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RECENT TRENDS AND DEVELOPMENTS IN
INDUSTRIAL RESEARCH IN THE
DEVELOPING COUNTRIES OF THE MIDDLE EAST 1/

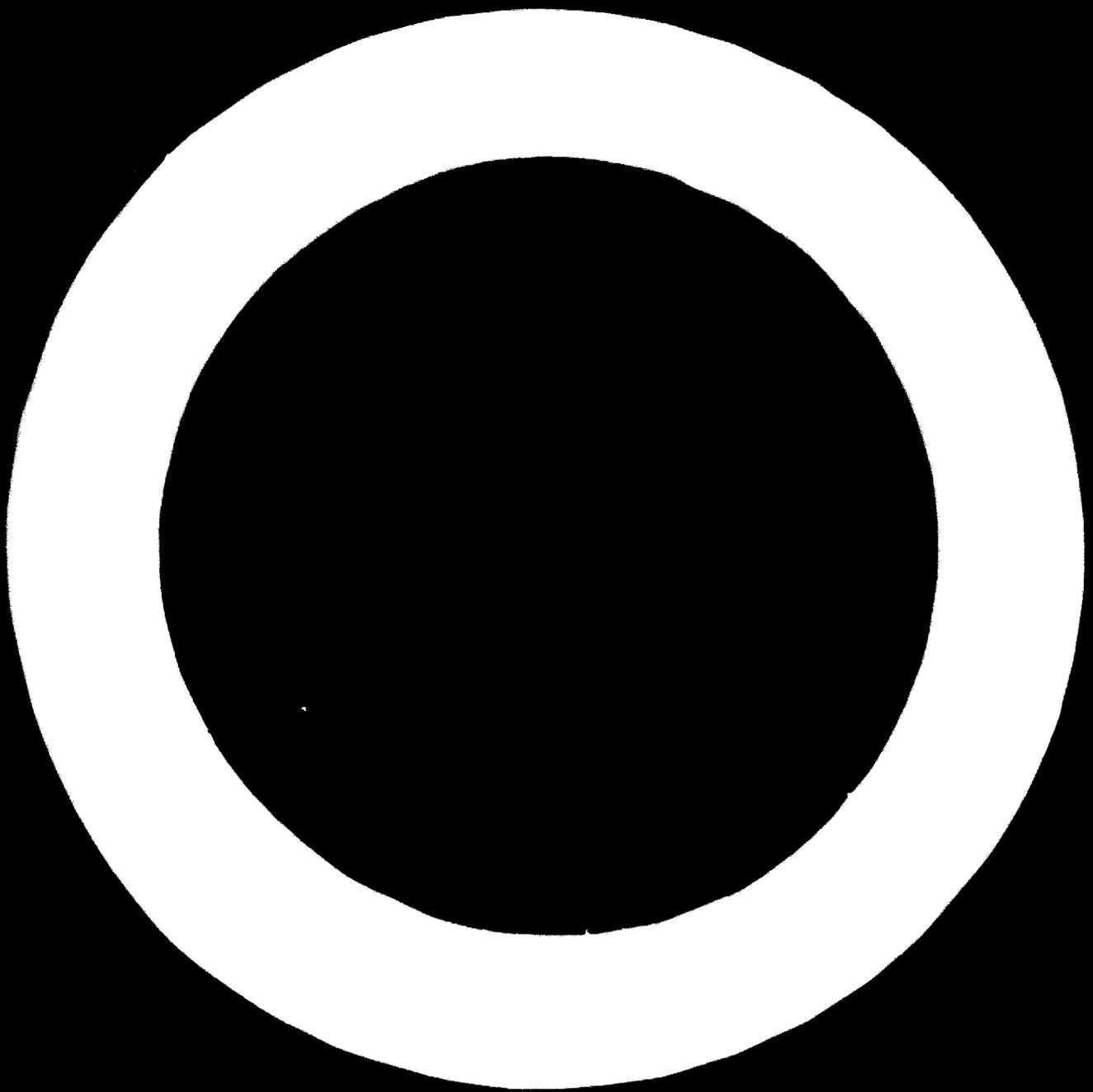
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RECENT TRENDS AND DEVELOPMENTS
IN INDUSTRIAL RESEARCH IN THE DEVELOPING
COUNTRIES OF THE MIDDLE EAST

Introduction

Developing countries of the Middle East, in embarking on their industrial development plans, have shown an increasing awareness of the vital importance of industrial research as a means of stimulating and maintaining accelerated industrial growth. Except for the National Research Centre in Cairo, and the Industry Institute of Lebanon, both of which started research activities as early as 1956, it is mainly within the last decade that general industrial research and development institutes have begun to be introduced in most Arab countries of the Middle East.

