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(NCHRD)

SCIENCE AND TECHNOLOGY IN JORDAN: A DEVELOPMENTAL PERSPECTIVE

By

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Introduction

It is universally acknowledged that science and technology are important engines of economic and social development. Nevertheless, it is felt that more political commitment to S&T is needed to ensure the necessary viable level that can be instrumental in having an impact on developmental efforts.

This publication which is issued by the National Center for Human Resources Development is the 110th in the series of the center's publications. It deals with a-subject of strategic importance for any country, namely Science and Technology. It could have also been called Research and Development (R&D) with the understanding that research is generally associated with science, while development is associated with technology.

This publication consists of five papers that were presented by the author on different occasions of scientific gatherings and seminars. Three of these papers dealt specifically with the Jordanian experience and perspectives, while the other two papers were of a general nature.

The first paper explored the Jordanian experience in science and technology with special focus on such components as institutional set-ups, policies, strategies, legislation, implementation and international cooperation. The paper, in addition, identifies the strengths and weaknesses that are relevant to the status of S&T in Jordan.

The second paper explores another dimension of the Jordanian experience in science and technology, which is the European cooperation initiatives and Euro-Mediterranean partnership within the existing institutional framework for S&T in Jordan.

The promotion of investment as one of the functions and targets of science and technology is the theme of the third paper which explores the different inputs that support such function, including governance, human and financial resources, socio-cultural environment, and regional and international cooperation.

Talent and innovation are functionally associated to a great degree with science and technology. The fourth paper looks at talent and innovation from the perspective of society rather than that of the individual. To this end, two major themes were explored: the forces of change in society and the role of education.

Finally, the last paper explores the actual and potential role of Arab universities and research institutes. Several dimensions of relevance were assessed including the pressures and challenges of mass education, the funding issue, the role of private universities, the gender issue, standards and accreditation, the regional dimension, and the constraints of research.

To conclude, science and technology should be viewed as an essential driving force for sustainable human development, thus necessitating a strategic approach and commitment on the various political and social levels.

The Author

Science and Technology: The Jordanian Experience*

* *Presented to the "International Workshop on Experiences and Perspectives of Palestinian-European Scientific Cooperation" 29 February - 2 March 2000, Ramallah- Palestine.*

Science and Technology: The Jordanian Experience

This paper is presented to the "International Workshop on Experiences and Perspectives of Palestinian-European Scientific Cooperation" which is dedicated to identifying the best means to promote and enhance scientific research in Palestine. Such networking is of great importance in keeping abreast with trends in global research and technological development (RTD). To succeed, networking requires the identification of a national focal point, an administrative body to be entrusted with furthering and fostering science and technology initiatives, primarily at the national level; and beyond that developing a regional and eventually global cooperative capacity for successful networking. The paper will discuss the experience in Jordan in such relevant spheres as: institutional set-ups, including the Higher Council for Science and Technology (HCST) and affiliated centers; the relevant policies, strategies and legislation. The main focus will be on Jordanian implementation frameworks and activities; and examples of efforts in the field of international cooperation.

Institutional Set-ups

In a country with limited natural resources such as Jordan, it has always been necessary to match research capacities to societal needs through the evolution of the appropriate science and technology and research policies, and the parallel development of the relevant infrastructure. In response to the official perception of the importance of this field to Jordan's future, the Higher Council for Science and Technology (HCST) was established in 1987, as an independent institution entrusted with the planning, coordination, and implementation of science and technology activities in Jordan. Its objective is to build and develop a national science and technology base to support the socio-economic and cultural development of the Kingdom. To achieve this objective, the Council assumed the relevant responsibilities that included ratifying the national science and technology policy and strategy, establishing required scientific centers, providing financial support to research and development projects, and supporting the development of R&D manpower for socio-economic development.

The HCST General Secretariat adopted a dynamic sectorial approach to its in-house activities, tailored according to national developmental priorities. At present, its interests reflect those of the five-year developmental plan, covering four sectors, namely, Infrastructure and Social Services; Industry and Mineral Resources; Agriculture, Water and Environment; and Developmental Cooperation.

In the first sector, **Infrastructure and Social Services**, the main areas of involvement include health, communications, transportation, education, construction, and trade.

In the second sector, **Industry and Mineral Resources**, the main areas include mineral resources extraction of new drug ingredients, renewable energy, thermal performance, and food technologies.

In the third sector, **Agriculture, Water and Environment**, the main areas in which the HCST supports R&D activities include: biotechnology, plant protection, animal production, biodiversity, water- conservation technologies, food processing, range land management, surface and groundwater quality, wastewater treatment technologies, air and ground water pollution monitoring. and the conservation of historical monuments.

Activities in the fourth sector, **Developmental Cooperation,** include seeking and following-up on bilateral and multilateral cooperation agreements aiming at socio-economic development through S&T cooperation.

The HCST also has a number of affiliated centers established according to developmental priority. Each of these centers undertakes research in priority areas, tailored to societal needs, within their given fields. These include:

The **Royal Scientific Society (RSS)** undertakes S&T activities, particularly in the field of industrial development, through offering technical consultancies, services and training. Its departments cover research activities in the fields of computer technology, technology, industrial chemistry, mechanical design building, electronic services and the environment (including water and air monitoring).

The **National Center for Human Resource Development (NCHRD)** undertakes educational research and development (including educational reform and innovation), with the technical support of the Ministry of Education, and in collaboration with other institutions of higher education. The Center also monitors and evaluates developmental trends in education through its policy council and technical unit, and undertakes the coordination of internationally funded projects in the fields of education, higher education, training, and information systems.

The **National Information Center (NIC)** undertakes the establishment and classification of the national data base, developing the software necessary for an integrated national information system, and coordinating and organizing information between the systems of various institutions. The Center also coordinates relations between national and global sources of information to facilitate access to users and provides consultancy services to the public and private sectors.

The **Institute of Diplomacy (IOD)** undertakes research and post-graduate studies for the development of diplomatic and communications skills as suited to the evolution of international relations within a global society. The Institute develops human resources and national research. The Institute develops human capacities in the fields of diplomacy, strategy, external communications and international relations, establishing a rich database in these fields and strengthening scientific cooperation within this sphere of activity.

The **National Center for Diabetes, Endocrine and Inherited Diseases (NCDEID)** undertakes the implementation of an integrated system for specialized health care for diabetes, endocrine and inherited diseases in both the public and private sectors This is in collaboration with medical institutions in both sectors to enhance the level of medical care offered, cooperating with related institutions at local, regional and international levels, and furthering training, qualification and research and development in these fields.

The **National Energy Research Center (NERC)** undertakes scientific and technological research and development in new and renewable energy sources and energy conservation, operating research units and experimental stations throughout the Kingdom. The Center networks with local, regional and international parties to enhance its capacity and acts as an advisory body for the Ministry of Energy within its field.

Policies, Strategies and Legislation

The last few decades have witnessed an increase in awareness of the potential of science and technology as a cornerstone of the developmental process. The Higher Council for Science the and Technology has been playing a central role in promoting such awareness. Its National Science and Technology Policy document, published in 1995, secured the input of a large cross section of institutions of the Jordanian science and technology community. Technical sectorial committees, instrumental to consolidating and shaping the principles and directives of the policy, were established and made up of delegates from ministerial and other governmental bodies alongside representatives of the private sector, universities and research centers. They worked closely with those involved in structuring the Jordanian

economic and social development plan. The Council's policy and the strategy or methodologies used to further national aims have always been arrived at through national consensus, with the necessary sensitivity to national developmental priorities within a long-term process.
The result has been the growth and promotion of a broad based national awareness of the vital link between S&T and development. In turn, this led to support for increased expenditure on S&T in general and R&D in particular. Nevertheless, R&D expenditure undertaken by national institutions, namely universities and research centeres, remains at very low levels, not surpassing 0.4% of the Gross National Product, whereas the globally accepted level, as recommended by specialized international organizations, should not fall below 1%. In awareness of this fact, the Higher Council supports R&D and human resources development programs in the various S&T institutions through its budget. The aforementioned National Science and Technology Policy that had been arrived at in 1995 provided a clear basis for the support and evaluation of research.
Due to increasing recognition of the fact that S&T advances could lead to improved manufacturing quality and increased productivity, and raising national competitiveness, an **Industrial Policy Unit** was established in the Higher Council in 1997. Its national advisory committee is made up of representatives of various local industries, related ministries, research centers, financiers and the media. Direct administration is undertaken by a smaller steering committee that includes the Secretary General of the Higher Council, as well as the Secretary General of the Ministry of Planning, and the President of the RSS. This unit reviews policies, studies industrial bottlenecks and attempts to arrive at solutions.

Implementation

As previously mentioned, the HCST has supported R&D and human resources development through its budget since its inception. The premise is that accurate information on S&T requirements and potential is essential to sound developmental planning. Enhancing the role of S&T in socio-economic development necessitated determining national priorities through the study of S&T requirements and potential. Therefore, the General Secretariat of the HCST undertook, and continues to undertake the identification of priorities as a part of the continuous update of S&T policy and strategy and review national research and development (R&D) and human resource development, matching S&T potential to requirements. To this end, a study of S&T requirements (demand) and potential (supply) was undertaken over a two year period (1996-1998), covering more than two thousand institutions and identifying their needs in training, scientific research and S&T services. The study identified indicators of potential S&T activities, manpower, facilities, information, projects, funding and expenditure and postgraduate research.
Based on the results of the survey, recommendations were made according to needs in the fields of manpower, R&D and technology. Explicit national priorities for R&D were evolved in the fields of industry, infrastructure, agriculture, environment, energy, mineral resources and water. The Higher Council approved the final details of National Priorities for Research and Development in September 1999; these were then sent to Jordanian universities and research centers to solicit research for the year 2000 according to the priorities defined. The Council has already received more than 200 proposals based on these priorities.
The General Secretariat developed its approach to R&D project funding since 1996, to become more pro-active in soliciting specific R&D topics, reflecting the sectorial objectives of the national development plan. The projects supported for the past 5-years cycle (1996-2000) had fallen under the heading of Earth Resources, namely

minerals, water, energy, and the environment. From 1993 to date the Council has been able to expend roughly JD2.5 million in support of more than 100 R&D projects. The **Industrial Research Fund** was established in April 1994 as an additional mechanism for supporting research at the national level, besides what the Council supports through direct solicitation of prioritized research. It offers financial support to R&D projects and studies and industrial consultancy services to Jordanian industry. Its aim is to pinpoint industrial priority and assist industries in solving related technical problems in developing products and operational services so as to improve their competitive edge. This helps to bridge the gap between scientific research centers and industry, and encourages national industries to optimize benefits from scientific R&D. The fund's budget is around 500,000 JD a year. To date it has supported 150 projects at a cumulative cost of JDl.2 million.

