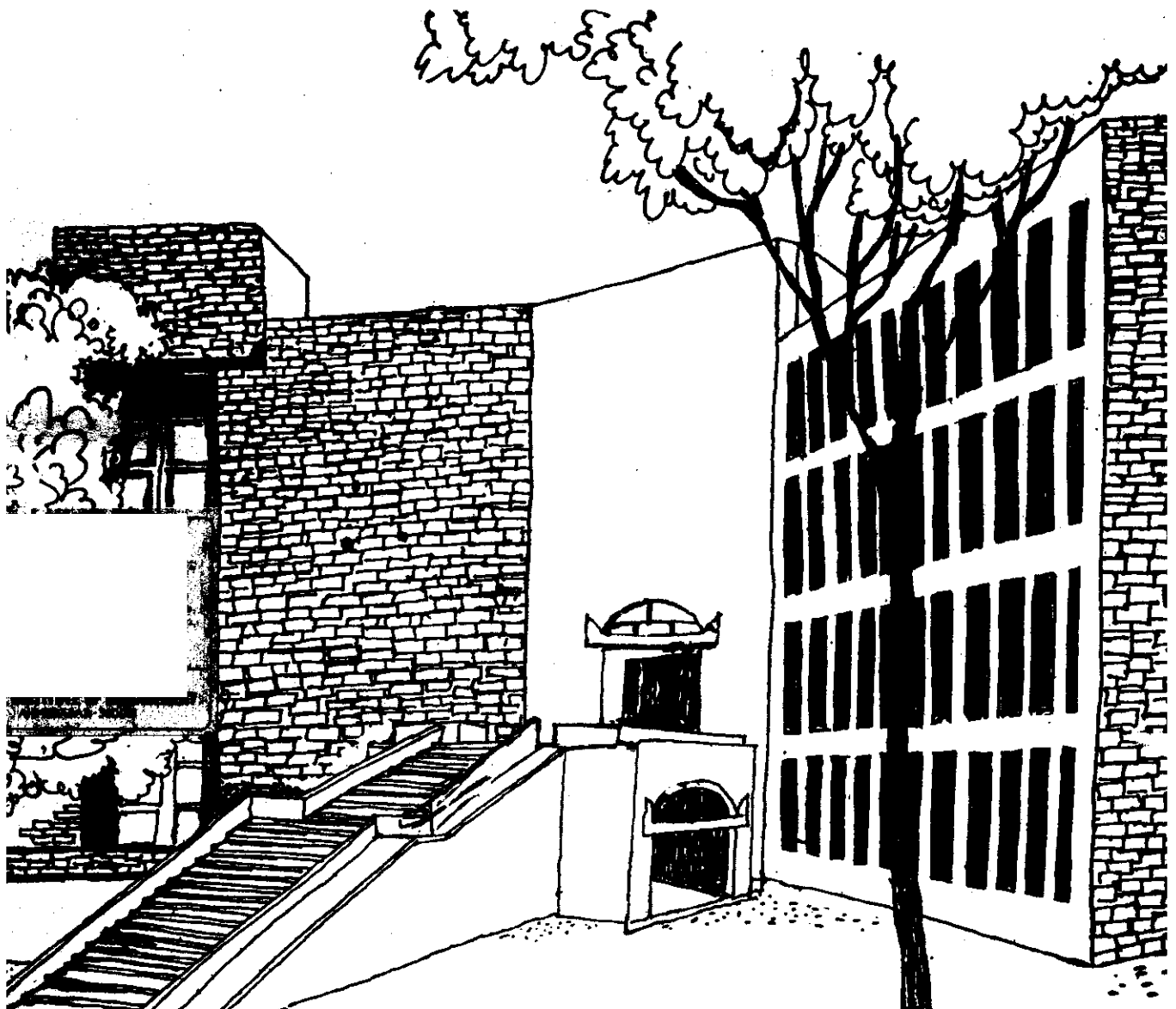




Working Paper



**SOME ASPECTS OF TECHNICAL CONSULTANCY
ORGANIZATIONS IN INDIA**

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SOME ASPECTS OF TECHNICAL CONSULTANCY ORGANIZATIONS IN INDIA

Abstract

The growth of technical consultancy organization (TCO) is very much a post Independence phenomenon. Prior to India's Independence the few Indian TCOs that existed acted as sub-contractors to foreign consultants for projects undertaken in India. However in recent times Indian TCOs have flourished in a number of fields ranging from simple technology like food processing to advanced fields like electronics and power generation. As an illustration the entire design and engineering work of major power projects can be completely handled within the country. Many TCOs have also made forays in the international market for technical consultancy services. However, only a few TCOs have made a mark for themselves in the field of international technical consultancy. This study of TCOs is based on published information, a survey of 94 TCOs, and a study of technology export from India done by the first author. It brings out the key aspects of the growth and development of Indian TCOs and the major problems being faced by them.

SOME ASPECTS OF TECHNICAL CONSULTANCY ORGANIZATIONS IN INDIA

Shekhar Chaudhuri and A. Eugene*

1. Introduction

The growth of technical consultancy organizations (TCO) is very much a post Independence phenomenon (Anonymous, 1970). Prior to India's Independence the few Indian TCOs that existed acted more as subsidiaries to foreign consultants for projects undertaken in India. Indian TCOs lacked technical competence and so domestic clients preferred to go to foreign TCOs for technical advice (Dastur, 1978).

However in recent times, Indian consultancy organizations have flourished in a number of fields ranging from simple technology like food processing to advanced areas like electronics and power generation. The development of consultancy services in India has now reached a fairly high level and in certain areas is comparable to that obtainable anywhere else in the world. As an illustration the entire design and engineering work of major power projects can be completely handled in the country (Venze and Kulkarni, 1968).

After Independence many changes came about in the Indian Government's industrial policies. The rapid industrialization that took place gave an impetus to engineers to start technical consultancy organizations. The Industrial Policy Resolution (IPR) of 1956 marked a significant turning point in the

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industrial development of India and the Scientific Policy Resolution enunciated in 1958 particularly focused on the development of science and technology. A good number of TCOs were started during the period 1957-77 (DSIR, 1986; NACE, 1985). Table 1 provides data on the number of TCOs set up during different periods. It is interesting to note that of the 94 TCOs for which published information was available only five had been set up prior to Independence and of the remaining 89, 67 were established during the period 1957-1977.

Table 1
Period of Establishment of TCOs

Sl. No.	Time period	No. of TCOs
1	Upto 1947	5
2	1947 - 1957	4
3	1957 - 1967	32
4	1967 - 1977	35
5	1977 - 1987	15
6	Not available	3
Total		94

Source: Prepared from information provided in:

1. Department of Scientific & Industrial Research, Consultancy, Directory of Consultancy Organizations (New Delhi) 1986.
2. National Association of Consulting Engineers, Directory of Members, (New Delhi), 1985.

From 1970 onwards, the Industrial Development Bank of India (IDBI) started setting up TCOs for the development of small scale industries in every state (Bhatt, 1981). The TCOs performed

multiple functions like rendering project consultancy and detailed engineering services; developing industrial estates and entrepreneurs; and transferring technology for industrial development in backward areas. At the state level they were supervised by an inter-institutional group comprising representatives of commercial banks, state industrial development corporations, state financial corporations, and representatives of IDBI, Industrial Credit and Investment Corporation of India (ICICI), and Industrial Finance Corporation of India (IFCI).

Despite the involvement of various financial institutions in the development of TCOs a need to establish a separate organization for facilitating export and import was felt and the Export and Import Bank (EXIM Bank) was set up during the second half of 1981. It was involved in making financial arrangements for a variety of Indian projects abroad like power plants, cement, railways, agro-based industries, infrastructure related projects, etc., which had a major technology component (EXIM Bank, 1986). On the recommendation of the Government appointed Committee on Technical Consultancy Services in 1970, the National Association of Consulting Engineers (NACE) was established in 1976 to fill the need for an all India institution which could lay down proper standards of education, experience and capability (Economic Times, 25 September, 1970). The Federation of Indian Export Organization (FIEO), set up under the Ministry of Commerce was also intimately involved in the development of technical consultancy organizations. It contributed to the development of TCOs by assisting in their efforts to export consultancy services.

2. Scope of the Study

Given the importance of TCOs to India's economic development there seemed to be a paucity of systematic research in this field. Betrabet (1982) mentioned that only a few studies had been undertaken on consultancy organizations in India. This paper, an off-shoot of a larger study of the development of technology and its export from India undertaken by the first author, examined various aspects of 94 TCOs. It covered aspects related to location, ownership, type of manpower, fields of activity, patterns of diversification, scope of services, level of technology, and the major problems faced by them. The study is based on published information and questionnaires filled up by 12 consultancy firms. Some case studies written as a part of the study on technology export mentioned earlier were also useful sources of data.