In December 1964 a United Nations inter-regional seminar on "Industrial Research and Development Institutes in Developing Countries" was held in Beirut⁽¹⁾. In March 1966, a symposium on "Industrial Development in the Arab Countries" was convened in Kuwait⁽²⁾. The Symposium devoted special attention to the subject of industrial research and approved among other recommendations (i) the need to promote industrial research activities in the Arab region; (ii) the adoption of the report and recommendations of the U.N. Beirut Seminar; and (iii) the need for establishing machineries for industrial design and for industrial standardisation in the Arab countries.

(1) United Nations. Proceedings of the Inter-regional Seminar on Industrial Research and Development Institutes in Developing Countries, Beirut 1964. (New York 1966; ST/TAO/SER.C/77/Vol. I & II).

(2) United Nations. Report of the Symposium on Industrial Development in Arab Countries, Kuwait 1-10 March 1966 (ID/CONF.1/RR.3).

Regional Industrial Research and Development Organizations

The Symposium also stressed the need of co-operation and co-ordination between Arab countries in the field of industrial development and for this purpose recommended to the Arab States (i) the establishment of an Industrial Development Centre, and (ii) the ratification of the agreement pertaining to the establishment of the Arab Organization for Standardization and Metrology. This agreement had been adopted by resolution of the Arab Economic Council in December 1965.

Consequently, the Arab Organization for Standardization and Metrology (ASMO) achieved full legal status in July 1967 and started its activities in March 1968; the Industrial Development Centre of Arab States (IDCAS) was established in May 1968 by a resolution of the Arab Economic Council and both organizations, with Headquarters in Cairo, became technical bodies of the League of Arab States in the field of industrialisation.

The objectives of ASMO are as follows:

- (a) To promote co-operation between Arab countries in the economic, industrial, agricultural, scientific and cultural fields on the basis of unified standards and measures;
- (b) To promote commercial exchange between member-States and develop Arab export;
- (c) To help Arab States to establish and develop their national bodies of standards and measures in order to consolidate the role of standardization as a tool of economic planning and development programs;

- (d) To issue Recommendations and Unified Arab Standards for raw materials, products, apparatus, equipment and codes of practice;
- (e) To co-ordinate and unify symbols, terms definitions and technical classifications, as well as methods of inspection, analysis and measurement and the drawing and design and execution practices, the methods of quality control and conformity marking;
- (f) To establish an Arab Centre for training and qualification in the fields of standardisation, metrology and quality control; and
- (g) To establish a documentation and information centre for the dissemination and exchange of information data and studies related to standardisation.

ASMO has already been active in the fields of training engineers and technicians in standardisation, issuing Unified Arab Standards and documentation and information services.

The objectives of the Industrial Development Centre for Arab States (IDCAS) are as follows:

- (a) To promote Arab co-operation in the field of industrial and economic planning;

- (b) To carry out technical and economic feasibility studies in order to secure a sound industrial development and realise the optimum utilization of resources;
- (c) To consolidate efforts directed towards raising productivity, developing skills, and improving the efficiency of organisation in industrial establishments;
- (d) To promote industrial information and create and maintain close relations with the advanced sources of knowledge and information, in addition to offering advisory services in the fields of production, marketing and finance;
- (e) To co-operate with training establishments in the Arab States and with international bodies and organisations for setting up training programmes that would serve the purposes of industrial development; and
- (f) To organize industrial conferences, seminars and workshops for the purpose of studying the various aspects of industrial development and providing solutions for its problems, with the participation of Arab and international planning machinery and experts.

