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**ENGINEERING DESIGN AND CONSULTANCY SERVICES  
IN DEVELOPING COUNTRIES**

**AN AGENDA FOR UNIDO ACTION**

1/25

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POST SCRIPT

EXECUTIVE SUMMARY AND PROGRAMME OF ACTION

1. Overall Objective: Develop and strengthen engineering design and industrial consultancy capabilities in developing countries and promote increasing use of their capacities.

2. Present Scene: There are two categories of country groupings in the developing world.

- Those where virtually no consultancy capability exists due to scarce manpower/expertise resource and lack of adequate industrial experience.
- Those where consultancy capabilities have been developed to some extent. In this group are countries where the consultancy profession is still in an adolescent stage and some capabilities exist in/civil engineering, electrical and mechanical utilities, preparation of feasibility studies, etc. There are other countries in this group with fairly well developed consultancy capabilities, although external inputs particularly process product design knowhow/and basic engineering for selected industries such as for steel, fertilizers,

.../capital

capital goods, are still necessary.

In some countries capabilities to modify and adapt technologies to appropriate designs have also been developed.

3. Conceptual Philosophy  
of Consultancy  
Development:

1. Selectivity in Development:-

- Functional components of consultancy, e.g., feasibility study, project appraisal, detailed engineering, project management, product design, process engineering,
- Industry specific, e.g., machine tools, forest-based industries, process industries, metallurgical industries, small industries, etc.

2. Cooperation (TCDC)

Maximum use of

scarce expertise and experience through pooling of human resources, expertise and experience.

4. Why Develop?

- .. To strengthen capability to make rational choice in selection of industries, technologies, industrial infrastructure.
- Increase negotiating capability for purchase of equipment, technology, turnkey projects. Maximize use of indigenous resources and skills.
- Capability on the part of clients to be able to draw up terms of reference

.../for

for consultants and monitor and supervise consultant's work.

5. Life Cycle of a Project:

- 1. Preparatory phase:-

Conception - resource/needs/market surveys

Promotion - project profiles/  
prefeasibility studies  
to attract investors,  
public or private, local  
or foreign

2. Planning phase:-

Project Preparation

- feasibility study/project report

Project Decision

- evaluation/appraisal

Planning Decision

- comparative hierarchy of projects -  
integration - resource allocation

3. Implementation phase:-

- Detailed project report

- Basic engineering/process knowhow product/  
design

- Choice of technology and assistance  
in its acquisition

- Detailed design and engineering

- Specification and assistance in

.../acquisition

acquisition of plant and machinery

- Construction and Project Management
- Start-up and commissioning
- Initial operation

Activities on the part of owner

- Decision on implementing the project on the basis of appraisal/evaluation of project report
- Financing pattern of the project
- Selection of consultants - criteria, negotiations, terms of reference, responsibilities
- Selection of equipment suppliers
- Selection of contractors
- Project cost and time control
- Monitoring and supervision of consultant's work
- Manpower training and development - technical, managerial

4. Operational phase:-

- Management consultancy inputs
- Problem-solving capability
- Optimal capacity utilization
- Product upgrading and innovation, diversification
- Plant rehabilitation and productivity improvement



- Value engineering
- Methods and systems

6. Alternative  
Strategies of  
Growth:

Captive/Internal Consultancy:-

- Consultancy capability within a manufacturing/process plant, e.g., steel mill
- Consultancy skills available with capital equipment manufacturers, e.g., electrical power generation equipment manufacturers

External Consultancy:-

- Independent consultants
- Turnkey contractors/equipment manufacturers/technology suppliers

7. The Perspective  
for Consultancy  
Development:

Selectivity:-

Spectrum of consultancy needs is wide, availability of expertise is limited and competing demands on the scarce technical human resource are many; from government, industry, contracting and construction companies.

HENCE, SELECTIVITY IN AREAS OF SPECIALIZATION, FUNCTIONAL AND INDUSTRY SPECIFIC - IS VITAL.

The Resource:-

The prime resource for consultancy is:

.../Manpower

Manpower with adequate EXPERTISE

EXPERIENCE

CREATIVITY and

INNOVATIVE APPROACH

Time Horizon:-

It takes time for experience to be acquired and expertise developed. The time dimension can be telescoped to some extent by drawing upon the experiences of others, but/cannot be wholly second hand. Time horizon to be thought of is 5 to 7 years, for adequate experience and expertise to develop. This does not mean that till then no work need be done by a local consultancy firm, it only tends to emphasize that elements of consultancy work both in project formulation and engineering design should continue to increase through greater participation in projects, keeping in view the selected areas of specialization, so as not to fritter away the human resource.

Acquiring Expertise and Experience:-

Experience and expertise can be acquired through:

- On the job training in the design offices

- of foreign consultants;
- Association of local engineers with foreign consultants working on projects in the country, in design and constructing phases of a project;
- Internal training programmes at the consultancy firm level;
- Twinning arrangement between consultancy organizations, within a country, among developing countries and between developed and developing country firms

Induction of Manpower:-

For training and development to be effective, and to reduce the mortality rate in consultancy, screening and selection of potential consultants is important and should be done with extreme care. Ideally, it should be a mix of young engineers, technologists, economists, etc., from universities with a flair for creativity, and men with experience from government, industry, universities and contracting firms.

The Cost:-

Development of consultancy services involves

certain costs to be incurred for training, for development, for risk involved in first time use and hence the desirability of a second opinion in the initial years. The entrepreneur, be it public sector or private sector, cannot be expected to bear this cost, which should be borne by the government as a legitimate cost for development of desirable professional and institutional capabilities in the country. However, consulting institutions cannot be subsidized by the government for all time to come, after the initial stage of development of 5 to 7 years they should aim at self-sufficiency through the fees they earn.

8. Suggested Action

Plan:

An Action Plan has been conceived to be implemented in two phases, based on the profile of the needs and the availability of funding. The first phase which would be the preparatory phase would cover the following:-

- Survey of available capabilities and capacities in selected countries in various regions.
- Identification of various institutions and consulting organizations in the

.../countries

countries

- Focal points in each country. e.g. Consultant's Association.
- Information gathering and dissemination about the projects, available consultancy capabilities, etc.

The second phase which will be the operational phase will include the following:-

- Assistance in specific projects;
- Training workshops and seminars;
- Providing assistance in developing joint co-operative ventures among consultancy firms, of different countries;
- Preparation of guidelines of specific interest to the consultancy profession.

Essentially, the promotional of UNIDO activities would be grouped

in the following categories:-

- Organization of workshops and roving seminars;
- Specific training programmes concerned with methodologies and techniques of consultancy practice; and development of consultant managers and entrepreneurs.
- Pooling and dissemination of information of interest to consultants;
- Assistance to governments through

.../preparation

- preparation of guidelines for project evaluation and appraisal, supervision and monitoring of consultants, evaluation criteria for selection of consultants, etc.
  
- Assistance to governments in developing guidelines for policy measures and strategy actions for fostering growth and increased use of domestic engineering design and consultancy capabilities

C. AN AGENDA FOR UNIDO ACTION

Specific Projects/Programmes

<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
1. Assist/develop governments in developing policy instruments and strategies for growth and increasing use of domestic engineering design & consultancy services.	1. Develop flexible guidelines for policy options and framework for strategic decisions from which governments can choose elements to design their own policies	UNIDO	1. Guidelines for developing policies and strategies for domestic consultancy development
	2. Discuss at Expert Group Meeting	UNIDO	2. National and regional inputs and recommendation for finalizing the guidelines
	3. Finalize guidelines	UNIDO	
	4. Make these available to various governments and financing agencies	UNIDO	
	5. Assist in evolving national policies, when required	Government <sup>s</sup> assisted through technical assistance by UNIDO	1. Technical assistance and Advisory Services
2. Criteria for selection of consultants:-	1. Survey, research and ground work for existing practices	UNIDO	1. Guidelines

<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
- capabilities and procedures for evaluation	and special needs keeping in view the diversity of the countries and their stage of industrial development		
- preparation of terms of reference			
- contract negotiations			
- supervisor and monitoring of consultant's work			
	2. Preparation of case studies	UNIDO	2. Manuals
	3. Preparation of draft guidelines	UNIDO	3. Checklists leading to enhanced capabilities to select and use consultants
	4. Discussion of/draft guidelines at an Expert Group Meeting/s	UNIDO and Regional Commissions	
	5. Dissemination of guidelines to governments for their use	UNIDO	
3. Remuneration to consultants and billing rates	1. Survey and research on existing practices and problems	UNIDO	1. Guidelines for calculating remuneration leading to rational growth of consultancy



<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
	2. Preparation of <sup>draft</sup> guidelines providing methodology and parameters of calculation, manner of remuneration, development cost of consultancy, foreign and local consultants - rationale for differentials		
	3. Meeting of users, governments and consultants, funding institutions to discuss guidelines	UNIDO	
	4. Finalization of guidelines	UNIDO	
	5. Dissemination of guidelines	UNIDO	
4. Project preparation and design techniques; enhancement of skills; - developing countries - LDCs	1. Survey and research on existing state-of-the-art in selected countries	UNIDO (with collaboration of regional commissions)	1. Training workshop
	2. Development of background paper/manual on application of techniques		Project Design 2. / Application manual

<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
	3. Training workshop for planners and evaluators from government and for consultants engaged in Project design		
5. Project management training	1. Survey of causes of project delays and cost over-runs in developing countries 2. Preparation of training material 3. Organization of training workshop and a roving seminar	UNIDO	1. Training workshop 2. Roving seminar
6. Pooling and dissemination of information of relevance to engineering design and consultancy	1. Research on information needs of consultants and users of consultancy services, such as types of projects to be undertaken in the region, consultancy resources available in the region, equipment and technology availability, CAD/CAM/techniques etc. 2. Identification of existing institutions and mechanisms which could be strengthened for this purpose, and any new links needed	UNIDO	1. Publish survey results 2. Expert group meeting

Basic Recommendation:

Methodology/Activities

of

To be undertaken by

Output

3. Background paper for development/ Consultancy Information Network (CIN), integrated into INTIB.
4. Expert Group Meeting
5. Finalization of proposal for CIN

3. Consultancy Information Network proposal

7. Assist in developing joint ventures for co-operative working arrangements among consultancy firms

1. Survey of available consultancy capabilities and capacities in the region
2. Analysis and identification of complementarity of resources and expertise
3. Matching co-operative capabilities to needs of projects
4. Organize a 'dialogue' to facilitate such co-operation between firms

UNIDO

1. Co-operation dialogue forum
2. Specific co-operation arrangements with UNIDO as matchmaker. (UNIDO system of consultations may be used for this purpose).