3. Location of TCOs

Location and geographical proximity of TCOs to clients seemed to play a significant role in their development. Easy accessibility to entrepreneurs, industrialists, and other clients enhances their probability of getting more projects. Information on geographical location of TCOs is given in Table 2.

Most of the TCOs had their head offices in the four major metropolitan cities with the maximum number at Delhi (30.8 per cent) followed by Bombay (25 per cent), Calcutta (14.9 per cent) and Madras (4.3 per cent). Besides, 48.8 per cent of branch offices of some of the TCOs were also located in these four cities.

TCOs having head offices in other major cities accounted for 24.5 per cent of the total. They are located in Hyderabad, Jaipur, Bangalore, Pune, Ahmedabad, Ranchi, etc. Head offices of government owned TCOs were generally located in metropolitan cities for better administration; for example, the head offices of Rail India Technical and Economic Services Limited (RITES) and Water & Power Consultancy Services (India) Limited, were in Delhi. Location of TCOs also seemed to depend upon regional resource endowment. For instance, the head offices of the Central Mine Planning & Design Institute and Metallurgical Consultants were in Ranchi, however their branch offices were located in the four major metropolitan cities.

Table 2
Geographical Location of TCOs

Sl. No.	Location	No. of Head/ Branch offices	% of Total
<u>I. Head Office</u>			
1	Bombay	24	25.5
2	Calcutta	14	14.9
3	Delhi	29	30.8
4	Madras	4	4.3
5	Other Indian cities/ major towns	23	24.5
Total		94	100.0
<u>II. Branch Offices</u>			
1	4 major metropolitan cities in India	82	48.8
2	Other cities/major towns in India	48	28.6
3	Cities/towns abroad	38	22.6
Total		168	100.0

Table 3
Ownership and Status of TCOs

Sl. No.	Type of TCOs	No. of TCOs	% of total TCOs
1	<u>Private</u>	75	100.0
	a. Affiliated to parent	22	29.4
	b. Independent status	53	70.6
2	<u>Government</u>	19	100.00
	a. Affiliated to parent company	4	21.1
	b. Independent status	15	78.9

Some TCOs had branch offices in foreign countries also. Development Consultants, (DCPL) foreign offices were located in Egypt, Iran, Libya, Phillipines, Syria, Singapore, Tanzania, U.K., U.S.A., and Venezuela. The company had secured a variety of projects from these countries. Initially, DCPL had only site offices for the projects undertaken in some of these countries, which in course of time became permanent branch offices.

4. Ownership and Status

TCOs were independent or affiliated to parent companies which were either government or privately owned. Data on status and ownership of TCOs is provided in Table 3. The percentage of TCOs affiliated to privately owned parent companies was 29.4 per cent whereas that of government owned was 21.1 per cent. The parent company of a TCO was either a consulting firm or a manufacturing enterprise. Consider the case of Development Consultants Group. The company originally started as a branch of the Kuljian Corporation, USA in 1949. In the year 1961, the company was renamed Kuljian India. In course of time, the

company terminated its collaboration agreement with the parent company and changed the name to Development Consultants Private Limited, a wholly Indian owned company. The Development Consultants Group comprised the Development Consultants Private Limited (DCPL), Development Consultants International Limited (DCIL), and the New York based America Development Consultants (AmDC) Company. The parent company may also be a manufacturing unit. For instance, HMT (International) Limited, was an affiliate of HMT Limited, a public sector manufacturing company. Some manufacturing companies had separate consultancy divisions. For example, the Tata Iron and Steel Company Limited (TISCO) and Associated Cement Companies (ACC) had consultancy divisions which functioned as TCOs. Some of the Indian TCOs were affiliated to parent companies abroad. Holtec Engineers Private Limited was affiliated to a Swiss Company, and Arjay Management Private Limited was associated with Boasard Consultants, Paris. Some consultancy organizations were originally set up under parent organizations and later spun off into independent TCOs. For instance, Pallavan Transport Consultancy Services Limited was initially set up as a part of the Pallavan Transport Corporation, Madras, but later separated. The company was later separated.

Most of the consultancy organizations in India - 70.6 per cent government, 70.1 per cent private - have independent status. Independent consultancy organizations were autonomous. They had no corporate, financial or other links with process or equipment suppliers and contractors, business houses or other commercial

activities. For example, MN Dastur & Company, one of the largest private TCOs in India did not have any financial ties with suppliers of process know-how and equipment manufacturers. The company maintained its independent status scrupulously in the interest of the client. Some of the independent TCOs like Engineers India Limited and Engineering Projects India Limited however, supplied equipments and machinery.

Technical Staff

The primary asset of a TCO was its professional staff comprising engineers, technicians, scientists, and other specialists. Its technical competence and expertise was measured by the number of trained, experienced, and qualified personnel from multi-disciplinary streams a firm had. The number of technical staff in Indian TCOs is given in Table 4. The number in the private TCOs varied from four in Four Eyes Consultants Private Limited to 1600 in M.N.Dastur Private Company Limited.

In the government sector, the number ranged from 32 in ATIRA to 3537 in Water and Power Consultancy Services (India) Limited. It is evident from the figures that there was great variation between the consultancy organizations in terms of their staff strength. This was reflected in the nature of activities and the volume of work undertaken by them.

6. Fields of Activity

TCOs covered a wide spectrum of activities in various sectors and sub-sectors. Broadly, the five major sectors were agriculture, industry, natural resources, public utilities, and transportation. Both public utilities and transportation could be

grouped under social and economic infrastructure or the tertiary sector. The areas covered under various sectors by TCOs are given in Table 5.

Table 4

Technical Staff in TCOs

Sl. No.	Type of TCOs	No. of TCOs	Total technical staff	Average no. of technical staff per TCO
1	<u>Private</u>			
a.	Small	42	1678	40
b.	Medium	15	3241	228
c.	Large	3	2668	889
d.	Very large	2	2791	1396
2	<u>Government</u>			
a.	Small	1	32	32
b.	Medium	7	1969	281
c.	Large	2	1406	703
d.	Very large	4	12346	3087

Out of 75 private and 19 government TCOs, data related to technical staff was available only for 62 and 14 TCOs. The small; medium; large and very large represent TCOs' technical staff ranging between 1 -100; 100 - 500; 500 - 1000 and above 1000 respectively.

6.1 Agricultural Sector Most (50 per cent) of the TCOs involved in this sector (20) had rendered services pertaining to irrigation and about 45 per cent in agricultural development activities like land reclamation, land reforms, averting soil erosion, etc. TCOs in agriculture had also provided services for landscaping and silviculture. For example, the Agricultural Finance Corporation Limited undertook consultancy projects for member banks, private corporations, and international financial agencies. The Jaipur based Haq Consultants had developed a number

of rural and regional development plans for irrigation. The company claimed to have completed 1400 projects.

Table 5

TCOs rendering services under different sector and sub-sectors

Sl. No.	Sectors and sub-sectors	No. of TCOs	% of total TCOs in sector
I	<u>Agriculture</u>	20	100.0
1	Agricultural development	9	45.0
2	Irrigation and water supply	10	50.0
3	Dairy and livestock	3	15.0
4	Fisheries	3	15.0
5	Forestry/social forestry	2	10.0
6	Horticulture	2	10.0
7	Rural development	5	25.0
8	Non conventional energy related to agriculture	2	10.0
9	Others	5	25.0
II	<u>Industry</u>	90	100.0
1	Power generation and power distribution	20	22.2
2	Chemicals, petrochemicals, fertilizers, pharmaceuticals and pesticides	31	34.4
3	Cement and construction materials	17	18.9
4	Agro based industries	32	35.6
5	Textiles/man-made fibres	11	12.2
6	Light engineering goods	30	33.3
7	Automobiles	5	5.6
8	Electronics/computer	18	20.0
9	Heavy engineering	16	17.8
10	Architecture/civil engineering	35	38.9
11	Steel and other metallurgical industries	27	30.0
12	Pollution control and environmental engineering	22	24.4
13	Others	9	10.0

Table 5 (contd.)

