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ORGANIZATIONAL GROWTH AND CHANGE
IN NATIONAL OIL COMPANIES

- A CASE STUDY -

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ORGANIZATIONAL GROWTH AND CHANGE IN NOCS

A CASE STUDY

A.K. MALHOTRA

1. INTRODUCTION

During the last six decades, society in every country has become increasingly dominated by large institutions. Every major task, whether it be education, public health, setting up steel mills, pursuit of new knowledge or defense, is today being entrusted to big organizations--either in the public or the private sector. Since these organizations usually function in key areas of the national economy, on their performance oftens depends the future of the country. The National Oil Companies (NOCs) tend to be the largest commercial entities in virtually every developing country, and the largest among them rank among the biggest industrial enterprises in the world. Thus their organization and performance over time has been, and continues to be, an area of crucial strategic national interest.

Historical forces have shaped the emergence and growth of the NOCs in the developing countries. And as they have grown, their internal structure and management systems have moved through various stages of development in response to their environment. An organization structure and form considered optimum for one set of circumstances has proven to be completely inadequate as the organization grows, or the technology alters or the external environment shifts significantly. The critical dimension of time is an element in management decision making on organization structure that has often been missing.

Any organization architect has basically five design principles, i.e., five distinct organization structures for the placement of activities and the ordering of relationships; two of them are traditional--Henri Fayol's functional structure and Alfred Sloan's federal decentralization. Three others are relatively newer--team organization, simulated decentralization and the system or matrix structure. But each of these designs express different design logics and are built with different structure. For large and complex organizations, the important thing to grasp is that organizational structure is only one manifestation of the organization's strength and ability to perform, and even this changes with the age and size of the organization, the growth rate of the industry or the external environment and its own internal dynamics.

The various phases of growth that all growing organizations tend to go through will, of course, vary from country to country and company to company. In the succeeding pages, the case of a national oil company (NOC) in a developing country is traced over three decades to identify its various stages of growth, as well as its responses to the external and internal environment. A number of issues such as--(i) the role and composition of the Board of Directors, (ii) the role of regional managers in different stages of growth, (iii) the problem of integration mechanisms in large institutions, (iv) internal research and development (R&D) and the problem of innovation and (v) the mechanism of organizational change--are studied to derive lessons

which may be of some relevance to decision-makers in other countries contemplating change.

2. ORGANIZATIONAL CHANGE

The nationally owned corporations in the developing countries function in a unique environment and successful organizational change in them requires a somewhat different approach than the conventional

A major issue in understanding organizational change in the developing countries is to recognize that government owned corporations function in a system which is, in many ways, fundamentally different from that of the private--or even the publicly-owned corporations in the West. The Indian public sector organization, for example, functions in an environment which is different from say a publicly owned corporation in USA or Europe for it is not possible here to apply the simple framework characteristic of the corporate sector the world over, of the interrelationship between the shareholders and the corporate management. The shareholders to board of directors - corporate management framework is invalidated in India because of two factors:

- (a) The government is the sole shareholder and is accountable to the Parliament; and
- (b) The corporate management itself is an entity that is composed of three diverse constituents, i.e., the Minister, the administrative ministry embodied in the Secretary of the department and the Chief Executive of the enterprise.

This diverse corporate management in turn has different values and frames of reference and hence their objectives and actions are normally not in consonance. The Minister's reference groups are the Parliament, the legislative assemblies of the states where the facilities may be located and the various parliamentary committees that oversee the ministry's work in a democracy. And, of course, the press. The administrative secretary and ministry looks for legitimacy and approval to a reference group constituted of the planning commission, the public investment board, the relevant state administrations, the finance ministry and the various ministries which purchase or provide raw materials inputs/outputs to the enterprise. The Chief Executive on the other hand has to deal with a diverse reference or pressure group which includes not only his minister, but also the administrative ministries, the trade unions and the managers of the enterprise itself who are sometimes his colleagues on the board. Thus in managing the organization, there are diverse pressure groups, which need to be catered to. And any change in the existing order of things creates opposition of a magnitude and intensity that is, perhaps, foreign to most publicly-owned corporations in the West. A major restructuring of a national owned corporation requires the approval--or at least benign neglect from--the three constituents as well as their reference groups.

A second major factor to note is the fact that though there is no such thing as a "perfect" organization, even the "optimum" organization structure changes over time. Every organization, and its component parts, are at different phases of development, and each phase is characterized by a dominant

management style and a structure which is most effective in achieving growth. There is a school of management thought that argues that all growing organizations move through five distinguishable phases of development, each of which contains a relatively calm period of growth (evolution) that ends with a management crisis (revolution), and that each phase is both an effect of the previous phase and a cause for the next phase, and that for each phase there is a distinct form or organizational structure and system. There are a number of key dimensions which seem to define organizational development (Annex 1). Management problems and principles are rooted in time. The passage of time also contributes to the institutionalization of attitudes in an organization making any change progressively more difficult. The change in size creates problems of coordination and communication, levels of hierarchy increase and integration of functions requires changes in systems and structure. The increasing complexity in technology as well as the rate of growth in the external environment make demands on an organization which require differing responses. Thus an organization as it grows may go through a number of phases--from the earliest, entrepreneurial days of creativity to progressively more and more formalized structures in response to the various crises that confront it. During each of these phases, the management focus alters and the organization structure, and practices have to be changed to increase effectiveness (Annex 2).

It is now also evident that organizational structure by itself is not enough. Nor is a new strategy an automatic answer to corporate failure. Chronic use of military metaphors leads people to think of all organizations as being hierarchical, rule-driven, impersonal and bureaucratic. But for NOCs, which are organizations that are seeking improvization rather than forecasting, that value argument more highly than serenity and compliance, that dwell on opportunities rather than on constraints, that encourage doubt and contradiction rather than belief and that need to look to the future rather than defend past actions, neither an organizational chart nor a well-defined strategy is enough. Recent research reveals that a new approach to organizing requires attention not only to structure and strategy, but also to five other variables--systems and procedures, shared values (i.e. working culture), management style, skills and, of course, people. A framework for understanding the way organizations function--and the way they can be made to function more effectively--therefore requires focus not only on the hardware--the strategy and structure--but also the software--style, systems, staff, skills and shared values--of the organization. Thus for an organization to grow and function effectively, it must not only master the above seven levels of complexity at a point in time, it must also develop the capability to change as the environment changes. And this response to the environment--be it the forces of international trade, shifts in government regulations, the skills of the competitor, etc., has to go beyond mere changes in structure and strategy.

In analyzing organizational growth and change of a national oil company (NOC), it is, therefore, essential to keep the above factors in view. The case study of a NOC in India thus examines not only the organization structure and strategies over the last three decades, but also the dominant patterns of style, systems, skills and staff in the organization.

3. ORGANIZATIONAL PHASES OF GROWTH IN INDIA'S OIL INDUSTRY

The oil industry in India is primarily in the public sector. The activities of the public sector are administered by the ministry of petroleum in the areas of exploration and development of oil and natural gas, petroleum refining, trading in crude oil and petroleum products including their marketing and distribution, production of petrochemicals and other allied products, research, development and training in the field of oil industry including the regulation of the oil industry, rendering of consultancy in engineering services, and pollution control.