Additionally, a series of intensive training programmes such as the following would have to be arranged by UNIDO with some expert inputs from Development Banks, Productivity organizations and other institutions:

1. Training programmes ranging in duration from 2<sup>weeks</sup> to 3 months in:-
  - 1.1 Methodologies of project design modules
  - 1.2 Product and Process development for engineering products.
  - 1.3 Basic design disciplines such as:
    - Industrial structures
    - Electrical utilities
    - Mechanical services
    - Plant layout
    - Material handling
    - System Planning
    - Industrial infrastructure
  - 1.4 Project Management techniques
  - 1.5 Systematized information gathering and analysis for use in engineering design and Consultancy.
  - 1.6. Specified courses in CAD in engineering design and CAM in manufacturing processes.
  - 1.7. Professional management of Engineering Design and Consultancy organizations.
  - 1.8. Developing consultancy and Design engineering entrepreneurs in developing countries.
- 2 Help arrange Internship in other consulting firms in various engineering disciplines and methodologies.
- 3 Provision of direct technical assistance for helping in organising core consultancy firms and providing on the job training

## I. PREMISES AND PERSPECTIVES

(Background and Basis)

### A. Introductory Remarks

1. The importance of <sup>engineering design and</sup> industrial consultancy has been recognized in all countries which have entered the phase of industrialization. In developing countries the role of consultancy services becomes particularly important as the overall industrial infrastructure presents a number of constraints in such critical areas as project formulation and design expertise, technological base, availability of skills, lack of industrial experience, and paucity of data.
2. There is an increasing appreciation among Policy Makers in developing countries of the crucial importance of local consultancy capabilities for rational and balanced industrial development at an accelerated pace, and a growing concern that such capabilities be strengthened and enhanced speedily. Indeed, the measure of industrial and economic self-reliance has shifted significantly from merely the ability to operate and manage industrial plants efficiently - important though it is - to the indigenous skills and machinery necessary for planning rationally, choosing investment projects wisely, selecting technologies appropriately, designing industrial projects prudently and executing them expeditiously.
3. The above considerations should be in particular viewed in the light of the role of the governments in the developing countries, both as promoter of industry and in many countries as the major user of consultancy services, and the need for accelerated industrial growth. Thus, the need for consultancy services does not exist only at the micro or enterprise level (as was historically the case in most industrialized countries), but it also exists at the macro or government planning level.

B.. DEVELOPMENT OF DOMESTIC CONSULTANCY SERVICES:  
ANALYSIS AND APPROACHES

4 It is beyond the scope of this paper to prescribe policies and incentive systems conducive to development of domestic consultancy, which are of general applicability. Perhaps it is not possible to do so a priori since a country's industrial strategy and technological policies of which policies conducive to growth of DCS need to be an integral part can be expected to vary according to its chosen style of development, level of industrialization already achieved, export endeavor, etc., and according to its policy responses to dynamic changes in the international economic situation.

5 Discussed in the following paragraphs, therefore, are some of the more important issues and possible approaches to the rational and relevant development of domestic consultancy services. The principal actors on the scene are the consultants, governments and financing institutions. The client for the purposes of this paper has been taken as the government as the major user of DCS, and private sector industry

6 The Basic Thrust

6 Initiative to develop their capacities to an adequate level of competence essentially lies with the consultancy profession itself. This can be brought about through in-house training programmes, cooperative training seminars, exchange of experiences among firms, as well as exchange of personnel between them and through joint working on specific projects. The government and the financial institutions can provide supportive environment but this can prove effective in improving the acceptability of domestic consultancy profession to the users only to the extent that their technical competence is proven.

7 It has also to be recognized that the basic effort towards greater use of DCS has to come from consultants themselves, and that

this effort has to be on a continuing and sustained basis. The Association of Consulting Engineers can and should play the main role in this dialogue with the Government. The government on its part has to appreciate that DCS are a very valuable national human reservoir and that its multiplier effect on other sectors such as industrial operations, R & D, planning, etc. is large.

### Policy Issues

8. A clearly defined and articulated policy affirmation by the Government that consulting capabilities are essential and desirable elements of national technological self-reliance and that such national capabilities are intrinsically responsive to the country's objectives for rational and viable industrial development, would go a long way in fostering the growth and increasing use of such services. In this connection the government may consider the following measures.

1. Associate local consultants with foreign consultants so that transfer of knowledge and skills takes place. Government and public sector may set an example by making greater use of local consulting firms for their work, to the maximum extent possible consistent with the professional competence available.
2. Establish a Roster of Consulting Firms based on information gathered through a questionnaire evaluated and updated periodically, reviewing their performance, to inspire client confidence. Alternatively, Association of Consulting Engineers, as a professional body, can exercise this self-disciplinary role, provided it has the necessary authority to enforce it.
3. Support through full or partial funding, training programs for consultants in the country.

4. Finance trips of consultants overseas to refresh and update their knowledge of new techniques and methodologies being used in solving design problems. In this connection, visits to other developing countries, particularly in this region, would be very useful.
5. Provide a package of incentives to local consultants including tax relief, carry forward of losses, development rebate, etc. with a view to accelerating their growth.
6. Make available easier bank credits to consulting firms for their working capital requirements, since they have no physical collateral.
7. Develop a perspective plan of needs of consulting capabilities, and evolve long term plan for manpower needs for this purpose, with assistance of Assn. of Consulting Engineers and help from UNIDO.

#### C. Basis and Methods of Selection

9. It has been said in various developing countries that there are no specific and clear criteria for selection of Consultants and that, more often than not, the assignments are awarded on the basis of lowest price offer and not technical capabilities and experience. It would be desirable to develop guidelines for selection of domestic consultants, taking into account such factors as the nature and relevance of experience of the firm; the competence of individual professional members of the firm; the composition of the team intended to be deployed by the firm for the assignment under consideration, and the methodology the consulting firm proposes to adopt for the assignment. Development Banks such as IBRD and ADB



have useful guidelines in this respect, which could form the basis for developing national guidelines. UNIDO can play a significant role in evolving synthesized guidelines in this connection

10. It has to be recognized that the significance and weightage of selection criteria for domestic consultants would tend to be different than for international consultants. This is not to say that standards of technical competence have to be lowered. Rather the measurement and norms of components of capability have to be different. For example, length of experience would necessarily be less in the case of domestic consultants. However, if their experience is more relevant, it should receive greater weightage. Similar would be the considerations of the size of the firm, its financial standing, and aggregate of experience of individual members of the firm, even before they constituted the firm.

11. There appears to be an important need also in the area of training in application of guidelines for selecting domestic consultants and consultants in general. Consultants Assn. ., and the government<sup>s</sup> may perhaps wish to organize training and development workshops for this purpose, supported by UNIDO.

#### D. Terms of Reference (TOR)

12. The task of drawing up terms of reference on the part of the client is important. The specificity and clear enunciation of TOR would ensure that there is unequivocal understanding about what is expected to be achieved through a consultancy assignment. Equally important is the need on the part of the domestic consulting firm (DCF) to present a precise methodology and approach in its offer. Dialogue and discussion between the government client and the DCF to clearly understand each other in this connection is vital. Sealed tenders for consultancy services, which a number of developing country governments still invite - for traditional and historical reasons - tend to inhibit

the possibilities for such a dialogue so essential to the success of choosing the right DCF, and achieving successful results.

12. There is scope for both training workshops and discussion seminars on the subject of drawing up TOR, which could prove useful to the government/clients and DCS.

#### E. Adequate Remuneration

13. The costs of consultancy include not only the direct salaries of professionals, but also other related costs such as support staff, training and development costs, office overhead, idle time, marketing costs, and a reasonable profit. It is important for DCFs to pay adequate salaries to attract the required caliber and quality of professional staff. It is possible to develop formulae for working out the overall daily or monthly or yearly rate for various categories of professionals. The Assn. of Consulting Engineers could attempt this. However, the problem arises when negotiating fees, to determine the engineer-days required for the assignment. It has been found to be useful elsewhere that if the total assignment is broken down in its elements, and man-days assigned to each element and sub-element, then the process of arriving at a satisfactory understanding appears to be far better. It has to be appreciated that unlike equipment or office furniture or stationery, it is not easy to develop norms of inputs of consultancy for a given job, and the decision maker in the government naturally feels reluctant to take a decision which may place him open to criticism for favoritism or worse. We have also to remember the role of government audit which has to be satisfied that the fees paid to consultants are reasonable and not excessive. It may help if the Associations of Consulting Engineers and the government compile data on fees paid for similar projects in the country and elsewhere. These would necessarily be rough indicators, but would at least provide some broad guidelines.

14. A related factor here is the comparison of fees paid to domestic consultants to the government salary levels. Here again the analysis of the elements of cost of consultancy suggested earlier and the latent costs added to government salaries would help in bringing about a better understanding between the government clients and consultants about reasonable remuneration.

#### F. Continuity of Workload for DCS

15. One of the major problems confronting the newly created DCS is of sustaining itself through adequate workload to be able to retain and develop its professional staff. In consulting engineering fluctuating nature of workload is an unfortunate fact of life. It is sought here to see the manner in which government can provide workload to DCS during lean periods, which would be useful to the government agencies as well.

16. While the traditional role of government as a major user of DCS has been brought out there are several other areas where government can legitimately make use of DCS. Among these are:

##### 1. Industrial planning :

- Industrial planning inputs such as sectoral studies for creation of domestic manufacturing capacity for capital goods or steel, etc.
- Regional or sub-regional studies for integrated development of a given geographical area in the country.
- Integrated systems studies such as for forest-based industries which seeks to identify various economically viable industries based on forest resources, which the government planning agencies might consider for setting up in future.

2. Industrial products forecasting for domestic and foreign markets:
  - End products such as pumps, compressors, diesel engines, etc.
  - Intermediate products such as castings, forgings, industrial fasteners, etc.
  
3. Industrial raw material requirements for future:
  - Assessment and analyses of geological surveys
  - Identification of opportunities
  - Suggested development action plans for industrial raw materials.
  
4. Industrial infrastructure requirements to support industrial projections:
  - Energy, transport, water, communications.
  
5. Technology forecasting, monitoring, assessment, selection and acquisition.
  
6. Suggestions on product upgrading and adaptation to suit export markets.
  
7. Import substitution requirements and data for policy formulation.
  
8. Productivity improvement in existing plants.
  
9. Standardization of products.
  
10. Development of project portfolio for attracting domestic and foreign investment.

17. Thus at macro-level consultants can usefully assist the government decision makers in the above areas. It needs to be emphasized that the role of the DCS in this field is that of providing assistance to decision makers for future industrial planning.

18. It has to be recognized that adequate and relevant data base is important to decision makers for industrial planning exercises. A feature of such type of work is that it is continuous and yet flexible in a given time frame, unlike a project which has a rigid time schedule to adhere to. Thus such work can be programmed to fill in the lean periods of DCS and yet be very useful. It is an investment in future through human resources of the present, which may otherwise remain idle at a considerable social cost to the country.

#### G. Attitude to and Management of Risk

19. All clients and more so government clients are averse to risk associated with using DCS with little experience. This is only natural. However, a certain element of risk is inevitable in any decision, including setting up and operation of industries. In consultancy services, the element of risk seems to be greatly exaggerated, since consultancy services are intangible. It is suggested that it may be useful if the risk associated with consultancy assignments is disaggregated into various components such as buildings and structures, utilities and services, material handling and transport systems, production technology, etc. This would help in assessing the risk more realistically. At the same time it would help in deciding the division of work between foreign and domestic consultants. This would appear to be a rational approach to risk management. Otherwise DCS will never gain the experience to enable them to qualify for being entrusted with larger and more complex projects.

C AN OVERVIEW: ISSUES AND PROPOSITIONS

ISSUES

20. To summarize and recapitulate what has been discussed so far and to perceive and appreciate the relationship between Government and Consultancy Services in developing countries, it is useful to determine the role domestic consultancy services play in the economic and industrial development of a country.

I. Why develop domestic consultancy services (DCS):

1. Developing countries (DC) have generally resource constraints.

2. Objective of achieving technological capacity leading to improved economic and industrial decision making process.

3. Generation of hard data which remains in the country for use in future planning exercise.

4. Catalysts for increased use of local equipment and construction skills, and efficient turnstile between investment and production.

5. Human resource development with multiplier effect.

6. Reduction in foreign exchange drain both direct and indirect, and to reduce undue dependence on external support.

A sound and well

developed DCS base contributes to above objectives, and lack of this base tends to hinder the industrial development process.

II. Role of Government

1. Major user of consultancy services (CS)

- Infrastructure

- Industry (Public Sector)

- Development Finance Institutions

- Advice on national industrial investment priorities

2. Policy Maker

- Technological capabilities development

- Improved efficiency of economic activities

- Enhanced industrial policy formulation and planning capabilities.

