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OUTLINE OF A STUDY ON THE DEVELOPMENT OF ENDOGENOUS INDUSTRIAL CONSULTING AND ENGINEERING

COUNTRY: Tunisia

DATE: 13 December 1989

PROJECT NO.:

PROJECT TITLE: Study on the development of industrial Consulting and Engineering in Tunisia

ESTIMATED DURATION: 5 months

ESTIMATED COST OF THE PROJECT: US $46,000

A. OBJECTIVES OF THE STUDY

Tunisia is presently applying a structural adjustment programme (PAS), the main objective of which is to reestablish the macroeconomic balances mainly through quantitative control and strict limitations of imports. These measures have a direct effect on the supply of traditionally imported inputs to the existing industrial sector, and moreover on industrial capital formation.

Discussions held with the Tunisian delegation who attended the Regional Workshop on Strategic Management of the Adjustment Process in the Industrial Sector in Africa (UNIDO. Vienna 11/15 December 1989) lead to the idea that among other measures to sustain industrial development despite the limitations of a PAS, the reinforcement, generation and development of the local supply of inputs to existing industrial sector, and for future industrial investments could participate in curbing imports, and in increasing the global efficiency of the industrial sector.

Among those inputs related to forward and backward linkages of industry one can mention:

- the reinforcement of articulations between the education systems, national scientific and technological infrastructure, and the industrial sector ;

- the development of endogeneous engineering/consulting capabilities which play an Central role in integrating locally produced capital equipments and construction.

Consulting, engineering and construction services represent as much as an average of about 50 per cent of total industrial investment costs. The other half concerns capital equipments, th local production of which can be increased when industrial consulting and engineering is locally supplied. The

services dealing with project implementation during the investment phase are also the main suppliers of services during the operation phase, providing consulting services, advises and systems for plant management, operation, producting, maintenance, optimization, extension and development of existing plants. (See annex - Spectrum of consulting/engineering services for industrial development.)

The subject of the study is:

- to review and assess the current situation of the industrial consulting engineering profession in Tunisia in terms of demand and supply and their projection to horizon 2000;

- to identify and assess the local inputs susceptible of being included in the industrialization process (during investment and operation phase);

- to identify the institutional and legal constraints to the development of the consulting/engineering profession;

- to recommend measures and solutions to develop local industrial consulting capabilities, with special consideration to experiences of some NICs (the Republic of Korea, Brazil, India).

B. THE PRESENT SITUATION IN TUNISIA REGARDING INDUSTRIAL CONSULTING/ENGINEERING DEVELOPMENT

Tunisia has developed quite important project execution capabilities for civil engineering, commercial and non-commercial buildings, housing, and infrastructures. When it comes to project execution capabilities for industrial plants and facilities, most of the engineering/consulting, constraction services, and equipments are imported. Although some limited capabilities have been created, (such as TECI, a specialized firm in industrial engineering which has even developed a process technology for phosphate fertilizer production) these activities require substancial development.

In terms of qualified human resources which constitute the main input and asset for consulting/engineering services, Tunisia is well endowed to pursue the development of these activities and is even witnessing a strong emigration flow of engineers and qualified human resources which could be advantageously used for the benefit of the industrial development of the country, provided efforts are made to organize their use in scientific and technological infrastructure and mostly in consulting/engineering activities.

C. CONTENT OF THE STUDY

1. Diagnosis of the current status of industrial consulting/engineering activities.

2. Projection of supply/demand for engineering/consulting resources till horizon 2000.

3. The resources required
   - in terms of human resources
   - in terms of technologies
   - in terms of finance.

4. Identification of institutional and legal constraints opposing the generation/development of local consulting/engineering capabilities

   - organization of the profession;

   - forward and backward linkages with scientific and technological infrastructure, education system and the industrial sector;

   - incentives;

   - professional associations;

   - government procurement policies;

   - practices of development bank;

   - market reservation policies, national buying policies;

   - clients project management practices;

   - national focal point;

5. Recommendations - policies and strategies to generate/develop local industrial engineering/consulting capabilities.

D. PROJECT SCHEDULE AND COST

1. Schedule

The study could be prepared with the participation of UNIDO staff members and international experts. The duration is expected to be around 5 months:

- preparation of a full project document incl. detailed content of the study	Month 1
- Selection of international experts	Month 1 and 2
- Execution of the study	Month 3 to Month 5

2. Project costs

- Short-term international experts (fee and travel 3 m/m)	US $30,000
- UNIDO staff travel	US $10,000
- Sundries (incl. preparation and presenting of final report, overheads)	US $ 6,000
Total	US $46,000

ANNEX

Spectrum of services related to project generation and consulting/engineering capabilities

In the strict meaning of the term, consultancy services are mostly related to pre-investment studies and the demonstration of the feasibility of an economic project.