In a parallel development in 1998, and as a concrete indication of increased public awareness of the developmental role of R&D, the Ministry of Industry and Trade was able to push forward the approval of a by-law stipulating that 1% of the profits of all public share- holding companies should be channeled to scientific research and vocational training. This is to be put at the disposal of a Scientific Research and Vocational Training Fund established at the Ministry with an independent budget. The Fund will offer Jordanian industry financial support and consultancy services for R&D and vocational training in collaboration with local, regional and international, initiatives. The Funds Administrative Committee is presided over by the Minister of Trade and Industry with the Secretary General of the HCST as his deputy. Other members include the director of the Vocational Training Corporation, a representative of the Royal Scientific Society, the dean of scientific research of one of the public universities, and a representative from the public shareholding companies.

The Higher Council also seeks to encourage fresh and innovative technological initiatives, mechanisms, and linkages with foreign partners. To this end, an **Invention and Innovation Unit** was established at the General Secretariat to foster and encourage the issuing of patents.

In a further move to increase networking within the local S&T community, the **Jordanian Science Week** has been convened almost annually since 1993. It aims at the development of the national S&T base by bridging the gap between national institutions and the production and services sectors; enhancing levels of coordination and integration within the frame of comprehensive development initiatives serving socio-economic goals. It ensures the participation of the relevant institutions in the preparation of research papers, discussions and the formulation of recommendations and future plans of action, thereby creating an annual forum for their interaction as an S&T community.

International Cooperation

Having worked on networking in R&D since its establishment, the HCST is involved in many relevant bilateral and multilateral agreements. It represents the Kingdom at major international fora to strengthen linkages with international centers of excellence and national S&T agencies across the world. The HCST benefits from networking agreements with the European Union (EU) in fields related to: science, technology and innovation; industrial development strategy, focusing on both human resources development and industrial design; food technologies; and remote sensing applications in the agricultural sector. The HCST is also following up on previous Science and Technology Cooperation Projects between Jordan and the EU, under the terms of which funding for several developmental research projects between Jordanian institutions and European Universities was provided. Such S&T

partnerships foster national development in key areas and efficient cooperation between research institutions and industry.
Bilateral cooperation with the United Kingdom, on the other hand, spearheads developmental initiatives in priority areas. The General Secretariat of the Higher Council houses the **Jordan Badia Research and Development Programme (BRDP),** established in 1992 in collaboration with the UK's Royal Geographic society (RGS) with Durham University's Center for Overseas Research and Development acting as the implementing arm of the RGC. It aims at the transfer and harnessing of technology and the optimal exploitation of available resources in the Jordanian Badia, or semi-arid zones. This encompasses human resource development with due emphasis on the principles of self-reliance and sustainability in combatting desertification and providing sustainable lifestyles for the inhabitants of the Jordanian Badia. Fieldwork is built around societal needs with regard to livestock or agricultural capacities and water conservation or harvesting. Building bilateral agreements with developmental agencies and other countries with similar programs has contributed to benefiting from the wealth of global R&D in this vital field.
All these efforts help to promote scientific collaboration in fields like agriculture, water, and the environment in both arid and semi-arid regions; biodiversity/biotechnology; and human resources development, all of which are potential fields of interest for Palestinian development. Priority projects that could fall under these headings include water harvesting and desert ecology; the utilization of treated wastewater; the examination and conservation of biodiversity; and the diagnosis and elimination of pathogens from planting material. One successful initiative on Sustaining Freshwater Resources in the Middle East has already been implemented in collaboration between the U.S. National Academy of Sciences, the Royal Scientific Society of Jordan, the Israel Academy of Sciences and Humanities and the Palestine Health Council.
In fulfillment of economic development needs, current trends emphasize the importance of enhancing the competitiveness of small and medium enterprises (SMEs) through promoting relevant R&D. To this end, the Higher Council has fostered Memorandums of Understanding (MoUs) with various global partners; our most recent agreement was with the Italian National Research Council (CNR). Besides advancing the level of SMEs in Jordan, the training component forms the basis for the enhancement of the capability of those employed in areas supporting SMEs.
Other examples of fruitful cooperation include a collaboration agreement for joint R&D between Jordanian and German scientists with the German developmental agency (DFG) under the terms of which Jordanian scientists have already left for Germany. Similar collaboration with the Japan International Cooperation Agency (JICA) is underway in both the industrial and environmental fields.

Strengths and Weaknesses

Perhaps the greatest strength in the S&T field in Jordan is the dynamism that is growing with the awareness of the significance of S&T to the developmental process and the quality of life itself. At a time when the realities of globalization place a great emphasis on the capacity for regional planning and resource deployment, national development initiatives can benefit from linkages with both regional requirements and capacities. Based on our long-term surveillance of Jordan's national requirements and needs as well as our experience of regional S&T collaboration, we have identified specific themes or priority areas with an added regional depth. These fall under six categories, namely development of water resources, development of energy resources, environmental protection, industry, agriculture, and human resources development. For the purposes of the surveillance of national

requirements, we have always stressed the benefits of cooperation between universities and research centers, through the conclusion of direct agreements and joint research projects.
On the other hand, the most significant weaknesses are the financial constraints, especially in fields where results are not immediately perceptible such as in S&T. Another obstacle is the lack of focused R&D, as well as discrepancies in the focus of decision-makers due to weak linkages with research centers' output and industry. Furthermore, the lack of overall coordination and consistency leads to the duplication and scattering of efforts. The creation of a unified, cross-sectorial S&T community is a long process. It involves human and infrastructural resource development as well as sensitive policies and strategies evolving within a central perspective on developmental challenges, linking research centers to the productive process.

Conclusion

In closing, I would like to express the hope that conversations here today will be but the beginning of a long and constructive road, perhaps within a regional dimension. I hope that this meeting will precede many more meetings for scientific and technological enlightenment, towards a better future.

The Jordanian Perspective on S&T Research as a Tool for Regional Integration and the Development of the Euro-Mediterranean Partnership

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* *Presented to the "Euro-Med Forum on Scientific and Technological Research As a Tool for Regional Integration And the Development of the Euro-Mediterranean Partnership", Capri, Naples 9-11 December 2000*

The Jordanian Perspective on S&T Research as a Tool for Regional Integration and the Development of the Euro-Mediterranean Partnership

Institutional Framework for S&T in Jordan

In Jordan, the national umbrella for science and technology is the Higher Council for Science and Technology (HCST), which was established in 1987 as an independent institution entrusted with building a national science and technology base and developing it for the purposes of economic, social and cultural progress in Jordan. Related responsibilities included ratifying Jordanian science and technology (S&T) policy, defining its priorities and drawing up the related strategies, as well as following up on their implementation and evaluation in collaboration with the related institutions. The Council supports S&T research through the provision of financial aid to scientific and technological research programs, services and activities according to national development priorities. The Council may also establish affiliated specialized centers of S&T research and services. Another facet of the Council's activities is the undertaking of scientific and technological cooperation through concluding agreements related to scientific and technological research, networking with local, Arab, regional and international organizations.

The Higher Council science and technology policy was published in 1995, and was contributed to by a large cross section of institutions and individuals from the Jordanian S&T community. The policy was formulated along four major axis: (1) research and development; (2) technologies; (3) human resources and (4) information, providing detailed short and long term strategies from which plans and programs were drawn within each sector. This resulted in a broad based national awareness of the significance and vital linkages between S&T and development, leading to increased support for S&T in general, and R&D in particular

As part of the continuous update of S&T policy and strategy, and the review of national research and development (R&D) and human resources development, a study of S&T requirements was undertaken over a two year period (1996-98), matching potential to requirements. The related survey identified indicators of potential S&T activities, manpower, facilities, information projects, funding and expenditure and postgraduate research. Recommendations were then made according to R&D priorities in the fields of industry, infrastructure, agriculture, environment, energy, mineral resources and water. The Higher Council then approved the National Priorities for Research and Development derived from this survey in September 1999. Such priorities have, since then, been utilized as guidelines for research institutes, including universities and other research centers, to develop research projects and proposals for funding.

The following table shows the major indicators as identified by the study on national scientific and technological potential:

Indicator	1996	1986
No. of Institutions involved in S&T activities.	524	196
No. of Employees	18,364	4,389
No. of Scientists and Engineers working in R&D Full Time Equivalent (FTE)	1,593	418
Expenditure on S&T activities % GDP (1995):	2,36	3.77
- R&D	0.38	0.29
- Education & Training	1.48	2.07
- S&T Services	0.50	1.41

It is worth stressing that present expenditure on scientific research by national institutions, such as universities (out of twenty universities, eight offer related Ph.D. programmes) and research centers, remains at low levels, not surpassing 0.4% of the gross national product compared with the minimum accepted level of 1 %. More than 90%of funding for scientific research comes from the public sector.

As previously mentioned, by virtue of its law, the Higher Council for Science and Technology is entrusted with the establishment of specialized centers of scientific and technological research. This function has played a major role in S&T capacity building through the development of a S&T framework and network in Jordan, according to developmental priorities.