3. Provider of CS:

- Captive or Internal groups: PWD, electricity, roads, railway
- Project groups in state industrial enterprises
- Public sector consultancy firms

III. Demand and Supply

1. Demand

1. Domestic:
  - Government
  - Financial institutions
  - Private sector
2. Pattern of demand determines the types of capabilities required in DCS.
3. Difficult to determine demand for CS with precision. However it is necessary to undertake this exercise:

Association of Consulting Engineers  
Government

evens out workload fluctuations

2. Supply

1. Domestic and imported
2. Individual and corporate
3. Government/private sector/R&D institutions/universities/internal groups in manufacturing and construction firms.

3. Paradox of DCS underutilized yet CS being imported?

4. The problem is to use foreign consulting in such a way as to maximize its positive features and minimize its negative effects. This would mean the establishment of "rules of the game" and standard procedures that would

seek mechanisms of co-operation between both sources of supply in order to favour the maximum utilization of local sources and to make full use of foreign consulting as a vehicle for technology transfer and for the training of national consulting personnel.

IV. Problem Areas

1. Domestic Consultants:

1. Acceptability Issues: Competence/expertise

Experience

Attitudes

2. Survival Issues : Workload and opportunity to get work

Remuneration

Criteria for selection

3. Financial Issues : Access to credit

Bid bonds/earnest money

Consequential damages

Insurance

2. Government

1. Criteria to measure competence thus improve confidence level

2. Minimum Risk - Disaggregation

3. Ethics - code of conduct

4. How are broader national objectives fulfilled

5. Confidence level in organization and financial structure

V. How to overcome problems:

1. Competence: Improve through training - inhouse and overseas

Joint working with foreign consultants

On the job training : Provision of adequate work

2. Experience : DCS associated in assignments even where foreign consultants are retained

Assign Macro-planning work to DCS



3. Confidence level: Government to set example

Roster of domestic consultants and performance review: Association and Government

4. Package of financial incentives

Tax relief

Carry forward of losses

Development rebate

Easier bank credit

Insurance cover

5. Forecast of consultancy requirements - Evolve perspective plan to be updated periodically

6. Criteria for selection

7. Remuneration - evolve guidelines and methods of calculation

8. Evolve code of ethics

9. Policy affirmation about increased use of DSC

## 2. CREATING THE CLIMATE FOR SUCCESSFUL DEVELOPMENT OF DOMESTIC CONSULTANCY SERVICES

### Some Propositions

#### Proposition I:

Development and strengthening of DCS leads to greater technological/industrial self-reliance in a country and improved techno-economic decision making process. Deeper and more intimate awareness of resource and contextual constraints on the part of DCS, leads to evolution of technologically appropriate and economically relevant solutions to problems of development.

#### Proposition II:

Consulting services do not occur in a vacuum. They contribute to and derive sustenance from industries and industrial infrastructure. If DCS are not actively used they tend to become weak and may even die. It is therefore essential to bring about on a sustained basis awareness about their usefulness in a practical manner and thus strengthen a weak link.

/Proposition III:

Proposition III:

Merely existence of domestic consulting capability is not enough. What is needed for it to fructify are deliberate policy instruments and support institutions on the one hand, and receptive users on the other. Government has a major role to play in this area to create confidence in the capabilities of domestic consultancy and design engineering.

Proposition IV:

If supportive environment is to be created in which DCS may effectively function, then continuing relationship and dialogue has to take place between government and DCS. Such relationship must be based on mutual trust, mutual confidence, and mutual interest.

Proposition V:

Demand for DCS may be stimulated by willingness to allocate public resources to local enterprises for increasing process efficiency, improving quality, reducing costs and saving energy, through inputs of appropriate consultancy inputs.

Proposition VI:

There can be no compromise on quality of consulting services. DCS have therefore to demonstrate effectively their competence and capabilities. Appropriate training inputs and pooling of human resources and experience would help in this endeavour. This would include management training. Interaction of consultancy skills and industry and technology

Proposition VII:

Human resource is the most important development resource in a country and consultancy services nurture human resource development while many consultancy institutions may exist, in the ultimate analysis, it is the quality and capacity of consultancy manpower available in the country and not the variety of institutions which house them, that is critical to an indigenous consultancy capacity for innovation.

Proposition VIII:

Although difficult, it is, nevertheless, necessary to develop a perspective plan for requirements of consultancy services in the country over a 3 to 5 year time frame. This will help DCS to develop the required expertise. At the same time the plan would help in determining the crucial areas of expertise and promote selectivity in consultancy functions and sectors to which these are provided.

/Proposition IX:

Proposition IX:

If importance and usefulness of DCS are accepted, then consultancy should be treated on par with industry, and given the necessary financial incentives at least for some years in the beginning.

Proposition X:

Association of consulting engineers can and should play a key role in dialogue with government, industry, and financing institutions. It would have to project the right image, as well as ensure - through internal discipline - that quality assurance is given and code of Ethics adhered to.

Proposition XI

Creation of national, regional and global consultancy information networks and easy and timely access mechanisms will assist significantly developing country consultants in their work.

Proposition XII

Channels of communication need to be created which will disseminate timely information on available consulting capacities in developing countries so that greater use is made of such services by both developing and developed countries.

**TECHNOLOGY SYSTEM  
AND CONSULTANCY INPUTS**

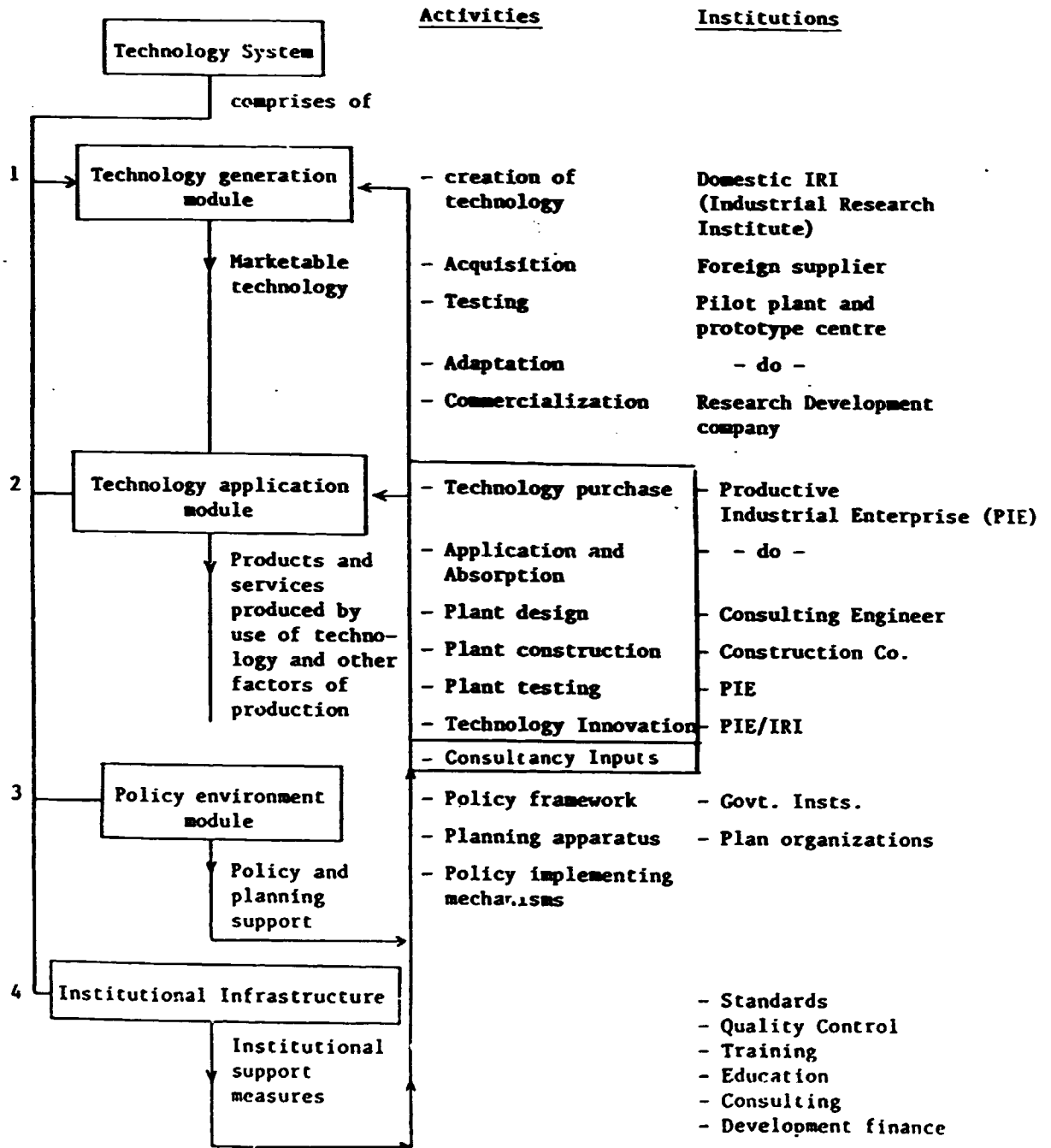


Figure 1

PRODUCTIVE INDUSTRIAL ENTERPRISE - Skills Spectrum

Establishment of PIE : Types of skills required

- Prefeasibility skills
- Technology choice/acquisition skills
- Project design and consultancy skills
- Project execution and construction skills
- Project management skills
- Entrepreneurial capabilities
- Financing capabilities
- Capital goods selection

OPERATIONAL INPUTS

- Technology
- Raw Materials
- Energy
- Working Capital
- Human Skills
  - Production
  - Maintenance
  - Marketing
  - Management

Productive  
Industrial  
Enterprise  
(PIE)

OUTPUT

Products  
Services

Impact of  
Technology  
on People

INFRASTRUCTURE SUPPORT

Policy Infrastructure

- Policy formulation and implementation
- Planning apparatus
- Industrial culture

Institutional Infrastructure

- R&D Institutes
- Design and Consultancy
- Standards
- Quality Control
- Safety
- Productivity
- Development Finance & Credit
- Universities
- Vocational Training

Figure 2

## II. PERCEPTIONS AND PREREQUISITES

### A. ROLE AND RATIONALE OF ENGINEERING DESIGN AND CONSULTANCY SERVICES FOR DEVELOPMENT

#### 22. The Need

The creation and enhancement of engineering design and consultancy capabilities in the developing countries - DCs - would have no justification unless it is demonstrated that such capability is vital in contributing significantly to a rational and logical, industrial and economic growth. What is desirable and what is indeed of great concern to the DCs is an urge for generating thrust towards betterment of the living conditions of its population and more equitable distribution of the fruits of industrialization in the country. An important instrument for achieving these desirable goals is that of an appropriate industrial and technological development. The extent to which the engineering design and industrial consulting capability indigenous to a DC can make useful and significant contribution to this pattern of industrial and economic growth, will determine the importance of the development of such capability. In the subsequent paragraphs for the sake of brevity 'engineering design and consulting' activities have been referred to as 'consulting' or 'consultancy' as appropriate.

#### 23. The Scope

It is felt and, indeed, proven time and time again that consulting activities form an inter face between the planning exercise which consists in right and rational selection of projects, evaluating their economic viability and choosing the most appropriate product design and technology on the one hand and the implementation of the projects on the other, which includes detailed design and engineering, procurement of plant, equipment and machinery through invitation and evaluation of competitive bids, preparation of contract documents and construction drawings, inspection of /equipment,

equipment, of construction and erection, commissioning and testing of plant and equipment and its initial start-up. Indeed, the consulting services go beyond the commissioning of plant and provide valuable Management, services in proper/operation and maintenance of the plant as well as services relating to training of personnel which are vital to the optimal running of the plant. Consulting and engineering services backed by R&D provide the necessary support to adapt and innovate imported technologies and techniques to render them appropriate to the "use environment", and also to help in the creation of new technologies indigenously which would be "custom made" and, therefore, automatically appropriate to the "end-use climate".

