

Summary of the Thesis on
METHODOLOGICAL BASIS FOR APPLICATIONS OF SCIENCE AND
TECHNOLOGY TO DEVELOPMENT STRATEGY

"Arab States Pattern "

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This study came into being because of a need, the Arab activities in science and technology in relevance to their all-round development is one of the world's least studied areas, either at home or from external scholars. Until very recently without fruitful trials and there rarely exists a publication that has treated this subject in one study. Therefore, its importance lies in the fact that it has never preceded before by a similar methodological scientific approach, based on social analysis techniques, and the search for an applicable model adaptable to the Arab conditions.

My theme for this thesis, as I presented it, concentrated on the interdependence of the many concepts of education, culture, science and technology, and those of the context in which they are introduced and grow, including the all-round development process, with its complex area of political, socio-cultural and economic aspects. This may be due to several reasons particularly; the Arab underdevelopmental conditions which cannot adapt one concept in absence or ignore of the others. Secondly, that in the Arab States no one isolated concept of them has grown enough with stabilized traditions and future growth programme, to form by itself an independent social institution. Thirdly, it is the nature and role of science and technology and its impact on the total systems of national and regional activities, and the international understanding .

The Arab States happened to constitute a substantial part of the developing world, both in population and geographical area, where revolution, freedom, socialism, unity and the application of science and technology in building modern society, are words that now occupy the minds of Arab-Middle East and symbolize their aspirations as they move along the path towards comprehensive development and modernization.

In the meantime, the present day revolution in science and technology is remarkable for the diversity of its social aspects and prospects. The function of science in society, the impact of the scientific and technological progress on development, then its influence on other national and international activities is a matter of reality and already command world-wide interest. This revolution is actively invading the social, economic, political and other spheres, affecting all classes, government systems and mass organisations. It is exerting an ever greater influence on the destinies of nations, an influence that will ultimately be felt by every human being on earth.

For these reasons, an increasing number of countries, having various political systems and socio-economic characteristics, nowadays regard scientific research and the application of science and technology to development as essential factors in their national policy. The two world wars, the desintegration of colonialism and the accession to independence of the majority of developing countries have accelerated this tendency. "Science Policy" has become an everyday factor among governmental preoccupations. This new discipline is now seeking to establish its methods of measurement and action, as well as its structures and correcting mechanism.

Another feature is that, with the advancing process of research and with the creation of socio-economic regional complexes, the research potential - having, in essence, a markedly all-social and international character - begins to differentiate even according to regions. In the framework of these regionally delimited complexes there arise a research potential which, in dependence on its level and its system of management, is affected by integration processes. Within these regions, the links between research and the social background are growing in intensity. Direct as well as feed-back relations arise between science and society, mediating the effects of socio-economic integration processes on the integration of research, and vice versa.

Books, articles, reports and academic studies on the efforts achieved or prospectives of science policy, co-operation and integration in S and T are multiplying. Governments are appointing officials at the highest level to co-ordinate their scientific and political affairs. International and regional organizations both inter-governmental and non-governmental have began to show real interest in the advancement of S. and T., its socio-economic implications and the importance of elaborating national, regional and international science policy. Also universities, academies, and science and technology foundations are establishing units and programmes of research and teaching on the subject.

In this connection, one of the prerequisites of any governmental science policy is a precise and up-to-date knowledge of the situation of the country from the political, economic, socio-cultural, educational, scientific and technological points of view. This positive knowledge is based on the measurement, analysis and evaluation of a number of complex variables, among which the national scientific and technological potential (STP) assumes prime importance.

Taking in consideration all above mentioned factors and features, this study is designed to show how Arab States are going about these tasks. It presents a comprehensive discussion of the issues involved, and gives a full-scale picture of their expected efforts to go into an examination of how they can carry out the processes of implantation of modern S. and T., its healthy growth and application to the present evolution of Arab World.

With the limitations of inadequate information, the paucity of data necessary for accurate and full scientific analysis of the subject under consideration and the recent evolution of its concepts or the limited practice, this work includes four main parts representing its body. The first part deals in Chapter I with the scope of study, while in Chapter II, the approach adopted as to identify briefly the relation between scientific research and

development, the need of developing countries for S. and T., and science in international affairs. It is an attempt to show that comprehensive development and international co-operation are important aspects in implantation of modern S. and T. in developing societies, and its study from one angle as inclusive would be incomplete.

