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THE ROLE OF INDUSTRIAL CONSULTING SERVICES

II

THE INDUSTRIALISATION OF DEVELOPING COUNTRIES ✓

by

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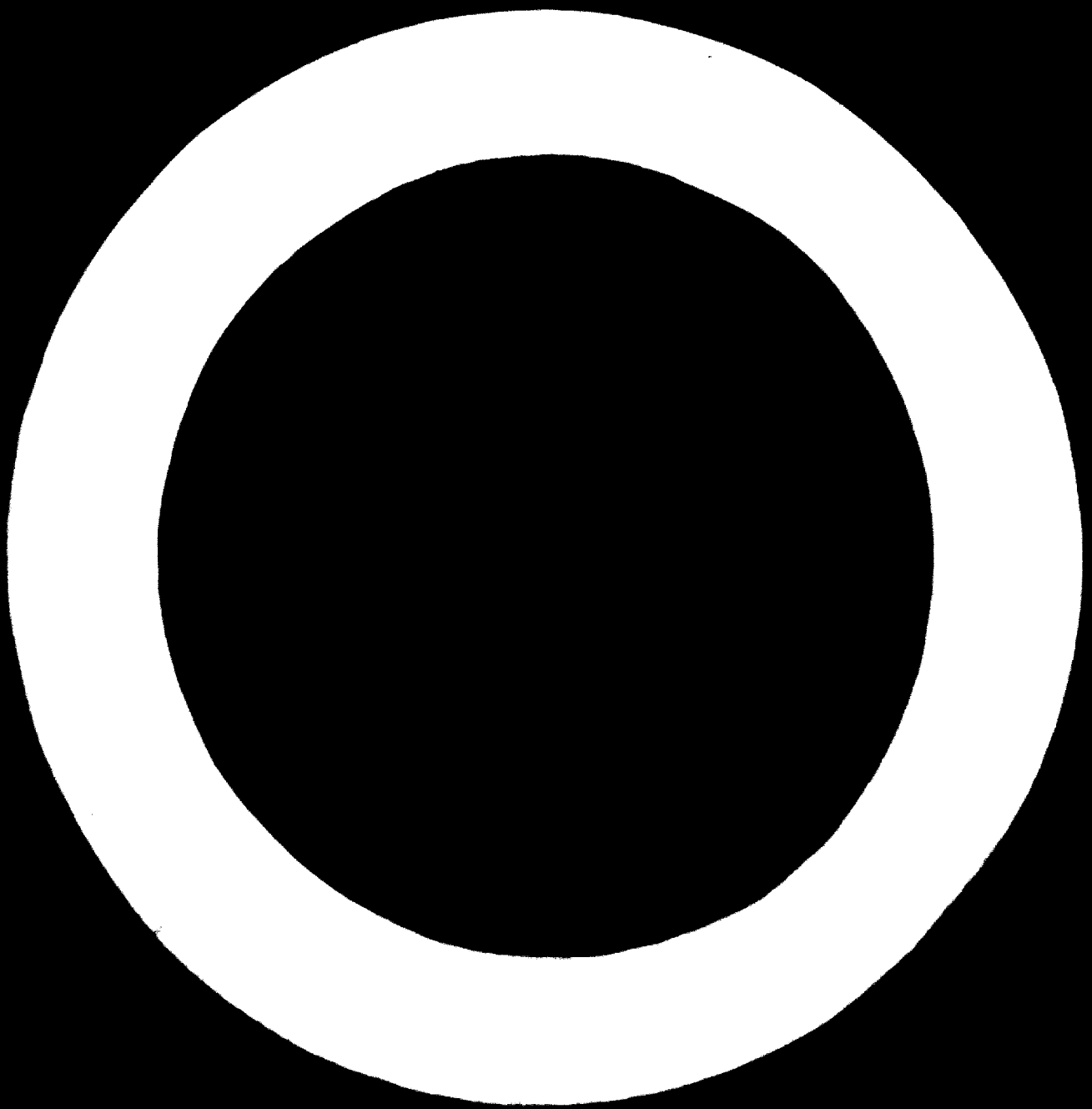
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### **SYNOPSIS**

Consultancy has a crucial role to play in the industrialisation of developing economies. This paper describes the industrialisation process typical of the developing countries and identifies the areas where consultancy can be used with advantage, the sources of consultant services, their problems and organisational practices. The peculiar problems a consultant has to contend with in developing countries and the extreme need to fit into the economic and social environment of the developing countries have been highlighted as well as the need for rapid development of local consulting services in the developing countries.

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## 1. INTRODUCTION

1.1. It is now generally recognised that transformation of poor and stagnant economies into affluent and growing ones can be achieved through a process of industrialisation. At the same time, it is recognized that the process of industrial development today is so complex that co-ordinated planning and well thought out strategy are indispensable for achieving desired results. There is also a growing appreciation of the fact that economic and industrial development should not be left to the vicissitudes of the economy but should be brought about by deliberate effort directed towards economic betterment of the people. The experience of industrial development process over the last two decades or so has brought out the fact that the role of the Consultant - whether private or public - is a crucial one in any development process but even more so in the case of developing countries where the resources are scarce and the demands on the use of such resources are many, pointing to the need for optimum allocation and employment of such resources to serve the goals of development.

## 2. THE PROCESS OF INDUSTRIALIZATION

2.1. The strategy of economic and industrial development includes both macro level programming activity as well as studies related to individual investment projects and activities associated with their implementation. At the macro level, the process of evolution of industrial development programmes involves a sequence of activities listed below:

- A. **NEED SURVEY** : General Survey and Analysis aimed at identification of economic needs of a geographical region.
- B. **NATURAL RESOURCES SURVEY** : Appraisal of raw material, human, natural wealth and similar resources which can be channelled into productive economic activities.
- C. **FISCAL RESOURCES ANALYSIS** : Analysis of present and potential financial resources which could be marshalled for industrial development.
- D. **SECTORIAL BALANCE STUDIES** : These involve studies to develop a balanced industrial development programme.
- E. **DEVELOPMENT OF OUTLINE OF BROAD INDUSTRIAL PROGRAMME** : Includes profiles of industrial development programmes on the basis of available resources and the anticipated needs.
- F. **RESOURCE ALLOCATION STUDIES** : Involve optimum distribution and phasing of capital expenditure.

- G. IDENTIFICATION OF PROJECT CONCEPTS : Includes individual project concept data such as inputs to a project, its wealth generating capacity, manpower employment capability etc.
- H. PRIORITIES STUDY : Involve determination of priorities and phasing of individual projects situated within an industrial development programme.

2.2. At the project level of planning and establishment of a new industrial facility, several well defined steps are also necessary. These are listed below:

- A. MARKET SURVEY : Establishes the need for setting up the facility.
- B. FEASIBILITY STUDY : Determines its technical viability and economic soundness.
- C. PROJECT REPORT : Incorporates design concepts, technical solutions and economic data.
- D. ENGINEERING OF PROJECT : Involves preparation of detailed designs and working drawings to enable construction to begin.
- E. CONSTRUCTION : Covers civil engineering construction and equipment erection and inter-connexion.
- F. START-UP AND INITIAL OPERATION : Involves bringing up the plant to designed level of quantitative and qualitative operation.
- G. PRODUCTION : Signifies start of commercial production.

2.3. Experience hitherto and distinct trends discernible for the future would point to increasing governmental involvement in macro level programming for industrial development in the developing economies. The need for setting up new industries on a substantial scale coupled with the appreciation of indispensability of co-ordinated planning to achieve a balanced economic development and the aspirations of most developing peoples for an articulated framework of development which would ensure social justice - all these increasingly warrant governmental involvement, not to speak of the massive sums required for new investment, considerable proportion of which are borrowed from international bodies. Broad economic programmes are normally developed by some form of Plan Organisation of Governments and priorities for sectoral growths are determined in order to meet the objectives that are set by a country. The role of the Consultant in the stage of macro level planning and programming broadly covers preparation of studies with regard to development in specified sub-sectors and comprises evaluation of resources, detailed examination of needs and determination of the technical feasibility of setting up facilities for satisfying such needs by an optimum allocation of available



resources. There is no doubt that in some of the developing countries Consultants are also engaged to draw up a total plan of development and are commissioned to carry out basic input-output studies to determine sectoral compositions and to evolve a broad plan for general as well as sectoral development. However, in some other developing countries, the tendency is for governmental agencies themselves to take on the planning and to evolve the development programmes at least up to sectoral level including identification of specific projects.

2.4. Once the identification of a specific project has been carried out, a Consultant is generally called upon to prepare Pre-investment and Bankability Studies for the same to project information on economic and technical justification of the project and to bring out commercial profitability as well as national cost-benefit analysis to enable a decision being taken by policy making organs of Government in relation to the overall objectives and the blue-print for development. Such pre-investment studies are carried out even in the case when the proposed projects are to be set up by private entrepreneurs. However, in such cases, the accent is on the projection of commercial profitability of the proposed venture.

2.5. After implementation decision for the project has been made, a Consultant gets involved in further stages of project development work which comprise detailed designs and engineering of the approved project and assistance in the actual implementation comprising construction, procurement, erection, start-up and commissioning activities.