III	<u>Natural resources</u>	30	100.0
1	Mineral exploration/beneficiation/ mining	13	43.3
2	Coal	10	33.3
3	Oil and natural gas	13	43.3
4	Soil survey	8	26.7
5	Ground water and water resources	8	26.7
6	Others	1	3.3

IV	<u>Public Utilities</u>	43	100.0
1	Water supply and distribution	20	46.5
2	Waste water treatment/sewerage	22	51.2
3	Dams	5	11.6
4	Gas pipelines/distribution	6	14.0
5	Air conditioning/refrigeration	4	9.3
6	Urban development/Town planning/ Housing	31	72.1
7	Hospitals and health services	8	18.6
8	Others	1	2.3

V	<u>Transportation</u>	31	100.0
1	Highways/roads/bridges	15	48.4
2	Road transport	5	16.1
3	Airport	8	25.8
4	Railways and locomotives	6	19.4
5	Ports/inland and sea water ways	17	54.8

Most (90 out of 94 organization) of the TCOs claimed to have rendered services to this sector, which comprised the following: Power generation and power distribution; chemicals and petrochemicals, cement and construction materials, agro-based industries, textiles, light engineering goods, automobiles, electronics and computers, heavy engineering, architecture and civil engineering, steel and other metallurgical industries, and

pollution control and environmental engineering. According to Dastur (1978), "India is well advanced in many engineering fields including such sophisticated ones as nuclear engineering and electronics. Despite a few gaps in machine building capacity, it is in a position to produce plant and equipment for a number of industries like sugar, textiles, chemical equipments".

6.2 Industry Some of the TCOs rendered consultancy services in the industrial sector only. For instance, the National Industrial Development Corporation (NIDC) provided technical services to a number of sub sectors like chemicals, metallurgical and mineral based industries, paper and pulp, textiles, etc. Kerala Industrial and Technical Consultancy Organization (KITCO) catered to small scale industries in backward areas of Kerala. Some of the TCOs were specialized in only one sub-sector. Some TCOs were well equipped to render the whole spectrum of services from feasibility report preparation to commissioning of plant. Consider a few examples J.P. Mukherji and Associates had confined itself to only sugar related areas. It had specialized in introducing new methods for cane crushing and improving sugar quality. Bhargava Consultants Private Limited and Parkhe Consultants Limited catered to only paper and pulp industries. In the public sector CMC Limited had specialized in computer related systems consultancy and engineering.

About 38.9 per cent of the TCOs in the industrial sector had offered consultancy services in architecture and civil engineering covering areas like naval architecture, industrial architecture, architecture for commercial complexes and

residential buildings, etc. For instance, AFCCO Industrial and Chemical Limited had specialized in naval architecture.

TCOs specializing in agro-based industries (35.6 per cent) had predominantly covered paper and pulp, and sugar industries. For instance, Hangel Paper Consultants had specialized in setting up small size low cost pulp and paper mills and had given technical assistance to large paper and pulp projects. Firms in this sub sector had also rendered consultancy services in food processing industries like fishery, brewery, winery, confectionery, frozen snack foods, etc. Suman Food Consultants was an example of such a firm.

TCOs providing technical services to chemical industries encompassed a variety of chemicals, petrochemicals, pharmaceuticals, fertilizers, and pesticides. For instance, Knik Chemical Engineers Private Limited had rendered services to a variety of chemical manufacturing units like ethyl benzene, titanium-dioxide, diethyl aniline plants, etc.

About 33.3 per cent of the TCOs had offered services to manufacturers of light engineering goods like pipe laying machinery, refractories, industrial structures, tools, TV towers, pneumatic conveying systems, ship off-shore equipment. The public sector TCO, HMT (International) Limited a subsidiary of HMT Limited had rendered services for manufacturers of machine tools and its accessories, press brakes, ball roller bearing, etc. Among private sector TCOs, Gammon India Limited, had provided services to firms manufacturing cables, industrial structures, prestressed horizontal silos etc.

In steel and metallurgical industries M.N.Dastur & Company the first Indian consulting firm for the iron and steel industry had played a pivotal role in the development of metallurgical industry. One of the largest public sector TCOs, Metallurgical Consultants (MECON) had provided technical services to a number of public sector iron and steel, aluminium, copper and other non-ferrous metal units in India and abroad.

About 24.4 per cent of the TCOs providing technical services in the areas of pollution control and environmental engineering had covered the broad areas of air, water, noise and lithospheric pollution. For instance, Environmental Engineering Consultants had experience in the fields of industrial waste water collection, treatment, disposal, and recovery.

A good proportion of Indian TCOs (22.2 per cent) offered technical services to hydel, thermal, nuclear and captive diesel power plants. They also covered power distribution systems. For instance, Desein (New Delhi) Private Limited had provided services in this field to thermal and hydro electric power plants.

One among every five TCOs (20 per cent) in the industrial sector provided services in the field of electronics and computers. For instance, Computer Maintenance Corporation (CMC) Limited; a public sector company and Tata Consultancy Services, a private sector company had developed computer software and hardware packages for application in various government and private organizations.

TCOs rendering services in the field of cement and construction materials (18.9 per cent) provided engineering

services upto the stage of plant commissioning, research on cement grade limestone reserves, and development of other construction materials namely bricks, castables, catalysts and absorbents. A typical firm was the Cement Corporation of India, a public sector company.

In textiles (covered by 12 per cent of the TCOs) Gherzi Eastern Limited had offered services in weaving, spinning, processing and embroidery techniques related to synthetic and cotton fibres. The Ahmedabad Textile Industries Research Association (ATIRA), a government owned TCO was a research-cum-consultancy organization. Its research and development unit aimed at optimization of new and existing processes and development of equipments for textile mills.

Indian TCOs (5.6 per cent) like M.M. Suri & Associates had provided services to manufacturers of four-wheelers like tractors and trucks, internal combustion engines and two-wheelers. In addition to all these sub sectors, Indian TCOs in the industrial sector had also provided services in the areas of telecommunication, plastics industry, and nuclear power, cement machinery, bulk material handling systems, etc.

6.3 Natural Resources This subsector covered areas like mineral exploration covering coal, oil and natural gas; soil survey; ground water, etc. About 43.3 per cent of the TCOs had rendered services pertaining to mineral exploration, beneficiation and mining. For instance, the Central Mine Planning & Design Institute Limited, the consultancy division of Coal India Limited, had covered areas like planning and designing of new

underground and surface mines, reorganization of existing mines and mining related infrastructural development (like surface telecommunication for mines). In order to avert environmental degradation due to mineral excavation, environmental safety engineering had also been covered by this TCO. McNally Bharat Engineering Company a private sector company had specialized in providing services in the areas of coal washeries, bulk coal handling, coal preparation plants, and wet and dry coal grinding systems, etc.

TCOs covering the oil and natural gas sub sector like Associated Enterprises, ICB Private Limited, etc., had provided services to related off-shore oil drilling and petroleum refining. Geology and water resources had been covered by 26.7 per cent of the TCOs. Geotech Consultants Private Limited had carried out a number of geotechnical surveys and soil engineering services. Haq Consultants had undertaken hydrographic surveys for locating ground water potential. The National Mineral Development Corporation besides rendering services for the excavation of a variety of mineral resources, was also operating the only diamond mine in India.

This sub sector covered 7 major sub-sectors; water supply and distribution; waste water treatment and sewerage; dams; gas pipelines and distribution; air conditioning and refrigeration; urban development, town planning and housing, and hospitals and public health.

6.4 Public Utilities About 72.1 per cent of the TCOs in the public utilities area had provided services related to urban

development/town planning and housing encompassing construction of residential, commercial and industrial complexes; urban community development programmes; preparation of master development plans covering schools, parks, playground, recreation centres, residential, commercial and industrial locations, road network etc. A number of private sector TCOs like Architects Collaborated, Bhagvati Associates, Consulting Engineering Services (India) Limited, MN Dastur & Company etc., had been involved in urban development programme.

Sewerage and water supply related services had been covered by 51.2 per cent and 46.5 per cent of the TCOs respectively. Environmental Engineering Consultants, Kirloskar Consultants, DCPL, IEG Consultants had provided services in water distribution system, construction of water tanks, sewage disposal, and water treatment.

Public health services - gas distribution, construction of dams, air conditioning and refrigeration had been covered by 18.6, 14, 11.6 and 9.3 per cent of TCOs respectively. For instance, Maser Private Limited had rendered public health and sanitation services. Projects related to gas distribution system, especially laying of gas pipe lines and supply of petroleum gas are predominantly undertaken by major TCOs like Engineers India Limited, MN Dastur & Company, MECON, Tata Consulting Engineers, etc. TCOs like Gilcon Project Services Limited, provided services for construction of dams and water reservoirs. Desein (New Delhi) Private Limited, had rendered services related to air conditioning and ventilation.

6.5 Transportation: A large number of TCOs (54.8 per cent) had provided services in ocean engineering, harbour engineering and maintenance, construction and electrification of ports, construction of jetty and barges and technical services for sea and inland navigation and ferry services. Howe (India) Private Limited, had undertaken a number of projects for Nhava Sheva Port Trust and Port Trusts of Vizag, Madras and Mormugao. About 48.4 per cent of the TCOs had provided services for construction of new bridges, highways, express ways and other arterial roads, and maintenance of existing ones. For example, Gilcon Project Services Limited had provided services to construct a number of flyovers and bridges in India and abroad.

