- Networking at the local, regional, and international levels.
- Securing finance to support research and development.
-

6.4.3. Mechanisms

Objectives of the strategy are to be met by the institutions affiliated to the HCST, through the following available mechanisms and new mechanisms that need to be implemented.

Available mechanisms:

- I. Planning and coordination mechanisms, which include:
 - Scientific and technological requirements and capabilities surveys.
 - National research and development plans.
 - National networks, such as the national center for biotechnology, and the national network for advanced materials and nanotechnology.

- II. Financing mechanisms:
 - Funds allocated to R&D in the annual budget of the HCST.
 - Industrial Scientific Research and Development Fund.
 - National Fund for Enterprises Support (NAFES).

Mechanisms to be established:

- I. Planning and coordination mechanisms:
 - New networks oriented towards cutting edge technologies.
 - Evaluation and follow-up system capable of evaluating the results and impact of the research and development projects, financed by the Council.
 - Database on cutting edge technologies.

- II. Financing mechanisms:
 - National R&D budget.
 - Matching research and development fund.
 - Seed capital funding.

6.4.4. Programmes and performance indicators**Programme 1: Regular review of the national science and technology policy.**Strategic activities:

1. Participation of all stakeholders.
2. Knowledge-based review and amendment.

Performance indicators:

- National S&T policy is reviewed and amended by the end of 2005, and periodically, thereafter, every 5 years.

Programme 2: Streamlining national scientific and technological activities, and proper planning to invest in such activities.Strategic activities:

1. Planning and coordinating R&D activities.
2. Supporting R&D activities.
3. Nurturing creativity and innovation.
4. Contributing to the development of SMEs businesses.

Performance indicators:

- Annual review of the R&D priorities.
- Establishing three new frontier technologies networks.
- Establishing the R&D matching fund.
- Supporting the R&D national plan (2008-2010).
- Setting up an institutional structure for SMEs development programmes.
- Formulating and implementing a national plan to nurture innovation.
- Developing human resources working in R&D, and upgrading the capabilities of research institutions on the one hand, and enhancing their interaction with similar institutions abroad on the other.

- Put into practice the outcomes of the annual Science Weeks.
- Developing El-Hassan Bin Talal Award for scientific excellence to assist in stimulating scientific achievements.

Programme 3: Establishing and strengthening linkages among S&T community, the industry, and the government.

Strategic activities:

1. Establishing effective mechanisms to strengthen dialogue between S&T community, service and production sector, and the government.
2. Strengthening existing mechanisms and establishing new ones.

Performance indicators:

- Annual brainstorming meetings to discuss issues related to different developmental sectors.
- Periodical meetings for specialized follow-up committees.
- Familiarizing the developmental sectors' institutions with research benefits, and participation of researchers in solving the technical problems facing these sectors.
- Identifying collaboration obstacles, and developing mechanisms to overcome them.

Programme 4: Regional socio-economic development with reliance on Research and development.

Strategic activities:

1. Augmentation of the national natural resources.
2. Identifying income generating activities and paving the way for people to benefit from them.
3. Support developmental research with special focus on enhancing the standards of living.
4. Developing integrated pilot locations, and setting them as practical models of holistic approaches in development undertaken with wide participation of local communities.
5. Introducing new technologies to achieve sustainability and integration in resource management.

Performance indicators:

- Economic utilization of mineral resources, and increasing its added value.
- New applications in the fields of new energy sources, and renewable energy.
- Applications of optimal and sustainable use of water resources.
- Pilot developmental projects to enhance standards of living of local communities in the less developed areas.

Programme 5: Protecting intellectual property rights.

Strategic activities:

Ensuring intellectual property rights of researchers and institutions, at the national and international levels.

Performance indicators:

- Institutions capable of catering for intellectual property services, knowledgeable of administrative and legal procedures, necessary to register patents at the national and international levels.
- Awareness programmes.
- Patents registered locally, and internationally, some of which are commercially invested.

6.4.5. The executive plan (2006-2010)²⁴

An executive plan was prepared for the implementation of the above listed programmes. Each programme included a number of projects and activities. These programmes fulfil the strategic objectives.

The plan was formulated by a team of experts in different disciplines, working in both public and private sectors. The general secretariat of the Council formed a committee for each programme of the plan. Sound views and suggestions of participants were taken into account.