2.6. In certain cases, a Detailed Project Report is prepared after a preliminary investment decision has been taken based on the Feasibility Study. The Detailed Project Report is, in effect, an entire engineering blue-print and incorporates all major technical solutions for the project, identifies all major equipment with general technical specifications, and includes additionally the basic designs for all schemes and systems of utilities, services, material handling and transportation, etc. In other words, the Detailed Project Report summarises all technical requirements of the project to a depth and detail from which the further detailed designs and engineering work can proceed without any more basic designing. In view of the technical details contained in a Detailed Project Report, the cost elements are identified

to a much greater accuracy and detail and hence the cost and profitability estimates computed therefrom are more realistic assessments than those contained in the Feasibility Study referred to earlier. The Detailed Project Report assumes special importance where the agency which undertakes the detailed engineering is different from the one which has been responsible for preparation of the Feasibility Study.

2.7. The process of industrialization both at the macro level and at the project level described earlier involves solutions to many complex problems and demands a wide diversity of skills and talents. Consultants - whether private or public - perform a crucial role on the development process because of their specialized know-how in specific areas and the wide spectrum of experience they are able to garner in that area on account of their involvement in a multiplicity of projects and their knowledge of the solutions which have been most effective in similar circumstances.

### 3. TYPES OF INDUSTRIAL CONSULTANCY SERVICES

3.1. The role of the Consultants covers activities required during the stage of macro level industrial programming as well as in the further stages of evaluating project feasibility and providing Detailed Engineering and Design Services for project implementation all the way up to plant commissioning and start-up. The services necessary for the macro level programming may be categorized as "Economic Consultancy Services" and cover development planning and determination of industrial potential. These services also extend to study of investment climate, review of industrial and economic institutions and suggestions for stimulating economic growth - in general, evaluating feasibilities of economic and industrial development programmes.

3.2. At the micro or project level, Consultants normally provide all the services from the stage of preparing and evaluating the feasibility and economic soundness of an industrial venture through the subsequent stages of detailed designing, specification of plant and equipment, advice on award of orders for equipment and civil works, supervision of construction and erection and assistance in commissioning, start-up and initial operation of the Plant.

3.3. Normally on the basis of the country or regional development plan, *prima facie*, suitable projects are identified and consultants are assigned the task of preparing a Feasibility Study. The Feasibility Study provides necessary technical and economic information for evaluating whether a particular project is the most desirable vehicle for investment in consideration of the objectives of development of a particular country. These services may be termed "Pre-Investment or Project Planning Services".

3.4. Thereafter the Consultant provides services for detailed designs and engineering of the project. The stages of detailed engineering are those enumerated below:

- (a) Detailed identification of all production and auxiliary facilities including repair and maintenance, storage, utilities, plant transportation, etc.;
- (b) Specifications of all items of equipment;
- (c) Detailed layout of specified equipment;
- (d) Detailed designs and preparation of working drawings for construction works including equipment foundations, pipeline support structures and for all utility and service systems and sub-systems;
- (e) Detailed designs and drawings for all non-standard equipment which has to be fabricated;
- (f) Preparation of bills of quantities and contract papers;
- (g) Scrutiny of bids;
- (h) Procurement of equipment including inspection at manufacturers' works and/or on receipt at site;
- (i) Erection and installation checking; and
- (j) Commissioning and start-up.

In certain cases Consultants are also asked to provide services with regard to organising and monitoring equipment procurement and construction operations and providing assistance in manpower recruitment and training, evolution of plant operating procedures, start-up and commissioning. Such services may be described as "Engineering and Plant Design Services".

3.5. Once the plant has gone into production, operational problems are thrown up calling for the use of specialist services such as can be provided by Specialist Consultants. These may relate to manpower planning and

organization structuring, industrial engineering problems related to production process and material handling, inventory control and managerial management; information and control systems, etc. These services are provided by "Management Consultants". Management Consultants also offer services during the initial stages of plant establishment, such as, for recruiting and training of personnel, setting up procedures and systems for production and financial control, etc. Specialist Management Consultants in industrially advanced countries also provide services in other specified areas such as those relating to product diversification, market development, financial and budgetary planning and control, acquisition of and mergers with other organizations, etc.

3.6. Product Design and Process Development are other areas in which Specialist Consultants play a very useful role in the industrialisation process. "Process and Technological Consultancy Services" include development of manufacturing process or technology, development of a product design and its method of production, exploration of natural resources and experimentation to determine the optimum manner and their utilization and economic exploitation. Additionally such Consultants may also provide services relating to improvement of productivity, utilization of waste products, development of industrial plant regulations and standards etc. Essentially the work of the "Process and Technological Consultants" involves a considerable amount of work in laboratory and pilot plant facilities and such Consultants usually have their own facilities for this purpose or, alternatively they associate with Research and Development Laboratories, Industrial Research Institutes, Manufacturers' facilities etc. to achieve this objective. Process Design, very often, also emerges through research and development activities of large operating Companies as well as research and development effort that goes on in Universities and Research Institutions. Similarly, product design and development is often carried out by Engineering and Market Development Departments of manufacturing organisations.

In most developing countries, however, Product and Process Development Consultancy is not yet available in any significant measure. At the start of the industrialization process in a developing country, product designs and processes are normally inducted through collaboration agreements from industrialized countries or by straight commercial purchase. The need for

developing a new product normally has not yet surfaced and manufacturers do not often have an incentive to adapt or modify the inducted product or process because the market within the country is normally assured to the output of local industrial plants by protective legislation often adopted in developing countries. However, after the satisfaction of the immediate demand, need for diversification into new product lines or for production of modified products is felt.

3.7. One other area which is of significance to the developing countries is the training services which the Consultants provide both for operational as well as for Management functions. Special expertise has been developed by Consultants in this field to evolve training programmes for manpower development which include recruitment and training of personnel to develop their capabilities to a level where they are able to take over the operation and the management of the Plant on their own.

3.8. To sum up, the following are the major types of consultancy services that enter the industrialization process:

- A. Economic Consultancy Services;
- B. Pre-Investment or Project Planning Services;
- C. Engineering or Plant Design Services;
- D. Process and Technological Consultancy Services; and
- E. Management Consultancy Services.

#### 4. SOURCES OF CONSULTANCY SERVICES IN DEVELOPING COUNTRIES

4.1. The growth of industrial and economic development process calls for an increasing use of industrial and management consultants whose skills and talents are an invaluable aid to the industrial development process. It is a curious paradoxical phenomenon that the growth of the local consultancy profession in developing countries also comes about as a result of the process of economic development itself. Consequently at the initial and earlier stages of economic development process, generally speaking, there is a severe shortage of organised local consultancy profession in the developing countries. However, experience and expertise which can be usefully employed for industrial consultancy services does exist in developing countries even at the starting point of the development process, although the scope of experience

may be limited and it is generally found in scattered pools of knowledge residing in individuals. However, universities and institutes of higher education, research and development institutes, individual Consultants and Consulting firms, government or semi-government agencies, foreign governments and international organizations as well as international consulting firms provide consultancy and advisory services necessary to the process of industrial development. Additionally, manufacturers of equipment and suppliers of equipment, engineering contractors etc. also sometimes provide consultancy services as a part of a package deal or turn-key project. The desirability or otherwise of this secondary source of consultancy services is discussed later in this Paper.

4.2. While it is true that during the earlier stages of the economic and industrial development process, there is, generally speaking, much more demand for consultancy services within a developing country than can be supplied by the local consultancy profession, it is nevertheless necessary that the local consultancy talent must get involved and associated with the foreign consultant to ensure that the economic, industrial, manpower and other similar constraints imposed by the conditions prevalent in the country are adequately taken note of in the development of technology or designs so that it will more readily meet the requirements of the country. Some of the sources of Industrial Consultancy services in developing countries are discussed below:

#### 4.3. Industrial Research Institutes

4.3.1. Industrial Research Institutes have been set up in many developing countries, both in the governmental sector or public sector of the economy as well as in the private sector. The range of services that these Institutes provide essentially relate to the following:

- (a) Development of a Process;
- (b) Development of a product and its associated manufacturing technology;
- (c) Construction methods best suited for adoption in a given set of conditions;
- (d) Use of local raw-materials and substitution of imported raw materials by local materials;
- (e) Operational data for process plants.

- (f) Product improvement; and
- (g) Quality control, etc.

4.3.2. Generally speaking, the Industrial Research Institutes do not involve themselves with the detailed plant design and engineering aspects of a project. In some cases, however, they associate with Engineering and Plant Design Consultants, and carry a project through its implementation stages.

4.3.3. In the initial stages, such institutes are broad discipline based (e.g. metallurgy) and not specific industry oriented (e.g. man made fibres). The general purpose nature of their organization is more suited to the availability of specialist manpower in the earlier stages of industrialisation. As industrialisation proceeds and the nature of demands becomes more specialised, such general purpose institutes grow into specialist units.

4.3.4. In India, a chain of National Industrial Research Laboratories has been set up during the earlier stages of industrialisation which are now in a position to provide industry with this form of service. Additionally, associations of manufacturers have set up industry oriented research facilities e.g. textiles, cement, paper etc.

#### 4.4. Universities

4.4.1. In industrially advanced countries, the staff and students in universities do a great deal of contract research work for the industry. In most developing countries, unfortunately, the position is quite the contrary. While universities and institutes of higher learning exist, they seem by and large to keep themselves insulated and isolated from industry. Possibly, the historical background and the genesis of the university education in most developing countries, which followed the traditional pattern of pursuing basic and fundamental knowledge whether in the field of humanities, social and liberal sciences or applied scientific disciplines, has traditionally tended to isolate the process of higher education from the practice of an applied science and technology in a real world situation. However, in the recent past, this scene has begun to alter and there is much greater awareness of the need to bring about a closer involvement of the universities in the process of development.