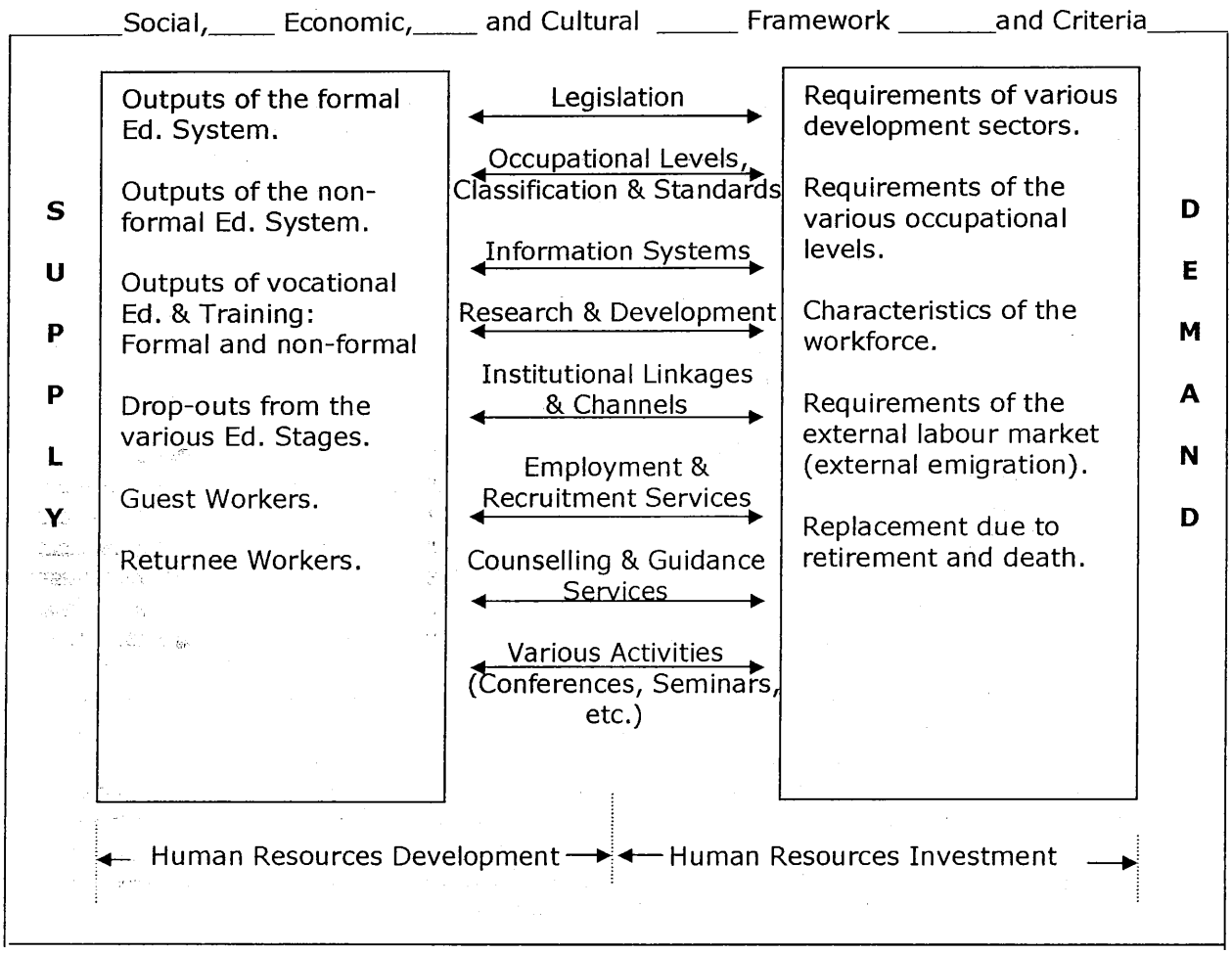
The following specialized centers fall under the umbrella of the HCST:

The **Royal Scientific Society (RSS),** which was established in 1970, undertakes S&T activities, pauticularly in the field of industrial development, through offering technical consultancies, services and training. Its departments cover research activities in the fields of computer technology, industrial chemistry, mechanical design and technology, building, electronic services and the environment. The RSS also incorporates a specialized university college, the Princess Sumaya University College of Technology (PSUCT), which awards Bachelor of Science Degrees in computer science and electronic engineering, thus responding to a growing national need for professionals in the fields of IT and Electronics.

The **National Center for Human Resources Develonment (NCHRD),** which was established in 1989, undertakes educational research and development (including educational reform and innovation), monitors and evaluates developmental trends in education through its policy council and technical unit, and undertakes the coordination of internationally funded projects in the fields of education, higher education, vocational education, teacher training, and information systems.

In 1995 the mandate of the NCHRD was extended to cover the various human resources development (HRD) issues, and therefore began the groundwork necessary to prepare an intensive and extensive evaluative study on the status of HRD in Jordan resulting in the publication of the Jordanian Human Resources Development Strategy which was approved by the Council of Ministers. This was of major significance as it was the first thorough and systematic work that took both the main and subsidiary sectors within the HRD sphere into account linking supply and demand according to a developmental pattern spanning the requirements of the various development sectors.

The following figure shows the model that was developed as part of this strategy, and that was later amended slightly, to show the various components and linkages concerning human resources development and utilization.



Human Resources Development & Utilization System

The **National Information Center (NIC),** which was established in 1993, undertakes the establishment and classification of the national data base, developing the software necessary for an integrated national information system, and coordinating and organizing information between the systems of various institutions. It coordinates relations between national and global sources of information to facilitate access to users, and provides consultancy services to the public and private sectors.

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The **National Center for Diabetes, Endocrine and Inherited Diseases (NCDEID),** which was established in 1996, undertakes the implementation of an integrated system for specialized health care for diabetes, endocrine and inherited diseases. This is in collaboration with medical institutions to enhance the level of medical care offered, cooperating with related institutions at local, regional and

international levels, and furthering training and research and development in these fields.

The **National Energy Research Center (NERC),** which was established in 1998, undertakes scientific and technological research and development in new and renewable energy sources and energy conservation, operating research units and experimental stations throughout the Kingdom. The Center networks with local, regional and international parties to enhance its capacity, and acts as an advisory body for the Ministry of Energy within its field.

The common features shared by all these institutions are that (i) they are autonomous under the umbrella of the HCST which approves their legislative tools, policies and funding frameworks; (ii) they undertake R&D as well as income-generating services; (iii) they are run by Boards made up of representatives of both governmental and non-governmental agencies and organizations.

European Cooperation Initiatives

The HCST is involved with several research cooperation initiatives with European partners. One example is the ongoing cooperation with DFG in Germany that includes provisions for the exchange of scientists and the implementation of joint research programs. Other initiatives supported by the European Union include a food technology project, to be implemented at the beginning of 2001, and a remote sensing project for agricultural applications. Other research projects that are expected to be financed by the EU in the field of strategies include an industrial development strategy project and another on S&T requirements. In the area of policies, one example is the industrial modernization program, to be implemented in Jordan within the next three years with EU financing. Its components include capacity building for agencies dealing with industrial development in Jordan, extending technical assistance to SMEs, and providing the Jordanian government with policy advice in the field of industrial development.

RSS projects with the EU include:

(i) THEME, Textile Application of High Performance Computing in the Middle East, a project aiming at increasing the uptake of High Performance Computing (HPC) based quality control within the textile industry in the Middle East, offering HPC application development and technology transfer for the textile industry in Jordan and Egypt;

(ii) CJIS, Cultural Journey in the Information Society, a project aiming to set up a framework to build distributed interactive multimedia networks over the internet and worldwide web, acting as electronic roads for cultural and historical exploration in 5 Euro-Med countries (Jordan, Egypt, Cyprus, Greece and Spain) with particular emphasis on cross national links;

(iii) The MEDISAT Mediterranean Science and Technology Information Network which aims to strengthen research and technological development in Europe and the Mediterranean region, and hence competitiveness and integration, free access to information sources; and close cooperation in S&T.

(iv) A previous project, undertaken in 1997, covered wastewater recycling supplied by renewable energies in the Near East, with the participation of institutions from five Mediterranean countries.

The NCHRD is involved with a major project with the EU focusing on improving teacher education at Jordanian universities, jointly funded by the EU and the government of Jordan.

Assessment of the Euro-Mediterranean Partnership

From the Jordanian perspective, any assessment of the Euro-Mediterranean partnership indicates that though it has resulted in several activities, as mentioned above, it is felt that more can be achieved. As a developing country, there is much more potential for Jordan to benefit from further developments in the Euro-Med partnership alongside other regional players. In general, it is widely felt that a more active European role would be highly beneficial to the region. While the Euro-Med partnership focuses on all three social/cultural, economic/financial and political/security themes, it is felt that the political context overshadows progress on different fronts in this region, and therefore greater European involvement in resolving regional conflicts and supporting regional peace initiatives would be universally beneficial. Furthermore, key areas for research in the political field could include the institutional and legal aspects of peace issues in the region, helping Mediterranean partnership countries to enact and develop legislative tools and regulations on such issues as: democratization, citizenship, immigration, the protection of human rights and the adherence to international treaties and conventions on disarmament, water resources management and the institutional and legal framework for environmental concerns. Capacity building and the human resource development necessary for such advances could be achieved through the exchange of researchers, the creation of networks and information systems guaranteeing the free flow of information.

Such comprehensive programs would require strengthening and promoting a stronger spirit of true partnership and regional integration, beyond the mere implementation of limited projects. With the attainment of such a spirit, long-term social, political and economic objectives could then be realized within greater aspirations for enhancing the quality of life. Furthermore, multi-disciplinary projects that cross set theme boundaries, involving socio-economic or socio- political themes should be aimed at and encouraged. Such a multi-disciplinary approach is needed when designing activities and projects that may deal with multiple and over-lapping fields of partnership, i.e. the economic, social and political. The political and security implications of economic and social partnership programs should always be taken into consideration, and should ideally be coordinated with other concerned parties from outside the Mediterranean region as far as possible. Improvements could also be attained through the simplification of procedures needed to benefit from available EU resources.

Future priorities can focus on the enhancement of the role of industrial enterprises in S&T and R&D for national and regional development; and providing increased funding for such endeavors. Efforts are needed to enhance the involvement of the private sector in R&D activities.

Broadly speaking, the appropriate culture for research, scientific and technological development remains to be enhanced to attain the necessary critical mass. This could minimize the brain drain Arab countries are currently suffering by providing an environment conducive to scientific and technological development, within the context of specific drives towards economic restructuring programs, accompanied by social packages to minimize social hardships. European support is vital to such progress, and the eventual aspirations for economic growth, prosperity and peace.

