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## Development of Industrial Technology through Specialized Centres

## (A Case Study and Critical Analysis)

by Dr. Yusef K. Mazhar

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# DEVELOPMENT OF INDUSTRIAL TECHNOLOGY THROUGH SPECIALIZED CENTRES

( A Case Study and Critical Analysis )

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# DEVELOPMENT OF INDUSTRIAL TECHNOLOGY THROUGH SPECIALIZED CENTRES

## ( A Case Study and Critical Analysis )

## 1.0 INTRODUCTION

Developing countries have in their efforts to improve living standards tried to industrialize as fast and as far as possible. Sooner or later they stumble against what they all now believe to be the biggest obstacle towards industrialization "technology". Many believe that once technology is transfered or developed, no serious obstacles are encountered.

### 1.1 "Prescriptions" for Technological Development

At this stage, different prescriptions are offered. Turn Key plants set up are ready to work with a push of a button, licensing and technical Know-how are offered for sale, technical assistance can be made available. Industrial development decision makers are dazed by this complicated array of quick and comprehensive industrialization.

There is of course those who also offer advice in so far as saying, why don't you try and do it yourself? With assistance of course. The idea is no doubt appealing and immediately a number of solutions are offered with the objective of enabling developing country's industries to try and develop some of the industrial technologies they need.

### 1.2 Centres and Institutes

The form suggested is usually an institute or a centre. Institutes of course also have different forms and varied objectives and functions1/. The main subdivision may appear to be "multipurpose" or "unipurpose" institutes. The former carry out work in a number of industrial fields. Specialist institutes concentrating on one discipline, or institutes devoted to the development of a particular product or process are in the latter category. Another form drawing on scientific disciplines and social sciences and working in the area of management are sometimes classified as "comprehensive", these are not really the object of this paper.

### 1.3 "Success and Failure" Stories

It is the writers belief that even though a great deal has been written and done in the field of technology for industry in developing countries, foremost among the U.N. Agencies in this field is UNIDO, yet so little has been done to evaluate how far are the offered "prescriptions" useful. How do institutes or centres involved in adaptation, modification or even development and innovation of technology function? Have they achieved their objectives? What are the "success" or "failure" stories.

1/ UNIDO Monograph. No. 10 Industrial Research

This excercise, if implemented will give decision makers in industry a chance to evaluate their policies and enable them to see clearly what can they expect when they rely on centres or institutes for technology development.

## 1.4 A Package of Development Institutes

Among the different centres/institutes in this field (industrial development) are industrial development institutes, industrial research institutes, design institutes, industrial planning institues etc. Further, along the way to specialization are textile development institutes, metallurgical, electronic, engineering and iron and steel. These types of institutes can really be considered adjusted to particular industrial subsectors where technologies are of a related nature. Further specialization leads to packaging development institutes etc.

With a particular objective in mind, institutes may take the form of transfer of technology institutes, appropriate technology or even export promotion institutes.

Any study trying to cover the viability or effectivity of such a wide spectrum of institutions would have to be undertaken by a large institution or preferable a U.N. body.

## 1.5 A Contribution

A modest contribution will be made in this paper with an expose of a centre which has now been active for a number of years, since 1969 and, and has made a major contribution towards the cause of industrial development through development of engineering and design in an advanced developing country1/

## 1.6 A Critical Evaluation

Wherever possible comments will be made to serve as critical evaluations. It is hoped that this critical approach will result in a useful presentation of a practical working experience in development of industrial technology.

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1/ See also ID/WG 233/10. An Experience in the Development and Transfer of Technology, Dr. Yusef K. Mashar. Meeting of Selected Heads of Research Institutions, Vienna 18 - 22 October 1976.

## 2.0 THE ENGINEERING AND INDUSTRIAL DESIGN CENTRE (EIDDC)

### 2.1 The History and Development of the Centre

It has been mentioned in the Background chapter that the Engineering and Industrial Design Development Centre (hereinafter: EIDDC or Centre) was established in 1969, as a joint project between the Government of A.R. Egypt and United Nations Development Programme (UNDP), with the United Nations Industrial Development Organization (UNIDO), as executing agency.