These services are presented in the following diagram:

CONSULTING SERVICES

Services
• Selection of production • Study of raw material availability • Selection of plant location • Planning of production system • Selection of production • Study of preliminary investment cost • Study of market and product price • Master planning
• Master research • Survey and selection of plant location • Study of raw materials and plant utilities • Optimization of production system • Study of investment cost • Financial study and economic evaluation • Environmental assessment • Planning of plant management • Planning of staff training • Time schedule
• Bid preparation • Pre-qualification of contractors • Tender execution • Bid analysis and evaluation

In fact, the consultancy services cannot be limited to preliminary and feasibility studies, and contractor selection. They are required during the whole investment phase. After the plant start-up they contribute to operate and maintain the plant, its management and efficiency. Consultancy services are also required for plant optimization, production improvement, extension of existing facilities generating new additional investments, thus feeding a

continuous process of self-sustained development and growth. To illustrate this succession of phases over the investment life is presented as a continous cycle divided into six major phases (see exhibit 1).

Phase 1 Project generation (planning and feasibility analysis)

Phase 2 Project execution (engineering, procurement, construction and commissioning)

Phase 3 Organization and systems (design and implementation)

Phase 4 Project management

Phase 5 Human resources development

Phase 6 Operation and operation planning

This presentation illustrates the idea that the plant start-up is not an end in itself and that the future owner shall be in a position to manage, operate and maintain the plant and above all to assure its continuous improvement and development. This way of presenting the industrial development cycle suggests the necessity to open the technological package and calls for the necessity to develop the owner's project management capabilities (it is an important part of the management consultancy devices). The owner's organization must be prepared to master the cycle of management and development and to procure itself the external consulting services, whenever required.

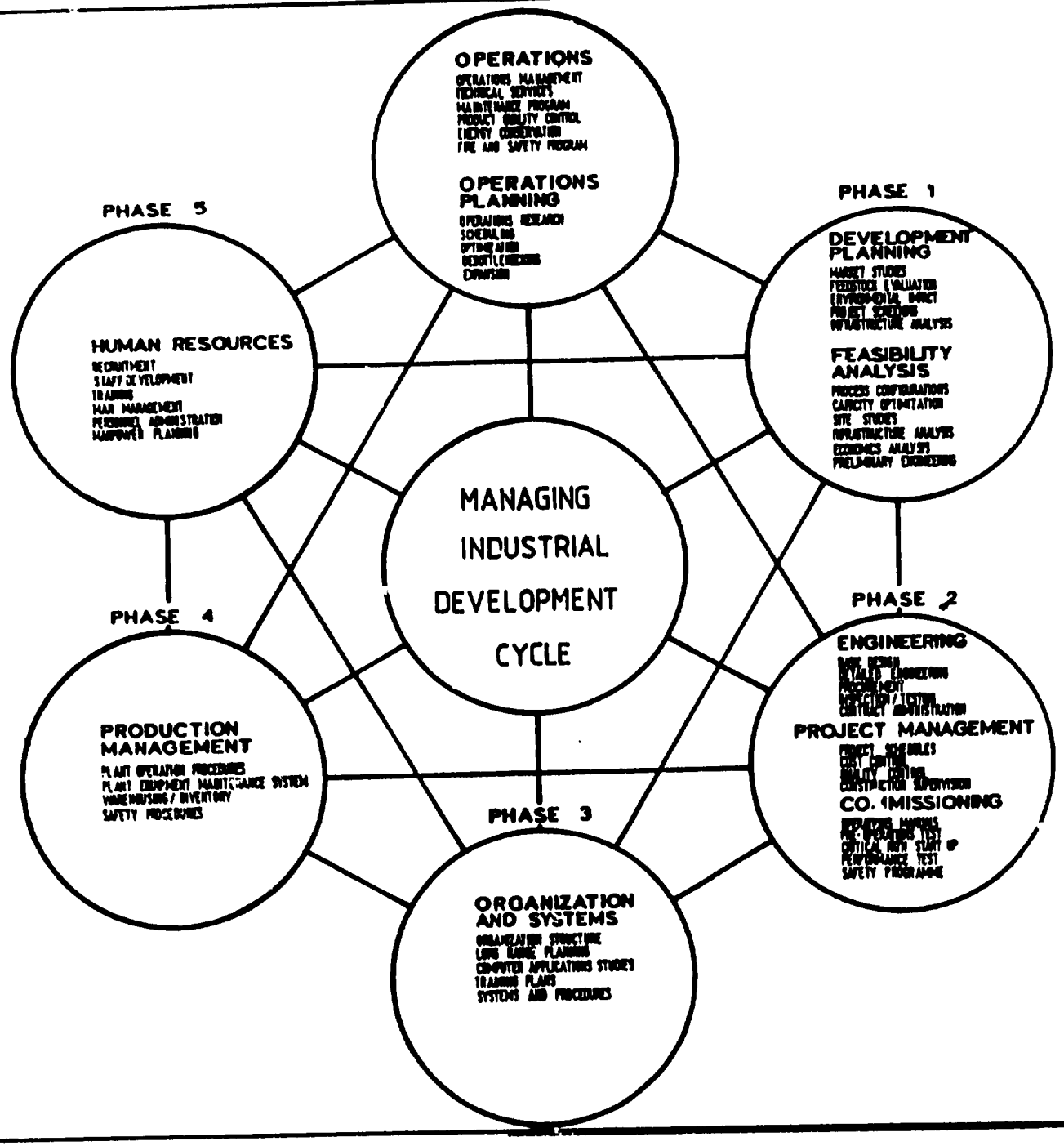
This division may appear, to some extent, arbitrary, but it has the merit of acknowledging the complexity of the process, and segmenting it into manageable parts. On the one hand, it illustrates the logical progression of tasks leading to an efficient plant operation, and to the implementation of future improvements. On the other hand, it identifies the complex spectrum of consultancy services during the investment life.