Science and Technology as a Tool for The Promotion of Investment: The Sustainability Dimension*

* *Presented to Jordan Seventh Science Week, Amman, Jordan, (1-6 November 2001)*

Science and Technology as a Tool for The Promotion of Investment: The Sustainability Dimension

Introduction

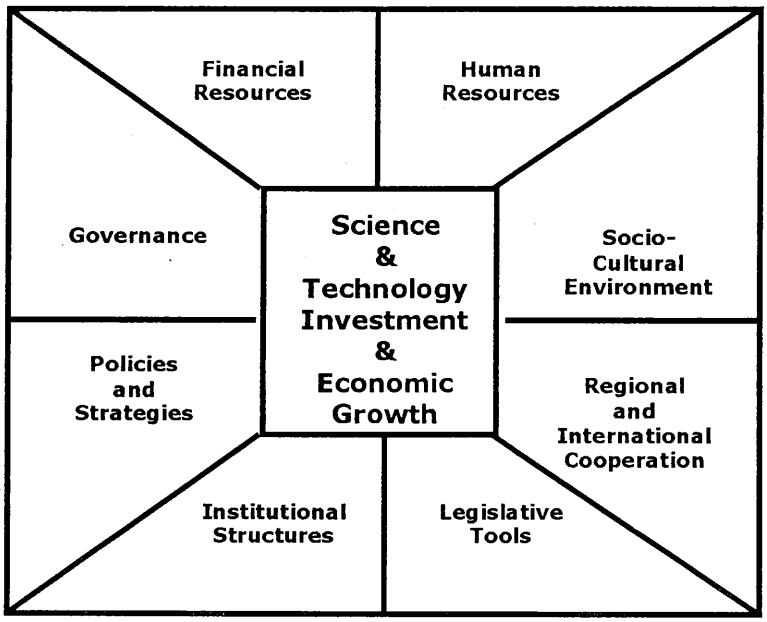
It is taken for granted nowadays that a state of interdependence exists between scientific and technological development on the one hand, and economic development and investment growth on the other. The promotion of Science and Technology (S&T), quantitatively and qualitatively, with special emphasis on the appropriate socioeconomic fields and priority areas, is an effective tool in the national efforts to promote and sustain investment, and hence economic growth. At the same time, scientific and technological developments are enhanced and guided by expanding local and foreign investment initiatives. This is because investment drives are usually accompanied by modern systems and transfer of know-how in such functions as planning, design, operation and sustainability.

On the other hand, modern information and communication technologies (ICT) have become essential tools in the efforts to enhance the effectiveness of the role of S&T in promoting investment activities. The special attention and focused support given to ICT in Jordan recently is expected to reflect positively in this respect.

This paper explores the sustainability dimension in the role of S&T as a tool for the promotion of investment. Eight main components of such a dimension were identified. These are

1. Legislation.
2. Institutional set-ups and structures.
3. Policies and strategies.
4. Governance.
5. Human resources.
6. Financial resources
7. Socio-cultural environment.
8. Regional and international cooperation.

The following diagram is a representation of these components in their relation to S&T on the one hand, and investment and economic growth on the other. A brief discussion of each component will follow.



Sustainability Components For Science & Technology and Investment

Legislation

A modern and flexible legislative framework is an important component for strengthening the role of Science and Technology as a tool for the promotion and sustainability of investment activities and socioeconomic development. In this context, the relevant legislative tools should be designed to serve both sides of the coin: Science and Technology on the one side, and the economic field on the other.

During the past decade, a great deal of legislation has been enacted in Jordan in such fields as investment promotion, national production, companies affairs, customs, income tax, intellectual property, etc. Nevertheless, more is needed, not only to operationalize all these legislative tools, but also to cover other relevant fields, and to improve procedures and enhance transparency and accountability in their implementation.

On the other hand, most existing legislative structures for science and technology seem to deal with the public sector, with limited provisions related to the private sector role. The HCST law, the law of the newly established Ministry of Higher Education and Scientific Research, the Universities law, and the various bye-laws of the concerned centers and institutes, are examples of such legislative tools. There seems to be a need therefore for more legislation in general, and to regulate the role and involvement of the private sector in S&T and research in particular, including the strengthening of ties and linkages between private enterprises and research institutes.

Institutional Set-ups and Structures

The success of Science and Technology policies and strategies requires the establishment of a national focal point or body to be entrusted with furthering and fostering S&T initiatives, primarily at the national level; and beyond that, developing a regional and global cooperative capacity for successful networking.

In a developing country like Jordan, it has always been necessary to match science and technology efforts and scientific research capacities to societal needs and investment initiatives, through the establishment of the appropriate institutional structures, and the adoption of the relevant policies and strategies. In response to such needs and requirements, the Higher Council for Science and Technology (HCST) was established in 1987 as an independent body, entrusted with the planning, coordination and support of science and technology activities in Jordan. Consequently the Council assumed the relevant responsibilities that included the development of a national science and technology policy and strategy, the establishment of the required scientific centers, the provision of financial support to R&D projects, and the support of human resources development for socioeconomic advancement. The four departments of the secretariat of the HCST reflect the coverage of the various socioeconomic sectors, including:

- Industry and mineral resources.
- Agriculture, water and environment.
- Infrastructure and social services.
- Developmental cooperation (regional and international).

The HCST acts as an umbrella for a number of affiliated centers that were established in response to developmental needs, and that are entrusted with activities and research in priority areas that serve societal needs and investment initiatives. These centers include:

- The Royal Scientific Society.
- The National Center for Human Resources Development.
- The National Information Center.
- The Institute of Diplomacy.

- The National Center for Diabetes, Endocrine and Inherited Diseases.
- The National Energy Research Center.

Other national institutions of related functions include the National Center for Agriculture Research and Technology Transfer as well as universities.
On the other hand, the recently established Ministry of Higher Education and Scientific Research is expected to complement the work of the HCST, especially in promoting and rationalizing the role of universities in scientific research.

Policies and Strategies

Policies and strategies that derive from the relevant legislative umbrellas and that rely on the availability and involvement of the appropriate institutional set-ups and structures are important ingredients to the development of S&T, and enhancing its role in the promotion and sustainability of investment efforts.
In this respect, the HCST has played a central role in promoting the awareness for S&T developmental potential, through the publication of a "National Science and Technology Policy" in 1995, in close cooperation with all concerned partners. This policy was formulated along four major axes that comprise research and development, technologies, human resources, and information; thus providing short and long term strategies from which plans and programmes can be derived and implemented.
In the field of human resources, the National Center for Human Resources Development issued a document entitled "Human Resources Development Strategy", which was approved by the Council of Ministers in 1998, thus becoming a national strategy in this filed. A similar effort was undertaken by another affiliated center of the HCST, the National Information Center, through the development and publication of the "National Information Strategy".
All these, and other efforts to design relevant policies and strategies should help to direct science and technology efforts towards developmental needs, thus helping to promote and sustain investment initiatives.

Governance

It has been proven, time after time, that the good management of any enterprise or system, including S&T systems and institutions, is an essential ingredient for success and sustainability. The institutionalization and promotion of such characteristics as transparency, accountability, fairness, efficiency, self-evaluation and human resources development on the one hand, and the avoidance of such ills as favoritism, over-employment, wastage of resources and laissez-faireism on the other, are essential factors in the implementation of S&T policies and strategies, and the utilization of the relevant activities to promote economic growth and investment initiatives.
The governance dimension of S&T comprises two major levels of responsibilities and mandates. The first is the national or system level that is usually undertaken and/or supervised by governments through national structures or councils that represent the public, private and voluntary sectors. The second is the institutional level that covers the various institutions, centers, agencies, enterprises and departments that have a role in scientific and technological developments and research activities.
In Jordan, one can cite some weaknesses in the governance dimension of S&T on the various levels of responsibility. Many of the social shortcomings reflect negatively on the efforts to institutionalize, promote and sustain scientific and technological developments and research efforts.

Human Resources

Human resources at the various occupational levels, including the professional, technician and craftsman levels, are important inputs for the success of scientific and technological developments on the one hand, and economic development and investment efforts on the other.

In Jordan, the education system has been characterized by many achievements during the past few decades. Nevertheless, many weaknesses still need to be addressed, especially that most of the achievements in the various levels and types of education were of a quantitative nature. In this respect, one can cite seven major needs, of a qualitative nature, to be catered for. These are:

(i) The adoption of modern teaching-learning methodologies that cater for individual differences; and that encourage critical thinking, self- learning and scientific approaches.

(ii) The enhancement of the relevance factor in the outputs of the education system in their relation to socioeconomic development and labour market needs.

(iii) The realization of a balanced approach to the social and economic dimensions of human resources development (HRD). Consequently, HRD should be viewed both as a social service and as investment with economic returns. In this context, the economics of education and HRD systems need to be better catered for.

(iv) The promotion and institutionalization of non-formal or adult education services and facilities, or what is sometimes referred to as continuous or life-long education. It is non-formal education that usually distinguishes developed systems of education.

(v) The empowerment of the school as the basic social cell for the development of human resources. Such empowerment would require the education system to introduce more decentralization in its structure and operations, and to promote a school environment conducive to innovation and excellence, with special emphasis on the governance component.

(vi) The enhancement of the "learning to do" concept in the systems of human resources development. One of the salient features of developed education systems is that the concept of "learning to do" is fully integrated in the objectives and practices of such systems, through the weight given to the practical and applied approaches and activities in the teaching-learning process, and through the social status of vocational and technical education in HRD systems.

(vii) The adoption of a comprehensive approach to the needs of groups with special needs. Such groups include the slow learners and the handicapped on the one hand, and the talented on the other.

Financial Resources

Jordan spends about 0.35% of its GDP on scientific research and technical development (RTD). This is roughly only one third of the minimum recommended for a developing country. Relevant figures in developed countries range mostly between 2% and 3% of GDP. Furthermore, the majority of spending on RTD in Jordan is secured from public sources. The contribution of the private and voluntary sectors is relatively small in this respect. Therefore, any plans to enhance the financial resources to RTD, and to approach the recommended figure of 1 % of GDP should

target mainly the private and voluntary sectors. The diversification of financial resources to fund RTD activities should be a major component of any strategy for the promotion of the qualitative and quantitative aspects of RTD. Furthermore, the linkages between research institutes and business enterprises need to be strengthened.

On the other hand, there doesn't seem to be a lack of financial resources and investment in scientific and technological development. Modern technologies can be identified in many of the major industrial enterprises, as well as other sectors of the economy. Nevertheless, this does not necessarily tell much about the status of S&T, because of the modest contribution to, or participation in the various dimensions of utilizing such modern technologies, including planning, design, installation, operation, servicing and development activities.

Socio-Cultural Environment

The national socio-cultural environment, including the political environment, acts as a general overall framework that helps, or otherwise retards and stands in the way of scientific and technological developments and their impact on investment and economic growth.

The socio-cultural environment is usually manifested in such aspects, traits and values that reflect directly or indirectly on S&T, and which include:

- The role of religion in society, and the approach to the various religious beliefs.
- The influence of the political life and institutions, including the status and influence of political parties.
- The role and influence of the various institutions of the civil society, including voluntary organizations, unions, etc.
- The type of allegiances that shape the individual's ties to the family, the tribe or the national good.
- The status of democracy and democratic institutions and practices in society.
- The status of academic freedom available to and practiced by scientists and researchers; and the extent to which such freedom is limited by political and security considerations on the one hand, and by social and cultural taboos on the other.
- The extent to which the spirit of entrepreneurship, technopreneurship, and risk taking as opposed to risk aversion, is valued in society.
- The social conception and practices of self-learning and life long education.
- The extent to which the socio-cultural environment accommodates and promotes such traits and values as transparency, accountability, institutionalism, fairness as opposed to favoritism, and teamwork as opposed to individualism.