Indian TCOs had also provided services related to airport (25.8 per cent), railway (19.4 per cent), and road transport development (16.1 per cent). Government owned TCOs had contributed more in these three sub-sectors than the private ones. The International Airport Authority of India had done a number of airport related projects in India and abroad. RITES had rendered a variety of services for construction of railway tracks and new railway links. The Government of Tamil Nadu owned Pallavan Transport Consultancy Services Limited had provided a number of services for traffic engineering and road transport development.

Besides, some of the private TCOs like Gilcon Projects Limited and Hangal Paper Consultants Limited etc., claimed to have rendered services for constructing airport hangers. The operations Research Group had done a number of road traffic

surveys.

Over the years with the progress of economic activities in the country there had been an ever increasing demand for technical consultancy services in a variety of spheres. Consultancy firms had responded by diversifying their fields of activity.

7. Patterns of Diversification

An UNCTAD report stated; "As industrialization progresses, a country does not merely duplicate its existing industries, but moves into a wider range of industries, most of which require large inputs of design and engineering services". (UNCTAD, 1978). Tables 6 and 7 provide a picture of the patterns of diversification in the Indian consultancy industry.

Table 6

Diversification Strategy in Different Sectors*

Sl. No.	Sectors	No. of TCOs	% of Total
I	<u>Intra sectoral diversification</u>		
1.	<u>Agriculture</u>		
	a. Low diversification	18	90.0
	b. Medium diversification	-	-
	c. High diversification	2	10.0
	Total TCOs	20	100.0
2.	<u>Industry</u>		
	a. Low diversification	70	77.8
	b. Medium diversification	18	20.0
	c. High diversification	2	2.2
	Total TCOs	90	100.0

Table 6 (contd.)

<u>3. Natural resources</u>			
a. Low diversification		23	76.7
b. Medium diversification		7	23.3
c. High diversification		-	-

		30	100.0
 <u>4. Public utilities</u>			
a. Low diversification		37	86.6
b. Medium diversification		6	14.0
c. High diversification		-	-

	Total TCOs	43	100.0
 <u>5. Transportation</u>			
a. Low diversification		25	80.7
b. Medium diversification		5	16.1
c. High diversification		1	3.2

	Total TCOs	31	100.0
 II <u>Inter sectoral diversification</u>			
a. Low diversification		58	61.7
b. Medium diversification		32	34.0
c. High diversification		4	4.3

	Total number of TCOs	94	100.0

* Legend

Sl.No.	Sectors	Involvement in Number of Subsectors		
		Low	Medium	High
1	Agriculture	1-3	4-5	6-9
2	Industry	1-4	5-8	9-13
3	Natural resources	1-2	3-4	5-6
4	Public utilities	1-3	4-6	7-8
5	Transportation	1-2	3-4	5
6	Inter sectors	1-2	3-4	5

Table 7
Intra sectoral and inter sectoral diversification and turnover of TCOs

Turnover (Rs. in lakhs)	No. of TCOs	Intra sectoral diversification												Inter sectoral diversification								
		Agriculture			Industry			Natural resources			Public utilities			Transportation			Low Med- ium	High	Low Med- ium	High		
		Low ium	Med- ium	High	Low ium	Med- ium	High	Low ium	Med- ium	High	Low ium	Med- ium	High	Low ium	Med- ium	High						
0 - 50	Pvt. 12 Govt. 2	-	-	9	3	-	-	3	-	-	6	-	-	3	-	-	3	-	-	7	5	-
50-100	Pvt. 5 Govt. 1	-	-	3	2	-	-	1	-	-	2	2	-	-	-	-	2	-	-	3	2	-
100-500	Pvt. 6 Govt. 2	1	-	3	3	-	-	2	-	-	2	1	-	-	-	-	4	-	-	3	3	-
500-1000	Pvt. 2 Govt. 1	-	-	-	-	2	-	1	1	-	-	1	1	-	-	-	-	-	-	-	2	-
1000 and above	Pvt. 2 Govt. 3	-	-	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-
		-	-	-	2	-	-	2	-	-	3	-	-	-	-	-	1	-	-	1	2	-

7.1 Intrasectoral Diversification Intrasectoral diversification refers to diversification of activities from one sub-sector to another within a broader sector. This type of diversification could be technologically related or unrelated to existing activities. In order to measure the intrasectoral diversification strategy, a yard stick was been devised. The extent of diversification was categorized into 3 categories; low, medium, and high. The classification scheme devised was somewhat subjective, as it was based on the researchers' judgement as to the nature of diversification strategy adopted by a firm. For example, involvement in upto 3 sub-sectors in agriculture was considered to be in the low category, upto five sub-sectors as medium and six to nine as high. Among the 20 TCOs in agriculture, 90 per cent had rendered services in upto three sectors and so were clubbed in the "low diversification strategy" category. For instance, the functional coverage of IEG Consultants Private Limited was only in two sub-sectors -- irrigation and livestock. In the industrial sector, 77.8 per cent of the TCOs had offered technical services in 4 sub sectors out of 13 and so were considered as having low diversification. For example, Knik Chemical Engineers Private Limited had specialized in chemicals and architecture. About 76.7 per cent of the TCOs in the natural resources sector had diversified in two sub-sectors, e.g., Environmental Engineering Consultants had provided services only in ground water resources. About 86 per cent of TCOs in public utilities had offered services in three sub-sectors. For instance, Gherzi Eastern Limited had confined

its services for the preparation of development plans related to town development, and construction of housing colonies. As far as the transport sector was concerned, 80.7 per cent of the TCOs had provided services in two sectors. For example, Sanghi & Associates had provided services for the maintenance of highways and development of ports.

Most of the "low" diversified private sector TCOs had an annual turnover of less than Rs. 50 lakhs (Table 7). Among the five private TCOs with annual turnover between Rs.50 and 100 lakhs, three had "low" diversification in industry, one in natural resources and two each in the public utilities and transport sectors. It is evident from Table 6 that in all the sectors the "low diversification" category was the most predominant. After that came the "medium" diversification category and the "high" diversification strategy seemed to be the least preferred. Medium level of diversification implies moderate coverage within a broad sector. In the industrial sector, 20 per cent of the TCOs had covered five to eight sub-sectors. For instance a private TCO, Humphrey & Glasgow Consultants Private Limited provided services in the areas of heavy chemicals, mechanical handling, cement companies, environmental engineering, and plastic industries. It had an annual turnover of Rs. 250 lakhs. A government TCO, Engineering Projects India Limited had diversified in to six sub-sectors and had an annual turnover of Rs.3,899 lakhs.

The natural resources sector had the maximum of 23.3 per cent of TCOs diversified at the medium level i.e. in three to four sub-sectors. For instance, M.N. Dastur & Company had

rendered services in three sub-sectors namely mining and mineral beneficiation, coal, oil and gas with a turnover of Rs.942 lakhs. In the public utilities sector, 16.1 per cent of the TCOs like Mahendra Raj Private Limited, had a moderate level of diversification.

High intrasectoral diversification refers to wide coverage of sub-sectors. About 10 per cent of TCOs in agricultural sector had covered six to nine sub-sectors. For instance, Multi Projects and Development Consultancy Private Limited had diversified into seven sub-sectors, viz; agricultural development, irrigation, dairy development, fishery, forestry, rural development, and sericulture. In the industrial sector, 2.2 per cent of TCOs had covered nine to thirteen sub-sectors. For instance, M.N. Dastur & Company and DCPL had diversified into 11 and 10 sub-sectors respectively covering major areas like iron and steel, metallurgical industries, power generation equipments, chemicals, paper & pulp, electronics, heavy engineering, etc. Their annual turnover are Rs.942 lakhs and Rs.700 lakhs respectively. Only one TCO in the transport sector, Rail India Technical and Economic Services Limited (RITES) with an annual turnover of Rs. 1942 lakhs had covered all sub sectors - highways, road transport, airport, railways, port development, and water ways. TCOs in natural resources and public utilities sectors had not pursued a "high diversification" strategy.

7.2 Inter-sectoral Diversification Inter-sectoral diversification refers to the involvement in activities across the five

different sectors. Generally the sub-sectors covered by TCOs across different sectors are technologically unrelated, which implies that skills may not be transferable easily when a firm diversifies in this manner. In spite of this, sometimes TCOs may follow technologically related diversification across sectors also. For instance, MECON had rendered technical services related to integrated iron and steel plants, aluminium, copper, and other non-ferrous metal industries in the industry sector along with only certain related sub-sectors in natural resources like mining, mineral exploration, and coal excavation.