Special significance for DCs

24. The role that the consultancy organizations are called upon to play in DCs is significantly different from, and much more crucial than, that of similar institutions in developed countries. While in the industrialised countries, major proportion of investment is for expansion of existing plants or for setting up of projects similar to those already in existence, in DCs, the consultant has to virtually start from scratch with the identification and generation of viable industrial projects, prepare feasibility studies in far greater detail, and design the first grass-roots project of its kind. Indeed, what adds to the complexities of this task is that the project is to be set up in an environment and with factor endowments and proportions which do not conform to any readily available model in the industrialised countries. The paucity of information, the sparse technological base and infant industrial culture make this task even more arduous. Added to these difficulties are the shortage of skilled human resource-technical and

/managerial

managerial as well as the constraints of finance. Finally, consulting organizations in DCs have to assume many of the responsibilities and take decisions which are normally discharged by the Project Owners in other countries. The reason for this is that the entrepreneurs in DCs, particularly those at the early stages of industrial development are, relatively inexperienced.

Similarly, indigenous machine tool or engineering industry, where it exists, being small, enjoins upon the local consulting firms to help and assist the fledgling industry by providing it much greater technical assistance than merely presenting it with machinery specifications and equipment tender drawings. The consultant's role as a catalytic agent in the development of indigenous engineering industry thus assumes special significance in DCs. Primarily small and medium industries would comprise the main focus, although in some cases large industries may also be required.

Local consulting firms can also provide useful information to research and development institutions - local or regional - about the type of technologies needed by the DCs, and hence identify relevant R&D projects which may be undertaken. In the reverse direction, the consulting firms play an important role in acting as a bridge between the R&D institute and the industrial user by providing to the latter a completely engineered package based on this specially created technology. Since the entrepreneurs in the DCs, generally, are new entrants to the field of industry, they feel much more comfortable with the engineered plant rather than R&D stage technology alone.

/Since intimate



Since intimate knowledge of local constraints and requirements are vital to the evolution of rational project design solutions as well as appropriate technology, these could best be evolved by local consulting organizations in the DCs. Where such institutions are not yet in existence, similar institutions from other developing countries could provide the necessary assistance which would be much more relevant since they themselves have gone through similar experiences under somewhat identical conditions of development in the not too remote past. It may well be that the institutions and organisations from two or more developing countries can join hands and each can provide a part of the input to make up the total package of technology, consultancy, engineering and project design services, as well as equipment and construction materials. Another need in DCs is the development of capabilities for identifying projects of national importance, evaluating these, evolving adequate terms of reference for the consultants, and the ability and skill to select the right consultant - local or foreign - and be able to evaluate his work. This will considerably reduce their dependence on consultants for advice on matters which pertain to policies and objectives.

#### Relevance and benefits

25. The relevance of local consultancy services in DCs and some of the major benefits arising from development of such local services are discussed below:

##### 1. More appropriate choice of technology:

Because of their knowledge about alternative sources of technology and their capability to evaluate the application of technology in varying environments prevailing in DCs, consulting organizations can assist the project owner in appropriate choice of technology, be it from overseas

/sources

source or from local or regional industrial research institutions.

ii. More efficient acquisition of technology:

By virtue of their knowledge of alternative sources of foreign technologies, their characteristics, the global demand and supply position, consulting organizations provide the necessary talent and expertise as well as the bargaining ability in negotiations for purchase of foreign technology. Disaggregation of foreign technology package by consultants leads to a better appreciation of its appropriateness as well as a more efficient selection of the components of 'technology package' which have to be purchased, the others being provided locally. This would also reduce the foreign exchange costs and at the same time ensure maximum local participation of technological and engineering inputs, as well as constructional skills in the design of the project.

iii. Adaptation of technology:

Since imported technologies are evolved under a different set of conditions, local consultants can help not only in choosing overseas technologies which are closest to the technologies most appropriate to local conditions, but also provide the requisite skills for modifying and adapting the chosen technology to render it appropriate to a given set of objectives.

iv. Absorption, diffusion and horizontal transfer of technology:

In view of past project experience and awareness of the local requirements, consulting organizations often make the most suitable and efficient recipients of technologies acquired from other countries and their diffusion to industrial units through the means of horizontal transfer. This results not only in acquisition of suitable technologies at minimum commensurate costs, but also adaptation of such technologies so as to make them appropriate to the needs of DCs.

v. Protection against obsolete or unproven technology:

Local consultants can safeguard entrepreneurs in DCs from acquiring obsolete technologies, inappropriate technologies and in some cases even commercially unproven technologies and thus preventing them from being used as test-benches for foreign technology supplier.

vi. Maximising use of indigenous equipment, materials and skills:

Due to their experience and knowledge of local availabilities, local consultants can make significant contribution to the more intensive use of local, human and physical resources.

vii. Catalysts in development of local industry:

By developing specifications and tender drawings for equipment around local industrial capability, local consultants can contribute significantly to the development and growth of indigenous industries and ancillaries.

viii. Linkage to R&D institutions:

Local consulting firms can act as catalytic agents to provide basic information on the areas of technology needs of DC to R&D institutions - local, regional or other - and help in the creation of technologies of specific interest to DCs. Such technologies can then be channeled into the productive sectors of the economy through commercialisation. The consulting firms would provide the necessary inputs to engineer these technologies into complete project packages, often supported by necessary guarantees, thus creating a measure of confidence and credibility in the minds of the users for the newly created or adapted technologies appropriate to DCs.

ix. Improved technical competence and reduced vulnerability:

Through local consulting capability the DCs can achieve improved technical competence and reduced vulnerability in technology, equipment and turnkey project purchases.

x. Technical Self-Reliance: By a judicious mix of the proportions of imported and indigenous components in a project and through provision of local Consulting, and Engineering services, the national technological self-reliance improves considerably as does the mutually/<sup>beneficial</sup>collective self-reliance among Developing Countries through sharing of knowledge, experiences and use of each others' Consulting and other Technical Services.

xi. Catalytic Role in Exports: Consulting organizations have to keep abreast of the machinery and component requirements of the various countries and industries all over the world and thus help the local industry in DCs to manufacture and produce some goods and components of such specifications and quality standards as would conform to the requirements of industrialised countries. This would, in time, lead to exports and export earnings for DCs through higher value added products rather than primary commodities.

xii. More Rational Planning and Investment Decisions. Local Consulting organizations with their intimate knowledge of local conditions, manufacturing capabilities, availability of material, human resources, involvement in actual implementation of earlier projects, can help, through hard data, thus collected, in macro level and sectoral planning at national levels. They can provide better choices and investment decisions, realistic estimates of project costs, gestation periods, linkage requirements (raw materials, intermediates, power, transport, storage, communications etc.) and realisation of rated output capacities. They can further contribute by forecasting likely delays in project implementation due to constraints arising from available infrastructure etc. and also suggest suitable solutions for these to be overcome.

/xiii. Sources of

xiii. Sources of Information and Its Transference Consulting organizations, for their very existence, depend heavily on technological, industrial and environmental information. This information base is useful in working out appropriate solutions for a given project to operate successfully in a specific environment. The documentation of such information base is a very valuable asset to the country as a whole for subsequent project planning, design and implementation.

xiv. Learning through Doing: There is no better means for development of local consultancy than by learning through doing. The use of local consulting firms for project work would thus considerably help in the growth of the local consultancy and engineering capabilities with a multiplier effect and these could be put to more effective and efficient use for the benefit of the economy and society of the country as a whole, as well as for sharing with other Countries through TCDC.

xv. Innovative Capability: The local or regional R&D institutes should take on applied research programmes aimed at improving the existing technologies in industrial units in DCs and also initiate activities leading to evolution of appropriate technologies required by industrial units. It is important that the R&D work to be done should have precise objectives particularly in respect of its market and applicability. R&D that does not take into account the consumer and the problem of marketing lacks that precision of objective which could render the exercise valueless. It has even been argued by some that R&D institutions probably fail more often because of inadequate links with the market than because of inadequate links with scientific and technological expertise.

/Sensitivity to

Sensitivity to demand is a key to a good R&D facility and one that enhances its importance in industry. Consulting organizations can provide the necessary market information to the R&D institutes to make their work sensitive to the needs of society.

**26- Cost of Developing Indigenous Consulting Services and Benefits Derived**

While the benefits which can accrue to the Developing countries through the development of consultancy services have been discussed above, one has also to be conscious that certain costs have to be incurred on the development of the required level of expertise among local consultants for these benefits to accrue. These costs essentially arise out of delays in project execution, possible increase in risks and in some cases possible rise in project costs. All these emanate from relative inexperience in the early stages of development of Consulting Services. On the other hand, inducting such services from developed countries in the past, has demonstrated that cost overruns and time delays have also taken place although the reasons for increase in costs and lengthening of project execution time, in such instances, are due to different causes, namely, unfamiliarity with local conditions and constraints as well as tendency to transplant technologies and plant design from industrialised countries to DCs. In the balance, the past experience justifies the assumption that perhaps risks attendant in both the alternatives are, more or less, equal and that as the indigenous Consulting and related services gather more experience, such risks reduce sharply in the case of indigenous services.

27. While it is extremely difficult to quantify the present costs to be incurred and future benefits expected to accrue from the establishment of local Consulting capability in a country, it has been

/amply

amply demonstrated in several countries such as Brazil, Argentina Mexico Egypt Tanzania, India, Indonesia, that the benefits which accrue to the country as a whole are, indeed, considerable. These lead to a measure of individual and collective self-reliance among Developing Countries by means of exchange of experiences. Such services also improve technical, planning and decision-making capabilities of a country and the future dividends attained and upon such capabilities are considerable.

28. The question also arises as to who is to bear the initial costs? Should it be the entrepreneur who is setting up a project or should it be the Government? This again is a very complex problem to justify a unique answer. Perhaps, Government or Industry Associations, could set up a Fund which can partially offset increased cost, if any, which may occur through the use of local services in the initial stages.

1.5.4 It is also of significance to note that the risks associated with cost overruns and project realisation delays could be considerably reduced, if not eliminated, through TCDC whereby such

Developing Countries who have acquired experience in this field, would be in a position to share their experience with others who are at the threshold of starting the process of industrial development. Thus, Consulting Services of one or more and industrialized countries Developing Countries/could be utilized by other North South and East-West countries in the spirit of mutual/cooperation and aim at development of their own capabilities.

29. Justification for Developing Indigenous Consultancy Services

In view of what has been discussed above, there are certainly overriding advantages for development of indigenous Consultancy Services in DCs for industrial and technological self reliance, and mutual cooperation.

/It has

It has to be appreciated, however, that development of a viable and mature consultancy profession takes time and effort. The two main ingredients are capable human resource and experience. Experience necessarily takes time and cannot be wholly acquired second-hand. Human resource capabilities and skills are often limited, and the demands on it are many - from industry, business, academic institutions and government. In view of the enormous efforts, physical and fiscal inputs necessary for the proper growth and maturity of consultancy services as also the long gestation time involved for their development, it is essential that selective approach may be adopted for development of such services to obtain optimum utilization within the country or a given region covering a cluster of DCs. Furthermore, the strategies would undoubtedly vary and will have to be tailored to suit the needs of the country or the region concerned.



## B. THE ROLE OF GOVERNMENT IN RELATION TO DOMESTIC CONSULTING SERVICES

30. In most developing countries, government plays a multiple role insofar as domestic consultancy services are concerned. Broadly, three roles are recognized. These are:

- As a user of DCS (domestic consultancy services)
- As a Policy Maker affecting the growth and use of DCS
- (Sometimes) As a Competitor particularly when public sector consultancy organizations and/or government departments take on sizable portions of available work.