IDCAS has already been active in fulfilling its regional role, particularly in the following areas:

- (1) **Industrial surveys:** The Centre has conducted extensive industrial surveys in Sudan, Iraq, Syria, Yemen Arab Republic, Southern Yemen Republic, Algeria and Lebanon.
- (2) **Productivity and management studies:** The Centre has conducted such studies for a number of industrial branches in Sudan, Syria, Algeria and Lebanon.
- (3) **Industrial information and documentation:** The Centre is setting up a central industrial documentation, information and scientific computation centre at its headquarters in Cairo, and a group of regional specialized centres in the Arab countries which would constitute a network covering the whole Arab region.
- (4) **Techno-economic studies:** The Centre is at present conducting feasibility studies for setting up joint inter-Arab projects for the production of agricultural machinery and implements, textile machinery, fertilizers, basic and intermediate petrochemicals, dye stuffs and synthetic fibres. IDCAS is undertaking these studies in compliance with a resolution of the Second Industrial Development Symposium for Arab States (Kuwait, October 1971).
- (5) **Meetings:** The Centre has conducted in co-operation with UNIDO, and sometimes with the United Nations Economic and Social Office in Beirut (UNESCO), a number of training workshops and seminars in areas pertaining to industrial development e.g. industrial policies, industrial profiles and industrial project implementation.

The Board of Directors of UNCTAD has proposed, early in 1969, to the Arab governments, the setting up of several specialized industrial research institutes, each serving one branch of industry. Each institute, though sponsored by, and mostly responsible to the Government of the country in which it would be established, could enjoy a measure of financial and administrative autonomy to enable it to provide regional services, upon request, to other Arab countries. Eight such institutes have been proposed and were allocated among the Arab countries in response to requests from these countries. These institutes are in the fields of food processing, textiles, small-scale industries, iron and steel, engineering industries, building materials, fertilizers and petrochemicals respectively. The food processing institute is already in operation in Sudan, the textile and the small-scale industries in Egypt, and the iron and steel institute is under implementation in Algiers. The engineering industries institute has been allocated to Iraq and the building materials institute to Jordan; the Governments of both countries have requested UNDP/UNIDO assistance in their implementation.

National Industrial Research and Development Organizations

Organizational patterns of industrial research in the developing countries of the Middle East present a diversity both in approach and stage of development reached corresponding to the diversity in their levels of economic and technological development. In a small country like Cyprus, industrial research and development activities, including standardization, are the responsibility of a special section within the Ministry of Commerce and Industry. Similarly, Kuwait is setting up within the Ministry of Commerce and Industry a special Bureau of Industrial Studies and Services. On the other hand, both Egypt and Lebanon have developed industrial research institutes, with well equipped laboratories and operate as autonomous bodies with government support.

The trend in most countries of the Middle East has been towards the establishment of the "multi-purpose" type of institute which, as the name implies, may be called upon for a wide range of industrial services. However, the relative importance assigned to the several services - including their recognition or omission - varies according to the stage of industrialization in each country as well as the socio-economic conditions. For example, the Sudan Industrial Research Institute provides technical information services, "trouble shooting" and problem solving services and undertakes pre-feasibility studies, standardization, testing and quality control activities. The Industrial Research and Development Centre of Syria, which is about to start full scale operations in its new premises, offers the same range of services.

On the other hand, the Jordan Centre for Industrial Development, and the Industrial Research and Development Centre of Saudi Arabia, both have no laboratory facilities. The Standardisation and quality control functions in both countries are assigned to other departments within the ministries responsible for industrial development. However, both centres offer management training and management advisory services to industry, in addition to techno-economic studies. The National Research Centre for Egypt carries out laboratory scale research and pilot plant investigations to solve raw materials problems, improve existing or develop new processes, but does not undertake standardisation or quality control activities nor any techno-economic studies as these are covered by two other autonomous specialised organisations.

In Iraq, the tendency has been towards "single-purpose" institutions. Techno-economic studies, elaboration of technical specifications and project implementation are the responsibility of the General Organization for Industrial Design and Construction. Standardization and quality control activities are carried out by the Iraqi Organization for Standards. Laboratory scale research and testing are carried out by the Directorate of Industrial Research and Control, Ministry of Industry. There is also a Petroleum Research Centre and a Palms and Dates Research Centre.