In the second part, the purpose is to determine the areas in the Arab socio-economic structures, where technological changes are deemed necessary, and hence to work out the norms for a scientific research policy in relation to the economic and social development of Arab States.

The point of departure in this part has been a general survey including the historical background and the analysis of the main determinants of the past and present state of the political and socio-economic conditions of the Arab region, that is in Chapter III. Then the main lines of analysis for our study case the Arab Republic of Egypt which have been, are the following :

- A brief account of the way the authorities have reacted to the problems in question, through economic planning efforts since 1922, this is made in Chapter IV called "Public Policy and Development Planning" .
- The changes in the economic structure which have taken place and the resulted technological changes due to the partial and comprehensive planning, this is made in Chapter V called "Economic Plans and Technological Changes" .
- In the light of this overall analysis, a study is made of existing structural determinants and this is given in Chapter VI titled "The Major Structural Problems and the Technological Changes Needed" .
- On the basis of the previous analysis, a broad lines strategy of needs for science and technology in Arab region could be determined and this was made in Chapter VII.

For a more precise study, a detailed analysis of the conditions of each Arab State is needed, where the similar

problems can be investigated and a definition of co-operative research strategy for Arab development could be structured.

Part three of this study represents the status of the existing Arab education, scientific and technological research activities. Here, an important principle is that progress in the scientific development cannot be evaluated only in terms of quantitative goals, but rests above all upon an entire cultural transformation of the society. Science education is of paramount importance, and science planning is void of any significance without educational planning, eradication of illiteracy, establishing of a network of schools on all levels, then of universities, these are the successive levels of the pyramid to be built.

On the other hand, in order that science might fulfil the mission of decisive factor in the macrostructural changes, it is necessary to concentrate part of the creative activity on the consideration of prospective socio-economic needs, and such research problems which would open up new paths for development of technology, knowledge and better health state of mankind. The needs of further advancement in education and culture are also closely connected with the necessity of an overall management and planning of science.

In the framework of this understanding, and from the point of view of practical action, this part is designed to provide four major issues :

i - A survey and analysis of the entire Arab educational policies and cultural patterns, in order to gain a true appreciation of the problems the Arab States confront in developing their scientific manpower resources, technical training and the labour force. Then, what changes are needed to create an educational content and objectives help in building a modernized Arab socialist society .

ii - Science and technology cannot play their full part in the material and spiritual development of the Arab society, unless first a suitable universal cultural climate is created, to cope with the contemporary civilization. Also it is no longer necessary to repeat that S. and T. have come to be an important part of modern culture, and that no man can consider himself in the main stream of modern thought, if he remains a "scientific illiterate". On the other hand, the ignorance and lack of knowledge on the part of the general public of the concepts of science, its objectives, its capabilities, its promises, form a major propellant of the epidemic of anti-science current in some Arab States.

Such tasks made it inevitable to discuss the current Arab culture, the promotion of public understanding of S. and T., as well as the appreciation of the spirit of science to be cultivated among their general public. All these points of study are given in Chapter VIII.

iii - The survey of quantitative and qualitative R and D activities provides the basis from which all analysis and prescriptions for change in Arab science must start. Therefore, it arose the need of elaborating a surveying of the national scientific and technological potential of Arab States, its analysis and the future prospects for formulating Arab science policy. This field is covered under ten aspects:

- Implantation of S. and T. in the Arab World.
- Research institutional structure.
- Human resources .
- Expenditures and financial resources .
- Research auxiliary services .
- Main research areas .
- Research management and planning.
- Research co-operation .
- Main shortcomings and problems.
- A general assessment of the total Arab STP.

iv - The systematic approach in the previous issues led to search for an Arab ideological relation between the concepts: Education-Culture-A. and T., and their interlinked policies. Then the suitable organizational measures to be taken in formulating regional Arab machinery, capable of co-ordinating Arab efforts to realise definite objectives in the fields of spreading education, erradicating illetracy, maintaining universal culture, implanting of modern S. and T., and combining their growth with the Arab socialist development.

All these points of study in the last two items are found in Chapter IX.

On approaching methodologically the problem of Arab States development in terms of the achievement of higher productivity and developing of Arab individual, by incorporating and spreading scientific and technical knowledge, and that they recognized the urgent need to examine the practical measures of economic and socio-cultural policies. This aspect of the interdependence and mutual relationship between political, economic, socio-cultural and S and T conditions, as far as structure and development are concerned, has not yet received adequate attention in the Arab context; hence the frequent repetition of proposals which were confused and ineffective when set against the development urge and the potentialities realisable in Arab States.