In general, the appropriate socio-cultural environment that is conductive to scientific and technological development and RTD in Jordan is in need of enhancement to attain the necessary critical mass needed to make life easier for researchers, scientists and entrepreneurs on the one hand, and to minimize the brain drain phenomenon, whereby scientists are encouraged to seek work opportunities outside for lack of the appropriate social, political and institutional environment locally.

Regional and International Cooperation

Regional and international cooperation and networking is an important element in the promotion of S&T and investment efforts and activities, especially in developing societies.

Since its establishment, the Higher Council for Science and Technology has established several networking agreements in S&T and research, and has been

involved in many bilateral and multilateral agreements in such fields as science, technology and innovation, industrial development, food technologies, agriculture, water, environment, biodiversity and human resources development. Nevertheless, and despite all efforts undertaken by the HCST and other governmental and non-governmental agencies, much more needs to be done in the field of regional and international cooperation and networking.

On the international level, such cooperation is important in keeping with trends in global research and technological development. For that purpose, existing resources and channels should be tapped and utilized. Twinning arrangements as well as contractual and exchange agreements among universities and research centers are useful tools in this respect.

On the regional level, the scarce and weak bilateral and multilateral agreements need to be increased and strengthened. Such regional agencies as the "Arab Union for Scientific Research Councils" need to be supported and activated. Specialized regional research centers, located in locations of comparative advantage can fulfill both technical and economic criteria and benefits. In addition to the political will, this would necessitate the activation of the relevant regional organizations, such as the "Union of Arab Universities" and other Arab and regional bodies.

Talent, Innovation and Society*

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Talent, Innovation and Society

Introduction

It is usual to tackle the issues of talent and innovation from the angle of individual talent and personal innovation, or from the angle of the education system itself, especially those characteristics that promote talent and innovation.

In this paper, the issue under consideration is tackled from the angle of society and the social environment that fosters growth and development in some cases, or hinders such growth and development in other cases.
With these issues in mind, the following assumptions and questions come to the forefront:

- Talent is not an exclusive phenomenon of academic performance.
- In addition to individual talent and innovation, there exist group or team talents and societal innovations.
- What are the forces of change and development in society?
- Is talent and innovation the main motivator for change in a lagging society? or is a suitable societal environment a prerequisite for such change?
- Does taking special care of the talented streamline with the concept of "the democracy of education", and consequently with the concept of "education for all"?

These assumptions and questions and others are dealt with in this paper through dealing with three major issues, namely:

1. Scientific and technological development.
2. Forces of change in society.
3. Education and democracy.

Scientific and Technological Development

One of the outstanding characteristics of the last decades of the twentieth century was the stunning acceleration of the scientific and technological developments in the various fields of life. A country with modest rate of growth finds itself running continuously behind such developments and their life applications, as well as their economic reflections and social and cultural extensions. The education system in general, and higher education and scientific research centres in particular, bear great responsibilities in this respect. The responsibility of the sociocultural environment and political framework is equal, if not greater than, that of the education system regarding the extent and nature of response to such scientific and technological developments. But to secure the appropriate roles of all these sectors, outstanding leaderships and innovative initiatives should be available. Consequently, the education system should be able of taking care of talent and innovation, and discovering those who own such abilities.
It is worthwhile mentioning that some futuristic studies for the first quarter of the twenty-first century indicate that the future of the World will be directed by four major forces. These are genetics, information and communication technology, technology of materials, and energy technology. In addition to these forces, environment will become an integrated universal network, thus directing the world towards a comprehensive environmental system. The world will furthermore depend more and more on automated machines and clever gadgets, and it will become possible to control, or reduce the effects of natural disasters. Human beings will furthermore enjoy more leisure, longer span of life and better education. Virtual institutions and societies that depend on electronic communications will become widespread, while a good proportion of the labour force will not have to leave their

homes for work. All this will be apparent and tangible in the developed countries. In the case of developing countries, the situation will vary considerably from one country to another, depending upon the efforts exerted and advances made in the field of scientific and technological development, and in the field of human and natural resources and investment, taking into consideration that the optimum investment in human resources needed to meet the requirements of scientific and technological developments can only be realized if entrepreneurs of such developments can be nurtured through a developed education system that caters for individual differences and provides special services and targeted care to the talented who are the source of such entrepreneurship.

It is taken for granted that human resources constitute the common factor that could lead to the success of development plans in general, and science and technology plans as well as R&D activities in particular. Such plans and activities are obviously pioneered by scientists and distinguished academicians who are the products of an educational environment that reveals their abilities, nurtures their talents, and motivates their inventive characters. Thus, the quality and standard of human resources, as well as the relevance of such resources to developmental needs, mark to a great extent the accomplishments, effectiveness and efficiency of socioeconomic development. Such accomplishments can only be realized by a rational and science-oriented governance structure that is free of backwardness and corruption, that is unaffected in serving its community by the negative forcers in society, that has a futuristic outlook and democratic approach, and that ensures institutional partnership as well as interaction and cooperation with all those who are concerned with the operations of human resources development inside and outside the education system, at the planning, implementation, follow-up and evaluation levels. Such administrative and organizational environment is necessary, even essential, for the birth of talent and innovation.

Forces of change in Society

The issue of forces of change in society can be considered as one of those issues that deserve to be classified as a national priority in the Arab Society due to its social, political and economic implications. This is due to the nature, effects and mechanisms of such forces, as well as the supporting and resisting factors, and the appropriate approaches to foster and rationalize these forces.

The change under consideration here comprises several dimensions. One of these dimensions is concerned with social and political change regarding the movement towards democracy, social justice, human rights, etc. Another dimension is concerned with the change required by scientific and technological development including deregulation, globalization and the spread of technologies in the various aspects of life.

Change in society is, by its nature, an innovative operation that can frequently be outside the boundaries of normal practices and a challenge to systematic procedures and approaches. Nevertheless, those who undertake change in society can on the one hand be innovative groups and talented individuals or can, on the other hand, be ordinary groups and individuals, depending upon the nature of approach or approaches utilized to affect change. The following are some of the relevant approaches, taking into consideration that what takes place in many societies can be a mixture of these approaches that interact in different proportions to push the forces of change.

THE FIRST APPROACH is that approach whereby the political leadership of the concerned country adopts the forces of change and sets its pace and modality within the prevailing conditions, variables and limitations, as has so far been the case in

China. This approach is characterized by being a relatively safe one and, to a certain extent, by leading to predicted outputs as long as it proceeds within a time-frame that is socially acceptable, and as long as it is fostered by reasonable amount of institutionalization, democracy and social justice. But the facts show that most Arab countries have not adopted this pattern of change effectively, and that those countries that have adopted some features of this pattern did so with many brakes and limitations, and sometimes with hesitation and failures every now and then under the effect of internal and external factors. It is clear that this approach to change requires the availability of political leadership that enjoys distinguished abilities, wide horizon of thinking, and assessment and planning talent.

THE SECOND APPROACH is the people's approach, whereby change is forced at the hands of the marginalized groups in society, following the intensification of social ills, including poverty, unemployment, social deprivations, corruption, denial of liberties, etc. In many cases the prime movers of such groups in society are individuals with leadership abilities and special talents, who are or are not associated with special ideologies. It is unusual for this kind of change to take place without acts of social friction or force.

THE THIRD APPROACH is the one that utilizes human resources development as well as the development of the education system as means and tools for change. This approach assumes that the education system, with its formal and non-formal components, is qualified to lead to the required change, all the more so since it is full of positive values and ideals, Nevertheless, there are some who believe that the education system is unable to lead to the required change because it is originally designed to serve existing national political systems. Nevertheless, the inability of the education system to trigger off change applies to short and medium terms only. This implies that the positive effects of education materialise mainly in the long term. Thus, through enlightenment, awareness raising and culturalisation, there appear those critical-minded, leadership-oriented individuals who do not get swayed by the tides of compliance and who do not take for granted existing standards and criteria. If these individuals find the appropriate institutional framework and democratic environment to work and act, change will take place constructively and peacefully. Otherwise efforts for change will be accompanied by different kinds of friction and violence. Depending on education as an agent of change in Arab Countries encounters a status-quo that does not lead to much optimism. To start with, the illiteracy rate in the Arab World as a whole is one of the highest among the various regions of the world. Such rate exceeds one third of the population of the age groups above fifteen years, with great variation between one country and another, as it is below 10% in some countries and over 70% in others. The situation looks more alarming when considering the noticeable difference in illiteracy rates between males and females or between urban and rural populations. All this, in addition to other weaknesses, leads to the belief that the ability of the education system to be an agent of change is limited in many Arab Countries due to the absence of the minimum standards of the universalisation, democracy and accessibility of education. But if the status of education looks so grim at the level of the Arab World as a whole, it is nevertheless much better in some Arab Countries that scored noticeable achievements in education, as clearly shown by the major education indicators concerning the rates of participation at the various educational cycles, gender equity, the number of schooling years for the new entrants to the labour market, and other relevant criteria that serve as a means to assess the education system. If that is the case, then what are the reasons that lie behind the weakness or delay in the social and economic breakthroughs in those countries that achieved a noticeable progress in their education systems? To answer such a question, there seems to be four probable scenarios of explanations or any combination thereof. These are:

The first explanation assumes that the progress achieved in the education systems in the countries referred to was basically of a quantitative nature on the one hand, and that it has not been in existence for a long enough time to have the sought-after social impact on the other hand. In contrast, relevant qualitative developments were relatively modest and short of being effective in causing the sought-after socioeconomic breakthrough. The education system, in this case, would thus produce the educated citizen who, at the same time, lacks the necessary characteristics related to innovation, initiative-taking, critical thinking and other qualities that pave the way for socioeconomic breakthroughs.

The second explanation assumes that, in principle, the education system is not the major agent of change in society. At the best, it can be a support factor that bears fruit only if other basic factors exist. Such factors are included into the general appropriate social environment and include the prevalence of democracy, social justice, public liberties, progressive leaderships and political wills. Most of these factors are obviously weak in the Arab Countries. Those who adopt this scenario seek evidence from the fact that industrial developments in Europe in the nineteenth century were not the outcome of educational developments. On the contrary, the progress in education was a natural outcome of industrial developments then. They also draw evidence from the case of some existing democracies among developing countries, such as India who started to realize the required breakthrough due to the existence of the appropriate social environment, although the traditional educational indicators do not show high achievements of the education system.