A main objective was identified for each programme, as well as its specific objectives. Expected outcomes were also identified. A logical framework matrix was developed for each programme. The matrix shows the interaction among the different components. The matrix also included performance indicators for each programme, and means by which outcomes could be monitored. The logical framework matrix also included the assumptions and risks that might arise and impact the attainment of objectives. In general that included securing the finance needed, as well as securing the appropriate and stimulating conditions.

6.5. Other National Strategies

Other official bodies have developed strategies that contain a strong link to the national S&T policy.

1. Towards the development of a national higher education and scientific research policy for the years 2005-2010, Ministry of Higher Education and scientific research.
2. National Centre for Agricultural Research and Technology Transfer, NCARTT 5 years work plan, 2001-2005, Ministry of Agriculture.
3. National Strategy for Agricultural Research and Technology Transfer, 1996.
4. The National Strategy for Agricultural Development 2002-2010, Ministry of Agriculture, 2005.

²⁴ *Ibid*

5. Jordan's Information Policies and Strategies, preparing Jordan for the 21st century, National Information Centre, 1998.
6. National Biodiversity Strategy and Action Plan, Ministry of Environment, 2003.

6.6. Studies and reports on science, technology and innovation

6.6.1. The IDRC review²⁵

The origins of the review study stemmed from discussions between the Chairman of Jordan's Higher Council for Science and Technology, (HCST) H.R.H. Prince El-Hassan and IDRC during a 1999 meeting. The Jordanian interest was in conducting an assessment – or peer review – of the HCST and its General Secretariat and of its affiliated institutes. At that time IDRC had begun responding to selected requests for assistance to governments in understanding the complex issues relating to stimulation of the functioning of 'national systems of innovation' in various parts of the world. In this context therefore, IDRC agreed to finance a preliminary activity aimed at developing a common basis upon which future IDRC financial contributions might be negotiated between the HCST and IDRC. The preliminary work was carried out in October 2000 and resulted in a report entitled "**Developing a new Science, Technology and Innovation Strategy for Jordan**", presented to the Higher Council and IDRC by a Canadian firm of consultants, Mullin Consulting Ltd. Based directly on that work, the Mission was activated with the joint financial support of the Higher Council and of IDRC.

The specific objectives of the study were as follows:

1. to assess and report on the policies, programs, priorities, institutions and policy instruments managed by the Higher Council on Science & Technology to promote technical change as a stimulus to economic and social development within Jordan;
2. to assess and report on the policy and institutional environment within which HCST and its affiliated institutions operate
3. to assess and report on the administrative, legal and financial environment in which the HCST and its affiliated institutions operate
4. to assess and report on the interactions among HCST's principal activities and those of other stakeholders supporting technical change within Jordan's National System of Innovation ;
5. to assess and report on the impact of the activities of HCST on the performance of scientific and technological activities within Jordan's scientific base of enterprises, universities, and governmental S&T institutions;
6. to assess and report on the impact of the activities of HCST on the promotion of technical change in Jordan's economic and social life as a means of accelerating national economic, social and cultural development.
7. to assess and report on the options for action in terms of:
 - the overall framework for science and technology policy-making in the country'
 - the appropriate roles and responsibilities for the HCST and its affiliated institutes;

²⁵ James Mullin, Carlos Abeledo, Danielle Mazzonis, Anne Whyte, **Science, Technology and Innovation-Policy and Programs in Jordan**. A report of a mission sponsored by The Higher Council for Science and Technology (Jordan) and the International Development Research Centre (Canada), May 2002.

- the institutional and policy framework for HCST activities;
- the integration of HCST activities and those of other stakeholders in Jordan's national system of innovation; and
- The management of individual HCST institutes and activities.

The report was divided into three Parts, the first dealing with the HCST and General Secretariat, the second with the six associated centres and the third containing the mission's conclusions and recommendations.

In the analysis of activities in Jordan, the Mission used the concept of a "*National System of Innovation*" as an organizing framework.

In this context, "Innovation" is defined as the introduction into a market (economic or social) of new or improved products, processes or services. This simple definition draws attention to the importance of markets, and is the basis of the understanding that successful programs of research or technological development designed to promote innovation must take full account of the constraints imposed by the market into which the innovation is to be introduced.