4.4.2. While the basic contribution that the universities can make related to undertaking specific research oriented problems with relevance to the process of growth such as resource surveys, development of economic and industrial models, operations research analysis for various problems etc., the technical universities can also help in solving plant design and construction problems such as evolving optimum designs of a structure keeping the local materials in view etc. It is felt that in most developing countries, the universities and the institutes of higher learning provide a very valuable resource which could be tapped partially for consultancy and advisory services necessary to the process of development.

#### 4.5. Public Sector and Governmental Agencies

4.5.1. Apart from the industrial research institutes and universities, in most developing countries government agencies concerned with technical and economic activities do provide a source of consultancy and advisory services both for large and medium scale industry as well as for small scale industry.

4.5.2. Small Scale Industries play a crucial role in the industrialisation of many developing countries. On account of their de-centralised and non-capital intensive character, the Small Scale Industries are potent instruments for transformation of traditional technology characterised by low skills and low productivity into modern technology characterised by improved skills and contributing to improved productivity. In India, for instance, Small Scale Industries have developed by conscious and deliberate governmental policy and occupy today a significant position in the country's industrial base. Consultancy Services to small entrepreneurs are as important and as desperately needed as for the larger entrepreneurs. Small industry has its own peculiar problems. Their solutions demand a large amount of innovation and adaptive skills and familiarity with their special conditions. In order to provide the necessary advisory services to the Small Scale entrepreneurs in India, an integrated industrial extension service has been evolved through a network of Small Industries Service Institutes and Extension Centres in nearly 85 locations in the country. These centres provide advice regarding new industries to be



set up, preparation of schemes and advice on machinery requirements, advice on manufacturing processes, the design and manufacture of dies, tools, jigs and fixtures, distribution methods and market development etc. Additionally, the National Small Industries Corporation Limited of India, a Public Sector Corporation, not only provides financial assistance to small industries but also provides training facilities for technical personnel in their various training centres and operates proto-type centres to meet the needs of Small Scale entrepreneurs for new designs, proto-types and manufacturing techniques. What is true in India in this respect is also true of many other developing countries. I have taken the example of India to illustrate this point merely because that is the scene with which I am most familiar.

4.5.3. Additionally, the following types of Government and semi-Government Agencies in most developing countries do provide some kind of guidance and advisory services relating to the industrial development process:

- (a) Planning Commissions and Plan Organizations;
- (b) Industrial Research Institutes;
- (c) National and Regional Productivity Councils;
- (d) Industrial Development Corporations;
- (e) Industrial Development Banks and Industrial Finance Corporations;
- (f) Management Institutes;
- (g) Statistical Departments; and
- (i) Ministries of Industry and other Economic Ministries.

4.5.4. While some Industrial Development Corporations and Industrial Development Banks do prepare Feasibility Studies for Projects, either themselves or in association with firms of consultants, primarily their services are advisory in nature and their basic objective is to help bring about industrial development. With experience, the professionals employed by such Corporations build up a fund of expertise with regard to the particular problems of development, the needs of the area being served and the problems with regard to establishing feasibility and soundness of possible industrial ventures. However, since the industrial development organisations are essentially oriented towards promotional work, they are likely to find that certain

technical and technological skills are lacking which stands in the way of proper identification of feasible and profitable projects. In such cases such Corporations can draw upon the services of independent consultancy firms to prepare a blue-print for industrial development on a regional basis after conducting proper surveys of sources and needs and establishing the technical feasibility and economic profitability of possible industrial facilities. The schemes identified in the blue-print are then made available to prospective entrepreneurs to choose from for the purposes of implementation.

- 4.5.5. In certain cases, Industrial Development Corporations have set up their own consultancy services, building around the nucleus of technical and economic expertise built up in the Corporation through experience of industrial development and promotion activities. A ready example in India is the case of National Industrial Development Corporation Limited, which today has a staff of trained and experienced professional men and offers total planning and project consultancy services including pre-investment services, project planning and design and assistance in project implementation both within the country and abroad.

4.6. International Consultants:

- 4.6.1. There are a number of programmes of technical assistance offered to developing countries by Governments of industrialized countries as well as international organisations on a bilateral, multi-lateral or international basis. These programmes usually provide to the developing countries either individual Consultants or Groups of Consultants or Consulting firms to provide them with the specialist services required in the development process.

4.7. Individual Consultants:

- 4.7.1. Individual Consultants are available in developing countries also though their numbers are much fewer than in industrialized countries. Usually, the individual consultant operates in a narrow field and where major projects are concerned, works in association with organised consultant firms. The role of the individual consultant is, however, more pronounced as problem identifier and problem solver in Management Consultancy.

4.8. Consultant Firms:

4.8.1. The diversity of scientific, technological and engineering disciplines involved in setting up and designing of a new plant, has accelerated the process of setting up of consulting firms as against use of individual consultants. Consulting firms are generally multi-disciplinary by employment of professionals in a wide variety of disciplines such as civil engineering, mechanical engineering, electronics, chemical engineering, economics, market surveys specialists etc. Such firms, while quite common in industrialised countries, are beginning to get established in developing countries also.

4.9. Additionally, Consultancy Services are available both in industrialised and developing countries from equipment manufacturers, operating plants and contracting firms, all of whom are normally willing to offer consultancy services for plant establishment as well as plant betterment. However, there is a certain amount of in-built hazard in using such secondary sources of consultancy, largely because their primary motivation is sale of a particular proprietary product or process which falls in their manufacturing range which is, therefore, their prime business and in spite of their best intentions, a certain bias towards their own product or process is liable to creep in their recommendations. This would hinder independent evaluation and judgment and hence detract from the value of such recommendations.

4.10. The above form of Consultancy often takes a slight variation. The operating plants or manufacturers or contracting firms often offer services on a turn-key or a package project basis. In the turn-key type of contract, the entire work is taken over by the main organisation - normally the major equipment supplier - who then obtains the other services through sub-contract.

4.11. When a manufacturing or a contracting firm offers a package deal, often the arrangement does not overtly specify payments to be made for design and consultancy services. A firm normally puts in preliminary design work on its own in the first instance and makes an offer for establishing the total facility including supply of all equipment, structures and supporting utility and service systems. In such a case the work that would normally have been carried out by a consultant is taken over by the contracting firm.

Although no specific payment is made on account of design and consulting services in the case of such package deals, the contractor nevertheless includes for the same in the total cost. The package deal, in the case of a standardised type of project, may result in speed because of the integration of the design, contracting and actual implementation work. However, two distinct and immediately identifiable disadvantages result from such an arrangement. Firstly, the client has little chance of estimating whether he is getting value for the money spent because normally item-wise breakdown of costs is not provided in detail and detailed specifications for each item are not available for the client to judge whether lower overall costs could have been the result of poorer workmanship. Secondly, a manufacturer or a contractor offering a package deal have much less motivation than an independent consultant to carry out the economic assessments of all available solutions in order to pick upon the one most suitable. For one reason, after having spent money on a preliminary study, he is less likely to advise a client not to proceed with the project; for another he has hardly any motivation and perhaps often a strong disincentive to specify equipment which does not fall within his own manufacturing range or that of his business collaborators in the package arrangement.

4.12. When consultancy is inducted from an industrialized country as part of the aid provided by such country to a developing nation, there is a possibility of two conflicting aims of the industrialized countries overlapping unless strict discipline is enforced. The two conflicting interests are:

- (a) Unbiased and whole hearted desire to assist in the speedy economic development of recipient countries.
- (b) Concern for the development of their own country's economy which may demand stepping up of exports so as to maintain or improve the level of industrial activity in their own countries.

As aid-givers, the prime objective of the donor country is the development of the recipient country and hence there is no room for conflict of objectives. However, if as has been seen in certain cases, a secondary aim of providing aid is to utilise spare domestic capacity, there is a chance that instrument used for enlargement of such export markets is biased consultancy offered to the recipient country. Particularly where the recipient country does not possess the necessary technical expertise to evaluate and to judge, the donor

country has a paramount obligation not to allow such secondary objectives to enter the bargain. Consultants from the industrialised countries can, however, without coming into conflict with their role of independent and unbiased advisers, help to promote exports of their country's products by unbiased dissemination of knowledge relating to such products.

4.13. To sum up, developing countries have access to the following sources of consultancy and advisory services for industrial development:

- A. Industrial Research Institutes;
- B. Universities and Institutes of Higher Education;
- C. Public Sector and Governmental Agencies concerned with economic growth including those set up for the development of small scale sectors of industry;
- D. International Consultants provided through bilateral, multi-lateral and international programmes by governments of industrialised countries and international agencies;
- E. Individual Consultants - local and foreign;
- F. Private Consultant Firms - local and foreign; and
- G. Secondary sources of consultancy such as equipment manufacturers and suppliers, contracting firms etc.

## **5. PROBLEMS ENCOUNTERED BY INSTITUTIONS PROVIDING INDUSTRIAL CONSULTANCY SERVICES IN THE DEVELOPING COUNTRIES**

5.1. There are several problems that confront Consultants when working in developing countries. One of the main hurdles that the Consultant faces in a developing country is the lack of organised information. When the Consultant is working in the area of macro level programming, he finds that often the requisite statistical base is lacking or discovers that the raw data with which he has to deal shows a number of inconsistencies or has not been collected in the manner in which it could be most helpful. In the field of specific project evolution, the Consultant will often find that the technical data as to the availability of equipment or construction materials and their costs are not properly documented nor are they readily available. Additionally to this, a local Consultant in developing countries may be confronted with the problem of finding suitably experienced and trained professional personnel - particularly in areas which may be considered non-traditional to the particular country.