The ministry is headed by a minister while a full fledged secretary to the Government of India (GOI) is in overall in charge of the Secretariat of the Ministry to assist and advise the Minister. The Secretary normally has a number of joint secretaries, Directors, Deputy Secretaries, Section Officers, etc., and also has had in the past advisers in the area of economic policy, exploration, refineries and petrochemicals to provide technical assistance. In 1985-86, the Ministry dealt with as many as 18 public sector companies or organizations with a combined total equity of about Rs 5,000 ^{1/} crores (including loans), and an annual plan outlay of Rs 3,200 crores. The organizations which are administered by the Ministry of Petroleum and which are owned by the government are:

Exploration and Production

1. Oil and Natural Gas Commission
2. Oil India Limited

B. Refining and Marketing

1. Indian Oil Corporation, Ltd.
2. Bharat Petroleum Corporation, Ltd.
3. Hindustan Petroleum Corporation, Ltd.
4. Cochin Refineries, Ltd.
5. Madras Refineries, Ltd.
6. I.B.P. Company, Ltd.
7. Lubrizol India, Ltd.
8. Indian Oil Blending, Ltd.

C. Petrochemicals and other downstream units

1. Indian Petrochemicals, Ltd.
2. Petrofils Cooperative, Ltd.
3. Bongaigon Refineries and Petrochemicals, Ltd.

D. Engineering and other services

1. Gas Authority of India, Ltd.
2. Engineers India, Ltd.
3. Balmer Lawrie, Ltd.
4. Biéco Lawrie, Ltd.
5. Bridge and Roof, Co., Ltd.

^{1/} US\$1 = Rs 12.7; 1 crore = 10 million.

The capital investment in the above companies are given in Table 1. This table shows that the companies involved in oil exploration and production had, as of April 1985, a major share of the capital investment of Rs 4,865 crores:

A. Exploration and Production	55%
B. Refining and Marketing	33%
C. Petrochemicals and other units	11%
D. Engineering and other services	1%

Table 1: CAPITAL INVESTMENT IN THE PUBLIC/SECTOR UNDERTAKINGS

Name of the undertaking	As on 1-4-1985		Total
	Equity	Loans	
<u>Exploration & Production</u>	<u>395.85</u>	<u>2,309.50</u>	<u>2,705.35</u>
Oil & Natural Gas Commission	342.85	2,270.93	2,613.78
Hydro Carbons India, Ltd.	25.00	-	25.00
Oil India, Ltd.	28.00	38.57	66.57
<u>Refining & Marketing</u>	<u>293.39</u>	<u>1,311.27</u>	<u>1,604.66</u>
Indian Oil Corporation, Ltd.	123.27	485.34	608.61
Bharat Petroleum Corp. Ltd.	16.57	139.24	155.81
Hindustan Petroleum Corp. Ltd.	40.20	244.01	284.21
Cochin Refineries, Ltd.	7.00	182.20	189.20
Madras Refineries, Ltd.	98.25	255.13	353.38
IBP Co. Ltd.	2.90	0.28	3.18
Lubrizol India Ltd.	4.80	5.07	9.87
Indian Oil Blending Ltd.	0.40	-	0.40
<u>Petrochemicals & Other Down Stream units</u>	<u>333.4</u>	<u>185.46</u>	<u>518.87</u>
Indian Petrochemical Corp., Ltd.	186.00	17.60	203.60
Petroflils Cooperative Ltd.	14.99	2.84	17.83
Bongaigaon Refinery & Petrochemicals Ltd.	132.42	165.02	297.44
<u>Engineering and Other Services</u>	<u>9.40</u>	<u>27.43</u>	<u>36.83</u>
Engineers India Ltd.	0.50	-	0.50
Balmer Lawries Ltd.	1.89	4.28	6.17
Bieco Lawrie Ltd.	1.77	13.80	15.57
Bridge & Roof Co. (India) Ltd.	5.24	9.35	14.59
<u>Total</u>	<u>1,032.05</u>	<u>3,833.66</u>	<u>4,865.71</u>

Table 2: FINANCIAL STRUCTURE/PROFITABILITY OF THE UNDERTAKINGS DURING 1984-85

Name of the undertaking	Paid-up capital	Loans	Net-worth	Capital employed	Sales/Operating income	Gross profit before interest & tax	Net profit after tax and interest	Dividend	Corporate tax	% age of		
										Net profit to paid-up capital	Net profit to net-worth	Gross profit to capital employed
Explorations & production	<u>395</u>	<u>333</u>	<u>3,443</u>	<u>4,198</u>	<u>4,415</u>	<u>1,978</u>	<u>910</u>	<u>38</u>	<u>916</u>	<u>230.1</u>	<u>26.5</u>	<u>47.3</u>
ONGC	342	2,270	3,105	3,891	3,988	1,791	822	34	824	239.8	26.5	45.9
HIL	25		470	100		4	2		2	38.1	4.3	9.5
OIL	28	63	290	239	428	182	88	4	90	309.9	29.8	76.4
Refining & Marketing	<u>293</u>	<u>1,478</u>	<u>1,290</u>	<u>2,171</u>	<u>17,402</u>	<u>327</u>	<u>116</u>	<u>370</u>	<u>49</u>	<u>39.6</u>	<u>9.0</u>	<u>15.1</u>
IOC	123	485	808	1,010	10,969	193	63	172	45	51.2	7.8	19.2
BPCL	16	110	123	334	2,142	34	16	23		120.1	13.7	10.4
HPCL	40	424	1,879	434	2,825	46	9	40		22.5	5.4	10.7
CRL	7	198	28	71	162	6	1			17.1	4.6	8.7
MRL	98	255	128	280	868	33	9	12	N	20.0	15.3	12.1
IBP Co. Ltd.	2		17	12	540	5	2		2	100.7	16.9	45.9
LIL	4	5	18	24	90	5	3	9	1	62.7	16.7	23.7
IOB			2	3	4					102.5	14.8	32.8
Petrolchemical & other downstream units	<u>333</u>	<u>204</u>	<u>635</u>	<u>537</u>	<u>889</u>	<u>97</u>	<u>64</u>	<u>9</u>	<u>23</u>	<u>19.5</u>	<u>10.2</u>	<u>18.4</u>
IPCL	186	37	430	379	579	66	50		9	27.2	11.7	17.4
POL	14	2	65	67	154	32	17	9	14	117.2	27.0	47.8
BRPL	132	164	139	91	155	-	-3			-2.5	-2.4	-0.9
Engineering & other servicing units	<u>9</u>	<u>29</u>	<u>40</u>	<u>78</u>	<u>192</u>	<u>22</u>	<u>7</u>		<u>9</u>	<u>75.5</u>	<u>17.6</u>	<u>29.1</u>
EIL			39	33	44	15	7		8	1,400.0	17.8	45.0
Balmer Lawrie Ltd.	1	4	10	27	92	5	1		1	83.6	15.4	19.7
Biecco Lawrie Ltd.	1	18	-13	3	65		-2			Neg.	Neg.	Neg.
Bridge & Roof Ltd.	5	9	4	14	485	3	12			24.4	29.2	21.4
Total	<u>1,032</u>	<u>4,077</u>	<u>5,409</u>	<u>6,975</u>	<u>22,899</u>	<u>2,427</u>	<u>1,099</u>	<u>76</u>	<u>999</u>	<u>106.5</u>	<u>20.3</u>	<u>34.8</u>

Note: The paid-up capital of IBP Co. Ltd. included preference.