In the industrialised countries, and in a growing number of newly-industrialising countries, policy makers have found that the concept of a "national system of innovation" provides a **useful framework for technology policy formulation** since it makes explicit the many different kinds of inputs which are necessary to produce an economy which is innovative and hence competitive in today's increasingly globalised markets. Such a framework can be used as a means both of organising information and of structuring questions about what is happening within a given national system of innovation. However, the study did not treat the concept as a model to be implemented. It was a useful and helpful guide to analysis of a complex reality, rather than a prescription for ways in which to organise either institutions or programs.

In the study "A national System of Innovation" was defined as follows:

"A national system of Innovation is a network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies. It is made up of units that interact through linkages and are shaped by various factors:

- Units include institutions such as private firms, universities, government laboratories, state corporations, government coordination agencies, government funding agencies, and non-government coordination agencies.
- Linkages are legal, political, social, economic, and business interactions that involve flows of information, money, materials, services, and people.
- Factors are characteristics of the region that shape how units behave, and include markets, natural resources, technical interdependencies, collaborations, and science and technology policies.

The phrase "*system of innovation*", as it is used in the study, *is a metaphor* - a powerful metaphor for describing the many interactions among many participating institutions, organisations and firms, most of which operate independently of each other. The system therefore encompasses interactions, which are co-operative and others which are competitive. In this use of the term "system of innovation" there is no single entity with the power to control the workings of the system, but there are many which exert significant influence.

The study identified certain government functions and other shared functions as follows:

Central Government Functions

- Policy Formulation and Resource Allocation at the National Level;
- Specialised Advisory Functions
- Regulatory Policy-making;

Shared Functions

- Financing of Innovation-related Activities;
- Performance of Research, Development and Innovation;
- The Creation of Linkages and Knowledge Flows;
- Human Resource Development and Capacity Building; and
- The Provision of Technical Services and Infrastructure.

Principal conclusions of the review²⁶

The review team believes that Jordan needs a strong Higher Council on Science and Technology supported by a strong General Secretariat and therefore, indicated some of the ways in which the strengthening can be accomplished.

1. Expansion of the role, and range of activities, of the HCST/GS in S&T Policy

The Mission recommends that the HCST give serious consideration to other activities that would expand its role and increase its influence in setting and monitoring science, technology and innovation policy.

The mission believes that HCST could exercise its legal mandate to generate a general consensus towards a common vision among the different stakeholders that participate in the national innovation systems. These include governmental institutions, universities and other educational institutions, the private sector and civil society.

2. Implementation and monitoring the National Science and Technology Policy

The report recommended that HCST should pay more attention to monitoring the implementation of national S&T policy. Such monitoring would require maintaining a set of qualitative and quantitative indicators that could serve to follow up the achievements of national science and innovation activities and to evaluate the success of the different instruments -both within and outside the specific domain of HCST- that are applied by the government to promote science, technology and innovation policy.

3. The role of HCST in generating funding for S&T

One of the challenges facing Jordan is the low investment in research and development in the public and private sectors. In this, the HCST has important roles to play, both as a convenor and as a champion for S&T in Jordan. The Mission believes that the HCST could play a more proactive role in promoting S&T, specifically in raising funds, with several key constituencies: government, private sector, and external donor.

4. Regional policy: Links in the Middle East

²⁶ *Ibid*

Peace in the Middle East would open the way for the creation of a bloc capable of being linked as a whole to the world economy. The HCST is already involved in regionalizing the research sector, and this may become a central part of its work.

Global linkage, if achieved, will not lead to the disappearance of local cultures. To the contrary, the challenge in guiding the modernization of Jordan from the standpoint of technical change and linking it to the rest of the world will be to exploit the nation's distinctive assets – its culture and traditions – to the maximum. It is a known fact that in matters of immediate importance for social, economic and technological development—actions can be effective only if they have a regional dimension. This is all the more true if they involve sectors such as the environment, natural resources, energy and telecommunications.

This approach leads us to recommend that the Council adopt an orientation toward cooperative action plans designed and implemented at the regional and sub-regional level. It is important that these plans be drawn up with the aid of interdisciplinary task forces made up of people from highly specialised spheres, both public and private, so as to assure that Jordan, through the HCST, plays a true leadership role. This type of approach could achieve higher economic returns and would help create shared cross-border interests. In research and development, as in any other field, the exploitation of economies of scale is a matter of mutual interest.