5.2. It would, therefore, appear desirable that in the developing countries action is taken immediately to build up Centres for Industrial Information where up-to-date information with regard to availability of equipment and its technical and economic characteristics is properly codified and kept. It is accepted that in most developing countries a start has been made only recently in local manufacture of many items of capital equipment. A very desirable first step in establishing organised industrial information systems would be to collect and codify information with regard to equipment availability in developed countries, their technical and operating characteristics and up-to-date prices. Much of this information which can be obtained from equipment manufacturers can by proper system of up-dating and codification, provide local Consultants with a ready fund of information for purposes of equipment selection and sizing. Similarly, considerable amount of non-proprietary information exists in various Centres in industrialized countries with regard to alternative processes for manufacture of a variety of products. Such information should also be similarly codified to provide local Consultants in developing countries with readily available general information for evaluating alternative technology for manufacture of products. It is to be conceded in this connexion that in the case of products or processes which are relatively new or which are highly proprietary, operating information may not be readily available. In some developing countries where the industrialization process has been apace for some time already, governmental organizations concerned with licensing and clearances for import of equipment as well as major public lending institutions have a wealth of information contained in the various Feasibility Studies and Project Proposals submitted to them by entrepreneurs. Considerable information on equipment prices, process parameters and operating economics of alternative processes is, therefore, available and if properly codified can form the nucleus of plant and process information around which one could build further. However, it would be necessary in such cases to see that proprietary information is excluded and the secrecy of certain information provided by entrepreneurs and consultants is guaranteed.

5.3. Additionally, information of local character such as local wage rates and construction costs, costs for local materials, transportation and handling expenses, Government levies, meteorological and general soil

information, norms of productive skills available in the country which are developed by local productivity councils etc., should be compiled and made available for use both by local consultants as well as foreign consultants operating in developing countries.

5.4. Very often, consultants evaluating the feasibility of a project in a developing country find that adequate information on the markets for industrial products is lacking. In certain cases where a detailed blueprint for development has been drawn up and is available, such markets - particularly in the cases of industrial intermediates - can be projected by reference to the existing or programmed capacities for end-use items. However, in some developing countries such a detailed plan is absent and the development programme really contains very broad targets for achievement and includes additionally a few specified projects only. In such cases, the consultant has to rely on an analysis of economies in analogous stages of development to project, however broadly, possible demand for industrial products, such as foundry products, steel rolled products, etc. This lacuna can be removed if documented information on an international scale can be compiled and analysed to yield norms for judicious application in developing economies. Such a task can perhaps be best undertaken by international bodies like the UNIDO.

5.5. Another major problem encountered by local consultants in developing countries is in the acceptance of their competence by potential clients. Entrepreneurs who would engage the services of consultants tend to place reliance on foreign consultants who might have done similar jobs in their own countries rather than on a local consultant who has just started his professional career. The consultant has a very major role to play in developing the confidence of his clientele by persuasion with technical logic and argument but, most of all, by providing his competence on every job that he undertakes. At the same time, governments and public organizations in developing countries must ensure that a local consultant is appointed in all cases wherever available even though such a local consultant has to draw heavily from foreign consultant sources.

5.6. A special problem of particular significance to the practice of consultancy in the developing countries related to the necessity for evolving

solutions in line with local constraints and local objectives. This problem would appear to be of particular relevance for a foreign consultant practising in a developing country. Because of the differences in the stage and phase of development, the foreign consultant is likely to find that the solutions with which he is familiar in his home country are not the best solutions - even the most economic solutions - in the developing economy. Concepts as to "plant size" and "plant organization" cannot be transplanted from one economic environment to another without serious detriment. Solutions with regard to the degree of automation are dependent upon man machine trade-off which vary significantly between developing and developed countries.

5.7. One of the problems facing the consultant in a developed country is the determination of the type of technology most suitable for a local environment. Sophisticated technology resulting from innovation in developed economies does not always provide a satisfactory solution in the developing countries where the criteria for the selection of technology for adoption may be radically different. These may be:

- (a) Ensuring maximum employment opportunities to a large reserve of unemployed personnel.
- (b) Ensuring maximum utilization of existing manufacturing capability in the country.
- (c) Ensuring maximum utilisation of indigenously available raw materials.
- (d) Ready availability of technology at minimum costs.

Technology that satisfies the above criteria may often be compatible with the country's overall development and hence may be considered to be a compatible technology for a developing country.

A compatible technology for developing countries may in certain cases be the so-called "intermediate technology" which has perhaps been just discarded in highly industrialised countries. On the other hand, it must be mentioned that there are areas like sophisticated process industries where compatible technology has necessarily to be the latest technology.

5.8. It is vital that facilities for consultative assistance be developed in the developing countries to meet the needs for Product and Process Development. Two distinct kinds of activities in this area need



to be distinguished when analysing the problems in the context of developing countries. The first one relates to the development of a process or the design of a product in tune with local conditions for adoption in a new manufacturing facility and the other relates to the modification of product designs to meet changes in consumer requirements during plant operation. There has been a good deal of controversy as to whether developing countries should develop their own processes and products to suit the local economic and technical environments or should induct such processes and products from industrialized countries. Without going into an extended discussion on the subject, it would appear that considering the needs for rapid industrialisation in most developing countries, the paucity of resources that can be committed for developing a totally indigenous product or technology and the undesirability of developing countries not taking advantage of the tremendous technological progress that has been registered in the industrialized nations over the last four to five decades, the developing countries should induct products and processes from the industrialized countries but must adapt the same to satisfy local constraints and local needs. The work of adaption can be taken up by the various industrial research laboratories and by local consultants operating on their own or with the process or product design owners who form the primary source for such induction.

5.9. While the above relates to the development of products and processes in tune with local conditions and local constraints, a manufacturing organisation nevertheless needs to have its own product and process design facilities to adapt and innovate inducted designs to meet changing consumer needs during plant operations. Such plant design offices have, as a main role, the research and development of products into which the firm would diversify to suit changing market demands. It may be mentioned that a number of industrial facilities are often set up in the developing countries but they are handicapped by the lack of designs to diversify their product lines or to offer slightly modified products to suit specific customer requirements. In some instances engineering plants have been designed with an indicator production programme assumed on the basis of a general evaluation of the country's requirements. Such plants have been traditionally looked upon and identified in terms of the products comprising the indicator programme and viewed as specific product-oriented such as for manufacture of cement equipment, sugar plants etc. However, if the same plants were viewed in terms of the

process capabilities they possess, it will be seen that they can turn out a much wider spectrum of products provided the necessary designs are available for the diversified manufacturing programme. This would indicate that facilities must be available with them to design products to suit specific customer requirements. Often such products are not radically new but only engineering modifications of an existing product or model, as for example overhead cranes with different spans or different cabin arrangements etc. Plant Design Offices can fulfil a very useful role in turning out such modified designs to suit customer requirements if this aspect is adequately taken care of while planning new industrial facilities. The engineering consultants in developing countries must properly evaluate these aspects when planning and engineering new plants so that as soon as the product demand alters, even slightly, the capital plant and equipment does not have to remain idle but can immediately switch over to production of other items which it can manufacture and which the market will buy.

5.10. In developing countries, the use of consultants by private entrepreneurs is still somewhat limited and in any case has only now begun to emerge. The utility of a consultant is generally understood but most organisations with even a small engineering department of their own prefer to attempt solutions of problems within their own organisation. However, the utility and the crucial role that a consultant can play is now beginning to be recognized and it is to be expected that with time the role of the consultants and the type of services that they are called upon to render to business and industry will progressively increase.

5.11. Another specific local factor in the industrialisation process of developing countries may be noted here. Most of the developing countries still have agrarian economies and the large mass of their population derive their subsistence from agricultural pursuits. Traditional skills are largely concentrated in pastoral occupations. The need for providing food to large populations often is met by imports with a subsequent strain on scarce foreign exchange resources. Improvement of agriculture is, therefore, a prime requisite in these countries.

At the same time development of agro-industries which utilise agricultural products or produce inputs for agriculture are a prime need. Planning and engineering for such agro-industries on a decentralised regional basis is

a specific field of consultancy which is a crying need in developing countries. The problems in this case are so intimately local in character that the lacuna can best be filled by local consultancy organisations.

5.12. Local consultancy organisations can also play a vital role in the development of infrastructural facilities since these are far removed from the level at which they obtain in advanced industrial economies. The evaluation of infrastructural needs of most developing countries and their planning demand a close study and knowledge of local conditions, both as existing and in perspective.

5.13. Apart from the technical and technological services discussed above, in all developing countries there is an urgent and vital need for effective management both at the macro level which is concerned with overall planning and directional control aspects of a total economic system and at the micro or unit level. Most developing nations at the dawn of their economic betterment activity, share a large and uneducated population, scarce capital, a rudimentary infra-structure and a rather primitive agriculture. To attempt to build the basic economic framework from this stage calls for managerial skills and talents.

5.14. Major macro-management and economic administration decisions thus relate to the proportion of capital to be allocated to social, educational and other over-heads in relation to the capital to be used for immediate productive facilities; and secondly the types of productive facilities in which investment will lead to maximisation of generation of surplus funds and fulfilment of physical needs. Both these decisions are obviously dependent on the stage of economic development.