The financial structure and profitability of these companies during 1984-85 is given in Table 2. From this table, it can be seen that on the total capital employed of about Rs 6,975 crores during 1984-85 the net profit after taxes and interest amounted to Rs 1,099 crores or about 16%--a very creditable performance indeed. As may be expected, the refineries and marketing companies had a gross profit to capital employed ratio of 15%, the petrochemicals sector about 18% and the exploration and production sector about 47%. These companies together paid a corporate tax of the order of Rs 1,000 crores for the year and yet made a net profit of almost an equivalent amount. With a total annual sales income of the order of Rs 22,900 crores, this sector thus represents an extremely healthy sector of the economy's resource base. This is also reflected in the actual expenditures incurred by these companies during the sixth plan period (1980-85) as given in Table 3 below:

Table 3: PLAN EXPENDITURES IN THE SIXTH FIVE YEAR PLAN
(Rs crores)

A. Exploration & Production	6,632
1. ONGC	6,228
2. OIL	404
B. Refining & Marketing	1,845
1. IOC	707
2. BPCL	275
3. HPCL	418
4. CRL	167
5. MRL	211
6. IBP	35
7. ILIL	11
C. Petrochemical & other units	447
1. IPCL	209
2. PCL	2
3. BRPL	220
D. Engineering and others	
1. GAIL	19
2. EIL	16

The organization of the oil exploration and production sector in India has gone through a number of phases, responding both to the external environment and to the policy needs of the country. These phases can very broadly be divided into four:

- Phase 1: The Pre-National Oil Company Phase (1947-59)
- Phase 2: The Onshore Oil Development Phase (1959-74)
- Phase 3: The Offshore Development Phase (1974-84)
- Phase 4: The "Common Basin" Development Phase (1984-)

Phase 1: The Pre-National Oil Company Phase (1947 - 1959)

At independence in 1947, India was almost totally dependent on the import of petroleum and petroleum products. The total indigenous production of crude in 1948 was 0.25 MMT by the Assam Oil Company, a subsidiary of Burmah Oil of U.K., and indigenous production of petroleum provided less than 7% of the total consumption. Despite the Industrial Policy Resolution of 1948, which stated that the Government should be responsible for the future development of the petroleum sector, the Government entered into discussions with a few international oil companies to invest in exploration and development of oil resources in India. This step was taken in recognition of the fact that there was neither expertise nor technology in the oil exploration area available locally and there was also difficulty in mobilizing foreign exchange and local currency resources to finance the essentially risky investments in oil exploration. Thus, Government of India (GOI) entered into a joint venture agreement with Stanvac for exploration in the Bengal basin, with 75% of the funds being provided by Stanvac for a 75% share of production of oil if any were found. The project was, however, abandoned in 1960 without producing any oil. A second joint venture agreement was signed in 1959 with Burmah Oil, which created Oil India Limited (OIL), a private company, in which GOI had initially a one-third interest. OIL, whose areas were limited to the north-east of India, was successful in the early years of its operation, and its production increased from about 0.25 MMT in 1959 to 1.4 MMT in 1964. In 1961, the Government increased its share to 50% and also permitted OIL to enlarge its prospective areas in the northeast frontier area and Assam.

During the 1950s, GOI continued its attempts to attract foreign companies to participate in oil exploration but without much success. In the late 1950s, it convened a panel of international experts from eastern and western countries which recommended a strong impetus from privately-financed exploration and development. GOI thereupon invited companies to make proposals by early 1960 and although 14 companies responded, no agreements could be signed. The failure to obtain foreign participation for exploration, coupled with the conclusion of Indian geologists that India's prospective areas were under-explored, led to the creation in 1956 of the Oil and Natural Gas Commission (ONGC), with the charter of exploring for and developing oil resources in India outside the areas being prospected for by OIL. Until 1955, Indian oil policy suffered from a division of responsibility between various government departments and the failure to coordinate the work. Exploration was being carried out by the Geological Survey of India under the Ministry of Natural Resources and Scientific Research; supplies and the pricing of oil was being handled by the Ministry of Works, Construction and Supply, and legislation for the petroleum sector by the Indian Bureau of Mines under the Ministries of Finance and of Trade and Industry. The setting up of the Oil and Natural Gas Directorate under the Ministry of Scientific and Natural Resources in October 1955, was the first step towards achieving some co-ordination in exploration and development policy. Having decided to develop its oil

industry, the Indian Government turned to a detailed study of both statist and private oil industries. This was initiated by a delegation that visited the Soviet Union, Rumania, Poland, Czechoslovakia, Austria and Switzerland. A major result was the increased and long-term involvement of the USSR and Rumania in India's oil industry. ONGC, which had commenced operations as a department within the Geological Survey of India, became an independent statutory commission in 1959. The upgrading of the ONGC to a statutory commission in 1959, produced a lively debate in the Lok Sabha on various aspects of the oil policy being developed. In introducing the bill in the Lok Sabha, Minister Malaviya explained the purpose of the upgradation:

"A Commission that will be entrusted with the task of searching for oil must have full powers, to change, shift and modify its program in such a way that leads to expeditious discovery of oil and gas. That cannot be done under the framework and limitations under which a government department suffers.

ONGC started its operations with the assistance of experts from the USSR and in January 1961 discovered oil and gas in Gujarat. This discovery marked the beginning of the growth of the oil industry in India in the public sector which in 1985 produced 30 mmt of oil. Starting with a handful of professionals, led by an enterprising minister who taught himself geology, the total staff of ONGC grew to almost 44,000 in 1986, and the scale of activities grew manifold (Annex 4).

Phase 2: The Onshore Oil Development Phase (1959 - 1974)

According to the Act of the Parliament creating ONGC, it was to be responsible "to plan, promote and implement the development of petroleum resources and the production and sale of petroleum products produced by it." ONGC was, and is, a corporate body with power to acquire, hold and dispose of property, to contract and has the authority to borrow. According to its statutes, the Commission was to consist of a Chairman, and not less than two and no more than eight members appointed by the Government for a period of five years. The Commission thus acts very much as a Board of Directors and is responsible for setting ONGC's policies and implementing the approved programs. Its development plan has to be approved by the Planning Commission and its annual budget for current and capital expenditures has to be approved by the Ministry of Petroleum and the Ministry of Finance before it is sanctioned by Parliament.

The organizational structure of the Commission has changed over the last 25 years and an indication of this change can be seen in the shape and form of the Commission's membership. During the sixties, the Commission generally consisted of a Chairman, four full-time members--finance, engineering, drilling and production and exploration--and two part-time members representing the Ministries of Finance and of Petroleum. The Chairman was the chief executive officer, while the members were staff to him. The regional managers reported directly to the Chairman, who took decisions with the help of the members (Annex 5).

The administrative and financial functions--planning, procurement, stores, accounting, computer activities, etc.--were centralized in the corporate headquarters at Dehradun along with the main research and development and training activities. Operations staff was divided among three regional offices--central, western and eastern regions. During this phase, most of the operational decisions tended to be taken centrally from the corporate headquarters, with the regional managers having little or no independent authority. This was a "classic" functional organization with all the advantages and disadvantages such an organizational form entails. It was an organization of great clarity and stability. It helped specialization to grow--and this at a time when there were few trained managers or engineers and scientists available. An organization "map" of the system is shown in Table 4 which attempts to capture the dominant features of the organization during this period.

TABLE 4

Objectives:	Creation and development of oil exploration and production capability in the country for the first time.
Strategies:	Technical assistance and support from USSR and East European countries.
Structure:	Functional structure to ensure competence development in each specialized area.
Systems:	Centralized control from headquarters with Chairman as CEO.
Skills:	Creation of IPE (1963) training in USSR for technical development.
Staff:	Direct recruitment of fresh graduates and transfer of senior staff from Geological Survey of India.
Style of Management:	Formalized and hierarchical. Foreign technical advisers in each functional area, as well as in overall management support.

* IPE - Institute of Petroleum Exploration

By the end of the 1960s, ONGC and OIL had proved oil reserves of about 175 MMT of oil and of 75,000 Mm³ of gas and their combined production covered about 37% of total crude consumption in India. ONGC's production, which started in 1961, reached 1.1 MMT in 1965, 3 MMT in 1970 and 4.5 MMT in 1974. Most analysts estimated that the return of OIL-ONGC's investments had been about 13-19% in pre-1973 prices. In addition, this phase had seen the development of a body of trained technicians in almost all facets of the industry--a no mean achievement.