### 2.2 Phase I

Phase I of the EIDDC's project had as its main purpose, to train designers in products development, to develop industrial products design capabilities and to assist in development of tools manufacturing capacities, as well as to assist in the development of capabilities for technology for manufacture and processing. In Phase I, concentration was mainly on the engineering industries, through the work expanded to other types of industries. The work of EIDDC following the main objectives although there were large demands for complementary activities in the field of industrial design development. The Work Plan of the project has been followed as closely as possible in spite of the changes in the Egyptian Industry, and the growing demands. To fulfill the requirements and the main objectives, some new activities had been introduced: plant layout studies, heat treatment and material tests.

### 2.3 Difficulties in Phase I

During these first five years considerable experience was accumulated as to the real needs of the industry. The Centre also faced some problems as is the case of any new project. These difficulties have been summarized for reference.

a) Difficulties of training of local staff in design and related engineering work. Previously most engineers were adjusted in industry to production, maintenance etc. Design work was minimal.

b) Difficulties in getting engineers to work at the Centre due to wage differentials in industry.

c) Adjustment of the experts brought in from developed countries to the conditions of the country, industry and the Centre's work.

d) Acceptance problems in so far as industry was sceptical and mistrusful of the Centre's engineering and design capabilities.

e) The limited number of contracts (unpaid) left a relatively small impact on the large industrial spectrum, leaving the Centre relatively unknown.

f) Problems with local counterparts to the experts, as some especially on managerial level did not originate from industry proper but were civil servants.

However, inspite of these difficulties and problems, the first 5 years did produce positive results and achieved the following:

## 2.4 Positive Results

a) Established a core staff of engineers and designers, who with the aid of fellowships and experts coaching possessed the basic skills needed for further development of the Centre.

b) Introduced to industry the concept that an outside establishment could contribute to solving their problems in product design, processing, engineering and tool making.

c) A design system was established within the Centre where design work could proceed correctly on a scientific basis from one stage to another, according to preset plans.

d) An industrial concept of work was achieved and industry became aware of the long preparation and time needed before a product emerged on the production lines of a company. The correct sequence of product identification, design, complete documentation, process design, tool design, prototype building and tooling for final production was established in a number of factories.

By the end of Phase I the following activities were operational

- Product design and development
- Production technology and tool design
- Process design
- Mechanical workshops and mechanical laboratories
- Prototype building.

## 2.5 Phase II

The Second Phase started in 1973. Government contributed as well as UNDP with UNIDO as the executing agency.

The long-range objectives of the Centre were altered to further develop industrial products design capabilities within the country, to assist in the development of capacity for manufacture of tools, as well as to develop capital goods equipment design. This was considered essential as the country had already achieved considerable industrialization.

According to these long-range objectives, the Centre was reorganized to work on the following main activities:

- industrial product design and development.(industrial design was introduced)
- production technology and tool design
- process design.
- mechanical workshop and prototype building
- heat treatment workshop and mechanical laboratories
- factory and plant layout
- capital goods equipment design for the food, chemical and petrochemical industries.

Divisions dealing with training, industrial information and documentation were introduced as well as a separate financial and administrative division. Previously, the financial and administration was with GOFI (General Organization for Industrialization and the Engineering Organization (EGOTI).

## 2.6 New Aspects Phase II

Phase II introduced the following new aspects which were essential to develop the Centre and progress from the limited activity of the first Phase.

Among these new aspects, the following are noteworthy:

a. Granting of autonomy from the Governments side with an independent management as well as establishing a separate financial and administration division.

b. Expanding the Centre's activities horizontally to expand activities in plant layout and new factory design.

c. Introducing a new field in capital equipment design according to the changing needs of the country.

d. Complementing the picture of industrial development and providing technological information through an information and documentation division. A vital issue neglected during phase I.

e. Vertical expansion of activities with more concentrated efforts to strengthen technological capabilities. More specialized experts.