The third explanation adopts the assumption that it is the economic factors and criteria, including the systems and frameworks that encompass such factors and criteria, which are the prime movers for the realization of socioeconomic breakthroughs in society.

Lastly, the fourth explanation assumes that any socioeconomic breakthrough in the Arab World is greatly influenced by external forces and factors that mostly act, directly or indirectly, against the realization of the required breakthrough and against Arab national interests in general. Those who adopt this scenario draw evidence from the apparent foreign dominance over Arab national resources, as well as from the Palestinian, Iraqi and other cases.

Nevertheless, despite all the indicators and evidence that support each one of the four scenarios of explanations, the most probable one is a mixture of these explanations. The education system forms a factor whose weight and importance would vary from one location to another in light of a group of other internal and external factors.

Democracy and Education

Democracy and education, it can be stated, is an issue that has its roots deep into the educational philosophies and policies. Its branches extend to reach all the components, factors and horizons that are dealt with by the education system in general. Although the issue of "democracy and education" seems, on the face of it, to be an educational issue, yet it is a socio-cultural political issue in its essence. This is so because the great majority of the democratic aspects in the education system are natural extensions of the system of democracy in society, and a reflection of its culture. This is the more so because democracy, in its political, social and economic conceptual framework, is a pattern of life, a culture and an environment for living before being mere institutions, structures and legislative tools. In general, the concept of "democracy and education" can be realized in the education system, and hence in the school environment, if such environment contributes to the building of the individual's balanced personality mentally, physically, emotionally and socially in

such a manner as to help him attain the type and level of education to the maximum limits that are made possible by his abilities and inclinations, through the various modes of formal and non-formal educational systems and institutions.

In general, there are three main and inter-related dimensions to the concept of "democracy and education". These are:

- Democracy of education;
- Democracy in education, or democratic education; and
- Education of democracy, or teaching of democracy.

According to the first dimension, i.e. "the democracy of education", the education system is structured, and its inputs, processes and practices are organized in such manner as to realize equity and equal chances to the learner, and lead to building his personality to the maximum level made possible by his abilities, so that his social or economic standing does not stand in his way to join or advance along the education ladder. Such a definition of the concept of "democracy of education" necessitates the individualisation of teaching, and taking care of individual differences among learners to facilitate their development to the maximum extent possible. Relevant measures include the provision of special attention and services to the talented and high achievers on the one hand, and to the slow learners and the handicapped on the other.

The second dimension, i.e. "democracy in education" is concerned with the organization and management of the education system at the various administrative levels, including the school, local and central levels, in a democratic manner that ensures interaction and partnership with all concerned with the educational process, inside and outside the education system. In addition to the adoption of democratic practices and procedures by all stakeholders, this would require the development of students` organizations and unions, rasing the roof of academic freedom for teachers, and phasing out relevant security and political limitations. It goes without saying that the adoption of democratic practices in education provides the appropriate environment to encourage critical thinking, initiative, and innovation among learners.

Finally, the third dimension, i.e. "education of democracy", is concerned with providing the learner with the concepts, knowledge, skills, values and attitudes related to democracy, through the relevant information about democratic institutions, structures, legislative tools and practices, in addition to relevant international models, with the objective of acquiring an upbringing that helps him in the future to practice democratic life and contribute to building a democratic society.

In light of all that, the following is a critical evaluation of the status of democracy in the education systems of the Arab World at the outset of the third millennium. But, before that, it is worthwhile referring to two main characteristics of Arab education systems: the first is the great variations among these systems regarding the achievements, standards and the extent to which the various dimensions of the concept of democracy are realized in education. The second is that, on the average, the status of educational conditions, judged by the standard quantitative and qualitative criteria, does not call for optimism, as such status falls considerably below the world average in general. To illustrate this conclusion, the following are some examples that describe the educational conditions in the Arab World regarding the concept of "democracy and education":

(i) Participation rates in the various cycles of education:

The net participation rate in all educational cycles, primary, secondary and tertiary varies between less than 20% in some Arab countries and more than 80% in others, with a 60% average in all Arab Countries, but with considerable variation between males and females and between urban and rural populations in many countries.

(ii) The concept and duration of basic compulsory education:
Most Arab Countries adopted a system of compulsory education that spans the first nine years (ten years in Jordan since 1988) and caters for the age groups 6-15. In practice, nevertheless, the low internal efficiency of the education systems in many of these countries, accompanied by the drop-out phenomenon and the inability to reach all children of the relevant ages with the necessary educational facilities in some countries, lead to the conclusion that compulsory education is still a target to be achieved by the Arab World, rather than a fact on the ground, with great variations among countries.

(iii) Educational opportunities for children with special needs:
Special needs children are meant here to comprise the talented and high achievers on the one hand, and slow learners and the handicapped on the other. In some situations, which are not common in Arab Countries, they also include the socially and/or economically underprivileged, ethnic minorities, refugees and females. Great variations exist among Arab Countries regarding the size and quality of education services provided to special needs children. Nevertheless, it can be stated that such services fall short of the minimum requirements in most Arab Countries, quantitatively and qualitatively.

(iv) Teaching-learning methodologies:
Teaching-learning methodologies are characterized by the prevalence of traditional give-take patterns, with a weak participatory role of the learner. Furthermore, the transfer of knowledge and information is emphasized, at the expense of the skills and attitudes components.

(v) Administrative models in education:
Administrative structures and practices are generally characterized by the lack of participatory methods and applications, and the prevalence of dominant fatherly practices. This can be seen at the school, local and central levels. This is in addition to weaknesses in transparency, institutionalisation and participation, as well as the prevalence of central authority in the governance of the education system.

(vi) Community participation:
Participation in the various aspects of Arab education systems by the various stakeholders and social partners is in general almost absent. Such stakeholders include institutions of the civil society, employers and parents.

(vii) Student organizations:
Student organizations in the majority of Arab education systems are either prohibited, or non-existent, or under government control, or ineffective because of various limitations.

(viii) Academic freedom of teachers:
The academic freedom of teachers is restricted by two groups of limitations: the first group comprises security and political limitations, while the second group includes social and cultural limitations and prohibitive taboos that stand in the way of educationists and researchers dealing with certain topics for fear of unfriendly reactions from security institutions or from societal organizations.

The Actual And Potential Role of Arab Universities And Research Institutes*

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The Actual and Potential Role of Arab Universities and Research Institutes

I. Introduction

A comprehensive approach to the issue related to higher education and research institutes, necessitates taking into consideration the position of such education within the overall system of human resources development (HRD).

Human resources development, mainly through the formal and non-formal systems of education, is the concern of both educationists and economists. This is so because education is recognized both as a social service on the one hand, and an investment and hence an economically feasible activity on the other. As an investment, education is expected to lead to higher productivity and economic development, on the national level, and higher income and potential advancement, on the individual level.

It is not unusual to find the term "human capital", which to an educationist might seem a phrase with inhuman overture, being used by economists to emphasize the investment dimension in education. Approaches to the economics of education in general can have positive as well as negative reflections. The positive aspect lies in the recognition given to the importance of education as an essential factor in national development, justifying its place as a priority in investment policies. The negative aspect, on the other hand, accrues when education is viewed predominantly as an economic investment, thus facing the danger of sacrificing some of the values and ideals which do not lend themselves to economic evaluation, and hence are not measurable by purely economic criteria. Nevertheless, the existence of a link between education and economic development, is a feature of modern national economies and education systems. Such a link is mainly the result of manpower needs being translated into educational targets and plans.

The criteria used for the evaluation of educational and HRD strategies and systems frequently reveal the differences in the views of economists and educationists. Thus the feasibility of a university education system can be assessed through the ability to secure employment, level of earnings, self and social image, and job satisfaction, on the individual level; and through productivity levels, quality standards and national income figures on the national level.

To an educationist, HRD mainly through formal and non-formal education, should first be human and then professional, since such education should do more than provide the learner with the skills and knowledge specifically needed for his job, and since occupations are more effectively performed by individuals who are generally, as well as specifically, prepared. An economist, on the other hand, would emphasize the need for as accurate a matching of supply and demand in educational and manpower planning as possible, and would in general be sensitive to the 'marketability' of the 'products' of the education system. Poorly balanced education systems, to an economist, are a waste of resources that are usually badly needed elsewhere. Vocational and career guidance, from the point of view of economists, therefore, is oriented more to the fulfilment of market needs and the adjustment of learners' inclinations to such needs, than to the discovery of their abilities and inclinations and the realization of their potentials and educationally justified ambitions.

The gap between the views of educationists and economists can be narrowed if the approach to HRD issues is guided by a comprehensive strategy that encompasses economic, social, cultural and political development. It will be a major step forward if, instead of measuring national development through GNP and GDP figures, appropriate criteria and indices are devised to measure such development through GHP or "Gross Human Product" attainment. According to the GHP approach,

egalitarian as well as utilitarian aspects of HRD are taken into consideration. The gap can further be narrowed if economists and educationists agree that the quantitative aspects of HRD, including manpower requirements of the various occupational levels and sectors of the economy according to the absorptive capacity of the economy, lie more within the economist sphere of concern; while most of the qualitative aspects, including the structure and content criteria of manpower preparation systems, are the concern of education.

II. Universities and Research Institutes in HRD Systems

Figure (1) shows the various components of systems and networks that constitute both sides of the formula of human resources development and human resources utilization (HRU) within the relevant social, economic and cultural framework.

As illustrated by the figure, HRD comprises both the supply side of humanpower and the links that bind, loosely or otherwise, the supply and demand sides. Therefore, in order for university education, which is part of the formal and non-formal education system, to be viewed as an HRD component, rather than just a humanpower supply component, it should utilize and 'take into consideration the various channels that link it with the demand side of humanpower. Research and development, which can be initiated by universities, industry, demand-side institutions, or independent institutions is, in this context, one of the important HRD/HRU links.

The actual role of Arab universities at present, including their role in the field of research, is predominantly defined as a component of humanpower supply. It is their potential role as an HRD component that needs development and enhancement. With few exceptions, a typical Arab university tends to be more of an academic inward-oriented source of humanpower than an interactive outward oriented institution. This requires serious measures to activate the links and channels referred to, including institutional setups, information systems, legislative provisions, research and development, etc.