Before plant start-up, these services are related to the conceptualization and formulation of a project, its implementation through inputs of technology, consulting engineering and design, capital equipment, trained human resources, and financing. At the operating stage, it requires management and entrepreneurial skills improvement, products adaptation, manpower training, systems and procedures design and implementation etc.

An industrial plant operates in an environment which includes government policy, strategy and planning framework on the one hand, and industrial infrastructure - electrical energy, water, transport, communications - on the other (Exhibit 2 illustrates the industrial unit and its inputs, outputs and environment).

These include R&D institutes, consulting and design engineering firms, standard institutions, industrial safety units, productivity centres, industrial finance institutions, vocational and academic institutions, training centres, etc. No significant industrial development can be sustained over a period of time without this supportive institutional infrastructure.

During the operating phase of the industrial unit, other problems arise relating to efficiency of operation, capacity utilization, market changes and product line diversification, debottle-necking and extension of existing units. All these aspects call for a well-developed management consultancy profession.


MANAGING
INDUSTRIAL
DEVELOPMENT
CYCLE
OPERATIONS
OPERATIONS MANAGEMENT
TECHNICAL SERVICES
MAINTENANCE PROGRAM
PRODUCT QUALITY CONTROL
ENERGY CONSERVATION
FIRE AND SAFETY PROGRAM
OPERATIONS PLANNING
OPERATIONS RESEARCH
SCHEDULING
OPTIMIZATION
DECISION MAKING
EVALUATION
PHASE 1
DEVELOPMENT PLANNING
MARKET STUDIES
FEEDSTOCK EVALUATION
ENVIRONMENTAL IMPACT
PROJECT DEFINITION
INFRASTRUCTURE ANALYSIS
FEASIBILITY ANALYSIS
PROCESS CONFIGURATIONS
CAPACITY OPTIMIZATION
SITE STUDIES
INFRASTRUCTURE ANALYSIS
ECONOMICS ANALYSIS
PRELIMINARY ENGINEERING
PHASE 2
ENGINEERING
BASIC DESIGN
DETAILED ENGINEERING
PROCUREMENT
INSPECTION / EXPEDITING
CONTRACT ADMINISTRATION
PROJECT MANAGEMENT
PROJECT SCHEDULES
COST CONTROL
QUALITY CONTROL
CONSTRUCTION SUPERVISION
CO. MMISSIONING
OPERATING MANUALS
PRE-OPERATIONS TEST
CRITICAL RUN START UP
PERFORMANCE TEST
SAFETY PROGRAMME
PHASE 3
ORGANIZATION AND SYSTEMS
ORGANIZATION STRUCTURE
LONG RANGE PLANNING
COMPUTER APPLICATIONS STUDIES
TRAINING PLANS
SYSTEMS AND PROCEDURES
PHASE 4
PRODUCTION MANAGEMENT
PLANT OPERATION PROCEDURES
PLANT EQUIPMENT MAINTENANCE SYSTEM
WAREHOUSING / INVENTORY
SAFETY PROCEDURES
PHASE 5
HUMAN RESOURCES
RECRUITMENT
STAFF DEVELOPMENT
TRAINING
MAN MANAGEMENT
PERSONNEL ADMINISTRATION
MANPOWER PLANNING