But by early 1970s, the level of oil production seemed to be levelling off. No significant discovery had been made since ONGC struck oil in Gujarat in the early 1960s. It also seemed that only a small portion of the potential oil bearing structures had been fully explored. The late 1960s also showed an increasing trend in the real price of oil, which culminated in the tripling of oil prices in 1973/74. Further, the surveys conducted by USSR technical assistance teams had identified a number of prospective areas offshore by the late 1960s. This fact and the changing world market conditions created an impetus among the international oil companies (IOCs) to offer to move into the offshore areas to explore and develop the oil potential. Negotiations were initiated with a number of these companies--for e.g. Tenneco, but in the end, the Government decided to proceed in its offshore exploration on an "owner assisted basis" in the early stages. This implied that ONGC would use foreign consultants, contractors, service companies, etc., while retaining the responsibility of the development and training of their own staff in offshore techniques. This led to the next phase in its organizational structure.

Phase 3: The Offshore Development Phase (1974 - 1984)

The potential of offshore--fueled by the 1973-74 price hike, the interest evinced by the IOCs and the new geological assessments--propelled the creation of a separate region--called the Bombay Offshore Project (BOP) in the early seventies. Recognizing the economic importance to the country and the need for rapid decisions, the senior management of ONGC changed its structure. The Commission now consisted of the Chairman, six full-time members--finance, materials, personnel, exploration, offshore and onshore--and two part-time members representing the Ministries of Finance and Petroleum. This was clearly a move towards a more decentralized form of management. ONGC's organization chart is shown in Annex 6. The two members in charge of onshore (onshore transition, however, came only towards the end of the seventies) and offshore became "de-facto" responsible for all operations with the other members moving into primarily staff functions. The fact that the BOP was placed directly under Member (Offshore), whose headquarter was located in Bombay, further accentuated the decentralized process of decision-making. While major policy decisions continued to be taken at the corporate headquarters, BOP was delegated sufficient powers to be able to run the offshore exploration and development program efficiently and effectively.

The dominant features of the organization during this period are captured in Table 5.

TABLE 5

Objectives:	Rapid increase in oil production in view of price hikes.
Strategies:	Major focus on offshore as providing rapid production increase potential. The basic strategies were: (i) Master the "Core" Technology through "on-the-job" training; (ii) Accelerate production through hire of international services but maintaining management control; and (iii) Develop indigenous capability through R&D, Private industry induction through government fiscal concessions.
Structure:	(i) Offshore unit created as a semi-autonomous division under direct control of Member (Offshore)/Chairman; (ii) Functional units created reporting to Member (Offshore); and (iii) Onshore structure left as in Phase 2.
Systems:	"Ad-hoc" procedures developed for offshore unit functioning. Decision-making decentralized and delegated to autonomous unit.
Skills:	Creation of * IRS (1977), IDT (1978) and IPT (1983). Use of contracts for training of staff, particularly CFP.
Staff:	Fresh graduates recruited directly. Selected experienced staff from onshore transferred to management positions in the offshore unit.
Style of Management:	Direct and personal at Board level. Participative at the offshore unit level.

- * IRS - Institute for Reservoir Studies
- IDT - Institute for Drilling Technology
- IPT - Institute of Production Technology

The offshore based staff grew from 20 in 1974 to 600 in 1977, 2,800 in 1982 and about 4,500 in 1984. Between 1975 and 1985, the crude oil production from BOP grew from 0.4 MMT to 20.73 MMT, contributing about 70% of the total annual production of the country. The detailed organizational systems and procedures which contributed to this development have also been

indicated in some detail in the paper "Development and Management of Offshore Technology" (Annex 7).

The onshore production during this phase, though growing, was not achieving the offshore rates of increase. Certain organizational strains and inefficiencies had developed due to ONGC's rapid growth during this period. It had progressed from the relatively small onshore operations and almost complete reliance on in-house capabilities, to large integrated offshore projects requiring sophisticated management, the acquisition of modern technology, and the use of international contractors. But the fast growth, the diversification of activities, the complexity of technology and the change in the external environment caused serious organizational and managerial problems. These were recognized and sought to be largely remedied through a restructuring of the organization which would decentralize the operating management while retaining a centralized policy-making system. The demands of the large offshore operations, which continued to absorb most of ONGC's resources, had led to a relative neglect of onshore operations. They had also stretched ONGC's project implementation capacity, created a shortage of experienced technical staff and brought about a need to mobilize large amounts of foreign exchange resources very quickly. As a consequence, ONGC's onshore operations had suffered from insufficient exploration and development budgets, less experienced technical staff, and inadequate equipment, as well as obsolete technology. These factors were clearly reflected in the lack of any substantial growth in ONGC's onshore oil reserves and production over the period 1974-84 (Refer Annex 3). But in addition to the organizational restructuring and larger budget allocations for the onshore operations, it was necessary also (i) to adopt a policy of contracting a substantial proportion of the drilling and technical services in onshore operations (as in the case of offshore operations), not only to complement ONGC's own limited capabilities and act as vehicles for technology transfer, but also to focus more of ONGC's scarce technical manpower and financial resources on the basic exploration and development activities; (ii) to expand and upgrade the training program for oil field workers which was minimal and unsatisfactory; (iii) to use technical consultants to help improve onshore operations as was the case in offshore operations; (iv) to replace and upgrade the existing obsolete equipment and technology for exploration, drilling, workover and production in onshore operations; (v) and to improve field communications in all onshore regional units. All this required a major change not only in the form and structure of the organization, but also in its systems and procedures, staff and skills.

Phase 4: The "Common Basin" Development Phase (1984 -)

In 1984, after two years of debate and discussion, a major reorganization of ONGC was implemented. This was based on a functional structure for the Commission and a regional or "common basin" approach for the operating field units. In this approach, all operations in a given basin were integrated where formerly offshore and onshore operations in the same basin had been handled under separate organizational units. The Commission was now changed to a Chairman, six full-time members--operations, exploration, drilling, technical, finance and personnel--and two part-time members representing the Ministries of Finance and Petroleum. The six operational regions--eastern, central, southern, offshore, western and northern--were each headed

by a regional director. Reporting to each regional director were general managers in the six functional areas of exploration, drilling, production, technical, finance and personnel. The outline of the structure and responsibilities of this reorganization is shown in Annex 8. The dominant characteristics of the revised organization are indicated in Table 6.

TABLE 6

Objective:	--	Major increase in exploration effort to establish reserves; and
	--	Onshore production effort to be brought on par with offshore.
Strategy:	--	Merge onshore and offshore units for common basin management and transfer of experience and skills;
	--	Business unit concept for functional units;
	--	Contracting out onshore drilling and technical services; and
	--	Technological upgradation of onshore equipment and manpower.
Structure:	(i)	Functional structure with members of Commission as heads of each function; and
	(ii)	Six geographical units.
Systems:	--	Organizational manuals developed; and
	--	Formal reporting and MIS implemented.
Skills:	--	Creation of IEOT* (1985); and
	--	Training institutes for oil field workers set up.
Staff:	--	Transfers of staff to mix onshore and offshore experiences as well as regional experiences; and
	--	Induction of external staff limited.
Style of Management:		Formal and formalized with integration at the Chairman level.