Independent research institutes tend to be more demand oriented and, hence, more relevant to socioeconomic needs than universities in the field of research. Nevertheless, the modest involvement of the demand-side institutions, in general, and industry in particular, deprives research efforts from a valuable source of expertise and humanpower, thus, adding to the constraints and difficulties in the field of research, as will be explained in more detail later.

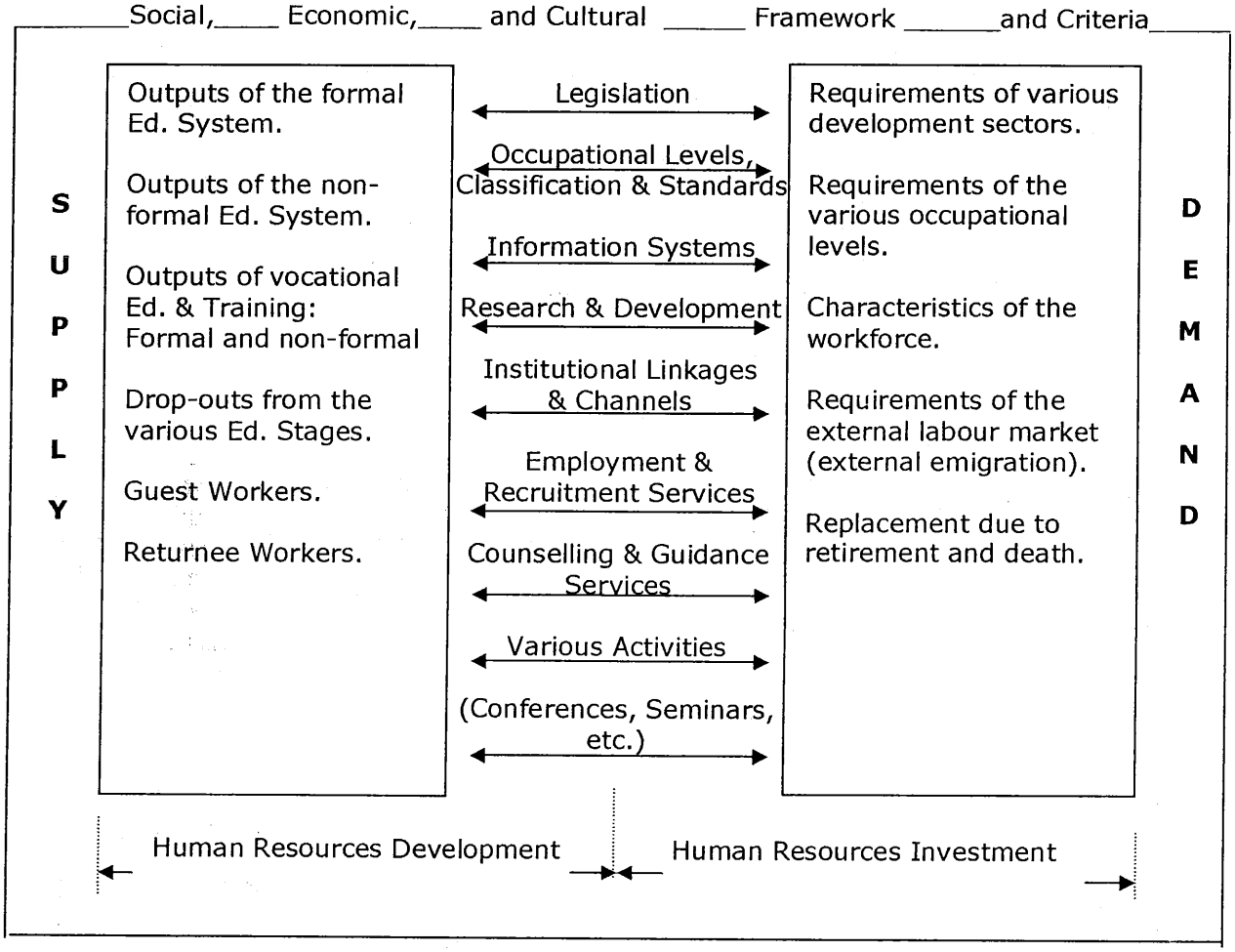

Figure 1: Human Resources Development and Utilization Systems

III. Occupational Levels and Educational Outputs

Every occupation comprises a great number of functions, tasks and skills performed by individuals of varying performance, ability and degree of responsibility, thus requiring different occupational and skill levels as part of the more comprehensive 'division of labour' concept. Theoretically, there is an infinite number of such levels, but in practice the skill ladder is usually divided into 'bands' to simplify the process of classification, the hierarchy of responsibilities, and the design of manpower development programmes.

Figure (2) shows a diagrammatic representation of one of the well-known systems of occupational levels and the relation with the outputs of the various educational levels.

Occupational levels at the top of the skill ladder include professionals and technicians (sub-professionals) who are usually prepared in tertiary level educational institutions; while occupational levels at the lower or basic occupational levels comprise skilled workers and craftsmen prepared frequently within senior secondary education or parallel to it. A professional or specialist who performs functions that require a high level of scientific, technological and managerial skills with advanced knowledge content is, in general, prepared in educational institutes of university level. A sub-professional or technician, on the other hand, is prepared usually in

educational institutes of sub-university, but within the tertiary level of education, such as community and technical colleges. Each of the two occupational level bands that correspond to professionals and technicians is usually divided into sub-levels to cater for the need to have more than just one grade of professionals or of technicians in order to match different educational and occupational standards.
The traditional pyramid-like distribution of the labour force among the various occupational levels is gradually being replaced by an ellipse-like distribution in modern economies, as illustrated in Figure (3). A big deficit or surplus at the higher occupational levels can be as mush a source of imbalance and economic weakness as a similar deficit or surplus at the basic occupational levels. Nevertheless, it remains a basic educational issue and a social dilemma in many societies whether to accept or restrict the rush for higher education taking into consideration that much of the rush is, especially in developing countries, motivated by individual ambitions and aspirations for higher occupational levels and social status rather than by response to individual abilities or societal needs. Thus, vocational preparation at the basic occupational levels is accorded low status because of the employment levels it leads to and the social status it implies. The size of flow to higher occupational and educational levels is therefore as much an economic as it is a social concern. But the conditions and criteria of such flow should be such as to enable the education system to undertake its selective function free from socioeconomic prejudices and non-educational influences as far as possible.

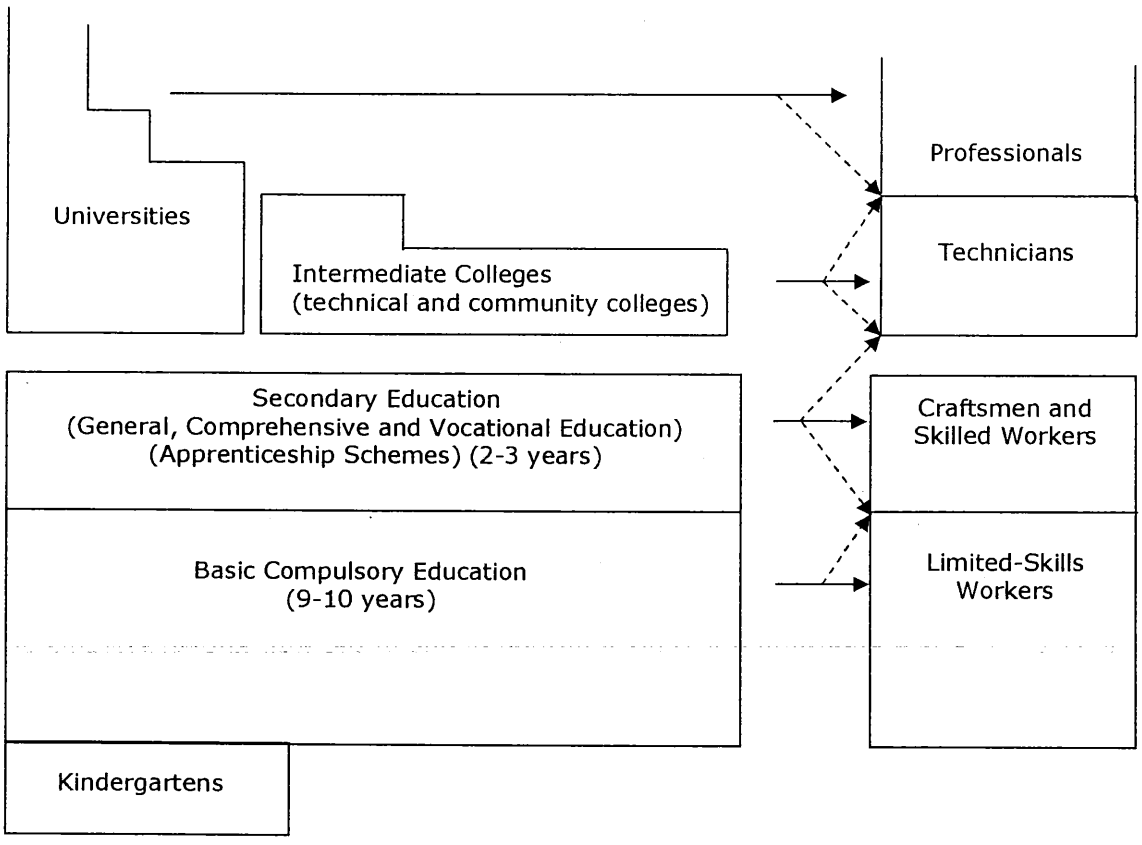

Figure (2): Occupational Levels and Educational Outputs

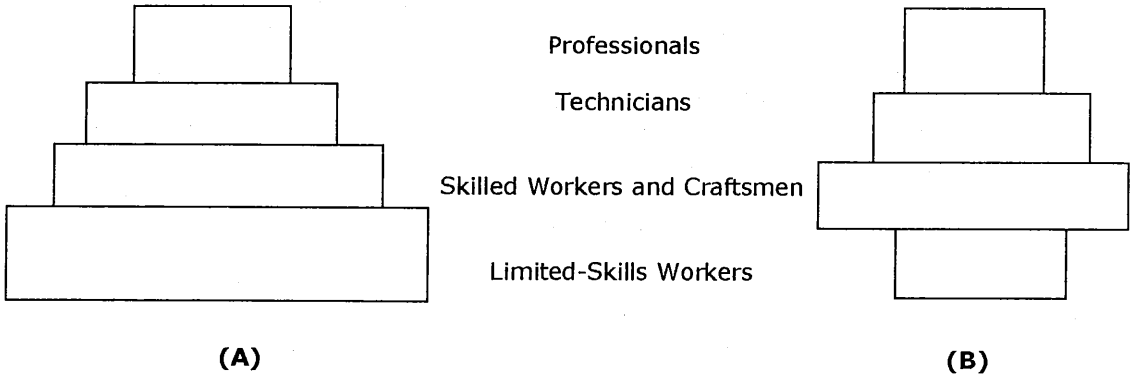

Figure (3): Occupational Levels and Labour Force Distribution
A: Pyramid-like distribution.
B: Ellipse-like distribution.