## 3.0 THE STATUS AND POLICY TODAY

In order to keep up with the changing industrial environment, the latest organization chart contains the following technical divisions: (1) Product Design and Development Division and an Industrial Design Section, (2) Engineering (or Production Technology and Tool Design) Division, (3) Process Design Division, (4) Workshop Division for manufacture of prototypes and special tools, (5) Heat Treatment and Materials Test Division, (6) Capital Goods Equipment Design Division, (7) Training Division, and (8) Documentation and Information Division. Every division is working in the field of its specialization except the training section whose task is to organize all training activities already technically prepared and to be conducted by the specialized sections or divisions.

### 3.1 Different Divisions

The work of the present project of the EIDDC is progressing satisfactorily as briefly explained in the following presentation of the different divisions:

1. Product Design and Development Division

Through Phase I and Phase II, the main objective was to develop the industrial products design capabilities within industry. Although it was a new activity in the country, good results have been achieved and a well established Product Design and Development Division now exists. Similar design offices have been initiated in several factories. When Phase II of the Project is completed, the Product Design and Development Division could continue to work without further assistance. Concentration in the future will also be in addition to the existing type of design work, to help the industry in proper technology transfer and implementation of documentation for sophisticated licensed products. Industrial design now operates separately as a Section.

2 Engineering (or Production Technology and Tool Design) Division.

During Phase I a good Engineering Division was established concentrating on engineering process planning and tool design. Through Phase II these activities have been continued and expanded to more complicated products and tools. Certain help was also given to companies to initiate the establishment of similar engineering offices. When Phase II of the project is completed, the Engineering Division could continue its activities without further major assistance. Concentration in the future should be on further involvement in design of more suphisticated special tools and engineering process planning for complicated products.

3 Process Design Division

Following the growing demands and completion of engineering design works, a Process Design Division has been recently established from sections working in that field. Activities are: process flow study, production process design, workshops and plant layouts.

4 Workshop and Prototype Division.

A well equipped prototype manufacturing workshop was established during Phase I and certain equipment has been added during Phase II. The main duties are to produce prototypes of products as well as special tools. Several prototypes, special tools and special compnent parts have been manufactured and this type of work should continue. Concentration in the future should continue in manufacturing prototypes and more complicated and sophisticated special tools.

5 Heat Treatment and Materials Test Division.

This division has been established recently after receiving the required equipment. The laboratories are already in function and the Heat Treatment workshop erected. Main aim of this division is to introduce proper heat treatment and material testing technology, as well as a service work for the treatment after manufacture of sophisticated component parts (for prototypes, tools etc.).

6 Capital Goods Equipment Design Division.

During Phase II, a processing equipment design division has been established and a work plan has been initiated. Several studies and design work have been undertaken with appreciated results. But, at the present stage, there are still certain difficulties due to the fact that the needs of industry are mainly for complete projects (flow study, design and manufacture as well as in some instances technical supervision of erection and putting into operation). EIDDC is with its present objectives and capacities unable to take over such tasks.

7 Training Division. During Phase II specialised short-term engineering oriented training courses have been introduced in addition to training on-the-job of factory personnel.

These activities are continuing with the aim to fulfil the demands of factories. There were no special external inputs to these activities, except the participation of the existing experts and two courses financed through UNIDO Voluntary Contribution (Quality Control/Regional and In-Plant-Group Training Courses for participants from East African and Arab Countries) as well as one bilateral (Management of Maintenance). The Centre has also conducted two training courses in Iraq, one regional on Industrial Product Design and one national on Tools and Dies Design and Manufacture. The previous Institute for Small Scale Industries is also proceeding with training activities. Taking into consideration the industrial development plan of the A.R.Egypt and its aims, as well as the specific requests of the neighbouring Arab States, further extension of training activities is very important.
At the moment, more than 20 local training courses are conducted annually which are attended by around 600 engineers, technicians, draftsmen and skilled workers. How these courses are designed as vehicles for the transfer of technology is shown later in this paper.