5.15. Since agriculture is the most important source of livelihood for the people in the majority of the developing countries, it is but right that in these countries a major initial onslaught should be directed towards the improvement of agricultural productivity. Planning for this vital and fundamental improvement in agricultural productivity should not merely consist of importing methods, techniques and equipment from the developed nations. More often than not such transplantation of technology and equipment without first having analysed the needs and the most appropriate

manner in which to satisfy them, has the tendency to aggravate problems rather than solve them. Furthermore, due to very low wage levels prevailing in developing countries there has to be a much greater increase in productivity due to mechanisation than in the case of developed nations before a labour-machine trade-off can lead to a productivity pay-off. A sound management would explore and evaluate all possible alternatives of productivity improvement before selecting the most effective instruments, related to the specific stage of economic development in the country.

What is true of agriculture is equally applicable to industry. The justification for replacement of manpower by machinery should come about only when an increase in productivity is achieved as a result - unless of course the nature of the tasks to be performed are beyond human capability. As a country advances on the industrial plane, the management at all levels is faced with a judicious choice from a plethora of alternatives for a production process or manufacturing activity.

All these are special problems peculiar to the practice of industrial consultancy in developing countries.

The success or otherwise of a consulting assignment in a developing country is often determined by the degree of awareness and appreciation of these problems that a consultant brings to bear upon his assignment on the lack of it.

## **6. INDUSTRIAL CONSULTING PRACTICES IN DEVELOPED COUNTRIES AND THEIR APPLICABILITY TO DEVELOPING COUNTRIES**

6.1. The organization of consulting services and the manner in which they are contracted out varies widely in the industrialized countries. In some countries the normal practice is for consultants - whether individuals or organizations - to keep themselves completely independent of any associations with equipment suppliers, contracting organizations or owners of proprietary processes. In certain other countries, on the other hand, the equipment manufacturers or contractors normally take on the entire work on a turn-key basis and provide the design and consulting services as part of the total contract. There are also other cases where the consultancy organizations are generally engineering departments of manufacturing organizations.

Exports or consultancy are sometimes channelled through organizations having associations with major manufacturers, business houses and banking interests.

6.2. In the developing countries, tendency hitherto has been for independent consulting organisations to offer such services although equipment suppliers and contractors also render consultancy services on a turn-key basis. The desirability of independent consultants not having any interest in specific products or processes or methods of construction has already been pointed out and it is considered desirable that in developing countries the functioning of independent consultants as distinguished from equipment suppliers offering services as part of a turn-key job should be promoted.

6.3. The obligations of the consultant have evolved steadily in industrialised countries and have crystallized in tacit as well as fully articulated codes of conduct. Additionally professional organizations like the institutions of consulting engineers have come to play an effective role in enforcing such codes of conduct. In the developing countries, the consultancy profession is still new and professional institutions are yet to emerge and even where a start has been made, they are not yet effective in administering codes of ethics. It is vital that for the healthy growth of consultancy profession and in order to ensure client acceptability, such codes of ethics should be drawn up and machinery set up for enforcing the same in developing countries.

#### 6.4. Remuneration for Consultant Services:

6.4.1. The manner in which the consultant receives remuneration for his services varies widely, all systems having the common objective of reimbursing the consultant for his costs and allowing him a reasonable profit. The major forms in which the consulting fees are charged in industrialised countries are the following:

- (a) Per diem payments;
- (b) Fixed lumpsum payments;
- (c) Percentage of project cost;
- (d) Cost plus fixed fee;

- (e) Retainer payment; and
- (f) Salary cost multiplied by a factor plus out of pocket costs.

6.4.2. The form of remuneration most preferred by clients in developing countries is the fixed lumpsum method of payment because it gives them a firm idea of the cost of the project beforehand. Secondly, in developing countries the clients are prone to a certain suspicion that a per diem contract with a consultant without a ceiling may lead to the consultant billing the client for more man-days than should have been required under efficient working.

6.4.3. Another form of remuneration in vogue in developing countries is to compensate consultants for the preparation of designs, drawings, specifications and other documents as a percentage of the total cost of works. Construction supervision is, however, normally billed on per diem rates. However, since proper codes of ethics are still to be evolved and mechanism for enforcement of the same still to come into being in most developing countries, there is possibility of bias creeping into the consultants' work towards increasing the project costs. Even where such bias is avoided but project costs go up on account of inefficient design, the client, in effect, pays the consultant for the inefficiency. In many developing countries, therefore, the clients are tending to prefer a lumpsum quotation or, where percentages are applicable, to ask for a prior agreement as to the ceiling fees.

#### 6.5. Obligations of Client and Consultants

The contractual obligations between the client and the consultant vary from assignment to assignment both in industrialized and in developing countries. It is, however, essential for ensuring proper client-consultant relationship that the obligations of both parties are clearly defined prior to the start of the engagement. The contract between the client and the consultant should normally specify the detailed scope of the assignment, the definition of the scope in successive phases, assignment of personnel responsibilities for supply of information, periodical reporting, duration, financial arrangements and guarantees as may be applicable. There has been a tendency in developing countries for clients to demand from consultants a guarantee to ensure that the assignment is completed and that the stated

objectives are achieved. The furnishing of financial guarantees by consultants is not normal practice in many industrialized countries where consultant services are equated with professional services rendered by the medical and legal profession. In such cases, the consultant is considered to be fully responsible though not financially liable. Normally, reputable consultants exceed their brief to fulfil the professional obligations in order to safeguard their reputation. In the developing countries, where the acceptance of the consultant as a professional is still perhaps to take place, it may become necessary in some cases for the consultant to offer financial guarantees for some time to come. However, with the acceptance of the consultant by the clients such insistence of financial guarantees may disappear. In order to create such a climate of acceptance, possibly the best means would be for the consultant to demonstrate by assignments properly carried out, his intentions to safeguard the clients' interests at all times and his competence to solve the problems of clients.

## 6.6. Selection of Consultants

6.6.1. The choice of the consultants having the training and capability to carry out the particular assignment lies with the client. A number of methods are followed for the selection of consultants both in industrialized and developing countries. Since the fee for consulting services normally is only a small proportion of the total project cost, it would appear logical not to allow a low fee to be the most decisive factor in selecting a consultant. What perhaps is most material to the successful completion of the assignment is the reputation and professional standing of the consultant, the previous clientele served, the volume of repeated business, the degree of knowledge of local conditions and the professional suitability of the consultant for the particular assignment. The method followed by international organisations for the choice of the consultant consists of preparing a list of consultants capable of executing projects in different areas and thereafter selecting the most competent consultant from out of the list in relation to the specific and detailed scope of the assignment. Negotiations are thereafter conducted with the preferred consultant with regard to remuneration, time-schedule, etc.

Other consultants in the list are approached only when negotiations with the most suitable consultant do not yield results.

- 6.6.2. A number of clients in developing countries, in particular governments, prefer some form of competitive bidding, similar to the system adopted for equipment purchase. Code of ethics of associations of consulting engineers in many industrialized countries prohibit competitive bidding and financial guarantees. They stipulate that the consultant should be selected on the basis of his qualifications and the fees should be negotiated afterwards. Considering that the consultants' fees are very small portion of the project cost and that in any form of competitive bidding there is likely to be much higher value assigned to the fees quoted than is warranted, it would appear desirable that the practice of selection of a consultant on considerations of competence rather than price should be promoted in developing countries.
- 6.6.3. In most developing countries, the prospective clients do not have the necessary experience to evaluate in what manner the assignment should be approached for effective solution. In such cases, it is even more vital that the selection of the consultant should be properly made so that only the most competent persons with sufficient background and experience are chosen. It is equally vital in these cases for the consultants to act always in the best interest of the clients and to perhaps exceed their normal brief in creating the proper atmosphere between client and consultant for effective completion of the project.
- 6.6.4. The consultant is always an agent for transference of know-how. In the case of developing countries, he is even more so. While in industrialized countries the consultants' assignment normally ends with the completion of the project on hand, in the case of developing countries it is most necessary for the consultants to train the client personnel during the engagement and, if necessary, offer follow-up services to ensure that the project is in fact operated and implemented in the best possible manner. This aspect of training of client personnel and of possible follow-up services



that can be offered should also be borne in mind in selection of consultants in developing countries.

6.7. To sum up, therefore, the industrial consulting practices vary widely in industrialised countries as also the manner of remuneration and procedure for selection. In developing countries, however, it is considered that the desirable form of consulting practice is independent consultants without any tie-up with equipment suppliers or contractors. The consultant for any assignment should be selected for his competence and not on the basis of a price quotation. The preferred manner of remuneration for consulting services in developing countries is the fixed lumpsum payment for planning and design assignments and per diem payments for construction supervision, equipment inspection and assistance in erection, commissioning and start-up.

Proper client-consultant relationship is vital for the effective completion of any consultant assignment. In order to foster such relationship, the duties and responsibilities of both parties should be spelt out in detail prior to the start of the engagement. In developing countries, it must be remembered that the work of the consultant often extends beyond the completion of the design or plant installation to training of client personnel during the engagement and follow-up services thereafter.