The fields that seem to lend themselves best to strong international co-operation on research in the Middle East are: Energy, particularly alternate sources such as wind and solar, Sustainable development, where the interrelated topics range from the overriding issues of water and resource (biological and mineral) management to the management of natural and historical assets, Health-related research and development, the major focus being on prevention, Agriculture, where international bodies such as ICARDA are already in operation, Archaeology, where research is oriented towards strengthening cultural assets.

5. Development of a Science Budget

Establishment of an S&T budget does not introduce a substantive change in the national budget; it is only a "bookkeeping" methodology that should be coordinated with the Ministry of Finance. However, an explicit S&T Budget is a powerful policy tool that allows an explicit knowledge of all allocations for S&T functions in the different areas of government.

The work of the Mission has culminated in the drafting of a series of “**Agendas for Action**” by the HCST and the General Secretariat, and for the six Associated Centres, which can be summarized as follows:

1) An Agenda for Strengthening the HCST

- Make the HCST a forum for discussion, at the Highest Level, of the management of technical change as a stimulus to Jordan’s economic and developmental performance;
- Encourage Ministers who are members of the HCST to consider how to make the best use of the work of the HC itself;
- Align HCST priorities, research funds and programs more closely with national economic, social and industrial strategies;
- Strengthen role of HCST in promotion and coordination of S&T within government Councils and committees;
- Strengthen role of HCST in monitoring S&T activities in Jordan;

- Promote an active dialogue with the donor community on future patterns of research support in Jordan;
- Develop policy mechanisms to encourage and reward innovation and excellence in S&T; and
- Develop a Science Budget.

2) An agenda for strengthening the Genetral Secretariat

- Policy Development;
- Fund Management;
- Administration of Associated Centres;
- Management of Special Projects;
- Management of its Information Function;
- The use of modern tools and techniques;
- Its Communications and S&T Promotion functions; and
- Its Organization and Human Resource Function

3) An Agenda for the Associated Centres of the HCST

6.6.2. Jordan as part of ESCWA studies²⁷

- **Science and Technology, policies in the twenty first century²⁸**

The study gives an overview of science and technology in selected ESCWA members including Jordan based on a review of a number of relevant indicators, followed by a series of more detailed reviews of the state of S&T, and brief summaries of implicit and explicit S&T policy orientations adopted by them. It also reviews policies adopted in some developed and developing countries for dealing with a number of current and emerging challenges. The study also introduced and reviewed a framework for future S&T policy formulation in the ESCWA member countries.

- **New indicators for science, Technology and innovation in the knowledge-based society²⁹**

The study reviews recent efforts at extending S&T indicators to cover innovation activities. It addresses science, Technology, and Innovation (STI) systems and the increasing importance of STI indicators in benchmarking competitiveness and socio-economic development. It examines indicators devoted to evaluating national innovative capacity. It also considers a set of composite indicators used by a number of international organizations in comparative surveys and studies touching upon STI capabilities. The study also provides a number of concluding remarks emphasizing essential elements in national strategies aimed at evolving viable capabilities in STI evaluation for the benefit of national STI-based development.

²⁷ <http://escwa.org.lb>

²⁸ United Nations, Economic and Social Commission for Western Asia, **Science and Technology Policies in the Twenty-First Century**, United Nations, New York, 1999.

²⁹ United Nations, Economic and Social Commission for Western Asia, **New Indicators for Science Technology and Innovation in the Knowledge-based society**, United Nations, New York, 2003.

- **Knowledge management methodology**³⁰
The study aims at creating awareness of knowledge as a resource, and the need for knowledge management. It also builds a methodology for the creation, sharing, and dissemination of knowledge in member ESCWA countries. It also aims at facilitating the implementation of knowledge management based on competitiveness. It concentrates on reviewing the benefits of collaboration in the development of a “knowledge society”.
- **Review of science and technology in ESCWA member countries, issue no.1**³¹
The primary objective of this review is to report on activities undertaken in the ESCWA member countries to enhance capabilities in science and technology. Information is presented on relevant activities implemented or planned for future implementation. It focuses attention on Moves towards formulating national S&T policies and strategies, assessment, and promotion of research and development activities, and technology transfer activities.
- **Review of science and technology in ESCWA member countries, issue no.2**³²
This study pays special attention to information and communications technologies (ICTs), it tackles policies aimed at facilitating the diffusion of ICTs.
- **Review of science and technology in ESCWA member countries, issue no.3**³³
This study is based on papers presented by a panel of experts convened in Beirut in 2000 to consider “information technology and development priorities; competing in a knowledge-based global economy”. It reflects growing concern in ESCWA member countries about innovative capacity-building. It concludes with a section on a regional science and technology capacity-building initiative the Arab Science and Technology Foundation launched in 1999.
- **Review of science and technology in ESCWA member countries, issue no.4**³⁴
This report devotes attention to four areas in new materials technologies, all emphasizing modern uses of organic polymers, namely fibre-reinforced composites, polymer blends, polymer modified cements, and polymeric membrane materials. All are regarded as areas of promise for the near and long term future in the ESCWA member countries.