8 Information and Documentation Division.(Centre)

An information and documentation activity is essential for technology development and design. EIDDC has been involved with IDCAS (Industrial Development Centre for Arab States)in starting a small scale industry docmentation centre. A small Engineering Information and Documentation Unit has been initiated during Phase II of the project, without any direct input from UNDP. A well organized and equipped Information and Documentation Unit is planned to meet the present and future requirements. Strengthening and expansion of these activities are part of future development schemes.

## 3.2 Institutional Organization, Financing and Manpower

### a) Institutional Framework

The Engineering and Industrial Design Development Centre is an independant unit with separate legal entity affiliated to the General Organization for Industrialization of the Ministry of Industry and Mining. The Centre has a Higher Administrative Committee whose duties are limited to set the general work policy, to follow-up the execution and to coordinate the Centre's activities with the industry and other institutions concerned. The Management is entrusted to a General Director, who is a member of the Higher Administrative Committee.

b) Financing

The Centre has adequate governmental budgetary provisions for its current activities, and is relatively well staffed with local personnel and is suitably housed. The Centre has UNDP financial assistance, executed through UNIDO. The UNDP financial contribution for the Second Phase for example was US $ 2.056.009. UNDP contribution is used mainly for expertise, training of counterpart staff through fellowships, and delivery of some items of equipment. The Centre has also some income from contracted jobs executed for the industry. For the time being, the fees charged by the Centre are very moderate. Part of these additional inputs are used now as incentives for the staff and for the further improvement of the Centre.

c) Manpower

The Centre has presently:

- 350 employees (sixtyone engineers, fourty draftsmen, workers, administrative and helping staff),
- United Nations experts.

## 3.3 Industrial Requirements

The industrial development plans of the Arab Republic of Egypt indicated the importance of development of industries and a better utilization of the existing capacities as well as the importance of economy of production through up-to-date products and production methods. A large number of the existing enterprises have to be modernized and enlarged. New efforts were needed by the Centre, expansion was the only solution especially that:

- The Centre has aquired increased recognition from the companies and Government authorities due to the fact that:
  - the project has been well planned, formulated and the institutional framework is excellent;
  - the Centre is working as an aggressive team in a friendly atmosphere with good relations to industry;
  - the Centre has full understanding and support from the Government authorities as well as from the UNDP and UNIDO.

## 3.4 Small Scale Industries

Due to the results reached by the Centre and increased demand for further development of its services, the Government had decided to attach the previous Institute for Small Scale Industries to the Centre. Therefore, from 1st January 1977, the Centre has two locations:

- Dar El Salam Centre, on the old road to Meady, and
- Pyramids Institute, on the Pyramids Road.

Both sites are staffed and well equipped. The different divisions now operate from both sites, with additional small scale industry activities.

## 4.0 PREREQUISITES FOR SUCCESS

### 4.1 Manpower Development at EIDDC

A Centre such as the Engineering and Industrial Design Development Centre must rely to a large extent on building up a large staff of highly skilled individuals in the basic specializations needed.

### 4.2 Basic Staff Requirements

It is believed that the main basic requirements of staff to be recruited by the Centre should be for (A) Junior Newcomers with:

a. good basic education and acceptable grades

b. interest in field of work

c. a creative attitude and readiness to develop.

In order to be able to aquire certain technological skills in specific industrial areas, the Centre must recruit (B) Senior Newcomers with:

a. basic educational requirements of the post and extensive experience in the field of competence

b. interest in the activities of the Centre and commitment to its cause

c. managerial and creative ability.