## 7. NEED FOR PROMOTING LOCAL CONSULTANCY SERVICES IN DEVELOPING COUNTRIES

7.1. Considerable expenditures are committed in developing countries towards creating new industrial facilities and in building basic infrastructural works. Insufficient attention to detail in planning and executing projects leads to results considerably at variance with expectations and in many cases such divergences from targets in the case of individual projects have serious repercussions on the total economic programme. Furthermore, the conditions in developing countries are peculiarly different from the environment obtaining in developed economies. Not only are certain infrastructures for industrial development generally inadequate but environmental conditions are largely different in these countries from those existing in developed countries. Technical innovations are almost invariably carried out in industrialised countries where the context is one of full employment and the cost of labour is relatively

high in relation to the cost of capital. In developing economies, there is a marked scarcity of capital and a relative abundance of labour. In many developing countries a high percentage of capital goods needs to be imported, there is an acute paucity of foreign exchange and there is a large reserve of unemployed and relatively unskilled manpower. The facts indicate that what the developing countries need immediately are in some cases and at least in certain cases, opposite of what has promoted the new innovations in developing countries. Secondly, the unsuitability of mechanized techniques does not always get reflected in a purely financial analysis in the case of developing economies, and can only be appreciated if opportunity costs are evaluated. The local consultants in developing countries having an intimate knowledge of conditions at home are best suited to appreciate these special factors which invariably effect the nature of the techno-economic solutions suitable for an industrial facility. Consultants in developing countries, in addition to their usual project analysis work, have to perform an additional function, that is to analyse manufacturing processes and machinery with a view to evaluating suitability for application in their local and environ. The above factors point to the fact that the local consultant must be fostered and in all cases the specialized knowledge of technologies which a foreign consultant may bring may need to be tempered by the intimate knowledge of local conditions to arrive at an appropriate solution. A feasibility study or an engineering design which does not take into account all economic realities and possibilities is of as little use as one which takes no account of technical realities. Some of the special problems the consultant is called upon to solve in a developing country are discussed below in some detail:

## 7.2. The Concept of Size:

7.2.1. The industrial consultant when working in a developing country has to be extremely careful in determining the optimum size of the plant for its economic working. There are several instances in a developing country where inadequate analysis of this problem on the part of the consultant as well as the client appear to have contributed towards diseconomies in industrial plants and facilities. Often it appears to be accepted as axiomatically true that the larger the plant, the cheaper the cost of production. It is no doubt true that the scale of operation has a significant effect

on production economies. However, it would be wrong to assume that there is one unique optimum economic size applicable in any country and at any stage of industrial development. Optimum economic size is very much a function of geography, local conditions, talents and skills available, time and phase of industrial evolution, man/machine trade-off ratios etc. Therefore, the decision on economic size of a plant should be carefully considered by the consultant in each specific case taking fully into account the local conditions and other constraints. In planning for the engineering industry particularly, determination of the size and capacity of the plant is often the result of inadequate analysis of the impact of economy of scale. Unlike a chemical or process plant, where larger production capacity does significantly reduce production costs, the heavy engineering industry has perforce to be capable of producing a variety of products in a developing country and the production is not on a continuous basis. The reason for this is that the volumes of demands for individual items of equipment are limited and, therefore, the plant production programme has to be flexible and more versatile. This fact must be taken into account when making the analysis relating to economy as a consequence of large scale production. Another aspect of determining the plant size is the fact that invariably the economic analysis at the time of planning a project seems to be done on the basis of 100 per cent production which is rarely achieved in actual practice due to the very nature of engineering industry. If the analysis takes into account the partial utilization factors for various sizes of installed capacities, the final conclusion on the optimum plant size may be quite different.

- 7.2.2. Another important aspect of the concept of size relates to the availability of indigenous capital plant and equipment. Very often because of the size of the plant, capital equipment has to be imported which would otherwise have been available indigenously if the size and capacity of the plant were smaller. As a consequence of imported equipment spares have also to be imported and stocked for a longer period of time than would have been the case if indigenous equipment were used.

- 7.2.3. It is also not implicit in the concept that a larger plant size necessarily leads to economies of production. One has also to take into account the concept of productivity in this connexion. More often than not, transplanted equipment and technology without first having analysed the needs and the most appropriate manner in which to satisfy these needs, has the tendency to aggravate problems rather than to solve them. Furthermore, due to lower wage levels prevailing in most developing countries, there has to be a much greater increase in productivity caused by mechanisation or by large plant size than in the case of highly developed nations, before improved economies are achieved. The cost of equipment, much of which has to be imported during the initial years of a developing country's industrial development, is higher and, therefore, its utilisation must be much greater because of the much higher cost of idle time for each unit of equipment. A sound investment decision policy would attempt to explore and evaluate all possible alternatives and productivity improvement and the size and capacity of the plant before selecting the most effective technology and the optimum economic size.
- 7.2.4. A large industrial plant is not a one sided blessing. In its wake it throws up major problems of management complexity and operational overheads. This aspect should also be adequately weighed in finally deciding the scale of production and the size of the plant.

### 7.3. Integrative Approach

Consultants providing services in developing countries have also to be aware of the integrative approach to project planning and implementation, without which, very often, the individual plant or project does not produce adequately to its design level due to other factors, such as, non-availability of basic raw-materials, human resources etc. There appears to be a need for an integrative approach to planning for an industrial plant by making sure that not only the specific industrial project is planned but that there are capacities in other sectors of the economy to fulfil the needs and requirements of the specific project for industrial raw materials, intermediate products, such as castings, forgings, bearings etc., and for skilled manpower. Unless all these factors are

taken note of in the development policy oriented towards development of industry, a situation may arise where large investments in the physical plant and equipment remain idle because of lack of industrial raw-materials and other inputs referred to above. An integrative approach policy must plan for timely availability of these inputs as well, to ensure increased capacity utilization and increased productivity of the industrial units set up in the country. In this area, both economic consultants who provide services for the economic development planning activities and the plant engineering and design consultants who provide services for determining the feasibility and subsequently, implementation of a new plant can play a very useful role by specifically pointing out the factor mentioned above.

#### 7.4. Human Resources

7.4.1. Apart from the physical production capacities necessary for industrial development in developing countries, there also appears to be a serious shortage of skilled workers, foremen, technicians, technologists, engineers and others. Consultants operating in developing economies, who are concerned both with the economic development planning as well as with the implementation of a specific project, need to devote a considerable part of their attention to the problem of manning industrial facilities which they design. At the macro level of educational planning, in a number of instances, there appears to be a great deal of stress laid on the theoretical and academic aspects of engineer development. Inadequate attention seems to be paid to the actual shop floor training facilities. Without these training facilities, the educational programmes do not appear to serve the purpose of enabling the young students of technology and engineering to relate the knowledge that they are requiring in the class room to the situations prevailing on the shop floor. In this connexion, a sandwich programme of technical education may be worth considering in developing countries wherein the students work in factories while acquiring academic education. In any case, the bulk of the requirements of engineers and technologists in developing countries are for persons who would be able to discharge their responsibility adequately in construction operations and maintenance aspects of an industrial plant. Only a smaller proportion of the students find employment as researchers and development engineers at least during the initial stages of economic and industrial development in these countries.

- 7.4.2. It is also useful to note that vocational training centres which are set up in a number of developing countries should get oriented to develop the skills of workers in harmony with requirements of industry. Consultants can help the vocational training centres by determining the likely needs of industry over the next few years for skilled workers so that the training programmes which these institutions impart are developed in a manner so as to fulfil the need for trained manpower most effectively.
- 7.4.3. Another crucial factor in the successful operation of newly created industrial facilities in the developing countries, at times, appears to be lack of skilled and competent managers. It has to be recognised that managers are not created overnight; rather they go through a gradual process of development by managing smaller and less complex plants and therefrom go on to manage larger and more complex plants. Managerial experience, unfortunately, cannot be acquired second hand. The manager has to go through the mill of experience himself to develop his competence to manage larger and increasingly complex plants. While it is true that the scientific management and executive development programmes hasten and accelerate the process of managerial development, it has to be recognised that such programmes cannot entirely eliminate the process of managerial development through actual personal experience. Most countries in the developed and industrialised world have come to their present stage of development some 50 or 100 years after their process of industrial development began. This gradual development of industrial capacity also provided them with adequate time for their managerial development. Most of the developing countries, on the other hand, have had to telescope the industrial development process and compress into a decade or so the achievements and objectives which took perhaps four to five decades in the countries which are now industrially advanced. This has had to be done - it is inevitable and it is essential for the developing countries - to accelerate their pace of industrial development. However, the accelerated pace of industrial development also tends to impose certain strains on management development and developing economies need to lay increasing emphasis on management development programmes and management education. At the same time, consultants entrusted with the work of planning and designing new industrial plants must give recognition to the fact that the level of management required for the large and increasingly complex plants is not created overnight

in spite of the educational programmes but that managers have to go through the process of growth through personal experience. This fact should not be overlooked by the client or consultant when determining the size and complexity of a specific manufacturing plant.