The relation between education and economic development is a complex one, because there exists no strict relationship between occupations and occupational levels on the one hand, and types or levels of education on the other, as illustrated by the broken arrows in figure (2). Consequently, the ability and need to design human resources development systems based rigidly on the needs of employment requirements are questionable. The complexity of the relationship between education and economic development is also due to the fact that education can be both a cause and effect of economic development. Therefore, any planning for human resources development, which usually involves some matching of supply and demand, should emphasize interdependence, rather than dependence or independence.

IV. Mass Education: Pressures and Challenges

Mass education is an issue that influences and is influenced by the socioeconomic development of the country concerned. It implies, among other things, the provision of formal education facilities to all citizens for a certain number of years as a minimum requirement. The problem that arises sometimes in developing countries with limited resources is that, although mass education has long been accepted as an important factor in development and in the realization of the democracy of education, the education system is not always capable of dealing adequately with all its requirements and by-products, because of the accompanying socioeconomic and technical constraints.

Mass education, which is considered a necessity at the basic compulsory stages of education up to the age of fifteen or sixteen, poses a challenge in later cycles of education. Such a challenge has to be dealt with by human resources development systems, including senior secondary and higher education cycles, which are often subjected to great pressures from graduates of lower cycles to provide equitable educational opportunities to the masses while, at the same time, being expected to maintain high academic standards, taking into consideration the degree of availability of financial resources.

The adoption of educational screens and filters, usually in the form of national examinations or evaluation schemes, helps to regulate the flow to secondary and higher education. But educational 'filters' can only help in the solution of the problems of manpower preparation if they are part of a comprehensive strategy that encompasses both general and vocational education.

In many Arab Countries, pressures on university education, due to the phenomenon of mass education in preceding cycles of education, coupled with inadequate financial and human resources, are creating concern and fears of lowered standards and inability to meet the relevant economic consequences.

The great social demand for university education has consequently resulted in irresistible pressures, inflated enrolments and a surplus of graduates who are expected to work as professionals and specialists in the various sectors of the economy. The dynamics of utilization and development of human resources reacted by having a good proportion of graduates:

(i) taking up work at lower occupational levels, mainly as technicians and sub-professionals, leading to reduced job opportunities for graduates of middle level post-secondary educational institutions, such as technical institutes and community colleges;
(ii) taking up work in fields that are different from those in which they specialized;
(iii) joining the relatively sizeable pool of the unemployed; and
(iv) emigrating to other countries of the region, or to Western countries. Nevertheless, the brain drain phenomenon is only partially explained by the oversupply of university graduates. Inadequate political, technological or research environments contribute greatly to such phenomenon.

In many Arab countries, it is not uncommon to have the education system out of phase with, and usually ahead of, the economic system, due to various economic, political and cultural factors. This situation has lead in some cases to the shortage of labour at the lower occupational levels despite the existence of unemployment, which is thus concentrated mainly among the higher occupational levels. Planners, in this case, are faced with the dilemma of whether to sacrifice some of the individual aspirations and social ideals to ensure the relevance and adequacy of humanpower supply, or to sacrifice the fulfilment of some of the economic needs in order to respond better to individual claims and social pressures.

V. The Funding Issue: Who Pays?

Practices in Arab universities and research institutes, as to the sources of funding, vary considerably between countries; and sometimes, between concerned institutions in the same country. University education is almost free to learners in most Arab countries. In this case, the state budget, and hence the taxpayer, constitutes the major source of funding. In some universities, as is the case in private universities, student fees meet the full cost. In other cases, student fees meet part of the costs, in which case university education is subsidized from the state budget either directly or through special taxes.

In general, university education and research activities can be funded from four main sources: the taxpayers through the state budget, the beneficiaries (learners and/or their families), the income from special services and income-generating activities such as research services, consultancies, extension activities, etc., and donations from various sources.

In general, Arab universities and research institutes seem to rely more on the state budget for funding than on other potential sources. In countries with limited resources, as is the case in most Arab countries, this reflects negatively on the quality of services, and the ability to expand and develop.

The diversification of funding sources for universities and research institutes should be seriously explored if the coverage and quality of services are to be guaranteed. More emphasis should be placed on such sources as income-generating services (e.g. to industry), fund raising and learners fees. In the case of learners meeting a substantial part of the relevant cost, care should be taken to avoid a situation whereby the economic status of the family stands as an obstacle in the way of

joining a university. Through a suitable system of loans, credits and exemptions, student fees would, instead of contributing to social elitism, become a democratizing agent through its contribution to the concept of income redistribution.

VI. Private Universities

Private universities are not common in Arab countries where public/state universities are the norm. Nevertheless, where they exist, private universities are either non-profit or profit-making institutions. The emergence of profit-making institutions of higher education has become a major controversial educational issue. The Jordanian experience in this respect is not old enough to evaluate. Even in the case of non-profit private universities, which usually charge relatively high fees compared with public universities, it is always argued that the existence of high-fee universities is an obstacle in the way of the democratization of university education when certain social groups of the population miss the opportunity to join such education because they cannot afford the cost, while at the same time they cannot join a public university because of the highly competitive nature of admittance to such universities, and the limited number of seats available.

VII. The Academic vs the Applied Approach

Arab universities derive their structure and approach to knowledge to two main sources: The academic traditions of the past, and the traditional European universities. Both sources value the academic standard, and emphasize the theoretical dimension of knowledge. The shift in industrialized societies to applied paths and approaches has not yet found full acceptance in Arab universities. Thus, degrees in applied engineering, that emphasize the technological and experimental dimensions, are rare and not as popular as academic engineering degrees that emphasize the design aspects with high content of basic sciences. The lack of graduate training apprenticeship schemes adds to the problem.

Although models of the applied paths and approaches do exist in some Arab university colleges, these remain the exception with a lower status and popularity. The applied approach to higher education is a challenge that has not yet been fully appreciated by Arab universities, reflecting negatively on their credibility and functionalism. The models that exist are even under pressure from students, parents and staff to become more academic.

VIII. The Gender Issue

The decade of the seventies witnessed a surge in the demand for higher education in general, and university education in particular, in most Arab countries. This was mainly the result of economic growth as well as the great expansion of secondary education. Because the participation rate of girls in university education was then much lower than that of boys, the rate of growth of girls participation was higher. At present, girls' participation rates in university education in many Arab countries are comparable to those of boys. In general, girls account for about one third of the student population in Arab universities; and, although some disciplines seem to be more popular to them than others, they virtually participle in all programmes.

Sometimes, high rates of participation by girls in such disciplines as medicine, pharmacy, law and engineering are questioned and criticized when they fail to join employment, either because they choose not to, or because of unemployment which is usually higher among women. The question arises because of the highly competitive nature of admittance to such disciplines, and the limited number of places available.

IX. Standards and Accreditation

The growing pressures on universities in many Arab countries, accompanied by the limitations on financial resources, have reflected negatively on the standards and quality of university education.

Uncertainties and doubts about standards are difficult to assess or measure with the absence of means, mechanisms and criteria to facilitate evaluation procedures for the performance of universities, through a national or/and regional accreditation system.

The accreditation function for university programmes, which can be undertaken by the concerned ministries, professional syndicates, or independent agencies, is practically non-existent in Arab countries. In some instances, as in Jordan, private universities are required to fulfil specific accreditation criteria before they are fully licensed. Nevertheless, this is applied only during the initial phases of operation, and is not implemented on a regular basis after that.

The Union of Arab Universities can undertake an important role in the field of accreditation on the regional level. At present, it does very little in this respect.

In general, therefore, Arab universities would benefit greatly from the establishment of national or regional accreditation systems, as this would help in raising the standards of university education, improve its quality, and facilitate international recognition and equivalence.

X. The Regional Dimension: a Planning Dilemma

For the past few decades, some Arab countries have been known to be regional sources of humanpower. These include Egypt, Jordan, Palestine, Syria, Lebanon, Sudan, Yemen and some North African countries. Other countries, including Saudi Arabia, the Gulf States and Lybia, have been known as humanpower recipients.

Some sort of a regional approach to HRD issues in general, and humanpower issues in particular, seem justified in view of the existing and potential labour mobility, and the common factors that underlie Arab education systems, not the least of which are culture and language.

At times, economic considerations and market forces seemed to be the decisive factor in labour mobility on the regional level. The surplus in the supply of higher education graduates in some countries helped to serve the demand needs of other countries suffering from humanpower shortages. Nevertheless, political factors have frequently caused some ups and downs in the size of labour mobility, resulting, sometimes, in big number of professionals and technicians returning to their original countries, and raising unemployment rates among higher education graduates. Under such circumstances, the regional dimension of HRD planning is characterized by weakness and uncertainty.

With the new political developments in the region, it is expected that labour mobility will be gradually enhanced and subjected more and more to market forces, thus facilitating a regional approach to human resources development planning.

XI. Research: Constraints and Challenges

In general, research facilities and services in Arab universities and research institutes suffer from the inadequacy of financial resources and the state of relative underdevelopment. Furthermore, the weakness of linkages between the universities and industry, as mentioned earlier, reflects negatively on the availability of adequate funding for research activities, and on the relevance of such activities to socioeconomic development needs and priorities.

The brain drain phenomenon, from which many Arab and other developing countries suffer, deprives research efforts from a valuable source of high-calibre humanpower,

and adds to the difficulties and obstacles encountered by universities and other research institutes.

To meet the challenges posed by the status and special requirements of research institutes, some radical solutions are needed. To start with, a regional approach to the establishment of research institutes and the initiation of research activities should be seriously considered, especially in such areas as energy, agriculture, environment and health. Linkages and interchanges with foreign universities and research institutes, on the other hand, help to activate research work and enhance its capacities. Furthermore, more emphasis on post-graduate studies is needed, especially for doctorate and post-doctorate work. Such studies are usually the backbone of research activities and the major source of the relevant humanpower.

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