These various development factors should be considered together, and as far as the subject of this study is concerned, the strategy should be worked out for a policy with three fundamental aims :

First: the removal of the institutional, political, socio-cultural and economic conditions which hamper the rapid incorporation of the scientific and technological knowledge in Arab development activities.

Second: a more precise determination of the nature of the scientific-technological co-operation on the international level and that needed from developed countries.

Third: the establishment of conditions to the Arab development of their own possibilities in research activities, application of knowledge and implantation of modern technology, that means the need to institute the Arab sources of scientific-technological creation and their suitable systems.

It is therefore a question of developing an Arab strategy for the incorporation and dissimulation of scientific-technological knowledge in line with the strategy of the Arab all-round development policies, deciding on the corresponding priorities to be given to the different activities, and within related activities and extending this analysis to the regional and international field in step with the progress, that could be made in the processes of regional integration, and international co-operation and participation .

This last part of the study, with its two chapters is devoted to the explanation and definition of basis for the solution of these tasks in its three mentioned directions as follows :

In Chapter X, the investigation leads to the consideration of the logic of Arab S and T policies as proposed in this study, is that it cannot be conceived as an isolated artefact. It must be conceived as an integral aspect of a political, socio-cultural and economic programme of national and regional reconstruction and development. A broad identification of the prerequisites for implantation of S and T in Arab world is attempted. Such prerequisites have been classified according to their nature and source of origin under different heads, viz, the strategy of Arab Unity, socio-cultural changes, regional-economic integration and the Arab development planning. The second issue, in this chapter, is the international co-operation and participation in the comprehensive development and science policies of developing countries, through better international relations.

The backwardness of the Arab States, not only needs foreign material aid, but also knowledge, consultation,

information and participation of experts and technical labour. Therefore the success of their future schemes of comprehensive development and the scientific-technological activities will depend on the part which done by the international co-operation policies, that cannot be disregarded, but which must be analysed and understood by the Arabs, if effective principals of action are to be worked out. However, such co-operation will depend upon two doctrines that of the abilities and policies of the developed countries, and the adaptation of the national structures and policies of Arab States to the new characteristics of that international co-operation.

Such wide areas of national, regional and international co-operation and integration form the context where S and T is applied and are all-important. Based on the analysis of these areas and problems, the directions along with measures could be diviced for arriving at optimum solutions. On the light and extent of success of these efforts and on the broad view of their objectives, depend the providing of a fruitfull context for formulating comprehensive national and regional policies designed to derive maximum benefits from the resources devoted to S and T. Also it will provide grounds and elements needed for elaborating future science policies and technological development, that also are indicated, in the same chapter.

In Chapter XI, the analysis goes to establishing the S and T programmes in Arab States, that can be only formulated on the basis of certain common characteristics guiding their overall S and T policies. Yet, the scarcer the national resources and underdevelopment conditions, the more urgent is the need of improved use of national resources. establishing and supporting regional joint works. In this respect the following three fundamental prerequisites form the main pillar for the fulfilment of such task :

- i - Integration, Mobilization and improved use of national S and T potentials.
- ii - A strategy for the regional co-operation and integration of scientific-technological activities.

- iii - The shift from integration and mobilization of S and T within the boundaries of individual Arab States, to regional, then to international co-operation and integration is a logical step, that it became inevitable and should be carefully considered in Arab S and T policies.
- iv - Improved techniques of work and creation of effective S and T system .

Here, the concept of co-operation and integration has not its wide extents and comprehensive explanation, but it mainly concentrate to find out a scientific formula for the correct priorities of work, and to establish the possibility of formulating fructifying connection between the above four aspects. This approach stresses firstly; the extreme importance of establishing firmly the practice of scientific-technological research in Arab Society. Secondly; the necessity of providing the S and T basis that coincide with the Arab current and future collective efforts. Thirdly : the favourable measures for effectiveness of research activities and its system.

The length of time required to realise such basic elements of building an Arab S. and T. structure, and an Arab scientific community in the total move to modernization, will be governed by the national and regional conditions, the international circumstances and the degree of interaction between them .

In this study the interdisciplinary method has been used to make benefit of the theoretical frameworks, methods and research techniques for a number of science branches related to each other. In this way only was possible to give such comprehensive outlook about our subject. But the creation of more or less permanent Arab scientific teams, with exponents of disciplines most essential to the solution of this or that task in the subject, will be of paramount importance.