* IEOT - Institute of Engineering and Ocean Technology

The salient features of this reorganization were:

- a. Each formation was to be headed by a Member in Charge. Thus exploration, drilling, technical services and operations were to function as "business" groups supported by personnel and financial groups.
- b. The operations group was to function as a coordinator for the domestic hydrocarbon resources while the exploration, drilling and technical groups were to play a "contractor's" role for the exploration and surveys, drilling, and the various support services needed for the operations. These groups were to be organized to be self-contained, the mutual dependence being on the basis of commercial transactions involving economic evaluation of services rendered.
- c. The operational projects were organized with the basins as unit for optimum utilization of resources and to ensure unified strategy foreexploration and exploitation.
- d. Material functions were fully decentralized with each Member being responsible for ensuring timely material inputs at the least cost. Existing research institutes were placed under the corresponding business groups--the IPE and IRS with Member (Exploration) and the IDT with Member (Drilling) to ensure utilization of research and upgradation of technology in the field. The institutes were, in addition, to generate their own funds by consultancy services and laboratory studies carried out.
- e. Separate planning and management service group including the functions of monitoring and control, management audit, efficiency studies were attached to each Member and quality assurance groups were attached to each operational regional unit for qualitative and quantitative results.

The detailed functions and responsibilities of the six full-time members are shown in Annex 9.

The emphasis in the revised structure was thus on functions rather than on "territorial" considerations. The thrust was on specialization and technological development and not merely on general management. To ensure accountability, a "business group" concept, was introduced in the Commission. The new organization structure set up formal program's and detailed systems for coordination. Growth was to be achieved through a more efficient allocation of the organization's resources, both of capital and manpower. By insisting upon each unit being a business group functioning as a profit or cost center, cost consciousness and efficiency in use of capital was sought to be attained during future periods of rapid growth. Resource allocation, resource generation and ensuring of efficiency through financial parameters was thus to be an important ingredient of the new system. The advantages of the revised structure were seen to be that being flexible, it lent itself easily to change whenever required to meet increases in volume of business or

future diversity; by focusing board level attention on disciplines, it encouraged growth of specialization and improvement in technology and skills in an increasingly complex world; and finally, considering common sedimentary basins as a unit could help ensure a unified strategy of exploration and development as well as optimum utilization of resources.

This organizational structure--as were the earlier ones--was a response to the perceived external and internal environmental pressures. In the birth stage of the NOC, the emphasis was on creating a new organization in a completely different area of activity, but which was crucial to the national economy. The organizational structure and leadership style had to be entrepreneurial, dynamic and inspirational. Communication among employees and the top management was informal and all systems and structures tended to be "ad-hoc" in nature. This was the period where the oil minister functioned almost as the chief executive of the NOC, so close and constant was his interaction. But as the organization grew in size and complexity, there emerged a leadership crisis in that the highly personal style could no longer manage the system. This led to the next phase of a functional organizational structure in the early sixties. In this phase, order and direction was sought to be attained by separation of functions, formalization of communications, adoption of work standards, stricter accounting and inventory systems, while attempting to retain the earlier creativity through increased specialization. The top management still retained the power for instituting direction and lower level supervisors were treated more as functional specialists than as autonomous decision-making managers. Although the new directive techniques channelled employee energy more efficiently into growth, they, too, eventually become inappropriate for controlling a larger, more diverse and complex organization. Lower level employees found themselves restricted by a cumbersome and centralized hierarchy. They had come to possess progressively more direct knowledge about the oil industry than did the leaders at the top; consequently, they felt torn between following procedures and taking initiative on their own. Thus, a crisis developed from demands for greater autonomy on the part of lower level managers. The solution adopted by the NOC was to move toward greater delegation and autonomy to the various geographical units particularly the offshore region. Yet, it was difficult for top management, who were previously successful at being directive, to give up responsibility. Moreover, lower level managers were not accustomed to making decisions for themselves. As a result, like many other organizations, the NOC tried to adhere to centralized methods in its countrywide operations while permitting greater regional autonomy in the technologically complex offshore area. There the organization moved toward a decentralized structure with much greater responsibility being delegated both to the functional and geographical zone managers. Profit center and cost center concepts were used to stimulate motivation on the one hand and management control by exception in the other. This delegation proved useful for gaining expansion through heightened motivation at lower levels and the decentralized managers were able to move with greater authority and incentive and were able to respond faster to the international industry. But a serious problem eventually evolved as the organization grew larger and more complex. The top executives started sensing that they are losing control over a highly diversified field operation especially since they were geographically remote and technologically complex. Autonomous field managers tended to run their own shows without coordinating plans, money, technology, and manpower with the rest of the organization. Some felt that

freedom had bred a parochial attitude. Many top managements seek to regain control over the total company at this stage by an attempt to return to centralized management, which usually fails because of the vast scope of operations. A more successful approach - and the one followed by the NOC - was a move towards a more formal structure and a decentralized system, but with much greater emphasis on coordination and control directed by the top management. The new system merged the autonomous decentralized units into functional units, which would be more amenable to central direction and control. Formal planning procedures were not only instituted but intensively reviewed through greatly expanded staff personnel located at headquarters. Control was exercised through careful allocation of capital and manpower resources across the organization and there was an attempt to centralize technical functions in the headquarters while leaving daily operating decisions to the field units.

But even this organizational structure will need to change with the passage of time. One may anticipate that the rigid systems and procedures of this quasi-functional form will lead inevitably to a "red tape" crisis. A lack of confidence is likely to build up between the line and staff and between headquarters and staff. Geographic dispersion and increased complexity of technology will require local solutions, and line managers in the field will increasingly resent heavy staff directions from those not familiar with local conditions. The staff people on the other, will find the line managers uninformd about the latest technology and reluctant to experiment. Procedures will tend to take precedence over problem solving, and innovation and experimentation will be less important than operational efficiency. Integration and cross fertilization across functional boundaries, so essential for the oil exploration business, will create new problems. And out of these problems, a new organization form will no doubt, in time, emerge.

4. SOME KEY ISSUES IN ORGANIZATIONAL CHANGE

During the various stages of growth of a NOC organization, a large number of issues normally need to be resolved. Some of the key ones are: What is the role of the board of directors? Who should be on it? What is its role when the company itself is owned by the government? Is there any "perfect" balance between line and staff for a NOC? What should be the relationship between the regional manager in the field and the headquarters? What is the correct degree of autonomy? How does one handle the research and development function? While it is difficult to find specific answers to these issues, perhaps, there is something to be learnt from the experiences of others.

The role of the board of directors. The ONGC has been run by a Commission, which functions exactly like a board of directors of a company. Its composition has been prescribed by an Act of the Parliament which created the Commission in 1958. The Act states that the Commission shall have "not less than two - and not more than nine members including the chairman." The act has not specified the functions of the members, and only one of the members - the member in charge of finance and owing functional allegiance to the ministry of finance - is considered to be a legal necessity. Over the past two and a half decades, the numbers and functions of the members of the board have changed - from a minimum of six to a maximum of the legal nine. Traditionally, there have been two kinds of board members - the full time

members and the part-time members, with the part-time members representing the parent ministry of petroleum and the ministry of finance. All members are appointed by the government through a committee consisting of the minister of home, petroleum and the prime minister. Towards the end of the seventies, a third part-time member was added, representing the ministry of planning (or the Planning Commission). During this period, there was a brief attempt to induct an outside oil technologist on the board, but that was a short lived experiment, as was the attempt to have secretaries of finance, petroleum and planning on the board instead of their junior colleagues. Both the Ministry of Petroleum and the Ministry of Finance are represented on the Board of ONGC, the former at the level of Joint Secretary, and the latter by an Additional Secretary. According to the Petroleum Secretary, the purpose of such representation,

".... is to reflect in the deliberations of the Commission the approved policies of the Government. We believe that an Additional Secretary or Joint Secretary is a senior enough officer to reflect the policy of the Government in the Commission. It is not to influence the decisions of the Commission but to make a contribution to the discussion by conveying to them the appropriate and relevant policies of the Government to the extent they are already there."