### 4.3 Staff Development

In the case of junior newcomers who are usually university graduates, their further development takes place along the following lines:

a. On-the-job training for approximately one year where the new staff members have a chance to pick up information from their colleagues and from the experts attached to the Centre.

b. Most new staff members attend the Centre's own training courses for industry and can attend other courses outside the Centre if needed.

c. The most useful development is accoplished by actual interaction with industry. Engineers spend a great deal of time within industry on the Centre's assignments.

d. A fellowship is planned for new staff members after about one year from joining. Fellowships vary in duration from six months to one year and are usually within industry in developed industrial countries.

e. Further development is ensured by short-term study tours during their career and which are planned for every second year. These study tours are also in developed countries.

f. Staff are encouraged, in addition to their work with industrial projects, to make use of the information and documentation Centre and work on translations to the Arabic language of new literature to enlargen the Arabic technological library.

## 4.4 Technical Manpower Problems

What are then the manpower problems. Some have been listed below.

a. Getting the best people is always a problem. Egypt does not have a problem of quantities of manpower. The birth rate and the educational system contribute to making hundreds of graduates available for work each year. But getting the people with the characteristics shown in the previous paragraphs is difficult.

b. Technology development work in general and design in particular, needs certain qualities as accuracy of work, patience and perseverence. The mediteranean area temprament and local inherent characteristics of individuals does not always confirm to these requirements.

c. There is always a turn over of staff, i.e. staff wanting to leave for higher salariedareas of the Arab world. As long as the percentage turn over is under control, there is no problem. But there is always possibility of the situation getting out of control.

d. Engineers and technical staff are not trained in information and documentation techniques. Time is lost in searching for information in a disorganized way.

e. Motivation is always a problem. Technical staff working in the design of complicated industrial products are often dissilusioned by the gap between their local capabilities and what the industrially developed workd is doing. Production techniques open to them are limited, hence designs have always to be adapted or simplified. Work can often be frustrating, hence the motivation problem.

## 4.5 Auxiliary and Assistance Staff Problems.

The above remarks are generally valid for the main responsible staff directly involved in industrial technology work. However, manpower working as auxiliary or assistance staff have also some problems. Draftsmen need to be developed and trained, it is necessary to bring them up to a level of accuracy and responsibility so that they take their share of the design work. As design work means prototype manufacture and testing of new products, processes or technologies, the Centre has large workshop facilities here again development of top level lathe turners, mechanical fitters, grinders etc. is not an easy job.

After these skilled workers are trained they sometimes use their acquired skills for extra external evening jobs which no doubt has a bearing on their main work at the Centre.

## 4.6 Experts

One of the acknowledged ways of transferred information for technology is by experts. This project has over the period of UN assistance had the services of a number of experts of various nationalities and who had contracts for varying periods of time. On the average, the period of stay was over two years at the start of the project.

The experience gathered can give some interesting indicators about the effectiveness of experts.

## 4.7 Advantages of Use of Experts

The main advantages of the use of experts can be summarized as follows:

a. The expert has direct contact with his local counterparts and can greatly influence their skills and technical knowledge.

b. Competent experts can also influence behaviour patterns and work modes of the local staff as far as accuracy of work, thoroughness and even punctuality.

c. In the case of experts devoted to their mission, a great deal of material may be transfered from the experts home country or even place of work to the project in a developing country.

d. Clever counterparts may reach high levels of competence even equal to their teachers.

e. Some experts have even been involved in having local technical staff to be trained in their own countries and their own industrial enterprises.

f. One expert can influence, instruct or train a large number of local staff with a multiplier effect so that a large number of skilled locals can slowly take over the duties of the expert.

However, this may not always be the case with all experts and cases vary according to the willingness of the counterparts to learn, the effort made by the expert, the local environment of the project and the personality of the expert.

## 4.8 Shortcomings in the Use of Experts

Some shortcomings in the use of foreign experts are given below, with the objective of identifying pitfalls and improve the use of experts.

a. The expert needs time to settle down, find a place to live and adjust to local living conditions. This takes considerable time in some cases.

b. When departing, the expert loses time again in writing final reports (considered part of his daily work), farewells, and packing. This varies from expert to expert, but may represent a considerable loss of time.