Single-purpose research institutes have been set-up, or under implementation in other countries of the Middle East. Examples are:

In Egypt - a metallurgical research and development centre; an engineering and industrial design development centre; a petroleum research centre and a textile quality control centre.

In Syria - a petroleum research centre

In Kuwait - Kuwait Institute of Scientific Research (petroleum)

Although there can be many arguments to favour the setting up of the single-purpose or specialized institute, developing countries should consider first the possibility of incorporating the desired new activity in a multi-purpose research institute. This is more economical not only in physical investment and operating cost but also in the use of skilled technical personnel who are already scarce in developing countries. Only when this incorporation is not feasible, can the establishment of such a specialized institute with its separate research facilities be recommended.

Main Trends of Industrial Research in the
Developing Countries of the Middle East

Industrial research and development institutions in the Middle East have recently devoted particular attention to certain priority areas considered to be of special significance to the process of industrialization in the region during the present decade. These are:

- Industrial economic studies such as surveys of industrial sectors and techno-economic feasibility studies for national or regional projects;
- Promotion and assistance in standardisation and quality control activities both at the national and plant levels;
- Investigations on the upgrading of raw materials and natural resources, including the establishment of pilot plants, with the object of better utilisation of these materials (examples: raw wool, phosphate ores, clay minerals).
- Industrial productivity studies and productivity improvement in certain branches of industry.
- Agricultural machinery design, adaptation, standardisation and testing.

Problems Impeding the Organization and Utilization of Industrial Research Activities

One way to define what should be done in stimulating industrial research activities is to present, from the author's experience in several countries of the Middle East, some of the problems involved in the organization and operation of industrial research and in the effective utilization by industry in these countries of the services of local industrial research. The author believes that most of these problems are also encountered in other regions of Asia and the Far East. The scope of this paper does not permit a detailed discussion of the problems and therefore only a brief outline is given below.

(1) Organizational Problems

- (a) Practically all industrial research institutes in the developing countries of the Middle East depend on the government for much, if not all, of their financial support. Even if the institute is not a government agency and enjoys a reasonable degree of administrative autonomy, there is often the danger of the government exerting influence over the institute to apply standard government procedures and civil service practices. Experience has shown that ordinary government regulations and administrative practices are unadaptable to the practical operating requirements of an industrial research institute and in cases where they have been applied, they seriously hindered the work.

- (b) Members of the board of management of the institute and/or the government chief executive responsible for the activities of the institute, particularly those with non-scientific qualifications, are often not ready to give the director of the institute, a reasonably free hand, nor ready to give prompt attention to worthwhile ideas.

- (c) Optimistic views of what research and development could contribute to rapid industrial development have led in some instances to the establishment of large research organizations in beautiful and impressive buildings. Such well-intended plans have often resulted in disappointments. Industrial enterprises, which have been expecting from such an impressive organization significant results that could be put to practical use, found difficulty in obtaining meaningful help.

It is preferable to start an institute with modest buildings until it has demonstrated its ability to serve industry. Consequently, investment in a more elaborate building can be justified. It is also essential that the institute's needs for equipment be assessed according to current and proposed activities rather than according to the sophistication involved in a particular and expensive piece of equipment. Some of the costly apparatus and equipment, procured in enthusiasm at the outset, turn out to be different from actual requirements.

(2) Personnel Problems

The productivity and efficiency of an industrial research organization depends to a large extent on the quality of its professional staff. F. N. Gowin⁽³⁾ in a paper presented at the Beirut Inter-regional Seminar on Industrial Research and Development Institutes states that "what makes a first rate institution is a first-rate staff, and nothing else will do it. The money spent on buildings, books and apparatus merely equips the staff with the necessary tools. Not even the largest electronic computer ever has an original idea. The useful output of a research and development organization depends wholly on the vision, competence and ingenuity of its personnel, and these attributes are measured in intensity rather than volume. That is how low levels of ability cannot be offset by larger numbers; if one man's training and ability are inadequate to cope with a problem, giving him a dozen helpers of the same or lower level will not solve it either".