The full time members have during this period varied from a minimum of four to a maximum of six, and their responsibilities from the purely functional to a mix of staff and line. Thus in the early stages, besides the common finance and personnel members, the board members were responsible for exploration, engineering and maintenance, drilling and production; which was changed in the seventies to onshore, offshore, material procurement and maintenance, and research and development. In the eighties, the members were for exploration, drilling, operations and technical services. In the earlier stages, the chairman of the board functioned as the chief executive officer with the other members functioning in staff capacity to him. During the seventies, the member (offshore) - and later member (onshore) - however, functioned more as direct line managers in addition to their staff functions. In the eighties, the members became line members for their own respective functional areas while the chairman became the focus for integration of functional areas.

Though the original intent of the Act was to have the chairman of the board answerable to and reporting to the Parliament, in practice this implied that he reported to the minister of petroleum, who reported to the parliament. The secretary to the minister was to be just that - secretary to the minister to assist him in the discharge of his ministerial functions. In practice, however, the secretary of the ministry has inclined to take over the review functions of the minister. The nature and extent of government control over the ONGC is determined by the constitutional document that govern its creation and functioning. For the ONGC, these controls emerge from the provisions of section 15 of the ONGC Act, under which the Commission needs to secure prior governmental approval for the implementation of projects above a stipulated amount of capital expenditure, and for the disposal of property valued above a certain fixed amount. These controls are exercised by the requirement of approval of investment programs and of purchase decisions. Under Section 20 of the Act, ONGC can borrow in the open market only with the prior approval of

the government. Thus Government controls over the national oil companies occur at various levels: approvals of investment programs, control over procurement, pricing of crude and over sources of financing.

The activities of the board itself have therefore tended to focus on overall strategy, planning, formal approval of capital investments and budgets and interface with the external world, in particular, the various ministries of the government. The part-time members have provided the board with not only a window on the thinking in various parts of the government but also a focus in the board's attempt to influence the various ministries policies. At the worst of times, the part time members would provide the board with unwelcome scrutiny, criticism and protracted delays - which they could in any case in their role in the ministries -, and at the best of times, they would prove to be extremely useful "agents" to expedite the policies and programs of the board. Even while this system has tended to work reasonable satisfactory, there are clearly certain problems which need attention. There are, for example, no industry representatives on the board. Neither is the external research or academic community represented. The role and stature of the full-time members vis-a-vis the part-time members is often obscured by their relationship to the chairman, especially when they are only in staff to him. But the role of the board is evolving as the organization grows and innovative solutions have been found to some of these problems.

The role of the Regional Manager: The manager located in a remote, geographic region far from the headquarters has always presented a major challenge to growing organizations. If left alone to function autonomously, he fall behind technologically. If tightly controlled from the center through his functional staff members, long lines of communication, conflicting ideas and orders make rapid decision making difficult. In the early stages of ONGC's growth, the regional managers reported directly to the chairman of the board. They had little autonomy, and a "control room" in the headquarters received data and issued instructors on a daily basis. The integration was thus done in the headquarters, while the role of the regional managers was to merely implement the decisions and communicate the data on which decisions were to be made. This was changed dramatically when the separate offshore unit was created in the mid-seventies. The regional managers in this case became a member of the board. Being located at the field site, the unit functioned almost autonomously, seeking headquarter support only on major policy issues, large capital investments, and on foreign procurement. Though this system worked effectively, the growth of the organization required that this concept be extended to the onshore regions as well. In the eighties, the regional manager was thus the senior most functional manager in the field coordinating all functions. This matrix style of functioning was soon altered by creation of a regional director. The major issue which needs to be resolved is that of integration of diverse functions in the field - in an industry which requires synergy for effectiveness. The autonomous or the "semi" autonomous regional manager seems to be a "sine qua-non" in the organizational design of successful organizations. The other forms of integration - task-forces, matrix-organization, committees, periodic review meetings etc. seem to be all relatively ineffective alternatives.

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Research and Development and Innovation: One of the major problems facing an NOC is the development of the R&D function. Of even greater import is its nurturing after its creation. The problem, perhaps, comes from confusion between creativity and innovation. While there is creativity, there is little innovation in these institutions. As Levitt points out, there is a world of difference between creativity and innovation. "Creativity is thinking up new things. Innovation is doing new things. A powerful new idea can kick around unused for years, not because its merits are not recognized, but because nobody has assumed the responsibility--for converting it from words into action. Ideas are useless unless used. There is no shortage of creative people. The shortage is of innovators. Creative people tend to pass the responsibility for getting down to brass tacks to others. The scarce people are the ones who have the staying power to implement ideas." And it is these innovative people who are in short supply. Thus the task of R&D and its utilization in the NOC is an intrinsically difficult one for there is also a "risk" averse culture in these organizations. A number of different solutions have been tried over the years to try and find a satisfactory organizational solution to these problems. In the early years, the R&D function was placed directly under the chairman to give it the necessary stature. But the formative years required much greater professional nurturing and so it was moved under a board member specially charged with exploration and a separate institute was created - Institute of Petroleum Exploration in 1963. Progressively, R&D institutes were also created to cover the other functions - Institute of Reservoir Study (IRS), Drilling Technology (IDT), Production Technology (IPT) and Engineering and Ocean Technology (IEOT). To ensure that the R&D performed would be utilized in the field, each of these institutes was placed under the functional member of the board concerned with the operations in that area. Thus member (drilling) in the latest organization, had the director of IDT reporting to him directly, on the theory that a drilling manager in the field would be less reluctant to experiment with new products and processes originating in the IDT since they both reported to the same board member. Another mechanism that was used was to regularly rotate staff in the R&D institutes into the field formations for extended periods of time in line positions. A third mechanism was to force R&D managers to take line responsibility for execution of "pilot" projects in the field. Needless to say, results were at best "spotty" till date. While these mechanisms tend to make the R&D staff more "real-life" conscious, the improvement in the quality of R&D work itself remains a far more intractable problem.

Organizing for Change. Most large organizations seeking to alter their structure seek assistance from external management consultants or international consulting companies. In the case of the NOC, the path followed was different. The first "reorganization", in a sense, was the setting up of the NOC as a Commission answerable only to the parliament. While there was considerable debate and discussion, the decision was primarily political and spearheaded by the dynamic minister for oil of the time. The form and structure as well as the systems and procedures were derived almost entirely from the practices of the oil industry in the USSR. The second major change in the structure, which came in the early seventies, was preceded by intense public debate. A special committee was set up under the erstwhile minister of oil to examine the functioning of the commission. This committee adopted a very public style of operation. It interviewed a very large number of staff within the organization and also sought the assistance of expatriate Indians who had

distinguished themselves in the international oil industry. Over a period of almost 12 to 18 months, this committee--called the Malaysia Committee after its chairman--was thus able to lay the foundation for the need for fundamental changes in the NOC within the staff of the NOC itself. The organizational change which came about as a result of their deliberations were major, but were effective, primarily since the participation of the NOC staff in the discussion had been keen, intense and wide. It needs to be noted that the initiative for the setting up of the Malaviya Committee had come from the external environment--mounting oil import bills and lack of major discoveries by ONGC by over a decade. The next major organizational change in the early eighties emerged, however, primarily from within the organization itself. It was preceded by a two year period of debate and discussion within the organization. A full time task force of senior managers of the NOC were assigned the job of evaluating the strengths, weaknesses, opportunities and threats to the organization; studying the structures of other international oil companies in the public and private sector, and preparing a detailed blueprint for the new structure. This blueprint was then presented to the operating units in the field and headquarters by the task force for criticism, evaluation and alteration. The final blueprint had then to be scrutinized by the entire board before being submitted to the minister for his formal approval. The major point that needs emphasis is that the mechanism for organizational change is important enough to be set up carefully and cautiously, and that participation of the staff in a formal, structured way helps in the eventual success of the reorganization.