A yardstick was developed to measure the extent of inter-sectoral diversification. If a TCO covered two sectors out of the maximum of five in the low inter-sectoral diversification category; if it covered three or four sectors it was classified as medium level diversification, and if all sectors were covered then the TCO was classified under high diversification category.

Most of the TCOs, i.e. 61.7 per cent in India had not covered more than two sectors i.e. they had preferred to pursue a low inter-sectoral diversification strategy. For example, Mehta Gandhi & Associates had rendered services mainly in two sectors - industry and public utilities. However low inter-sectoral diversification does not necessarily imply low turnover (Table 7). Annual turnover of seven TCOs in the low inter-sectoral diversification category was less than Rs. 50 lakhs. Two low inter-sectorally diversified private TCOs, ICB Private Limited, and Simon Carves India Limited and a public sector TCO, RITES however had more than Rs. 100 million turnover per annum.

About 35.1 per cent of Indian TCOs had medium level diversification. Most of the internationally reputed private TCOs like Tata Consulting Engineers, M.N. Dastur & Company, DCPL; and government owned TCOs like EPIL, WPCS Limited etc., had preferred to follow a moderate level of inter-sectoral diversification.

According to available data only four TCOs had diversified their activities into all the five sectors. They were Mahendra Raj Consultants Private Limited, Operations Research Group, Price Water House & Company, and Span Consultants Private Limited.

Interestingly, these TCOs had diversified haphazardly into few sub-sectors across all five sectors. For instance, Operations Research Group, a private sector TCO had low intra-sectoral diversification strategy in all sectors. It had covered two sub-sectors in agriculture, three in industry, one in natural resources, three in public utilities, and two in transportation despite its claim of having high inter-sectoral diversification (five sectors).

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8. Scope of Services

The type of services provided by TCOs covered a broad spectrum of activities. Technical consultancy services in general, could be classified into five major groups (UNCTAD, 1978).

- (i) Design and engineering services generally comprising a wide range of integrated services performed by consultants for the planning and implementation of an

industrial project through its successive phases from concept to completion;

- (ii) Technological services pertaining to product and process development and adaptation, development of new uses for local raw materials, by product and waste product utilization, etc.;
- (iii) Economic services covering all economic planning, industrial and sectoral planning, market studies and demand forecasts, financial and social cost-benefit analysis, etc.;
- (iv) Management services relating to general management problems of industrial enterprises such as production planning and control, marketing and distribution, corporate planning and administration, budgetary/financial control etc; and
- (v) Training and manpower development services including identification of the training needs and objectives, design and implementation of training programme at all levels for executives foremen and supervisors, plant operatives etc.

Services rendered by TCOs have been depicted in Table 8. The scope of services offered by the firms and their turnover are depicted in Table 9. Broadly, consultancy services are divided into technical and other related services. The eight-fold classification of technical services comprise (i) pre-investment and feasibility study preparation, (ii) detailed project reports, (iii) detailed designs, engineering, drawings and tender

documents, (iv) procurement of machinery, raw materials and equipments, (v) complete construction, supervision, erection and commissioning of plants, (vi) initial operation and maintenance, (vii) manpower training, and (viii) other technical services. The other related services consist of (i) market survey/economic investigation, (ii) management consultancy, and (iii) other services.

Pre-investment studies and/or feasibility studies are essentially conducted to examine the viability of projects. It is the basis for a planned project. It includes investigations like market viability for products, cost of raw material and other outlay, site suitability, rational product-mix, input-output ratio, forecasting of profit, etc. The approach of pre-investment studies may differ from one sector (say, agriculture) to another sector (industry). Most of the TCOs (90.4 per cent) were found to have done pre-investment studies. About 75.5 per cent of the TCOs had been involved in preparing detailed project reports. Out of 12 private TCOs having annual turnover of less than Rs.50 lakhs, 10 organizations had prepared detailed reports (Table 9).

Like pre-investment study, 90.4 per cent of the TCOs had also prepared detailed designs, engineering drawings, and had bid for tenders. They had at times covered the entire spectrum of production processes. TCOs generally commenced preparation of designs, engineering drawing etc., after the client organization had approved the feasibility and/or detailed project report.

Table 8

Type of services rendered by Indian TCOs

Sl.No.	Type of services	No. of TCOs	% of Total TCOs
I	<u>Technical</u>		
1.	Pre investment and feasibility studies	85	90.4
2.	Detailed project report preparation	71	75.5
3.	Preparation of detailed designs/ engineering/drawings/tender documents	85	90.4
4.	Procurement of machinery/raw materials/ equipments	41	43.6
5.	Complete construction/supervision/ erection/commissioning of plant	67	71.3
6.	Initial operation and maintenance	42	44.7
7.	Manpower training	25	26.5
8.	Other technical services	26	27.7
II	<u>Other related services</u>		
1.	Market survey/economic investigations	46	48.9
2.	Management consultancy	64	68.1
3.	Others	5	5.3

In some cases, TCOs had done projects without pre-investment and detailed project reports (which might have been done by other TCOs or clients themselves). Most of the TCOs irrespective of the size of their turnover were found to have undertaken these services. About 44 per cent of the TCOs had procured machinery/raw materials/equipments according to clients' specifications. TCOs having more than Rs.100 lakhs annual turnover had also procured equipments, machinery, and raw material for their clients. About 50 per cent of the TCOs with less than Rs.50 lakhs annual turnover had also been involved in providing this service. For instance, Chemical & Metallurgical

Scope of services and turnover of T C Os

Turnover (Rs. in Lakhs)	Owner	No. of TCOs	Type of services							
			Pre-invest- ment/feasi- bility study	Detailed project report prepara- tion	Detailed engineer- ing/desi- gns tender documents	Procurement of machinery/ equipment raw materials	Complete cons- truction; erec- tion; supervi- sion/commi- ssioning	Initial Man- opera- & Main- tenance	power train- ing	Others (research & development soil engi- neering, master plan)
0-50	Private Govern- ment	12	12	10	12	6	9	8	-	2
		-	-	-	-	-	-	-	-	-
50-100	Private Govern- ment	5	5	4	4	2	5	1	-	2
		-	-	-	-	-	-	-	-	-
100-500	Private Govern- ment	6	5	2	6	4	4	2	1	2
		2	2	2	2	-	2	1	2	1
500-1000	Private Govern- ment	2	2	2	2	2	2	2	2	1
		-	-	-	-	-	-	-	-	-
1000 and above	Private Govern- ment	2	2	2	2	2	2	2	-	-
		3	2	2	3	3	3	2	2	1

Design Company (P) Limited whose annual turnover was only Rs.28 lakhs had provided procurement assistance.

Complete construction, erection, supervision and commissioning of project had been undertaken by 71.3 per cent of the Indian TCOs. Size did not seem to be correlated with a firm's involvement in this kind of activity. For instance, United Consultants (India) Private Limited, a TCO with an annual turnover of only Rs.20 lakhs had rendered services for supervision of construction of steel melting and billet casting plants, and expansion of rolling mills. Tata Consulting Engineers with a Rs. 500 lakhs annual turnover had undertaken projects ranging from supervision of dismantling of old plant, inspection, expediting, plant construction, start-up and commissioning of a Dimethyl Terephthalatic (DMT) plant in India.

It was observed that the two services - commissioning and initial operation - were intertwined. About 44.7 per cent of the TCOs had been involved in initial operation and maintenance services. For instance, J.P. Mukherji & Consultants with an annual turnover of Rs.48 lakhs claimed to have rendered technical supervision, and monitoring services along with total erection and commissioning of projects.

Most of the earlier studies on technical consultancy organizations had grouped manpower training under a separate category. But training of technical personnel for total engineering, operation of machines and new systems, training for material handling and maintenance, etc., should be considered as a part of technical service. In India, only 26.5 per cent of the TCOs had provided training to client's personnel. ATIRA had

trained technicians and managers in the textile industry and CMC and Computernico India Limited had offered special training on computer networks for multi-purpose technical use to various sub-sectors.

About 28 per cent of the TCOs had rendered other related technical services like research and development, expansion of existing units, revival of sick units, systems consultancy, etc. Research and development encompassed a wide spectrum of activities like process engineering, new technology development, designing machinery and equipment, product development for clients, process control, cost reduction, etc. TCOs like DCPL had their own in-house R&D department, DCPL's R&D unit aimed at rendering high quality services and substituting imported technology. The company has obtained a number of patents.

TCOs had also rendered other related services like market survey, management consultancy and non-engineering services like development planning, financial assistance, loan syndication, etc.