It is estimated that in a years contract, an expertise loss between item (a) and (b) may very from a total of one month up to three months, where variation depends mainly on the expert, but also on the local management, the environment and other elements relating to the agency or institution the expert comes from.

c. Some experts may work aloof and find difficulties in establishing a working dialogue with their partners.

d. In remote cases experts may try to hang on to their jobs by making themselves indispensible so that their contracts are extended.

e. Again in limited cases special work peculiarities of the expert may be reflected on the counterparts. Slow work and extended scheduling of work is an example of this. It is remarkable how counterparts pick up the good and the bad personal and work habits of an expert.

f. Experts may be stingy with their knowledge, transferring it drop by drop to the local counterparts and not exposing sources of materials and information. This kind of attitude may be the most unforgivable of all.

g. Strangely enough the main responsibility of all may lie on the local staff and management. If management does not make good counterparts available and insist on the learning and absorbing, and if management is not demanding on the experts to exert more effort and meet objectives, then transfer of knowledge and technology will be greatly jeopardised.

In the writers opinion however, inspite of the previous rather critical presentation, experts and consultants remain a useful and effective means, if aware of the shortcomings, and sufficient effort is made to overcome them.

## 4.9 A Training Philosophy, a Necessity for Transfer of Technological Information

Does the Centre have a philosophy for its training programmes? Yes. It has indeed. The philosophy is "training to meet the specific changing needs of engineering design and industrial development". Maybe this is an ambitious statement, but actually training courses and programmes are drawn up according to the following policy:

a. Specialization courses are mainly concentrated on industrial engineering subjects and related technologies.

b. Flexibility. In so far as new courses are planned annually according to the actual technological requirements of industry, and the particular problem areas as identified in industry.

c. Intensive and relatively short courses. Mainly at the request of industry and short enough not to disrupt production by the absence of staff leaving their jobs.

d. Ample printed material, so as to encourage participants to read the background literature, as well as to make up for local shortage of text and reference books. The material is also designed as future practical references to be used by participants in their jobs.

e. Case studies and discussions are encouraged. Participants are asked to bring their problems from industry for discussion.

f. Transferring new Technologies, which the Centre has become aware of, so that industry is exposed to new developments all the time.

In fact, the Centre relies intensively on its training programmes, which are well advertised for assuring constant contact with industry, establishing its image, and obtaining more design and development consultancy assignments. Lately the percentage of the number of consultancy assignments and contracts awarded, as a result of contacts with technical staff of industrial companies attending courses has greatly increased.

## 5.0 SOME RECENT ACTIVITIES OF THE CENTRE

### 5.1 Product Design and Development Activities

1. Design of various consumer goods (heaters, fans, table type electric cooker, water heaters, irons and washing machines.
2. Design of various types of agricultural and transportation trailers from 4 - 24 tons capacity (trailers of 4-, 6-, 8- and 10 tons and semi-trailers of 10-, 16-, and 24 tons). These include water tanks, garbage disposal etc.
3. Design of various types of busbodies (for public transportation, tourists and schools) on various imported chassies.
4. Design of various components for trailers and busbodies as turntables brake cams, screw jacks, axles, door mechanisms, seats, etc.
5. Various industrial design activities as requested (economy housing furniture, seat design for transportation industry, interior design, etc).
6. Switches, sockets, plugs etc. for household use.
7. Mechanical equipment and simple machinery (cropping shears, gearboxes, haulage winches) etc.

### 5.2 Production Technology and Tool Design Activities

Production processing and tool design for various products

1. Gate valves for water supply,
2. Components parts for fluorescent lamp and TV sets manufacture,
3. Component parts for trailers manufacture,
4. Spare parts for textile machines,
5. Plastic moulds, for the consumer household industry,
6. Switches, sockets, plugs, etc.