**7.5. Marketing Development:**

7.5.1. One other aspect which appears not to be receiving adequate attention in developing countries in the future marketing development programmes and it is felt that consultants entrusted with the responsibility of planning and designing new industrial facilities can help in identifying this phenomenon. Interesting case studies have come about where a few years after the industrial capacity has been set up in a developing country, there exists the paradox of unsatisfied demand and under-utilised capacity which could fulfil this demand. A deeper examination of the curious phenomenon seems to point towards a hypothesis which may be enunciated in the following manner. When a developing country starts its journey of transformation from agrarian towards an industrial economy, in the initial stages the market within the country is assured for the output of newly created local industrial plants. This is generally brought about by adopting measures which inhibit imports with a view to giving a certain measure of protection to the adolescent indigenous industry. This is only right and it should be so. Stress is, therefore, laid by these newly created industrial plants on increased production; their aim being to produce as much as possible, in the shortest possible time, to satisfy the pent up internal demand in the country. There is really no direct motivation at this stage to look far ahead into the future, undertake market development work and initiate product development activities with a view to developing products for which demand may arise in the country in the years to come. As the process of industrial development and economic advancement accelerates and gathers momentum, a subtle and initially almost invisible change appears to come about in the qualitative needs of industry for equipment. For instance, the initial need for general purpose machine tools may in later

years convert itself into the demand for special purpose machine tools, transfer machines, programme controlled machines and such other sophisticated versions. Unless this potential transformation is foreseen, efforts on the part of the industrial plants and manufacturing industries in the country would not have been adequately initiated towards development of future product lines to meet future demand when it materialises. Consultants in developing countries can fulfil an extremely useful role by pointing out the desirability and, in fact, the inevitability of laying adequate stress on market development for the future and product development in time to meet the future market demand when it materialises.

7.6. Product and Process Design:

- 7.6.1. It has been pointed out earlier in the paper that it is vital to have product design facilities in a manufacturing plant particularly in the engineering industry, and that the consultant must recognise adequately the importance of this particularly in the developing countries. The nature of demand for industrial products in industrialized countries is more stable whereas in developing countries, at least during the initial stages of economic development, the nature of demand varies and the industrial facilities which are set up in that country have to be planned so that they can cater substantially to the needs of the products it is to manufacture. If this fact is not taken note of by the consultants who design and plan such industries, it may lead, in certain instances, to poor utilisation of the industrial capacity in the developing country. As can be foreseen, this suggestion implies diversification programme and flexibility to operate the industrial process capacities.
- 7.6.2. In planning for fuller utilisation of engineering manufacturing capacity in developing countries, product and process design facilities need to be given as much importance by the consultant as the requirements of plant and equipment, raw materials, intermediate engineering products, manpower etc. For successful plant operation - in addition to the other factors of production namely, raw materials, capital equipment, sources of energy and



qualified workers and managers- there must also be appropriate "Technology" which covers both the product design and its process of manufacture. The role of "Technology" can be illustrated by a simple example, namely, that of cooking a meal. Whether the recipe is in the memory of the cook or in a recipe book, it is essential that if there is to be a meal then the recipe will determine the nature of this meal. The other ingredients, such as the appropriate cooking utensils, fuel or any other source of heat energy, raw food items, and the cook himself would not by themselves be able to cook the meal without the aid of the recipe. Applying this example to a production system, the physical, financial and the human resources in a production plant would by themselves be able to achieve little if there is lack of appropriate "Technology". It is necessary and almost inevitable that the product design offices should be planned by the consultant to be attached to manufacturing plants and that these offices should concern themselves deeply with product designs/innovations, which should be their primary concern. Similarly the Prototype Centres, Research and Development Departments of the Manufacturing Plants, and the Industrial Research Institutes should direct their attention in developing countries towards this need of the engineering industry rather than expand time and resources on fundamental research for the dim future.

7.7. Technology: Import or Evolve:

7.7.1. The question which immediately arises concerns itself with the problem of the manner in which any developing country can speedily develop "Technology" so that it is available in an increasing measure to its industrial plants within the country. In the initial stages of growth of industrial economy, the industrial structure has necessarily to depend heavily on import of capital equipment as well as "Technology". Sometimes this inevitable dependence on import of "Technology" by the developing countries during the initial stages of industrial development has tended to inhibit the development of indigenous technology. It has also happened often that the technology thus imported has tended to be applied to the local industrial plants with little

or no modifications. However, it has been increasingly felt by the developing countries in the past decade or so that induction of technology from outside sources and its transplantation into an alien soil without suitably modifying and adapting it to satisfy the local constraints as well as local requirements, often results in diseconomies, excessive costs of production, under-utilization of equipment and improper use of locally available talents and skills. As a matter of fact, mere transplantation of technology is as hazardous as transplantation of organs in a human body and often-times the chances of rejection of the transplanted technology are as hazardous. Consultants engaged in developing new industrial facilities in developing countries must foresee this problem and take adequate measures both at the planning and designing stage of the project as well as post operative stage of the plant. The research and development activity within the country, whether in industrial research institutes or elsewhere, must also be oriented towards the objective of efficient implementation and absorption of imported technology for desired results.

Product design and production technology are evolved as a result of taking into account production volumes, market needs, resource availabilities, available production facilities, and local skills and talents. Only a judicious blend of these factors leads to the evolution of compatible technology for optimum economic production. Some of the production technologies transplanted from one geographic area and market to another prove to be inherently uneconomic. It has, therefore, come to be accepted that it is of utmost importance in the case of the transplanted production technologies and process designs, to examine these in the light of local factors referred to above and to alter and modify these to the extent necessary and desirable if future diseconomies are to be avoided. The consultants can fulfil a very useful role in this connexion.

- 7.7.2. The best course for the developing countries appears to be that they should not deny themselves the fruits of scientific knowledge and technology generated over a long period of time in other countries which are industrially advanced. Simultaneously,

to minimise the expenditure of time and money, it would be advantageous if indigenous research and development activity in the developing countries starts, wherever possible, at the stage of technological development elsewhere rather than starting from scratch. Industrial Research and Development Institutes in developing countries could arrange their research and development activity so that initially bulk of its work relates to adaptation and modification of the inducted technology to the extent necessary to suit local constraints; and secondly to continue with the Research and Development effort for subsequent improvement and innovation of this technology. What is being suggested is that while the greatest emphasis needs to be laid on indigenous development of "Technology" by developing countries, they should not fight shy of inducting "Technology" from elsewhere provided they are willing to use such inducted technology as a base for further adaptation, innovation and development.

#### 7.8. Standardisation

Standardisation of products, sub-assemblies and components is extremely vital to economies of industrial entrepreneurs in developing countries. Particularly in the case of product designs transplanted from different sources as in the case of most developing countries, it is important to attempt to standardise components and sub-assemblies so as to prevent sub-division of an already restricted market. Often, in such cases, absence of standardisation may deprive the industry of mass-production techniques and consequent diseconomies of production.

7.9. From the above examples it is clear that the consultant operating in a developing country has to reorient his thinking in this direction to a considerable extent. He has to firstly ask himself "why" rather than merely transferring the technique or a solution which has proved useful in an industrialised country. The role that a local consultant can play is extremely crucial and important if some of the above factors are to be involved in plant design. Arising out of this, the extreme desirability of developing local consultants in the developing countries is indicated.

## **8. SOURCES FOR PROMOTING THE DEVELOPMENT OF LOCAL CONSULTANCY SERVICES IN DEVELOPING COUNTRIES**

8.1. There are a number of factors which influence the growth of local consultancy services in developing countries. Not the least of these is the fostering of awareness in all sections of industry, government and public sector agencies for the need to employ consultants in all stages of project identification and implementation. One of the best means of promoting the services such as these is to create a demand for them while concurrently training the requisite manpower and establishing the necessary organisational and institutional facilities for their effective functioning. A very effective means of ensuring this in developing countries is for governments and public agencies who are generally the most important entrepreneurs, to insist on the appointment of a local consultant even when such local consultants have initial inadequacies which need to be supplemented by induction of foreign expertise. That is to say, on every project - even where foreign consultants are considered necessary - a local consultant should also invariably be appointed. Such a process would help in the speedy transference of know-how from the consultants of developed countries to the local consultants who would, in course of time, develop so as to independently fulfil the tasks assigned to them. The process of acceptance of local consultants by entrepreneurs in developing countries would be easier achieved if, in all cases where foreign consultants are considered, the detailed items of risk involved by using local consultants are assessed jointly between the client and consultant. It will then be possible to induct consultancy from abroad only for high-risk items and engage local consultants for other items of work.

8.2. At the same time, governments of developing countries should promote special training programmes so as to generate the necessary fund of technical and professional manpower for manning the consultant profession. The primary source of trained manpower for the consultant profession would necessarily have to be graduates of schools of engineering, management sciences and business administration. Such fundamental training in universities and schools should no doubt be supplemented by direct experience in industry in order to increase the potential consultant's technical proficiency and train him to be an advisor. It is, however, to be appreciated that for the consultant to receive and appropriate training in industry or on construction projects, a minimum industrial base is necessary, and hence the quality of the consultant

trained would improve and evolve as industrialization of the country proceeds. However, that is not to suggest that the development of local consultancy organisations should wait till an intermediate stage of industrialisation has taken place in the country. All developing countries can draw upon a trained base of professional men who have had industrial experience in developed countries, and these can form the nucleus of local consultancy organisations.

8.3. Foreign consultants inducted into assignments in developing countries can also assist substantially in transference of know-how to local consultants and in training their manpower if a well-thought out and deliberate policy in this regard is pursued by governments and public agencies who normally are the biggest entrepreneurs in purchasing such services.

8.4. At the same time, opportunities should be provided for local consultants to exchange their experiences with their counterparts in other developing countries. The developing countries being generally in analogous stages of development have a commonality of problems which admit of similar solutions. All such problems are essentially peculiar to developing countries and solutions therefore have to be sought mainly in the developing countries themselves. Consultants from one developing country can help their counterparts in other developing countries by the transference of such know-how and experience. Such an experiment has been tried with a fair degree of success between India and Iran. The National Industrial Development Corporation Ltd. of India is exchanging experience with Iran and assisting in transference of know-how and skills to an Iranian public sector consultancy organization.

8.5. Refresher programmes for training can be arranged for consultants of developing countries in industrialized countries where the emphasis is on training and on the transference of experience.