About 49 per cent of the TCOs broadly covered services like raw material survey, socio-economic impact of existing products, cost-benefit analysis, etc. Quite often, economic investigation and feasibility studies were complementary to each other. Management consultancy services provided by TCOs (about 68 per cent) included corporate planning and strategy, production planning, marketing strategy, recruitment and management of personnel at all levels, cost control and financial management, etc.

9. Depth of Technical Services

By "depth of technical services" we mean the number of technical services provided by a TCO. A consultancy organization may be highly diversified within and across sectors, but if the "depth of services" is low, it would be a clear indication of relatively low level of technical competence. There is a direct relationship between depth of technical services and technical competence. Data on the depth of technical services is given in Table 10. Data on turnover was not available for all the firms. Table 11 categorises the firms for which data was available into two broad groups; private and government owned, vis-a-vis turnover. A subjective measure of depth of technical services was developed and the firms were categorized accordingly into three classes; low, medium and high depth.

If a TCO provided three technical services out of a maximum possible of eight it was considered to represent low depth. About 28 per cent of the TCOs had provided low depth of services. Most of the TCOs in this group had covered two services namely preparation of feasibility report and detailed engineering. For

Table 10

<u>Depth of Technical Services in TCOs</u>			
Sl. No.	Depth	No. of TCOs	% of Total
1	Low	27	28.7
2	Medium	49	52.1
3	High	18	19.2
Total		94	100.0

Out of 8 types of technical services, the range between 1 - 3 represents low depth; 4-6 represents medium depth and 7-8 stands for high depth of competence respectively.

Table 11

Depth of Services and Turnover of TCOs

Turnover Rs. in lakhs	Private			Government		
	Low	Medium	High	Low	Medium	High
0 - 50	1	11	-	-	-	-
50 - 100	-	5	-	-	-	-
100 - 500	3	2	1	-	1	1
500 - 1000	-	-	2	-	-	-
1000 and above	-	2	-	1	-	2
Total	4	20	3	1	1	3

Table 12

Technology level of TCO

Sl. No.	Level of technology	Number of TCOs	% of Total
1	Low technology	13	13.8
2	Medium technology	35	37.2
3	High technology	11	11.7
4	Low and medium technology	3	3.2
5	Medium and high technology	32	34.1
6	High and low technology	-	-
	Total	94	100

instance, a private TCO, TIMS Consultants Private Limited with an annual turnover of Rs.15 lakhs had prepared only pre-investment studies, detailed project reports, and designs and drawings. ATIRA, a government owned TCO rendered only two types of technical services; manpower training and research and development. Another public sector TCO, Engineering Projects (India) Limited with an annual turnover of Rs. 3899 lakhs was reported to have rendered only three types of services; detailed engineering, procurement of raw materials, and complete erection

and commissioning of plants. Despite its low depth, specialized skills were involved in providing the three services.

Most of the Indian TCOs (about 52 per cent) had medium depth of technical services or in other words covered a minimum of four to a maximum of six types of services. In the private sector, Sanghi and Associates with Rs.51 lakhs annual turnover had covered four types of services; preparation of feasibility studies, detailed project, detailed engineering, and complete erection and commissioning of plant. Another private TCO, Simon Carves India Limited with Rs. 1820 lakhs annual turnover was reported to have provided six types of services from pre-investment studies to complete erection and maintenance of fertilizer and paper plants. In the government sector, the technical consultancy cell of National Industrial Development Corporation (NIDC) had provided five types of services in a variety of industries (its turnover was only Rs. 142.9 lakhs per annum).

About 19 per cent of TCOs had a relatively high coverage of technical services, i.e., they covered seven to eight types of services. Some TCOs specializing in particular fields, for instance, Parkhe Consultants Private Limited provide complete technical services for paper and pulp plants from preparation of preliminary feasibility studies, project reports, designs, detailed engineering and plant specification, fabrication and procurement of machinery, erection and commissioning of plant, process, flow sheet, electrical specification, other infrastructural development to maintenance and training of personnel.

Three firms each in the private and government sectors were in the "high" depth category. They were DCPL, M.N. Dastur & Company, Tata Consulting Engineers, in the private sector and MECON, RITES, and WPCS (India) Limited in the public sector (Table 11). They covered a wide spectrum of technical services from feasibility report preparation to technical manpower training and other additional services like research and development (e.g. DCPL)

10. Level of Technology

Table 12 depicts data related to the technology level of Indian TCOs and Table 13 provides information on both, the level of technology and annual turnover. About 14 per cent of the Indian TCOs had provided services in low technology areas. All sub-sectors in agriculture, food processing industry, construction materials, textiles, light engineering goods manufacture, architecture, mineral exploration, soil survey, ground water resources; and all sub-sectors in public utilities except dam construction, road construction, highways, and road transport related services were considered as low technology areas. A large number of TCOs (about 37 per cent) provided services in medium technology areas like power generation and distribution, cement, sugar, textiles, paper and pulp, automobiles, light engineering, some heavy engineering goods, marine and industrial architecture, steel and metallurgical industries, environmental engineering, oil and natural gas, heavy civil construction like dams, airports, etc. Among medium technology oriented TCOs, four private TCOs had annual turnover

of less than Rs.50 lakhs and one government TCO had more than Rs.1000 lakhs annual turnover.

The proportion of high technology oriented TCOs was only around 12 per cent. The high technology areas required specialized skills due to their sophisticated nature. Industries like heavy chemicals, fertilizers, pharmaceuticals, pesticides, electronics and computer, nuclear energy were considered to be high-tech areas. TCOs like Tata Consulting Engineers, CMC Limited, Computronics India covered exclusively high-tech areas; computer software and hardware development, and their maintenance.

Next to medium level technology, about 34 per cent of the TCOs provided both medium as well as high technology related services. For instance, despite a relatively small turnover of only Rs.28 lakhs per annum, Chemical, Metallurgical & Design Company had rendered services in high-tech areas like chemicals and medium tech areas like pollution control equipments, etc. DCPL had provided services in high-tech areas like pollution control equipments, etc. DCPL had provided services in high-tech areas like nuclear power generation equipment, chemicals and electronics as well as medium level technology areas like cement, paper and pulp, light engineering industries, etc.

Only about 3 per cent of the TCOs were reported to have rendered technical services in low as well as medium level technology areas. For example, Ghosh, Bose and Associates Private Limited with Rs. 50.6 lakhs annual turnover rendered technical services in medium and low tech areas like

environmental engineering and architecture.

Table 13

Level of Technology and Turnover of TCOs

Turnover	Owner	No. of TCOs	Level of technology					
			Low	Medium	High	Low and medium	High and medium	High and low
0-50	Private	12	1	4	1	1	5	-
	Govt.	-	-	-	-	-	-	-
50-100	Private	5	-	1	1	1	2	-
	Govt.	-	-	-	-	-	-	-
100-500	Private	6	-	3	-	-	3	-
	Govt.	2	-	1	-	-	1	-
500-1000	Private	2	-	-	-	-	2	-
	Govt.	-	-	-	-	-	-	-
1000 and above	Private	2	-	-	-	-	2	-
	Govt.	3	-	1	-	-	2	-

11. Affiliation with National and International Organizations

Registration with national and international organizations and associations ensured wider recognition for TCOs and helped in securing new projects. Table 14 provides data on the registration of TCOs with various national and international organizations. In India, the Industrial Development Bank of India (IDBI) took initiative to set up TCOs in backward states. This has become a model of the involvement of financial institutions in the process of technological development in developing countries. Besides the TCOs set up by IDBI it had also helped other TCOs both in the private as well as public sectors. Twenty four TCOs were registered with Indian financial

institutions comprising of IDBI, ICICI, and IFCI. All these 24 TCOs had registered with IDBI, 9 with ICICI and 7 with IFCI.

Professional associations like FIED and NACE had laid down certain codes of conduct and ethics for the TCOs. All the TCOs (94) were registered with some professional associations; 75 with FIED and 48 with NACE. Some TCOs in the private sector like Kirloskar Consultants and public sector like National Mineral Development Corporation (NMDC) had enrolled themselves with both the associations. Some TCOs had also enrolled with other professional associations like Indian Road Congress, Computer Society of India, National Safety Council, Indian Council of Arbitration, National Association for Chemical Engineers, etc.

Nine TCOs had registered with a number of government departments and ministries like Ministry of Mines, Department of Agriculture, Department of Technology, and Department of

Table 14

TCOs registered with national and international organizations

Sl. No.	Organizations/associations registered	No. of TCOs
I	<u>National</u>	
1	<u>Financial Corporations</u>	24
	a. IDBI	24
	b. ICICI	9
	c. IFCI	7
2	<u>Professional Associates</u>	94
	a. FIED	75
	b. NACE	48
	c. Others	3
3	Government Departments/Ministries	9
4	Public Sector Enterprises	5

Table 14 (contd.)