### 5.3 Layout Planning for Plants and Workshops in Different Industries

1. Tool room for an electrocable factory,
2. tool room for railway wagons factory,
3. heat treatment workshop for electrocable factory,
4. heat treatment workshop for production of spare parts of textile machines,
5. complete new plant for airconditioners and water coolers production,
6. complete new plant for trailers production,
7. complete new plant for maintenance of diesel engines, etc.

Technical assistance and consultation on specialized fields

- heat treatment process and material testing technology in automotive industry,
- heat treatment process for manufacture of component parts for processing industry, etc.

## 5.4 Capital Goods Industries Design Activities

1. General assistance in study and revision of projects for processing industries (technology, specifications, preparation, etc) in the food processing industry.
2. Assistance in revision of various projects in view of local production facilities (fruit canning, tea packing).
3. Design and unification of material handling equipment for proceesing industries (packaging, sugar, iron and steel castings) etc.

## 5.5 Engineering Consultancy Services to Industrial Companies

1. Improvement of material handling facilities (study, system design, relayouting, specifications of new equipment) for various industries.
2. Food processing industries (system design, engineering services, equipment design).
3. Modification of tin box production lines.
4. Building material industries (study and system design).

## 5.6 Workshops and Laboratories Activities

1. Manufacture of prototypes:
   - complete winch unit for heavy traction,
   - plate bush roller conveyor,
   - components for mobile conveyors,
   - components for trailers,
   - electrical utility components and component parts, etc.

2. Tool manufacture according to design made by the Centre for various factories (in automobile, household consumer, match industries).

3. Manufacture of some complicated components or component parts upon request from various factories (gear box, cutters, axles, etc).

4. Heat treatment of some component parts for various factories (valves, punches, parts, etc.).

5. Testing of various component parts and materials for factories (hardness testing, surface testing, material testing, etc).

P.S. The Centre is working with about 80 companies whose names do not appear here due to the limitation of space in this paper.

5.7 Training for Technology Transfer

The following is a presentation of the major training courses during a period of one year (1977).

| | Course Title |
|---|---|
| 1. | International In-Plant-Group Training Course in Engineering and Industrial Design. (UNIDO-In-Plant. |
| 2. | Inspection and Quality Control. |
| 3. | How to Read Mechanical Drawings. |
| 4. | How to Estimate the Working Time in a Mechanical Workshop. |
| 5. | Press Tools: Design. |
| 6. | Press Tools: Planning and Manufacture. |
| 7. | Press Tools: Materials Selection and Related Heat Treatment. |
| 8. | How to Read Mechanical Drawings. |
| 9. | Material Handling and Related Equipment. |
| 10. | Small Scale Industries: Objectives and Work Procedures. |
| 11. | Production Technology. |
| 12. | Factory Planning and Layouting. |
| 13. | Mechanical Workshop Management. |

| Course Title |
|---|
| 14. Seminar on:Role of Industrial Design. |
| 15. Engineering Product Design. |
| 16. Heat Treatment and Related Laboratories. |
| 17. Plastic Moulds: Design and Manufacture. |
| 18. Inspection and Quality Control. |

## 5.8 Information and Documentation

A comprehensive information and documentation unit has been established for (a) Engineering Technology and (b) Small Scale Industries.

These units work closely with IDCAS, and supply local and Arab industry with technological information and documentation. Full use is made of UNIDO, IDRC and other information services.