### Government as User of DCS

31. Governments in many developing countries are major users of consultancy services (CS), both domestic and foreign, in infrastructure projects which are primarily the responsibility of government. These include water supply and sewerage schemes; electric power generation, transmission and distribution; transport systems such as roads, bridges, railways; communication systems; and in many cases large civil engineering schemes such as development of urban and rural housing, hospitals, schools, airports, hotels, etc. This list is by no means exhaustive but illustrative. It also focuses primarily on industrial and municipal engineering and leaves out of consideration of this paper, other areas such as education, health care, social services, etc.

32. In a number of developing countries, the government also acts as an entrepreneur and sets up industrial projects such as steel mills; ship building facilities; paper projects; capital goods manufacturing plants, etc., particularly where the investments are large, the time for plants to be set up is long, and return on investment is low. The government also plays a major role in promoting the setting up of small scale industries. The pattern of such ownership of industry, however, differs depending on the philosophy and industrial policies and strategies of a country. In some countries the government owns the plants directly through one of its departments, or through separate public sector corporations, or jointly

with private sector. Be that as it may, it is important to note that developing country governments as industrial entrepreneurs are substantial users of CS.

33. There is yet another aspect of the role of government as a user of CS. In many developing countries, industrial financing institutions and industrial development organizations have been set up to help private sector to set up industries. They provide various types of assistance such as free feasibility or pre-feasibility studies, market studies, industrial loans, etc. Such government institutions are also - or should be - major users of DCS, both directly for getting market surveys and feasibility studies prepared, and indirectly by advising the potential private sector entrepreneurs about available DCS. Industrial financing institutions play an important role in this connection by involving DCS in project evaluation exercise along with their own staff.

#### Government as Policy Maker for DCS

34. Government also has a major role to play to promote the use and growth of DCS, through various policy instruments, it may fashion, both regulatory as well as incentives. The possible nature of such policies would be discussed later in this paper. However, a word of caution appears necessary here. The fundamental issue is to ensure that DCS of acceptable technical, professional and ethical standards are developed and provided. There should be no compromise on this. It is in the interests of the client, of the country, and of the future of domestic consultancy profession itself, to subscribe to this concept and accept its validity. It will be shown later in this paper that this objective is quite compatible with the extreme desirability and indeed urgent necessity to ensure increased workload to DCS. It needs, however, to be recognized that any legislative action or administrative procedure prescribing the proportion of work to be assigned to DCS and foreign consulting firm could be counter-productive and self-defeating in the long run.

35. Government has, however, to be fully aware of and accept the importance of DCS to the national self-reliance and improved technological capabilities. Only then can policy instruments be designed to support the development and growth of DCS and their increased use in the country and for exports.

36. If the key importance of consulting is recognized, as an important input in the processes of capital formation, development of technological self-reliance and improvement in the efficiency of economic activities, it follows that the State should have an interest in promoting the development of this activity and its efficient utilization by society.

37. Two aspects of policy should be distinguished; implicit and explicit. Under the first one, it should be pointed out that there are certain measures and actions on the part of the State which are designed to operate principally in fields other than consulting but have side effects on the latter. Examples are measures for the control of technology imports, the return of emigrated professionals, the promotion of certain types of investment, the decisions involved in a development plan and its related programmes, the practices of State agencies and enterprises in regard to their investments, and of financial agencies that grant long-term credits. By "implicit policy" we mean the effects which such policies, measures and actions have on the production and use of CS - effects which are in general unintended and about which there may be little or no awareness on the part of those who implement such policy. A better knowledge of them may enable policy makers to minimize or eliminate their negative influence or to heighten their positive implications, and eventually to transform these implicit policies into purposeful "indirect" policies for the promotion and utilization of DCS.

38. Explicit policies are intended to produce effects on a certain socio-economic variable, DCS in our case. Their design and instrumentation should follow from an analysis or diagnosis of the existing situation,

an image of the desired situation, and a clear idea about cause-to-effect relationships. Their action may be curbed by "contextual factors" (quasi-permanent features of the social, political and physical environment, such as, in our case, scarcity of trained personnel, defeatist or risk-avoiding attitudes, non-definition of national objectives, corruption, slow decision-making procedures, etc.), so that strong measures may be needed to overcome such limitations.

39. Explicit policy would be concerned with the supply of CS (imports or local production), the demand for CS (domestic and foreign) and the proper utilization of CS from the private and social points of view. Within this general framework, it would include measures for the strengthening and development of consulting firms, in a setting of complementation with other producers of CS.

#### C. Government as Possible Competitor to Private DCS

40. Government departments such as Public Works Department (PWD), Railways, Ministry of Power, Roads and Highways, etc., often have their own project groups which were set up initially for developing and conceiving new projects and maintenance of existing projects, but later began to provide internal consultancy services for the projects undertaken by their ministries or departments. As such internal project groups grew in size, numbers and experience, they also ventured to seek work outside their own departments. This has had a twofold effect on private DCS. Firstly, they have generally been denied access to consultancy work which is being done departmentally by project groups. Secondly, in similar work available outside of the department, they face additional competition from these project groups resulting in further shrinkage of available consulting and engineering work.

41. In a number of developing countries, the State has set up public sector consultancy organizations as corporate bodies, particularly in

sectors where incidence of government investment is high.

42. Private consulting firms have showed great concern about the expansion of State consulting activities, which they feel are encroaching more and more on their market. We may suggest that it is an important question to maintain a balance between public interest and private initiative, and obtain a rational distribution of supply between private CS and State consulting organizations, retaining the innovative virtues of the first and counteracting "bureaucratic" expansion of the latter.

43. Some people feel very strongly against State consulting. They agree that the State should take over various activities, but they draw the line at consulting since they feel that State consulting has inherent shortcomings. They are not against Ministries and public agencies having their own departments for the preparation of general studies and projects, but object to the growth of institutions that "without being really consulting" absorb many resources destined to consulting. They feel that the proper role of State consulting lies in the promotion of expertise in new fields, which once developed should be set up as private CS. They have doubts about the efficiency of State consulting, and point out that top personnel cannot be attracted to government employ since salaries are lower than in the private sector, that the pace of work in State organizations is much slower due to the characteristics of bureaucracy, that political influences are much more pervasive; and furthermore, that the best technical men move on to administrative posts. They add that private consulting does the job more cheaply, though this may be hidden from view because a government organization does not include in its costs the full amount of overhead items - sometimes only direct costs are charged, raising the cry of "unfair competition" from private CS. They point out that private CS are strongly motivated to be efficient since their earnings, and indeed their survival, depend crucially on their efficiency. State consulting organizations would lack such a motivation and would have to look to other types of motivation. Successful motivation in government work would greatly depend on the "spirit" of the working group and on

the abilities and push of their leaders. These characteristics may be present at a certain moment but many examples may be shown when they ceased to exist, perhaps because of the disappearance of that leader. In such cases the organization may sink to a much lower level of efficiency, and due to the inbuilt inertia of bureaucratic organizations, continue to absorb work it does not discharge well.

44 On the other side of the debate, arguments of various kinds are presented. It is said that the very profit-seeking nature of private consulting makes it vulnerable to ties with construction and equipment supplier firms, and with foreign CS to which the main decisions are left; legal and administrative regulations and ethical declarations of principle would be largely unable to curb such tendencies. Moreover, certain areas of consulting are said to be legitimate interests of the State: such would be the case in industrial sectors such as steel, petrochemicals and mining where the State has a central interest, or even a monopoly; in new activities where there is as yet no installed capacity in consulting; in small and medium-scale industry for which the fees asked by private CS cannot be met. In the latter case, mention should be made of industrial research institutes in several developing countries that offer among their services those of a consulting nature, in particular preinvestment studies. It is pointed out that these activities are a good means of connecting industrial research and development with industry, and that if they were not carried out, much of the research work would be left without a client and would not be transferred to the users.

45. The issue of State vs. private consulting probably cannot be solved on rational grounds alone. Much depends on the political style of the country - whether private enterprise is favoured or not - and other factors of the contextual type. The discussion should rather try to identify the areas each type of actor is better qualified to deal with, and how State consulting and private consulting may collaborate and complement each other. If, as we feel, requirements for CS are well ahead of demand, a good modus vivendi may be found. Some people

think that the proper areas for the State would be those of policy, planning, programming and preliminary project conception - the strategic decisions - leaving to the CSs the detailed and specialized studies needed by such State activities, the preparation of preinvestment studies and detailed engineering activities leading to tactical and implementation decisions.

C. MARKET FOR CONSULTING SERVICES: DEMAND AND SUPPLY CONSIDERATIONS

Demand for Consulting Services (CS)

46. CS are not products that feed final consumption in a society; they are inputs to other activities - formulation of development strategies, investment, production - and as such their demand largely depends on the volume of those activities, which are themselves related to the extent of actual or planned growth in the country. Unfortunately, no correlations of any specificity between industrial investments envisaged and magnitude of consultancy services required are available, except some rule of thumb figures of a general nature. If information of this nature could be developed, the application of coefficients to the whole of the investments contemplated by a country, and to the value added by activities and services that would employ CS (coefficients which would naturally vary from country to country), would give a rough idea about the magnitude of CS required.

47. It does not appear that the determination of requirements for CS is simple; there are several issues that need to be cleared up. However, it is felt that rough estimates may be made, and that these could be helpful for assessing the present and potential role of consulting activities. Such activities should contemplate areas in which CS would be required in the future, and in which there is as yet little or no installed consulting capacity. Long term economic and social development projections should be useful in identifying such areas. The creation of domestic consulting capacity in new areas should be undertaken early enough so that they are available when the demand for them emerges, thus minimizing dependence on external consultancy. Government may perhaps initiate such an exercise with the assistance of the Association of Consulting Engineers.

48. An important characteristic of the demand for CS, particularly on the part of the State, is its fluctuating nature. Economic cycles,



stop and go economic policies, strategic changes and the lack of long-term and well-balanced government investment programmes lead to ups and downs in the demand for consulting services, perhaps much more strongly so than in the case of the capital goods industry and other activities connected with investment. This is a well-known characteristic that makes life difficult for domestic consulting. There is a need for continuity if consulting organizations are to work properly and to develop steadily. The drying up of demand has not infrequently meant the disbandment of human groups that had been built up with much effort, and this may be considered as a net social loss on account of the accumulated expertise that has been lost thereby and of the need to have recourse to foreign CS when demand has picked up again. On theoretical grounds (congestion theory) it may be shown that a certain long-term average level of idle capacity is socially beneficial in activities where the nature of demand is not constant, on the one hand, and the length of services demand is not uniform, on the other. Mechanisms must be found to support occasional idle capacity, and to avoid disbanding groups when there is no work.

49. Finally, one should refer to the foreign demand which is satisfied by exports of CS. Some national producers of CS have been able to work for other countries in the region as well as internationally funded projects. It would seem that this is bound to happen increasingly if sustained efforts are made by the <sup>ations</sup> Associ/ of Consulting Engineers to show that services of comparable quality and greater relevance are available at less cost than from advanced countries. The approach of the CS producers is closer to the psychology and way of thinking of the client, thus facilitating relations. The CS producer is more aware of local problems and local conditions, which are not so dissimilar to what he is used to in his own country, and he can thus conceive technical solutions better adapted to the recipient country.

50. Other export markets lie in developing countries outside a region, and in fact some CS are being supplied to other regions as well as to industrially advanced countries as sub-contractors. This is a promising area that domestic consulting organizations should keep in mind when planning their future activities.