5. THE PROCESS OF CHANGE

It was Macchiavelli who said "it must be remembered that there is nothing more difficult - to plan, more doubtful of success nor more dangerous to manage, than the creation of a new system." Thus organizations embarking on a change in their structure and form need to understand the perilous nature of their venture. "For, the initiator (of change) has the enmity of all who would profit by the preservations of the old institutions and merely lukewarm defenders in those who would gain by the new one." But even as they do venture forth, there are a few lessons learnt from experiments in other societies and organizations, that they would do well to keep in mind.

The first lesson is that there is no such animal as a "perfect" organizational form for a company. The optimum form at any point of time is dependent on a large number of factors - the external environment, the agency and size of the organization, the type of industry and speed of technological change. A corollary to the above, is the necessity to incorporate in the thinking of the policymakers that all organizations must change with time. The duration of a particular organizational form will vary from industry to industry - in the case of NOC's it may be 5-10 years - but it will change. Thus any reorganization of an existing institution must provide for sufficient flexibility to change a few years hence. No organizational form is likely to last longer than a decade in the present turbulent times.

And while initiating change the objectives of the reorganization and its component elements should be explicitly defined even as the reasons for the reorganization are clearly spelt out. The organizational structure should

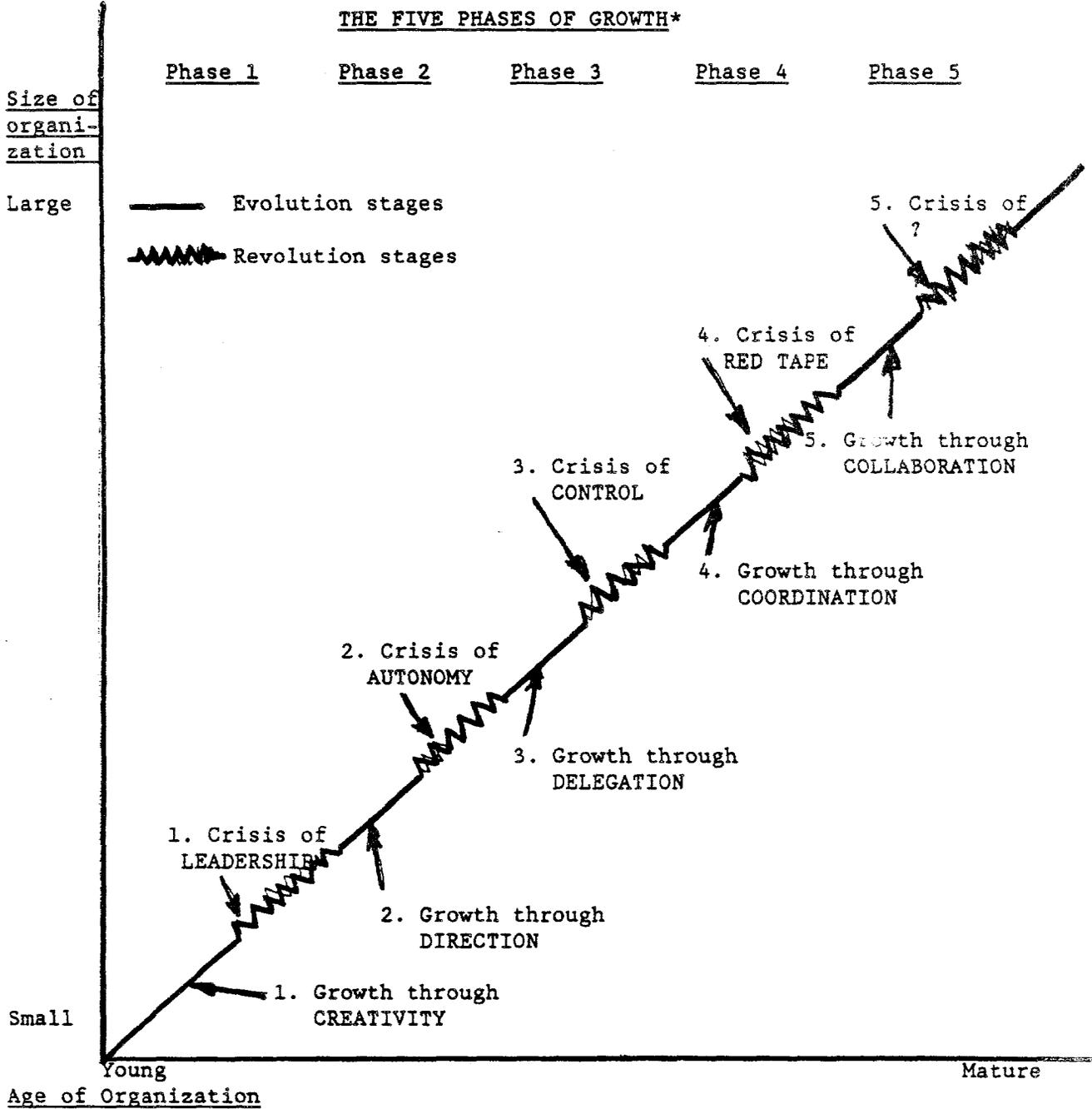
be designed to be flexible so that changes could be introduced periodically. In the design of its form, the basic principle to be remembered is that it has to be built around the strengths of individuals and the human resource available at that point in time; that human resources have to be optimally utilized, even while efforts are made to develop the people within it. It seems clear from all experiences that for large, national organizations, decentralization is normally desirable and can be successfully achieved by a proper balance of delegation and control. But control systems and procedures have to be drawn up as they are likely to be more effective in management than mere job titles and organizational charts. Structure and strategy are not enough to define the new organization, there will be a need to change the working "culture" of the organization--i.e., its systems, styles, staff and skills.

All organizations undergo change through their lifetime. Planned change is meant to reduce the pain of change. The issue, thus, is not so much the desirability of change, but the way in which it is implemented. The process of carrying out a reorganization is itself something which deserves far greater care than is normally bestowed upon it. A change initiated from the top, planned with the help of external management consultants, carries within it its own seeds of destruction. For organizational change to be successful, the deeper and closer the participation of the rank and file in the process, the greater are the chances of success in changing the "working culture" of the organization.

And the most difficult part of the process is managing the aftermath of the change. The object of change, implicitly, is to change some basic values of the organization. This cannot but have a major impact on those who are wedded to old values. Also the stated, explicit, intent is to change the working culture of the organization. This is a sharp break from the past. Again, systems can be changed by issue of office orders, working cultures are not that amenable to easy alteration. But, unfortunately, managing the aftermath is not usually recognized as a problem. So there is rarely any formal institutional arrangement to handle it. The steering committees and task forces set up to plan the organization change are normally dissolved once the reorganization plans are announced. There is, thus, left no objective champion of the reorganization in the most difficult period of implementation. As Macchiavelli astutely notes, those who have benefitted from the change, move to the sidelines, seeking legitimacy of their promotion by a studied indifference to the process that elevated them in the first place. Those who do not so gain, are obviously, critical of the change. Thus, far from any champions of change, the only voices to be heard are the critical ones. In this atmosphere, it is easy to conclude that reorganization was not a good idea in the first place! Not contained, this sullen muttering can prove to be extremely debilitating to the organization just at the time it needs its dynamism to make the new system work. But the problem is what should be done? Firstly, it should be recognized explicitly that managing the organization change aftermath is a problem which needs to be handled with as much care and effort as the reorganization itself. It would also be desirable to set up an institutional system for handling the aftermath on lines similar to that for the reorganization in which the CEO will have to play a significant role. The new values, as well as the new working culture of the organization have to be aggressively stated and promoted by the CEO and his chief lieutenants. An

announcement of flexibility as well as a statement that the new organization is neither carved in stone nor a structure designed to endure forever, can call for creative energies in the institution to be harnessed in the right direction.