³⁰ United Nations, Economic and Social Commission for Western Asia, **Knowledge Management Methodology- An Imperial Approach in Core Sectors in ESCWA member Countries**, United Nations, New York, 2003.

³¹ United Nations, Economic and Social Commission for Western Asia, **Review of science and technology in ESCWA member countries**, Issue No. 1, United Nations, New York, 1999.

³² United Nations, Economic and Social Commission for Western Asia, **Review of science and technology in ESCWA member countries**, Issue No. 2, United Nations, New York, 1999.

³³ United Nations, Economic and Social Commission for Western Asia, **Review of science and technology in ESCWA member countries**, Issue No3, United Nations, New York, 2001.

³⁴ United Nations, Economic and Social Commission for Western Asia, **Review of science and technology in ESCWA member countries**, Issue No. 4, United Nations, New York, 2001.

- **Using information and communications technologies to create employment and alleviate poverty**³⁵

This report addresses some of the main areas where information and communication technologies can assist in creating employment and reducing poverty. It presents a comprehensive analysis of ICT applications in rural communities. It describes a selection of innovative technologies for application in rural areas that are aimed at alleviating poverty and reducing unemployment. It also highlights the hardware devices suitable for rural applications.

- **Technology capacity building initiatives for the 21st century in the ESCWA member countries**³⁶

This study sets the scene for future activities aimed at the launching of initiatives in the ESCWA member countries with view to the development of new institutional forms, including technology parks, technology incubators, and high-technology enterprise clusters as well as bridging organizations linking research and development institutions with small and medium enterprises in the production and service sectors.

- **Environmentally Sound Technologies in the Metal Finishing Industry**³⁷

This study is part of efforts undertaken by ESCWA to characterize and promote the use of environmentally sound technologies in selected processing industries in member countries. It reviews metal finishing processes and elaborates steps that may be undertaken to limit, eliminate, or treat polluting effluents that generate and reduce water consumption to a minimum.

- **Biotechnology in the ESCWA member countries, sectoral issues and policies, 1997**³⁸

The study investigates leading technologies (genetic engineering and plant cell and tissue culture) with the aim of clarifying the opportunities and challenges for the ESCWA region. To avoid generalization the study allows for some differentiation in its policy recommendations for the selected ESCWA member countries to better cater for their individual situations *vis-a-vis* the impact of biotechnologies.

- **Report on business incubators in the ESCWA region, 1997**³⁹

This document reports on recent developments and activities related to business incubator concepts and practices in the region, as well as on the characteristics of business incubators. It also includes the conclusions and recommendations of the regional seminar on assessment of the role of business incubators in economic

³⁵ United Nations, Economic and Social Commission for Western Asia, **Using Information and Communication Technologies to Create Employment and Alleviate Poverty**, United Nations, New York, 2004.

³⁶ United Nations, Economic and Social Commission for Western Asia, **Technology capacity-Building Initiatives for the 21st Century in the ESCWA member Countries**, United Nations, New York, 2001.

³⁷ United Nations, Economic and Social Commission for Western Asia, **Environmentally Sound Technologies in the Metal Finishing Industry**, United Nations, New York, 2001.

³⁸ United Nations, Economic and Social Commission for Western Asia, **Biotechnology in The ESCWA Member Countries-Sectoral Issues and Policies**, United Nations, New York, 1997.

³⁹ United Nations, Economic and Social Commission for Western Asia, **Report on Incubators in the ESCWA Region**, United Nations, New York, 1997.

development, which was held to acquaint decision makers in the ESCWA region, entrepreneurs, and university professors with the potential and the problems of the business and technology incubators worldwide.