- (a) The recruitment of professional staff with suitable qualifications and technical abilities has remained one of the major problems hampering the efficient performance of industrial research institutions in the developing countries of the Middle East. In some countries, like Kuwait, Cyprus, Saudi Arabia and South Yemen, there is a general shortage of scientific personnel. Other countries, e.g. Egypt, Iraq, Syria and Lebanon actually possess abundant personnel of high calibre but their interests are academic rather than industrial and therefore are often very inappropriate choices for industrial research.

(3) F.N. Gowin Op. Cit. pages 39-40.

Experience has shown, both in developed and developing countries, that academic training alone is far from sufficient for handling practical problems of industry. In an industrial research institute the research approach and methodology are necessarily quite different from those typical in an academic milieu.

In view of the necessity of increasing the availability of experienced industrial research workers, it is imperative that the countries of the Middle East, with bilateral and/or multilateral assistance, should analyze their training requirements for industrial research and development and organize suitable training programmes either in the countries themselves or abroad, based on such estimates. Particular attention must be given to the training and development of a special group of professionals who are very scarce in the developing countries of the Middle East, namely, the industrial technologists capable of adapting laboratory research findings to a pilot plant scale and to commercial production.

- (b) The problem of the shortage of competent technical personnel has, of late, become more serious owing in part to the higher salary scales offered by private industry and more so to the very high salary rates offered in the industrially advanced countries and by international Agencies. It cannot be overstressed that the levels of remuneration, as well as other conditions of service applicable to industrial research workers in the Middle East, need substantial improvement.

- (c) Another factor contributing to this shortage problem is the tendency on the part of responsible ministers or chief executives to divert too many experienced men from industrial research institutes to government civil service either for political reasons or for shortage of experienced technical personnel in the government departments.
- (d) The research personnel of an industrial research institute are often burdened with administrative responsibilities and routine work and are sometimes denied adequate secretarial help or sufficient technical assistance, with the result that their precious time is not wholly devoted to research and development activities.

(3) Lack of Research Consciousness

In the developing countries of the Middle East, industry, whether public or private, is far less research-minded than industry in advanced countries. Accordingly, the link between research and industry is either weak or missing. Governments of these countries should try to create "research consciousness" in order to accelerate the full utilization of the services of industrial research institutes. On the other hand, the industrial research institute should endeavour to stimulate industry to become research-minded. The institute should establish a comprehensive programme to acquaint the managers of industrial enterprises with the existence of the institute, its skills, its facilities and the type of services it can offer them.