8.6. Above all attractive remuneration and social status needs to be accorded to the consultancy profession so that potential talent can be drawn to the profession instead of allowing them the normal drift to the traditional areas of administration or operating industry.

8.7. In the industrialized countries, universities provide advisory services of a consultant nature. The trend has to be generated in developing

countries also. The universities and academic institutions are peopled normally by persons with high professional competence who can be successfully used for providing advisory services in the industrial development process. Unfortunately, largely because of the historical background, the necessary liaison between industries and the universities is more or less absent in developing economies. This is perhaps the remnant of the tradition of isolation of the universities from mundane day to day problems, that largely characterized the centres of learning during the days when industries were absent. A lead in this matter can easily be provided in developing countries by governments who, as has been stated earlier, are the biggest entrepreneurs. Governments should adopt a deliberate policy of engaging universities in the problems of industrial and economic development and promote university participation in the process of industrialization.

8.8. Where a substantial operating industry is existent as in the case of certain developing countries, governments can perhaps take a lead in ensuring that a system of feed-back from operating industries to the local consultants with the minimum necessary operational information so vital for project evolution and design. For this purpose, fostering of professional societies which provide a platform for exchange of information is indicated.

8.9. It is most vital from the point of view of creating the necessary climate for acceptance of the consultancy profession to ensure that the consultants in developing countries adhere to a rigid code of ethics which will assure potential clients that their interests are adequately safeguarded. Governments can take a lead through their public sector consultancy institutions, where such organizations exist, in promoting a healthy code of ethics. Additionally, professional consultant engineering associations should be promoted and wherever possible a programme for registering of consultants may be adopted.

## 9. SUMMARY

9.1. It will be evident from the preceding discussion that consultants have a crucial role to play in the industrialization process of developing countries.

9.2. The specialist services of consultants can be effectively utilized both in the process of macro level programming as well as in the planning, designing and execution of individual industrial facilities. Service of consultants extend also to solution of specific problems thrown up during plant operation as well as for manpower development at the unit level and for evolution of operating procedures and standards. While the need for process and product design consultants may not be felt in the earlier stages of industrialization, they are nevertheless vital to the industrialization process of developing countries for adaptation of inducted products and technologies to suit local conditions and for product design and innovation thereafter.

9.3. Consultancy firms are only now emerging in most developing countries. However, advisory services, generally oriented towards industrial development and project feasibility, are available from governmental agencies like industrial development and promotion bodies, small scale advisory bodies, government departments and lending agencies. Industrial research institutes and universities (to a very small degree) also provide testing and research facilities. Advisory services in specialised technical and technological problems are, however, largely absent in most developing countries and the lacuna is met by consultants from industrialized countries.

9.4. Consultant organisations and practices in developing countries are in their evolutionary stages. Both individual consultants and large consulting firms exist in some developing countries.

9.5. Independent consultants without any tie-up with equipment suppliers or contractors are preferred to ensure unbiased judgment and assure clients in developing countries that their interests are paramount with the consultants who has no other conflicting objectives. As a corollary, turn-key contracts and package deals are not considered desirable.

9.6. Remuneration for consultation services is preferred on a lumpsum basis for planning and design work with per diem rates for construction supervision, inspection services, start-up and commissioning assistance.

9.7. Selection of consultants is recommended to be on the basis of their competence for the particular assignment rather than on price quotation.

In some developing countries, however, the practice of inviting price quotations for consultancy persists, though this is against the code of ethics followed in many industrialized countries.

9.8. A code of ethics for the consultancy profession in developing countries is essential to promote healthy consultant practices.

9.9. Consultants operating in developing countries suffer from lack of documented information on equipment availability and prices, local materials, norms, requirements and practices etc. Action needs to be taken to remove this lacuna.

9.10. Industrialization of developing countries cannot be achieved by mere transplantation of technology, equipment, or techniques from industrialized countries. Unless these are adapted to suit the technical, economic and social environment, such transplantation may aggravate - rather than ameliorate - the situation. Concept of plant size, degree of automation, technology to be adopted, product designs - all these need to be evaluated in the context of labour availability, scarcity of capital, paucity of foreign exchange, non-availability of adequate skills and managerial talent which are the normal conditions in developing countries. Local consultants, having a feel of the locale and environ, are best suited to evaluate local factors and hence use of local consultants should be encouraged in developing countries.

9.11. A nucleus of professional men trained in existing industry in the developing country or in industrialized countries would normally be available for the local consultancy profession. Properly designed schemes should be promoted for developing the local consultants. Some of the steps that may be taken could be:

- (a) appointment of local consultants in all cases even where foreign consultants have to be brought in to supplement their capability;
- (b) insistence on on-job training of local consultants by the consultant from industrialized countries whenever foreign consultants are used;
- (c) training of potential consultants from developing countries in the design and engineering offices of plant suppliers of industrialized countries whenever major equipment purchases are made by developing countries.




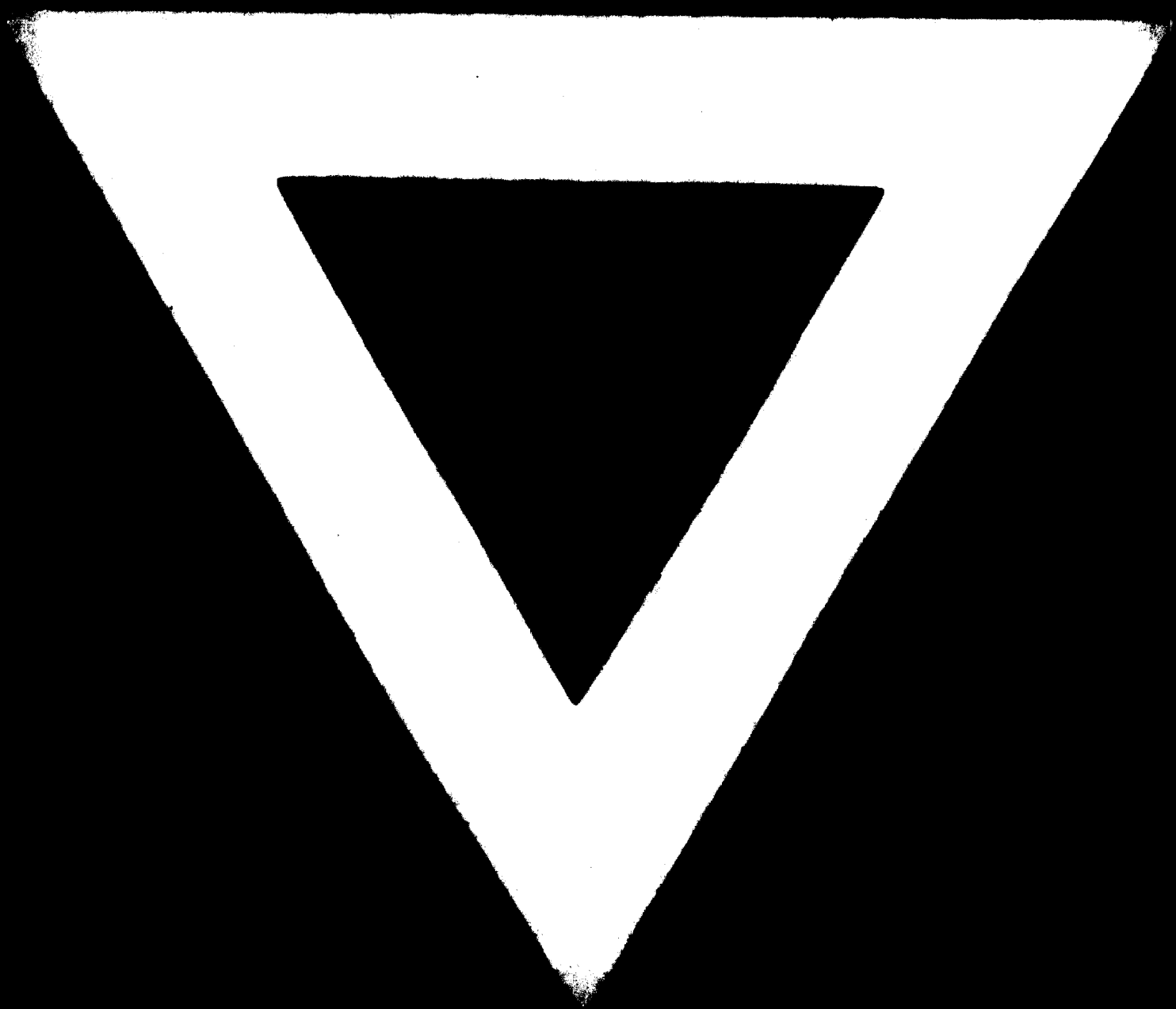
- (d) promotion of professional societies to stimulate exchange of experience between local consultants;
- (e) more widespread use by developing countries of consultants from other developing countries to stimulate transference of know-how for the solution of problems peculiar to developing countries; and
- (f) involvement of universities and centres of learning in industrial and economic development and their utilization for solution of technical problems in the context of local conditions.

9.12. It is recognised that the consultancy profession would grow in competence as industrialisation proceeds and the necessary base for local experience is created. Nonetheless, it would be unwise to wait till industrialisation has progressed sufficiently before the local consultancy profession is fostered. A start should be made early and local consultants involved in the process of industrialisation of developing countries. Initially, they may require considerable help from industrialized countries to supplement their own capabilities. Such dependence will however reduce with time.

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