- Other regional studies
 - Strategy for development of Biotechnology in the Islamic countries.
 - Research and development systems in the Arab States: development of science and technology indicators, UNESCO, 1998.
 - Strategy for the development of science and technology in Islamic countries, Islamic Educational, Scientific and Cultural Organization (ISESCO).
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 - Strategy for development of Science and Technology in the Arab World, Arab League Educational, Cultural, and Scientific Organization (ALECSO).
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Many specific questionnaires were designed to collect the information needed in this report (see Annex I).

Detailed table of contents of the report

CHAPTER 1. INTRODUCTION TO RESEARCH IN JORDAN	3
1.1. Social and economic Background.....	4
1.2. The institutional framework	4
1.3. Availability of data for this report	5
1.4. Organization of the report	5
CHAPTER 2. SCIENCE, TECHNOLOGY AND INNOVATION INSTITUTIONS IN JORDAN	7
2.1. The Higher Council for Science and Technology (HCST)	7
2.2. Research centers and units affiliated to the HCST	9
2.2.1. The National Center for Human Resources Development (NCHRD)	9
2.2.2. The National Center for Diabetes Endocrine and Inherited Diseases (NCDID)	10
2.2.3. National Energy Research Center (NERC).....	11
2.2.4. The National Virtual Center for Biotechnology (NVCB).....	11
2.2.5. Jordan Center for Public Policy Research & Dialogue (JCPPRD)	12
2.2.6. Jordan Badia Research and Development Center (JBRDC)	12
2.2.7. National Network for Advanced Materials and Nano-Technology (NNAMNT)	13
2.2.8. Regional Human Security Center (RHSC).....	14
2.2.9. The Environment Monitoring & Research Central Unit (ENMARCU).....	14
2.3. Other research centres	14
2.3.1. The Royal Scientific Society.....	14
2.3.2. National Center for Agricultural Research and Technology Transfer (NCARTT).....	15
2.3.3. Pharmaceuticals Research Unit (PRU)	15
2.4. Jordanian public universities.....	16
2.4.1. The University of Jordan.....	16
2.4.2. Jordan University for Science and Technology (JUST).....	17
2.4.3. Yarmuk University.....	18
2.4.4. Mu'tah University.....	18
2.4.5. Hashemite University.....	19
2.4.6. Al Al Bayt University	19
2.4.7. Al Hussien Bin Talal University	20
2.4.8. AlBalqa Applied University.....	21
2.4.9. Tafila Technical University	21
2.4.10. The German-Jordanian University	21
2.5. Jordanian private universities	22
2.5.1. University of Petra	22
2.5.2. Al Ahliyya Amman University	23
2.5.3. Princess Sumaya University for Technology	23
2.5.4. Jarash Private University	23
2.5.5. Irbid National University	24
2.5.6. Zerqa Private University	24
2.5.7. Al Isra'a Private University	24
2.5.8. Applied Science Private University	25

2.5.9.	Al-Zaytoonah University	25
2.5.10.	Amman Arab University For Graduate Studies	26
2.5.11.	Philadelphia University	26
2.5.12.	Jordan Applied University College of Hospitality & Tourism.....	26
2.6.	Technical Advisory Centers (TAC).....	27
2.6.1.	Center for Consultations, Technical Services and Studies (CCTSS) / University of Jordan	27
2.6.2.	Consultative Center for Science and Technology (CCST) / Jordan University of science and Technology (JUST).....	28
2.6.3.	Center for Studies, Consultations, and Community Services (CSCCS)/Hashemite University.....	29
2.6.4.	Center for Consultations, Technical Services & developing community/Al al-Bayt University	30
2.6.5.	Consultations, Studies & Training Center (CSTC)/Al Balqa Applied University	30
2.6.6.	Center for Studies, Consultations, and Community Service/Al Zaytoonah Private University	31
2.6.7.	Center for Continuous Education and Community Service/Zerqa Private University.....	31
2.6.8.	Center for Studies, Consultations, and Community Service/ Al Isra Private University	31
2.7.	Entrepreneurship support programs and Technology Business Incubators.....	32
2.7.1.	The National Consortium for Technology and Incubation of Business (NACTIB).....	32
2.7.2.	Information & Communication Technology Business Incubator (ipark).....	33
2.7.3.	Jordan Innovation Centre for Engineers and Industrial Enterprises at Royal Scientific Society	33
2.7.4.	Agro-industries Business Incubator (Jordan Innovation Center)	33
2.8.	Other entrepreneurship support initiatives.....	34
2.8.1.	The Intellectual Property Rights unit of HCST	34
2.8.2.	The Industrial Scientific Research and Development Fund (ISRDF)	35
2.8.3.	National Fund for Enterprises Support (NAFES)	35
2.8.4.	Enterprise Productivity Centers (EPCs) IRADA	36
2.8.5.	Jordan Upgrading and Modernization Programme (JUMP)	36
2.8.6.	Cooperation with the Private Sector; University of Jordan – Faculty of Engineering and Technology 37	
2.8.7.	Other programmes supporting enterprises	38
2.9.	Professional associations	38
2.9.1.	Agricultural Engineers Association (AEA).....	38
2.9.2.	Jordanian Geologists Association (JGA)	40
2.9.3.	Jordan Medical Association (JMA)	41
2.9.4.	Jordan Pharmaceutical Association (JPA)	41
2.9.5.	Jordan Dental Association (JDA).....	42
2.9.6.	Jordan Engineers Association (JEA).....	42
2.10.	Business associations.....	43
2.10.1.	Amman Chamber of Industry (ACI)	43
2.10.2.	Irbid Chamber of Industry.....	44
2.10.3.	Zerqa Chamber of Industry.	44
2.10.4.	Other business associations.....	44
2.11.	Jordan's Annual Science Weeks	45