51. The export of CS is beneficial on several grounds. Foreign exchange is earned, national technology may be exported, and in some cases a CS may keep up its level of activity when the local demand has momentarily dropped. It may be suggested therefore that national policies should consider promoting CS exports through tax measures, the awarding of credit and other ways.

#### Supply of Consulting Services

52. CS are supplied by multiple sources. A first division would be between local productions and imports. In regard to local production, this may take place by individuals or by small or large organizations. The latter may be a department of a productive enterprise or government agency, or a distinct organization specializing in consulting and other related services.

#### Import of Consulting Services

53. Let us now turn to the issue of the import of CS, and their place in the supply of CS demanded by the country. While in some cases there is no alternative to the import of CS, and recognizing that there are certain advantages in such a course of action on account of speed, efficiency and reliability, the use of foreign CS entails several drawbacks. One of them is their cost: fees per man-hour are larger, expenses on account of travel and subsistence of foreign professionals are sizable. Other disadvantages may be summed up by the expression "dependence". The country would in fact be relinquishing many important decisions to outsiders, and this may have several unfavourable

consequences. For instance, the project conceived by a foreign CS may not fully correspond to the conditions and needs of the recipient country.

54. Mention has already been made of the arguments for building up a national capacity in consulting, and to achieve "import substitution" in this field. A word of caution may however be in order. Too strong a nationalistic attitude may act as a barrier to the flow of technology; it may impose tasks on local consulting which it is not yet ready to discharge; or the policy may be negated in practice if weak local CSs are engaged which then take on foreign CSs as partners and leave to them the greater part of the substantive work and the decisions that go with it.

55. The problem is to use foreign consulting in such a way as to maximize its positive features and minimize its negative effects. This would mean the establishment of "rules of the game" and standard procedures that would

seek mechanisms of cooperation between both sources of supply in order to favor the maximum utilization of local sources and to make full use of foreign consulting as a vehicle for technology transfer and for the training of national consulting personnel.

D. SOME PROBLEMS ASSOCIATED WITH DEVELOPMENT  
OF LOCAL CONSULTING CAPABILITY IN DC:

56. Some of the developing countries have developed indigenous consultancy base, however small. Others have expertise available among individuals scattered in universities, industry, government etc. While no general prescriptive approach can be followed, some of the problems relating to the development of consultancy profession are common, irrespective of the stage of evolution. These are discussed in the following paragraphs.

Problems of Demand

Development Policies

57. The direction of technical change is strongly dependent on national development policies. The possibilities of applying local consulting capability to the goals of development are contingent upon the specificity and articulation of the objectives and the efficiency of administrative instruments for translating these goals into strategies and projects.

58. Creation of local consultancy capabilities and self-reliance do not have the same visibility in national accounting as the GNP and tend to receive much less attention. The need for more appropriate social and economic indicators in this context is urgent.

59. In a more market-oriented competitive environment, enterprises are faced with the need to employ the economic calculus rather than hoping for windfall under import substitution, almost regardless of what is produced or how. Often, quick and immediate benefits in this respect would tend to inhibit the use of local technical capabilities. The economic growth with social equity can be materially aided by changes in fiscal, financial and other policies with concomitant changes in the role that science and technology and local engineering and consultancy can play in technology transfer and adaptation.

### Capability Evaluation and Experience

60. It is a paradox that in evaluating the suitability of a Local Consulting Firm in LDCs invariably, past experience and in most cases, past identical experience is sought. Unless these fledgling institutions where they do exist, are entrusted with work in the first instance, it will be impossible for them to garner the experience on the basis of which their capability is sought to be evaluated for award of work. It will be desirable to break down total package of services into its various components and then evaluate the risk elements associated with each component such as Civil Engineering Work, Utilities and Services, Process Engineering Plant Engineering etc. Another approach could be that a Consultant from another developing<sup>or devel.</sup> country is retained to associate with the local consulting engineer's work in the first one or two jobs of a particular type to ensure its correctness. This would, no doubt, involve a little additional expenditure in the first instance but would be a very small price to pay for the development of competent Local Consulting profession in the DCs.

61. Often, length of experience is used as a major criterion for evaluation of the capability of a consulting organization in an DC. It is suggested that a more rational basis would be the relevance of experience in the context of the job content as well as the environment.

62. Similarly, the size of the overseas consulting firm and the total number of personnel on its role is often used as a criterion for selection rather than the experience of those personnel who are intended to be deployed on the specific job.

### Lack of Awareness of Local Consulting Contribution.

63. There also seems to be some doubt as to the real awareness about the contribution which consulting organisations make to the -

i. Economy as a whole (Macro level: impact on more rational industrial and investment policy instruments).

ii. Project (Micro-level; feasibility, optimal techno-economic solutions).

iii. Sector (such as Steel, Textiles, Cement etc. Here, the contribution lies in a sectoral approach and the advantages associated with optimal use of resources and judicious economic fragmentation of product mix among several units in the same sector).

64. It will be useful if knowledge and information about such contributions by Consulting organizations is compiled and persons in the decision-making positions are made aware about this. In this connection, it would be useful to have a National Association of Consulting Engineers or some such similar body to compile such studies in the manner in which Local Consultants are able to reduce costs, provide more appropriate design solutions, etc. This type of information would not only help in a greater awareness of the contribution of the Consultant within the country but such information could also be made available to other DCs as a measure of Technical Cooperation among Developing Countries and could go a long way in a greater use of Consultants of one Developing Country by another in association with its own Consultants.

65. Lack of Information: Considerable gaps exist in many DCs in respect of technologies and engineering and technical capabilities available in other developing countries in the region. There also appears to be a communication gap between generators of technology, namely, R&D and consulting institutions on the one hand and its end-users on the other. This is also a problem area and inhibits increased use of local capabilities within a developing country as well as use of such capabilities by other developing countries.

66. Lack of Motivation: It has been suggested in this Paper that the use of local consulting capabilities would lead to more appropriate

/appropriate

technology and project design and engineering solutions. The ultimate motive force for use of appropriate technologies and design solutions by the potential entrepreneur depends on the market conditions. National policies have, therefore, to be devised so as to provide the necessary package of incentives and regulation for the entrepreneurs to gravitate towards increasing use of appropriate technologies and hence local technical and engineering capabilities.

Attitude Barrier

67. Human resources, strictly speaking, should be considered on both sides of the technology equation - supply as well as demand. Administrators, managers and entrepreneurs, and the various levels of technical staff in production activities, all affect demand, while research scientists and consulting engineers affect the supply position. On both sides, the quality of training and the attitudes which have been inculcated are of decisive importance.

68. Typically, because of the educational and training programmes through which a large proportion of such people have gone through in institutions in developed countries, the net result is a somewhat limited interest in and appreciation of local problems and aspirations, and a strong elitist bias in favour of the latest, most sophisticated technologies developed in the industrialised countries, the most exotic scientific fashions of the day, and adoption of engineering and design solutions which are essentially suited to industrialised societies. This orientation has a strong influence on the range of possible solutions to practical problems which are seriously considered. - whether conventional or new - Appropriate technologies/rarely feature within this range, whether on the part of the administrator, the enterprise manager or the research scientist. There is an evident need to introduce real-life problems into training curricula, whether at vocational training level or the university level.

Fluctuation in Workload and Limitations of Finance

69. Fluctuation of Workload: Another problem relates to the fluctuation of workload which makes it exceedingly difficult for the Consulting Firm to carry the burden of its permanent pay roll without assurance of minimum work. This is more so with small and medium size firms. While such fluctuations in the pattern of workload are inevitable, their impact on small and medium size independent Consultant Firms in DCs is almost disastrous because they have no monetary means to carry them through the lean periods. Such is not the case for large Consulting Firms who have certain sustenance power due to the financial reserves they might have built up. Such is also not the case with those Consulting Firms who are either owned by or have corporate links with equipment manufacturers, contracting agencies or process suppliers.

70. Support from Financial Institutions : The Banks and Financial Institutions in DCs do not, as a rule, provide working capital requirements of the Consulting Firms as the latter have no collateral arrangements in the form of tangible assets except the corporate trained manpower and its earning potential. This needs to be overcome if the right type of Consulting Profession is to develop, otherwise the mortality rate in the profession becomes high. What is even worse, sometimes the Consulting Firms degenerate into agents of equipment or technology suppliers thus defeating the role which they are to play in the national development. This also results in a setback to the high ethical standards and traditions which the fledgling profession in DCs has to evolve for its own survival and future growth.

71. Government Support : Active support from Government, Planning Organisations and Financial Institutions to award work

/relating to



relating to Feasibility Studies, Project Evaluation etc. on a long term programmed basis would go a long way to sustain such firms while they are developing their expertise, experience and clientele.

72 Insurance: While it is quite customary in developed countries for Consulting Engineers to take out an insurance policy to cover their risk, this is rarely possible in DCs. Such an assistance extended to DC Consultants by their insurance companies or banks would go a long way to nurture the fledgling profession.

#### Quality Assurance

73 It is necessary to have quality assurance of the work of local Consulting Firms in developing countries to inspire confidence and credibility among its users. National Associations or Institutions of Consulting Engineers could usefully fulfil this role.

#### Problems of Supply

##### Manpower and Expertise

74. Lack of adequate manpower of the right calibre, experience, education and analytical skills.

75. The extreme desirability but difficulty of quickly welding individual expertise into harmoniously functioning multi-disciplinary corporate Consultancy teams.

76. Attracting the right calibre of personnel since the opportunity cost of such professionals in other alternative industrial and economic activities, such as manufacturing, administration, policy making levels in the Government etc., is considerable and the emoluments and status attached to such positions are invariably higher than the Consulting Profession can afford to offer in the beginning.

##### Attitude of R&D Institutes

77. It is important to reorient the attitudes of Research and Development Institutes in DCs to applied research, particularly in

respect of pressing problems. There is a tendency to get carried away with sophisticated research programmes which have no immediate relevance except the satisfaction of publishing the results of research in prestigious scientific journals. The emphasis has, therefore, to be shifted in a very large measure to practical, need-oriented applied research.

#### Divorce between Universities and Industries

78. Perhaps, due to old traditions, academic institutions have, in a large measure, remained aloof from the grassroot problems in DCs. It is vital that the talent residing in such institutions be inducted and involved in real life problems and their orientation should be changed. An intimate bond should be fostered between academic institutions on the one hand, and Consulting organisations on the other.

#### The Spectrum of Needs: Problem of Diversity

79. The principal needs of DCs for consultancy services, may be categorized as follows:-

1. Project formulation:- Identification of viable projects

- Preparation of pre-feasibility studies
- Preparation of feasibility studies and project reports
- Project evaluation and appraisal

2. Techno-Economic Surveys:-

- Regional and sectoral surveys to develop integrated industrial development plans, including identification of individual projects.
- Large and small scale industry linkage.

/3. Project

3. **Project Engineering:**
  - Basic Engineering
  - Process selection and Technology choice
  - Detailed design and engineering including:
    - Civil and structural engineering
    - Architecture
    - Electrical and Mechanical engineering
    - Chemical and Metallurgical engineering
    - Production engineering
    - Plant and Equipment layout
    - Electrical and instrumentation systems
    - Mechanical utilities and services
    - Material handling and transportation systems
  - Use of Computer aided design (CAD)
4. **Project Management:**
  - Project Planning and Scheduling
  - Network and PERT chart
  - Time and Cost Control
  - Construction Supervision
  - Equipment procurement
  - Start-up and initial operation of plant
  - Plant systems and procedures
  - Manpower planning and training
5. **Rehabilitation of Sick Units:**
  - Diagnostic studies,
  - Therapeutic Solutions which involve technical, economic, financial and management analyses.
  - Early warning systems for prevention of sickness in Industry
6. **Management Consulting for**
  - Performance appraisal and monitoring

specially for public enterprises

- Productivity Improvement
- Value Engineering
- Product upgrading
- Capacity utilization
- Product diversification and plant expansion studies
- Managerial training and development
- Marketing consultancy

### Analysis of Needs and Process of Development

#### 80. The Backdrop:

Having outlined the needs of DCs in terms of consultancy inputs, it may be useful to keep in perspective certain objectives, constraints and characteristics of development strategy for consultancy services.