II	<u>International</u>	
1	World Bank (IBRD)	30
2	UN Bodies	20
3	Asian Development Bank (A.D.B)	31
4	African Development Bank (Af.D.B)	8
5	Organizations in Asian region other than ADB	15
6	Organizations in African region other than Af. D.B.	5
7	Miscellaneous	8

Out of 94 TCOs, 35 and 38 TCOs are reported to have registered with national and international organizations respectively (except professional associations in India).

Scientific and industrial Research, etc. Some private TCOs had registered with public sector undertakings in the hope of getting more projects. For example, Sanghi & Associates, a private sector TCO has registered with the public sector TCOs like EIL, EPIL and NIDC.

On the international scene, 38 TCOs had registered with a number of organizations/associations. Most of the Indian TCOs in the private sector like Desein (New Delhi) Private Limited and public sector TCOs like MECON had registered themselves with the World Bank (IBRD).

The UN organizations with which TCOs had registered themselves were UNIDO, UNDP, FAO, WHO, UNCTAD, ILO, ESCAP, etc. For example, Bhargav Consultants Private Limited had registered itself with three UN organizations, namely, FAO, UNDP, and UNIDO.

12. Role of Indian TCOs Abroad

It is a matter of pride that Indian TCOs have now established a strong foot-hold in domestic and foreign markets. Besides

servicing domestic clients Indian TCOs have provided services to clients in other developing countries. The nature of problems faced by entrepreneurs or clients of other developing countries are more or less similar to those prevailing in India. Familiarity with local resources, socio-economic structure, alternative technologies and their appropriateness are unique strengths of Indian TCOs. Further, Indian TCOs have a large number of trained personnel in a variety of fields. The relatively lower salaries of personnel in Indian TCOs gives them a comparative cost advantage. Tikekar (1981), observes that "the rising costs of almost everything and shortage of trained manpower in developing countries and the booming scarcity of energy and materials resources in the world will open up new opportunities for Indian consultancy services in the home market as well as abroad".

The number of TCOs that had rendered services in India and abroad is given in Table 15. Their clients had varied from individuals and very small units to multinational giants both in the private and public sector. About 10 per cent of the Indian TCOs had also rendered technical services to technologically developed countries like Australia, Canada, France, F.R.G., G.D.R., Japan, Sweden, Switzerland, U.K., and U.S.A. For example, Gammon India Limited had rendered services like erection of desalination unit for Sumitomo Heavy Engineering Company Limited, Japan; construction of foodgrain silos for M/s. Fortschritt Landmaschinen, Berlin (GDR); and construction of jetty for M/s. Compagine Industries, Paris (France). No government owned TCO was reported to have offered services to

clients of developed countries.

The percentage of Indian TCOs providing technical services to clients in developing countries were as follows; about 40 per cent in the Middle East; followed about 36 per cent in South and

Table 15

Number of TCOs rendered services in India and abroad

Sl.No.	Location	No. of TCOs	% of Total TCOs
1	India	94	100.0
2	Developed countries	9	9.6
3	Middle East Asia	38	40.2
4	South and South East Asia	34	36.3
5	Africa	29	30.9
6	Latin America	5	5.3

Table 16

Export earnings from technical consultancy

Sl. No.	Year	Rs. in million
1	1970-71	10
2	1979-80	220
3	1980-81	251
4	1981-82	430
5	1982-83	530
6	1983-84	630
7	1984-85	570

Sources: 1. NACE; Workshop on Technical Consultancy: Status & Prospects (Report), 1982.

2. D.S.I.R; Technology Transfer & Trade (Report), 1986.

3. M.N. Dastur; International Projects and Export of Indian Consultancy Services (Article)

South East Asia, about 31 per cent in Africa and 5.3 per cent in Latin America.

The oil rich Middle East Asian region had the attracted attention of TCOs of the developed as well as developing countries due to their rapid development in recent times. Indian TCOs had also rendered variety of technical services to the Middle East countries like Abudhabi, Algeria, Bahrain, Iran, Iraq, Jordan, Oman, Kuwait, Saudi Arabia, U.A.E. and Yemen Arab Republic amidst fierce global competition. For instance, Associated Cement Company had prepared a feasibility report for the National Iranian Steel Corporation, Tehran. It had also undertaken turnkey services for the Kuwait Cement Company Limited and 2,00,000 TPY cement plant design to be commissioned for the Ministry of Industry, Iraq, etc. The public sector firm Engineers India Limited had provided a wide range of consultancy services from preparation of feasibility report to erection and commissioning of fertilizer, chemical and petro-chemical plants, and construction of oil and gas pipelines in Iraq, Algeria and AbuDhabi.

Indian TCOs had clients in South and South Asian region too. About 36 per cent of the TCOs had rendered technical services to small and major enterprises in countries like Afghanistan, Bangladesh, Bhutan, Burma, Fiji, Indonesia, Malaysia, Maldives, Nepal, Phillipines, Singapore, Sri Lanka, and Thailand. For instance, Holtec Engineers Private Limited had been involved in basic and detailed engineering services, procurement assistance, supervision of construction, erection and commissioning of complete projects for two cement plants in Indonesia and Bangladesh. The Government owned Water and Power Consultancy

Services (India) Limited had provided a variety of services like planning, providing design and specifications, quality control, field investigation, tender documents preparation, construction, supervision and maintenance of multipurpose hydel projects and dams in Afganistan, and Burma. Indian TCOs' major clients in the African region were from countries like Egypt, Ethiopia, Ghana, Kenya, Liberia, Libya, Nigeria, Somalia, Syria, Tanzania, Uganda, Zaire, Zambia, and Zimbabwe. For instance, a private sector TCO, J.P. Mukherji and Associates had provided services from pre-investment studies to commissioning for sugar related projects in Nigeria, Tanzania and Ethiopia. International Airports Authority of India had been engaged in providing consultancy services for a number of airport construction projects in Libya, Nauru, Tanzania, Mauritius.

Only a few Indian TCOs (5.3 per cent) had undertaken technical consultancy projects for Latin American clients and other nearby islands like West Indies and Cuba. Among the 94 TCOs, only two private sector TCOs, M.N. Dastur & Company and DCPL had undertaken a variety of services in almost all the major regions of the world; Middle East Asia, South East Asia, Africa, Latin America, and a few developed nations.

Indian TCOs' export earnings from technical consultancy is given in Table 16. This data was culled out from the available secondary sources. The earnings seems to be almost negligible in the context India's balance of payments position. It was very meagre during 1970-71, only Rs. 10 million. But recent times have shown an improvement in the foreign exchange earnings from export of technical services. During 1979-80, nearly 75 per cent

of the large value bids had been submitted to only three countries - Iraq (44%); Libya (17%) and Saudi Arabia (14%) whereas about 67% of the small value bids had gone to seven countries. (Tikekar, 1981). From 1979-80 onwards earnings started increasing; nevertheless there had been a slight fall during 1984-85. A modest target of Rs. 250 crores per year for new consultancy exports had been set to be achieved by 1990, the terminal year of the Seventh Plan. Given the rate of growth of export of consultancy services achieved in the past it is not difficult to imagine the difficulties Indian TCOs face in competing with well established technical consultancy firms in the developed countries. Some of the problems faced by Indian TCOs are described in a later section. Viewed in this context the target of Rs. 250 crores per year to be achieved by 1990 seems to be a tall order.

13. Problem faced by Indian TCOs

Indian TCOs faced many constraints and problems while bidding for national and international assignments like technological obsolescence, limited research and development capability, communication gaps due to traditional methods of communication, difficulty in coping with the language, distance, and paucity of funds.

Few Indian TCOs had separate in-house R&D facilities, and good rapport with national and international R&D organizations. This had resulted in further widening the technology gap between Indian TCOs and others from developed countries. It was also observed that TCOs with separate R&D units, faced the problem of

low human resource utilisation (Ramesh, 1981).

They also lacked proper communication channels to know about international tenders for projects. Many TCOs had no way of finding out about foreign projects because they did not have foreign offices or were not registered with international organizations. There was severe competition among Indian TCOs and even if a TCO happened to know the details of foreign projects, it may not necessarily disclose it. There are two other major constraints related to communication in terms of language and distance. For instance, Indian TCOs had difficulty in understanding the languages spoken in Latin America (Spanish and Portuguese). Distance was another major constraint. Indian TCOs could not easily reach the Latin American market. Further, Indian TCOs were also financially handicapped. Despite the efforts of the EXIM Bank to assist Indian TCOs in bidding for international projects, many TCOs faced the problem of depositing substantial amounts in foreign exchange as security at the time of bidding.