CHAPTER 3. HUMAN RESOURCES DEVOTED TO RESEARCH AND DEVELOPMENT 47

3.1.	Introduction	47
3.2.	Human Resources in S&T Activities.....	47
3.2.1.	Categories of S &T Human Resources.	48
3.2.2.	Distribution According to Economic Activity	48
3.3.	Distribution of Researchers	48
3.3.1.	Researchers According to Economic Activity	49

3.3.2.	Researchers According to Field of Study.....	50
3.4.	Academic Staff and Enrolled Students in Universities.....	51
3.4.1.	Academic Population According to Universities and Sex	51
3.4.2.	Academic Population According to Field of Study.....	52
3.4.3.	Academic Staff by Ranks of Staff and Fields of Study.....	53
3.5.	Employment in Public and Private Sectors	55
3.5.1.	Distribution According to Major Economic Activity.....	55
3.5.2.	Public Employment According to Educational Level.....	56
 CHAPTER 4. FINANCIAL RESOURCES DEVOTED TO RESEARCH		58
4.1.	Introduction	58
4.2.	Expenditure on Basic and Applied R&D.....	58
4.3.	R&D Expenditure of Private & Public Sectors.....	59
4.4.	R&D Expenditure of Universities.....	60
4.5.	R&D Expenditure of Scientific Research Centers	61
4.6.	R&D Budget (2006) of Universities	62
4.7.	R&D Budget (2006) of Scientific Research Centers.....	63
 CHAPTER 5. INTERNATIONAL COOPERATION IN RESEARCH		65
5.1.	S&T cooperation under Ministry of Planning and International Cooperation	65
5.2.	Cooperation under the Higher Council of Science and Technology.....	66
5.2.1.	Cooperation with Germany	66
5.2.2.	Cooperation with the European Union.....	68
5.2.3.	Cooperation with Tunisia.....	70
5.2.4.	Cooperation with Arab Scientific Research Councils.....	71
5.2.5.	Cooperation with Mubarak City for Scientific Research and Technology Applications MuCSAT (Egypt) 72	
5.2.6.	Cooperation with the National Science Foundation (USA)	72
5.2.7.	Cooperation with ESCWA.....	72
5.3.	Cooperation under universities and research centers	72
 CHAPTER 6. GOVERNMENT INITIATIVES IN SUPPORT TO S&T DEVELOPMENT		79
6.1.	Legislative framework.....	79
6.2.	Science and technology policy.....	81
6.3.	Statement of the Science and Technology policy.....	81
6.4.	Science and technology strategy for 2006-2010	82
6.4.1.	Strategy	83
6.4.2.	Strategic goals 2006- 2010.....	83
6.4.3.	Mechanisms	84
6.4.4.	Programmes and performance indicators	85

6.4.5. The executive plan (2006-2010)	87
6.5. Other National Strategies.....	87
6.6. Studies and reports on science, technology and innovation	88
6.6.1. The IDRC review	88
6.6.2. Jordan as part of ESCWA studies	92
REFERENCES.....	96
DETAILED TABLE OF CONTENTS OF THE REPORT	97