These are very briefly outlined below.

#### 81. - Selectivity

Spectrum of consultancy needs is wide; availability of expertise is limited, and competing demands on the scarce technical human resource are many: from government, industry, contracting and construction companies.

HENCE, SELECTIVITY OF AREA OF

SPECIALIZATION- FUNCTIONAL AND INDUSTRY SPECIFIC - IS VITAL

#### 82. The Resource

The prime resource for consultancy is

Manpower with adequate Expertise

Experience

Creativity and Innovative Approach

#### 83. Time Horizon

It takes time for experience to be acquired and expertise developed.

/The time

The time dimension can be reduced to some extent by drawing upon the experiences of others, but experience cannot be wholly second hand.

- Time Horizon to be thought of is 5 to 7 years hence, for adequate experience and expertise to develop. This does not mean that till then no work need be done; it only tends to emphasise that elements of consultancy work both in project formulation and industrial consultancy should keep in view the selected areas of specialization, so as not to fritter away the human resource.

#### 84. Acquiring Expertise and Experience

Experience and expertise can be acquired through

- on the job training in the design offices of foreign consultants
- association of local Engineers with foreign consultants working on projects in an DC, in design and construction phases of a project.
- internal training programs
- twinning arrangement between consultancy organizations, preferably among DCs due to similarity of objectives and constraints.
- Induction:

For training and development to be effective, and to reduce the mortality rate, screening and selection of potential consultants is important and should be done with extreme care. Ideally, it should be a mix of young engineers, technologists, economists etc. from Universities with a flair for creativity, and men with experience from government, industry, universities and contracting firms.

#### 85. The Cost

Development of consultancy services involves certain costs to be incurred for training, for development, for risk involved in first time use and hence the desirability of a second opinion in the initial

/years.

years. The entrepreneur, be it public sector or private sector, cannot be expected to bear this cost, which should be borne by the government as a legitimate cost for development of desirable professional and institutional capabilities in the country. However, consulting institutions in DCs cannot be subsidized by the government for all time to come. After the initial stage of development of 5 to 7 years, they should aim at self-sufficiency through the fees they earn.

## E. TRAINING AND HUMAN RESOURCE DEVELOPMENT FOR CONSULTANCY SERVICES

### Perspective for development:

86. Based on information and analysis provided in this study the following are identified as specific needs in Engineering design and consultancy services.

87. Enhancement, upgrading and strengthening of capacities through appropriate and pertinent training programs keeping in view the special needs and environmental factors, specifically covering:

1. Project formulation covering project proposals, prefeasibility studies, project profiles, project design and detailed engineering and design
2. Product design and Manufacturing processes methodologies specific areas
2. Project Monitoring at various stages of project cycle.
3. Project Management Time, cost and quality control.
4. Structuring, analysis and application of data base for projects
5. Competence in computer applications, particularly CAD/CAM.
6. Professional management of EDC operations
7. Marketing of engineering design and consultancy services
8. How to establish and operate consultancy joint ventures
9. Subcontracting in consultancy and engineering design.
10. Development of engineering design and consultancy entrepreneurs.

### ANATOMY OF TRAINING

#### Basic Principles and Approaches:

88. Stress in training should be on the practical aspects and their application, rather than merely on the theoretical sanitized type of text-book oriented or manual biased training.

89. For participants to identify themselves with training, it should reflect local content and flavour. This can be done by developing local case studies and persuading local resource persons to share their experiences. The standard and international study material can then be juxtaposed vis-a-vis the local backdrop and experience. Training would then not be transplanted training which may become imitative and may have difficulty taking root. Experiences of other developing countries would also be useful.

90. Training should be participative and not prescriptive, in order to be useful and effective. A planning exercise should be used as a learning technique. Additionally, each participant should be encouraged to bring own sectoral project to the training workshop. This will help training to become more contextual for the participant and also provide sectoral cross-fertilization for the group.

91. Emphasis in learning 'Tools and Techniques' should be not only on 'How' but equally on 'Why'.

92. An integrative holistic approach to engineering design and consultancy should be encouraged and intimate interrelationship among various elements clearly brought out.

93. Content rather than the design document nomenclature should be stressed. Relationship between content and enduse should be clearly brought out.

94. Since training workshops are just one episode in the whole cycle of individual's development, it should be realized that the process of development does not end but begins at the end of formal training workshops. Keeping this in view, ONIDO may like to maintain continued contact with the participants and obtain useful feedback from them, which could become valuable instructional and case study material for future.

95. Training is not a one time happening but a continuous process, and its role at induction stage, and at middle and senior management levels needs to be emphasized in consultancy organizations.

96. Training of Trainers with its potential multiplier effect should be kept in mind in selecting participants.



III. PLANS, PROSPECTS AND PRESCRIPTIONS

A. SOME SUGGESTIONS FOR DEVELOPMENT AND USE OF ENGINEERING DESIGN AND CONSULTANCY SERVICES IN DCS

97. In order to accel. rate the rational development of consultancy services in DCs and for achieving greater self-reliance on their part, concerted efforts would be necessary on the part of such organizations themselves and through various measures at national levels, at regional level through the U.N. system and particularly by UNIDO, as well as through technical co-operation with sister developing countries. Some suggestions are discussed below:

1. Role of Government and its Financial and Regulatory Agencies

98. A clearly defined and articulated policy affirmation by the Governments that Consulting Capabilities are essential elements of national and collective self-reliance and that such national capabilities are intrinsically responsive to a DC's objectives for rational and viable development, would go a long way in fostering the growth and increasing use of such services.

99. The Governments of DCs should recognize the consultancy profession as an input industry and consciously foster its growth through some of the policy and regulatory mechanisms indicated below:

1. Associating Local Consultants

100. Government through its various regulating agencies, to make it mandatory, that in all project formulation and engineering jobs, local consultancy be always associated even where a foreign consultant has to be inducted.

101. Government and public sector should set an example by making greater use of local consultancy capabilities for their project work.

102. Local Consultancy should be invariably associated in technology evaluation and project engineering.

Increasing Responsibility

103. As they gather greater experience, increasing responsibility for the assignment should rest with the local consulting firm, who, in turn, may seek the components of expertise as required from abroad.

Registration of Consultants

104. Government or a suitable Government agency should establish a Roster of Consulting Firms based on information gathered through a questionnaire evaluated and updated periodically, reviewing their performance, to inspire client confidence. Alternatively, a National Consulting Association can exercise this self-disciplinary role, provided it has the necessary authority.

Visits abroad for Updating Knowledge

105. Government may set up a fund to finance trips of consultants overseas to refresh and update their knowledge of technology, design and engineering techniques, plant construction solutions etc. Visits to developed and developing countries in this connection would be very useful.

Training Programmes

106. Training and Development Programmes need to be evolved for Consultants in association with consulting engineering firms, Operating Plants and Construction Projects and Universities and Research Institutions. Government should provide full or partial funding for this purpose.

Links with Universities and Technical Institutes

107. Encouragement by Universities, Industrial Enterprises, Government Institutes and Consulting firms to enable students to obtain at least one semester of on-the-job training in a consulting engineering firm, or on a construction job or inplant operation or in an R&D institution.
108. Establish close work relationship between consulting firms and faculty and students of technical institutes and universities.

Publicity

109. Support a publication to circulate news and the latest information on various aspects of consulting and project engineering activity in the country including some case studies and success stories as well as problems encountered and overcome. INTIB of UNIDO can also help in this.

Tax Incentives

110. Provide tax relief to consultants on their income.  
The tax relief should increase, greater the proportion of work done by local consulting firm on a given assignment.
111. Carry forward of losses by consulting firms should be permitted for 3 to 5 years for tax purposes.
112. Tax may be calculated on the average profits of say 3 years.
113. Generous development rebate may be allowed for expenditure incurred by a consulting firm on training and development of its manpower.

114. Since the capital of a consulting firm is its trained and experienced manpower, depreciation as a certain percentage of total annual professional wage bill may be allowed for manpower turnover and retraining. This would be analogous to depreciation allowed in industry for replacement of machinery.
115. Some incentives be provided to the users of local technologies and consultancy services by allowing, say, twice the actual expenditure incurred for such purpose as expenditure for tax purposes.
116. Amount paid towards consultancy services, if procured from a foreign consulting firm should not be permitted as the deductible expenditure for tax purposes, by the client, provided such capabilities exist in the country.

#### Financial Support

117. Easier bank credits should become available to consulting firms for their working capital requirements, since they have no physical collateral.

#### Support by Financing Institutions

118. Development Banks and Industrial Credit Institutions particularly the Government ones - should insist that their potential loanees submit detailed feasibility studies prepared by local consultants with outside assistance limited to what is considered absolutely essential. Preference in the case of outside consultant should invariably be given to one from a developing country.

119. Development Banks and Industrial Credit Institutions should themselves encourage indigenously developed technologies and local consultancy services by making increasing use of local consulting and engineering firms for project evaluation and subsequent to grant of loan, for project monitoring on behalf of the Bank.

120. The valuable tool of industrial credit may be used to ensure that, as far as possible, more and more engineering work is done in the country.

121. Facilities for deferred payment should be provided to entrepreneurs using indigenous technologies and local consulting and engineering services specially for large projects.

#### R & D Fund

122. Large industrial and business houses can set aside from their profits R & D funds which could also be made available to the consulting and engineering firms besides R & D institutions for development of local consultancy and R & D services. The organizations providing these funds could be given tax incentives. R & D cess/levy - on a graduated scale - could also be considered for sponsoring research projects of national importance, with appropriate consultancy inputs.

#### Insurance Cover

123. Insurance companies should provide insurance cover for reasonable premia to consulting and engineering firms for their work, who, in turn, can provide financial guarantees to their clients, to inspire greater confidence and credibility in the minds of the clients.

Long Range Planning for Consulting Capabilities

124. An identified plan of perspective needs of consulting capabilities should be developed where the needs are of national importance based on raw material resources, market needs etc. The Government may constitute a development council for developing such plans. Long term plan for manpower needs in this area may also be evolved.

Sponsoring R&D Projects

125. The Government may create an active Agency to promote indigenous Research and Development and should also take the lead in sponsoring applied research for public sector projects - at least during the initial period. Local Consulting firms should be retained to translate R&D effort into commercial projects and products.

2. Measures required at Regional Level

Training and Development

126. An important need of DCs is development of Consultants. Training workshops and development programmes need to be organized for this purpose with significant inputs from Regional Commissions UNIDO, and other countries of the region. The organizational aspects would have to be undertaken by UNIDO, apart from providing substantive inputs.
127. Training and development activities have to cater to the needs of evolution of consultants at three stages. Firstly, at the induction stage, when the new entrant to the profession

/from

from a university or with a few years of job experience, is to be trained in the methods, techniques and approaches of consultancy practice. Secondly, development at mid-career stage, for professionals with about 10 years experience in consultancy, with training emphasis on project management, co-ordination and management aspects of consultancy, apart from purely technical aspects. The third stage is at senior management level, where primarily the focus is on new developments in the science and art of consultancy practice, exchange of experiences with peers, marketing of consultancy services and some insight into the future trends.

128. Alternative approaches to training may be considered, which would be useful. Intensive training should be organized through workshops in the country, with national participants, and training inputs both from national as well as UN experts. Another mode of training would be with participants from various countries of the region, with focus on problems of common interest and exchange of experiences.