13.1 Problems of Taxation: TCOs were in general, liable to heavy tax burden except a few with restricted scope of activities under sections 80 (MM) and (O) of the Income Tax Act of 1961. The heavy rate of taxation hindered TCOs from widening their fields of activity. Recent changes in income tax provisions taken away some reliefs which had been available earlier. For instance, M.N. Dastur & Company "was not liable to pay tax for years 1983 in view of various tax reliefs available to consultancy organizations. In 1983 some of the major items of tax relief

measures on income derived from consultancy services were withdrawn and tax relief on fees received in foreign exchange was restricted to 70 per cent of the total taxable income." (Chaudhuri, 1988). TCOs were not allowed incentives like tax holidays; investment allowance; and other privileges enjoyed by manufacturing companies. On account of these reasons, TCOs were not in a position to build up their reserves for anticipated future expenses; modernization programmes and research and development activities, etc.

13.2 Stiff Competition: Clients are often not in a position to identify genuine TCOs due to the mushrooming growth of technical consultancy organizations in recent times. Some of the TCOs try to secure projects by quoting low prices by lowering professional standards and flouting the code of ethics of the technical consultancy profession. This affects the competitive strength of even well-reputed firms. A number of TCOs covered in this study had diversified inter-sectorally without acquiring the adequate technical personnel or experts. These inexperienced TCOs without proper technical background also participated in technical project tenders thus creating an improper techno-economic atmosphere. Ramesh (1981) cited the example of a public sector operating company that awarded an engineering contract to a private sector consultancy and engineering design organization mainly on the basis of its being the lowest bidder. The company finally found that lowest bid was lacked many essential features.

TCOs also faced the problem of encroachment in their business by equipment manufacturers. The clients of technical consultancy divisions of manufacturing firms were assured by the

equipment manufacturers of free services. According to Dastur (1986) "The free engineering will be undoubtedly slanted to favour the use of the products offered by the manufacturer or supplier, and the cost of free engineering will be invariably included in the price of the product".

13.3 Lack of Government Support: Often foreign consultants were appointed by public sector companies though Indian TCOs were well-equipped to do the same work. It was reported that once a visiting UN official remarked "in India the inevitable adjective for expert is foreign; so it is not surprising that the ordinary citizen has the impression that the Indian expert is a rare bird indeed". In 1964-65 a Britain based TCO was appointed for preparing a project report on expansion of TISCO. Indian TCOs were relegated to be sub-contractors. Indian entrepreneurs sometimes imported out-moded foreign technology without consulting any domestic TCOs. For instance for expanding the Bhilai and Durgapur Steel Plants the open hearth process, which was fast becoming obsolete, was selected instead of the LD Process which was the latest technology being adopted in most countries. "Thus on the one hand, expertise already available in this country is neglected, while on the other, even third-rate or unsuitable know-how is often foisted on the country" (Dastur, 1970).

Owing to the popularity of tied-aid arrangement, foreign TCOs were able to make major break-throughs in developing countries. Indian TCOs lamented that they were not in a position to obtain tied-aid loans from the Government of India. For instance, "DCPL

faced stiff competition from the European and US consultancy organizations. These companies have huge financial and marketing resources and also have a strong image. They have large initial loss bearing capacity because of the financial backing of their governments. For example, an American company may with the backing of USAID do some projects free of cost to the receiving countries which DCPL may not be able to secure" (Chaudhuri, 1988). Many Indian TCOs have also mentioned that in general Indian missions abroad had not provided needed support and assistance for overseas tenders.

13.4 Personnel Problem: Getting suitable personnel with proper qualification, experience, competence and training was not easy. Often TCOs had to pay competitive remuneration to these personnel, without a sufficiently strong financial base. Further, frequent shifting of technical personnel from one TCO to another led to delays and other problems. TCOs also faced underutilization of existing manpower due to lack of projects. Very few consultancy organizations had sent their technical personnel for training and retraining to improve their expertise.

14. Conclusion

The field of technical consultancy in India has developed to a large extent after Independence. Prior to Independence the few Indian TCOs that existed acted more as sub-contractors to foreign consultants, however, in recent times Indian TCOs have successfully created a fairly good image for themselves in a number of fields ranging from simple to medium technologies. This study of Indian TCOs has brought out the key aspects of

their growth and development and the major problems being faced by them. In this concluding section some of the more important findings are highlighted.

1. Financial institutions in India have been instrumental in a strong way in the development of the technical consultancy function. It was due to the efforts of the IDBI that TCOs were set up in the different states for the development of small scale industries.
2. Location and geographical proximity of TCOs to clients seems to be an important factor in their development. Most TCOs had their head offices in the four major metropolitan cities where there was greater accessibility to potential clients.
3. Most technical consultancy organisations covered in this study were independent companies, i.e. they had no corporate, financial or other links with process or equipments suppliers and contractors, business houses or other commercial activities.
4. Most TCOs were privately owned companies as exemplified by the fact that the 75 out of the 94 TCOs covered in this study were privately owned.
5. Though the number of TCOs in the private sector was much larger than in the Government sector there were considerable difference in the size of the largest firms in the two sectors. The largest firm in the private sector had a strength of 1600 compared to a strength of 3537 in the largest public sector TCO.
6. Indian TCOs cover a wide variety of activities in various

sectors and sub-sectors. Broadly, the 5 major sectors identified were: agriculture, industry, natural resources, public utilities, and transportation. Many TCOs diversified their fields of activity in response to an increasing demands for their services. Based on the researchers' judgement a classification of the pattern of diversification was developed. The two types of diversification identified were: a) intra-sectoral diversification, and b) inter-sectoral diversification. Intra-sectoral diversification refers to diversification of activities within a broad sector, whereas inter-sectoral diversification refers to diversification of activities from one sector to another. On the basis of available data the study revealed that though there was variation in the level of intra-sectoral diversification from one sector to another most TCOs had diversified to a low extent intra-sectorally. The sectors; industry, natural resources, public utilities and transportation exhibited a moderate intensity of "medium" intra-sectoral diversification whereas all the sectors except for agriculture showed a very low intensity of "high" intra-sectoral diversification. In the case of agriculture 10% of the firms were classified in the "high" diversification category. Most of the TCOs seemed to prefer a low inter-sectoral diversification strategy though they exhibited a fairly strong tendency for medium level inter-sectoral diversification also.

7. The level of technical competence of TCO may be determined by the number of technical services it may be able to provide. On the basis of a subjective measure which has been explained

in the text, TCOs covered in the study were classified into three groups according to the "depth of technical services". Most of the TCOs exhibited "medium depth" of technical service (53%). About 30% of the firms exhibited "low depth" of technical service and 19% "high depth" of technical service.

8. Approximately 14% of the Indian TCO covered in this study had provided services in low technology areas. A large number of TCOs (about 37%) provided service in "medium" technology areas and a small percentage of the TCOs (12%) provided services in high technology areas. About 34% of the firms provided services in both "medium" and "high" technology areas.
9. Affiliation with national and international organisations and associations seemed to be given importance by the TCOs. Twenty-four TCOs were registered with Indian financial institutions, 75 were associated with the Federation of Indian Exporting Organisations (FIEO) and 48 with the National Association of Consulting Engineers. On the international scene 38 TCOs were affiliated with a number of international organisations/organizations.
10. Indian TCOs have in the recent past attempted to get a foothold in foreign markets. Forty per cent of the TCOs covered in the study had provided technical services to clients in Middle East Asia, 36% in South and South East Asia, and 31% in Africa. On the contrary a very small number of firms (10%) had provided services to clients in the

developed countries. Among the TCOs covered in the study only two private sector firms had undertaken a variety of services in almost all the regions of the world. Despite the fairly strong tendency of Indian TCOs to go abroad their export earnings from technical consultancy was very small in the context of India's balance of payments position. However in recent times there has been considerable improvement in the foreign exchange earnings from export of technical services. This augers well for the future in the context of the Government's thrust on improvement of foreign earnings.

11. Indian TCOs face many constraints and problems while bidding for national and international assignments. The problems are related to technological obsolescence, limited research and development capability, communication gaps due to traditional methods of communication, in language barriers, distance, paucity of funds, and lack of marketing resources.
12. Due to the mushrooming growth of technical consultancy organisations in recent times there has been an increase in the competition. Some TCOs attempted to secure projects by quoting low prices, lowering professional standards, and flouting the code of ethics of the technical consultancy profession, thus affecting the competitive strength of even well-known firms. Another factor which was identified as being a constraint in the further development of TCOs was the lack of strong government support.

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