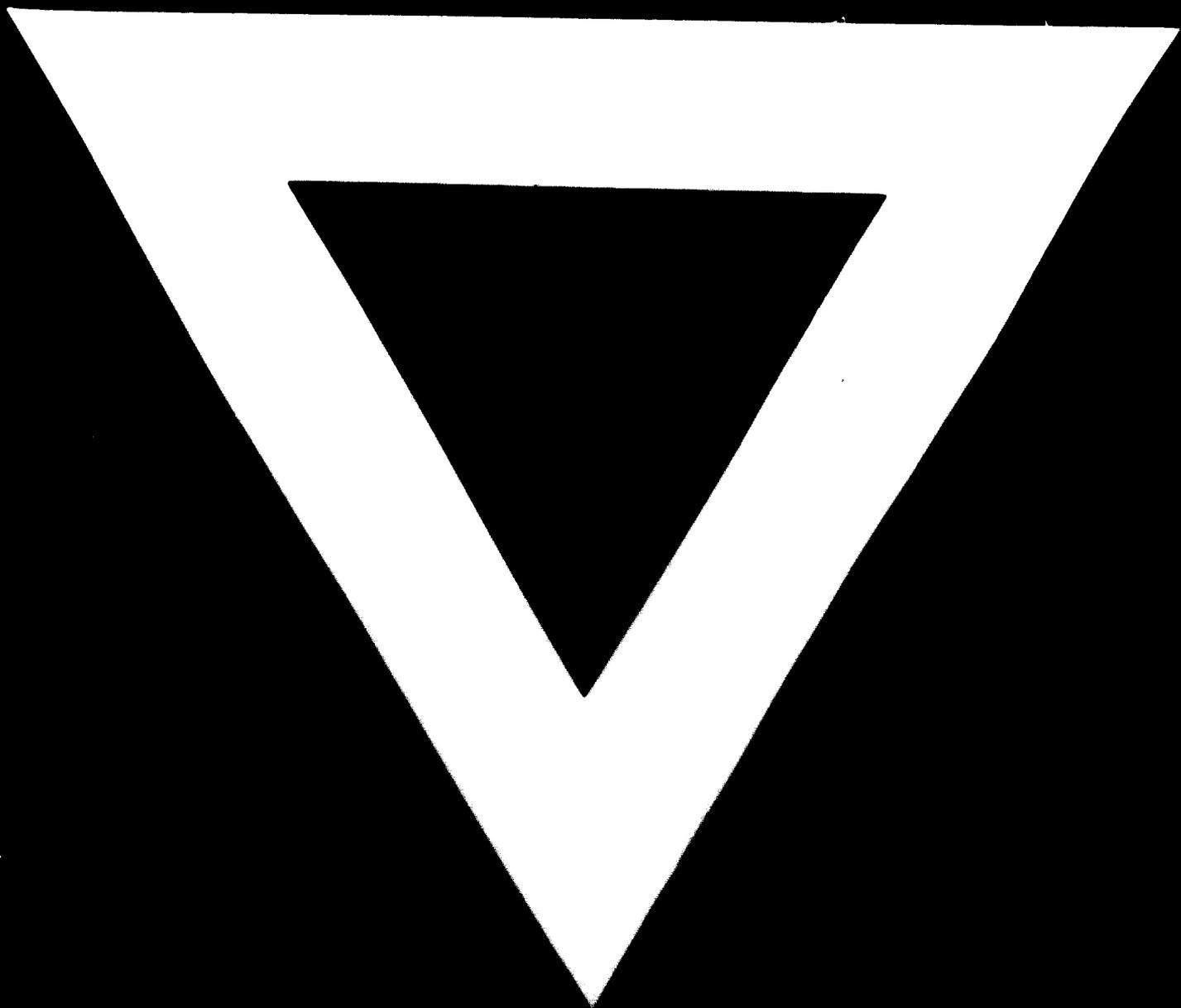
Summary, Conclusions and Recommendations

There is a general recognition among senior officials of the national machinery for promoting industrialization in Middle Eastern countries that industrial research and development constitutes one of the most important pre-requisites for a sound industrial growth. This has led, within the last few years to the establishment of industrial research and development facilities in almost every country of the region, mostly with UNDP/UNIDO assistance. In addition, two regional organisations were set-up in 1968, namely, the Industrial Development Centre for Arab States (IDCAS) and the Arab Organization for Standardisation and Metrology (ASMO). Several specialized regional institutes, each serving one branch of industry are already in operation and others are under implementation.

However, in most countries of the region, industrial research is still in its early stages and is faced with a number of difficulties due mainly to the shortage of well-trained industrial research technologists and to the fact that most industrialists are still not research-conscious. Industrial research cannot be conceived of in isolation from the surrounding industrial development activities. The success of the industrial research effort depends not only on the ability of the research institute to produce useful results but also on the capacity and willingness of other industrial development agencies and enterprises to utilise the results produced.

In the light of the above considerations, the following recommendations are set forth:

- (1) UNIDO should assist the developing countries of the Middle East to strengthen their industrial research and development activities particularly in the area of adaptation of foreign technology to the conditions prevailing in these countries.
- (2) Developing countries of the Middle East should pay particular attention to the training and adequate remuneration, of industrial research technologists especially those capable of transferring laboratory research findings to a pilot plant scale and to commercial production.
- (3) To attain better utilization of trained research personnel and funds allocated for industrial research, Governments of the Middle East countries are advised to plan their industrial research activities as an integral part of their overall development programmes.
- (4) The competent national organizations, with the assistance of UNIDO, UNESCO, IDCA and ASMO, should promote between the Arab countries of the Middle East co-operation and co-ordination of industrial research programmes and facilities.



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