Information and its dissemination

129. Pooling and dissemination of information of relevance to project development and consultancy is an important need to be filled. Information would relate to
- (a) Available consulting capabilities and capacities in countries with their experience updated periodically.

/(b)

- (b) Sources of project formulation, appraisal and implementation techniques of major interest to DCs available both in the industrialized countries and within the developing world.
- (c) New conceptual work in the field of engineering design such as CAD/CAM and industrial consultancy/under way in various developing and developed countries which could be of special interest to consultants in developing countries
- (d) Experience with imported engineering design and industrial consulting techniques and their adaptation, success stories and problems and pitfalls.
- (e) Industrial consulting experiences in evolving solutions in conformity with local conditions and the methodologies adopted for the purpose.



3 Co-operation among DCs and other Developing Countries in Consultancy: Some Suggestions

Twinning Arrangements

130. This involves pooling complementary capabilities of Local Consulting Firms in DCs with sister organizations from another developing country for joint work on project-to-project basis or on sustained basis.

Training

131. Training facilities to be provided by Consulting Firms in a developing country to the personnel of Consulting Firms from other DCs.

Joint Ventures

132. Assistance to be provided by Consulting Organizations in one developing country in the setting up of similar organizations in an DC by providing documentation, information and training. The concept of joint venture in Consultancy needs to be seriously considered and supported for rapid growth of the professional competence in DCs.

Triangular Arrangements

133. In projects of high and specialized technology content where such technologies at a given period of time, are not available within the Developing World, a triangular blend could be adopted

/with

with technology being inducted from an Industrialized Country and Engineering of the Project and its Construction are accomplished through the twinning arrangements discussed earlier.

Availability of Information

134. One of the most serious handicaps to the greater use of Consulting and Engineering Services from one developing country by another, is the lack of adequate information with regard to the capacities, capabilities, available technologies, experience with imported technologies, capital goods and raw material availabilities, skill requirements, research and development programmes etc. It is vital to have an Information Bank such as INTIB of UNIDO to provide this support.

4. What the Profession can do for Itself

Credibility among Prospective Clients

135. Consulting firms in DCs should attract the most competent and capable manpower and ensure very high standards of professional competence and conduct to establish credibility among the users of their services who are initially sceptical. This may mean more attractive remuneration to be paid to the professionals as well as a better status provided to them.

Sharing of Knowledge and Pooling of Expertise

136. A co-operative spirit should be actively cultivated amongst Consulting firms in an DC so that they are able to share and pool their knowledge, experience and personnel and thus better fulfil the requirements of a given assignment. This sharing of the scant manpower resources and experience would not only mean an improvement in the quality of services rendered but would also make an optimal, efficient and economic use of the scarce skill resources.

Interaction with R&D and Technical Institutes

137. Consulting firms should make a determined effort to forge strong links with universities and technical institutions and industrial research and development organizations in the region through the means of interlinked professional associations or governing councils. This would ensure a more intimate contact between various institutions and break down the barrier which unfortunately, more often than not, exists between them.

Interface with Industry and Professional Bodies

138. Consulting firms should work actively towards forming specialized industry or technology oriented professional societies in association with industries using those technologies. Such professional force would provide a desirable opportunity for a closer appreciation of the problems of that industrial sector by the Consultants. It would also lead to a better understanding on the part of industrial entrepreneurs of the manner in which local

Consulting Organizations can assist them in design and products engineering of new plants/or effecting improvements in existing operations.

National Association of Consulting Engineers

139. Consulting Firms should get together and set up a strong and highly representative Association of Consulting Engineers who would look after their common problems as well as project an image of local consultancy profession on the minds of the users.

Code of Professional Ethics

140. The Association of Consulting Engineers should evolve a self-imposed code of professional conduct and ethics, to inspire confidence among the users of their services.

Quality Assurance

141. The Association should also set for its member consulting firms high standards of professional competence and conduct. This would go a long way towards finding acceptance among the users.

Contribution to Existing Industry

142. It may also be useful for the consultancy profession to launch a well conceived and well organized productivity <sup>rehabilitation and</sup> movement aimed at improvement in the operation of existing plants and thus increasing the efficiency of existing investments. This would considerably help in bringing about quick recognition and acceptability to the fledgling consulting profession. UNIDO can effectively help in this.

Roster of Experts

143. A Roster of top level experts and specialists, both in Government and private sector organizations, should be evolved so that information about the professional talents in the country in various fields of specializations is readily available to Consultants for making use of these experts for specific assignments.

B. PROMOTIONAL MEASURES BY UNIDO

144 UNIDO is the primary international agency concerned with industrial development. engineering design and consultancy services are a prime instrument for industrial growth and technology development. It would thus be appropriately the responsibility of UNIDO to assist the governments of developing countries in the enhancement and strengthening of domestic consultancy and design engineering capabilities and for increased use by local public and private sector industrial entrepreneurs. With this in view several areas have been identified for UNIDO to play its major role in this field of activity and these are discussed briefly in the subsequent paragraphs. Detailed activities and action programmes are given in the UNIDO Agenda for Action which follows:

145. Areas of research:

Large gaps still exist in the knowledge base about domestic consultancy capabilities and the government policy and strategy framework to make increasing use of such capabilities in the country. UNIDO could help by undertaking specific Objective Oriented Research (OOR) programmes to identify specific actions aimed at enhancement of engineering design and consultancy capabilities in selected developing countries. The research programmes should aim on specific and concrete modules, some of which are described below.

How have domestic consulting firms helped in

- reducing foreign exchange outflow
- increasing use of local materials and equipment
- in developing manpower and expertise in the country

146. The objective oriented research programmes must place priority emphasis on country specific action programmes to overcome identified constraints and attitudinal barriers in the use of local consulting capabilities in the country. The findings in several countries should then be analysed to learn lessons applicable on regional and on global basis. It is important to emphasise that the various actors concerned should be actively involved in identifying constraints and in developing strategy and actions which they themselves will pursue. The main actors

in the Engineering design and consultancy field are governments, development banks and financing institutions in the country, public and private sector clients of consultancy services and consultants themselves.

Areas of Training

147. These are identified in detail in the accompanying Agenda of Action Programme.

Areas of Assistance to governments

148. **Assisting Governments in preparation of guidelines for evaluation of consulting capabilities and selection procedures for consultants.**
149. **Assisting in the preparation of guidelines for remuneration to consultants.**
150. **Assisting in developing joint ventures and joint working arrangements on projects among consultancy firms from various DCs of the region and from other countries.**
151. **Helping to promote the association of local consultants in DCs with foreign consultants.**
152. **Providing advisory assistance in strengthening local design engineering and consultancy capabilities.**
153. **Establishing a network of information engineering design and consultancy centers and associations for the development of industrial consultancy through inputs of information, training and mutual corporation in design work. and through it providing special programmes of assistance for accelerated development of such capabilities in DCs.**

C. AN AGENDA FOR UNIDO ACTION

Specific Projects/Programmes

<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
1. Assist/develop governments in developing policy instruments and strategies for growth and increasing use of domestic engineering design & consultancy services.	1. Develop flexible guidelines for policy options and framework for strategic decisions from which governments can choose elements to design their own policies	UNIDO	1. Guidelines for developing policies and strategies for domestic consultancy development
	2. Discuss at Expert Group Meeting	UNIDO	2. National and regional inputs and recommendations for finalizing the guidelines
	3. Finalize guidelines	UNIDO	
	4. Make these available to various governments and financing agencies	UNIDO	
	5. Assist in evolving national policies, when required	Government <sup>s</sup> assisted through technical assistance by UNIDO	1. Technical assistance and Advisory Services
2. Criteria for selection of consultants:-	1. Survey, research and ground work for existing practices	UNIDO	1. Guidelines



<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
- capabilities and procedures for evaluation	and special needs keeping in view the diversity of the countries and their stage of industrial development		
- preparation of terms of reference			
- contract negotiations			
- supervision and monitoring of consultant's work			
	2. Preparation of case studies	UNIDO	2. Manuals
	3. Preparation of draft guidelines	UNIDO	3. Checklists leading to enhanced capabilities to select and use consultants
	4. Discussion of/draft guidelines at an Expert Group Meeting/s	UNIDO and Regional Commissions	
	5. Dissemination of guidelines to governments for their use	UNIDO	
3. Remuneration to consultants and billing rates	1. Survey and research on existing practices and problems	UNIDO	1. Guidelines for calculating remuneration leading to rational growth of consultancy

<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
	2. Preparation of <sup>draft</sup> guidelines providing methodology and parameters of calculation, manner of remuneration, development cost of consultancy, foreign and local consultants - rationale for differentials		
	3. Meeting of users, governments and consultants, funding institutions to discuss guidelines	UNIDO	
	4. Finalization of guidelines	UNIDO	
	5. Dissemination of guidelines	UNIDO	
4. Project preparation and design techniques; enhancement of skills; - developing countries - LDCs	1. Survey and research on existing state-of-the-art in selected countries	UNIDO (with collaboration of regional commissions)	1. Training workshop
	2. Development of background paper/manual on application of techniques		Project Design 2. / Application manual

<u>Basic Recommendation</u>	<u>Methodology/Activities</u>	<u>To be undertaken by</u>	<u>Output</u>
	3. Training workshop for planners and evaluators from government and for consultants engaged in Project design		
5. Project management training	1. Survey of causes of project delays and cost over-runs in developing countries 2. Preparation of training material 3. Organization of training workshop and a roving seminar	UNIDO	1. Training workshop 2. Roving seminar
6. Pooling and dissemination of information of relevance to engineering design and consultancy	1. Research on information needs of consultants and users of consultancy services, such as types of projects to be undertaken in the region, consultancy resources available in the region, equipment and technology availability, CAD/CAM/techniques etc. 2. Identification of existing institutions and mechanisms which could be strengthened for this purpose, and any new links needed	UNIDO	1. Publish survey results 2. Expert group meeting

Basic Recommendation

Methodology/Activities

of

To be undertaken by

Output

3. Background paper for development/  
Consultancy Information Network  
(CIN), integrated into INTIB.
4. Expert Group Meeting
5. Finalization of proposal for CIN

3. Consultancy  
Information Network  
proposal

7. Assist in developing joint  
ventures for co-operative  
working arrangements among  
consultancy firms

1. Survey of available consultancy  
capabilities and capacities in  
the region
2. Analysis and identification of  
complementarity of resources and  
expertise
3. Matching co-operative  
capabilities to needs of projects
4. Organize a 'dialogue' to  
facilitate such co-operation  
between firms

UNIDO

1. Co-operation  
dialogue forum
2. Specific co-operation  
arrangements with  
UNIDO as matchmaker.  
(UNIDO system of con-  
sultations may be used  
for this purpose).

Additionally, a series of intensive training programmes such as the following would have to be arranged by UNIDO with some expert inputs from Development Banks, Productivity organizations and other institutions:

1. Training programmes ranging in duration from 2<sup>weeks</sup> to 3 months in:-
  - 1.1 Methodologies of project design modules
  - 1.2 Product and Process development for engineering products.
  - 1.3 Basic design disciplines such as: Industrial structures  
Electrical utilities  
Mechanical services  
Plant layout  
Material handling  
System Planning  
Industrial infrastructure
  - 1.4 Project Management techniques
  - 1.5 Systematized information gathering and analysis for use in engineering design and Consultancy.
  - 1.6. Specified courses in CAD in engineering design and CAM in manufacturing processes.
  - 1.7. Professional management of Engineering Design and Consultancy organizations.
  - 1.8. Developing consultancy and Design engineering entrepreneurs in developing countries.
2. Help arrange Internship in other consulting firms in various engineering disciplines and methodologies.
3. Provision of direct technical assistance for helping in organising core consultancy firms and providing on the job training