## 6.0 REGIONAL ACTIVITIES AND IMPACT

### 6.1 Role in the Arab World

Being situated in Cairo, at the centre of the Arab World, the Centre has been directly involved in various activities in the area. This has been directly and also through the different Arab Regional Organizations in the area, as well as through the Bilateral agreements with other Arab countries. Some examples are given below:

a. Participation in a regional study of the electrical industries in the Arab World in collaboration with the Industrial Development Centre for Arab States, IDCAS. This involves sending study teams to Arab countries for study and information gathering. An Arab Meeting for Electrical Industries was later held in Cairo which discussed and reviewed the situation of the Arab Electrical Industry. One of the recommendations of the meeting was the setting up of an Arab Federation of Engineering Industries.

b. The design and running of a training course in Industrial Product Design for Arab engineers in collaboration with IDCAS and the Ministry of Industry in Baghdad, Iraq.

c. A study and design of the Specialized Institute for Engineering Industries in Baghdad, which included the organizational set up, area and equipment requirements, workshop and laboratory design etc.; services also included training of personnel.

d. Training of engineers and technicians of the Industrial Development Centre in Riyadh, Saudi Arabia.

e. Preparation and running of a training course on Tool Design and Manufacture for Iraqi engineers in Baghdad.

f. A working agreement exists between the Centre and the Industrial Development Centre in Khartoum.

g. Participation in a number of regional seminars on industrial information and documentation organized by IDCAS.

Many other activities on Arab level are on record and the Centre is being increasingly involved in Arab Industry.

The training courses run every year are now well attended by Arab engineers.

## 7.0 A MODEL FOR THE FUTURE

The present stage of development of the industry in the A.R. Egypt further required more sophisticated technical and technological work aiming at achieving an acceptable economy of production. This work has to be done through:

### 7.1 Work Programme

(a) Promotion of transfer adaptation and use of appropriate up-to-date technology, (b) better utilization of capacities, (c) Introduction of new products and/or production methods, (d) Planning and/or replanning and organizing the plants, and (e) introduction of up-to-date industrial technologies, methods and systems.

### 7.2 Foreign Competition

During the past period, EIDDC has been receiving many requests in these fields, but due to the original objectives, present capabilities and capacities, it was not possible to implement them. Only assignments were awarded to foreign consulting firms.

### 7.3 Future Development Scheme

The industrial development policy of the A.R. Egypt underlines the great importance of the rationalization of production as well as introduction of new production and industrial technologies and techniques. Therefore, the future development scheme of EIDDC has to have as its main task to fill the existing gap in the requirement of the industries and industrial development with introduction of industrial consulting and at a later stage, contracting services in the field of mechanical engineering for various industries.

Investments are available for the establishment of new enterprises aiming to boost the Country's economy. Following the new economic policy, the industrial development plans include the public and the private sectors as well as gives opportunity to joint venture investments, with foreign investors.

## 7.4 Rapid Advances in Technology

On the other hand, rapid advances in engineering science, technology and industrial technology are permanently opening ways for improvement and further development of the industrial production. The results of such acheivements and experiences have to be followed closely and used in the execution of the industrial development plans of the A.R. Egypt. Therefore, the proposed future policy of the Centre should be aimed at:

## 7.5 Proposed Future Policy

a. render technical and technolgical assistance to achieve better efficiency lower cost of production (through better utilization of capacities, introduction of new products and production methods, planning and replanning and organizing of the industrial plants, etc.);

b. promote the transfer and use of appropriate up-to-date technology;

c. develop the highly specialized industrial consultancy and-at a later stage- contracting services; and

d. promote capabilities on the long run to render combined services (technical, economical, managerial, etc.) which will have a positive impact on the development of the industry. Promotion of these capabilities should be stressed upon due to the new open-door policy of the country.

## 8.0 CONCLUSION

It is debatable whether this paper should have a conclusion or not, it is the writer's opinion that the reader should draw out his own conclusions from the subject matter presented.

However, it may be safely said that specialized institutions as the Centre in this case study, are positive vehicles in transfering and developing technology for industry, as we hope has been demonstrated here.

The success or failure of such undertakings depend on a variety of factors which were brought out in the paper.

Let us hope that a lively discussion will result in some interesting conclusions.

NOTE: This paper of course represents the personal opinions and experience of the writer, both within the Centre and the experience accumulated during an extensive study tour of similar institutes and centres in the Middle-East, South-East Asia and the Far-East. It does not reflect in any way the opinion of official related or associated bodies.