In conclusion, the only lesson to be learnt is that each institution must develop its own answers suited to its own genius. The experience of others is at best an important indicator of the kinds of elements needed for success. Ezra Vogel, who studied the success of Japanese corporations, states this succinctly when he says "I wanted to understand the success of the Japanese in dealing with practical questions. My first inclination was to examine how such Japanese virtues like hard work, patience, self-discipline, culture, etc., contributed to their success. But the more I examined the Japanese approach to modern organization, the business community and the bureaucracy, the more I became convinced that Japanese success had little to do with traditional character trait than with the specific organizational structure, policy program and conscious planning, that successful management organizations and style are not the result of some cultural pattern or historical inevitability but are the result of good corporate planning, proper management structure and the most effective leadership."



* Greiner, E. Larry, "Evolution and Revolution as organizations grow." Harvard Business Review, 1972.

ORGANIZATIONAL SYSTEMS

	<u>Phase 1</u>	<u>Phase 2</u>	<u>Phase 3</u>	<u>Phase 4</u>	<u>Phase 5</u>
MANAGEMENT FOCUS	Make & sell	Efficiency of operations	Expansion of market	Consolidation or organization	Problem solving & innovation
ORGANIZATON STRUCTURE	Informal	Centralized & functional	Decentralized & geographical	Line-staff & product groups	Matrix of teams
TOP MANAGEMENT STYLE	Individualistic & entrepreneurial	Directive	Delegative	Watchdog	Participative
CONTROL SYSTEM	Market results	Standards & cost centers	Reports & profit centers	Plans & investment centers	Mutual goal setting
MANAGEMENT REWARD EMPHASIS	Ownership	Salary & merit increases	Individual bonus	Profit sharing & stock options	Team bonus

PRODUCTION OF CRUDE OIL IN INDIA

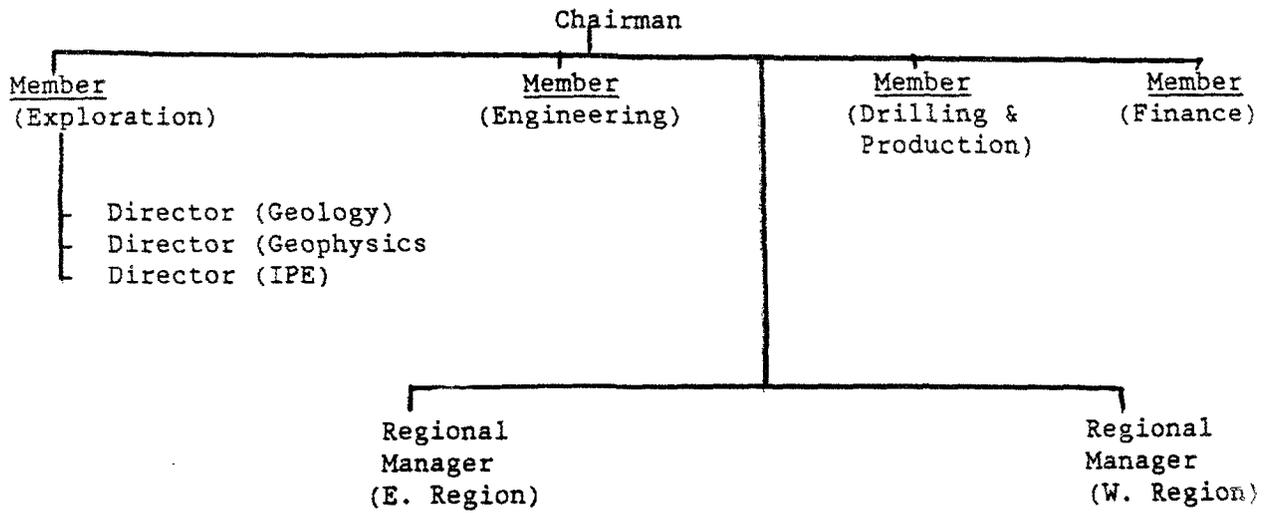
<u>Year</u>	<u>Total</u>	<u>ONGC</u>		<u>Total</u>	<u>%</u>
		<u>Onshore</u>	<u>Offshore</u>		
1947	0.250	--	--	--	0
1951	0.269	--	--	--	0
1956	0.396	--	--	--	0
1961	0.513	0.010	--	0.010	--
1965	3.473	1.427	--	1.427	41
1966	4.903	2.538	--	2.538	
1967	5.785	2.821	--	2.821	
1968	6.059	3.084	--	3.084	
1969	6.819	3.627	--	3.627	
1970	6.822	3.634	--	3.634	53
1971	7.299	4.003	--	4.003	
1972	7.321	4.100	--	4.100	
1973	7.189	4.028	--	4.028	
1974	7.684	4.534	--	4.534	
1975	8.448	5.279	--	5.279	63
1976	8.882	5.345	0.406	5.751	
1977	10.763	5.519	2.074	7.593	
1978	11.633	5.599	3.310	8.909	
1979	11.766	5.089	4.422	9.511	
1980	10.507	4.231	4.985	9.216	88
1981	16.194	5.201	7.975	13.176	
1982	21.063	5.356	12.877	18.233	
1983	26.020	5.755	17.392	23.147	
1984	28.990	6.120	20.140	26.260	
1985	30.220	6.780	20.730	27.510	91

ONGC: PATTERN OF GROWTH

	1961/62	1972/73	1982/83	1985/86
		00,000	00,000	00,000
<u>Oil production (management)</u>				
Onshore	0.010	4.1	5.4	6.78
Offshore	=	=	<u>13.0</u>	<u>20.73</u>
<u>Total</u>	<u>0.010</u>	<u>4.1</u>	<u>18.4</u>	<u>27.51</u>
<u>Gas production (BCM)</u>				
Onshore	-	0.7	1.1	5.6
Offshore	=	=	<u>1.8</u>	<u>14.2</u>
<u>Total</u>	=	<u>0.7</u>	<u>2.9</u>	<u>22.3</u>
		00,000	00,000	00,000
<u>Manpower</u>				
Onshore		21 448	29,377	}
Offshore	=	<u>20</u>	<u>3,643</u>	}
<u>Total</u>	=	<u>21,468</u>	<u>33,020</u>	<u>43,940</u>
Of which				
Management/supervisory		2,901	9,232	15,077
Skilled		7,464	13,060	17,538
Clerical and unskilled		11,103	10,728	11,325
<u>Wells Drilled ('000 metzage)</u>				
Onshore		61(115)	114(224)	190(410)
Offshore		=	<u>64(162)</u>	<u>77(180)</u>
<u>Total</u>		<u>61(115)</u>	<u>178(386)</u>	<u>267(590)</u>
<u>Total Assets (US\$ million)</u>				
		250	4,310	7,840
<u>Net Income After Tax (US\$ million)</u>				
		10	690	1,302
<u>Total Long Term Debt (US\$ million)</u>				
	-	9	1,610	5,638

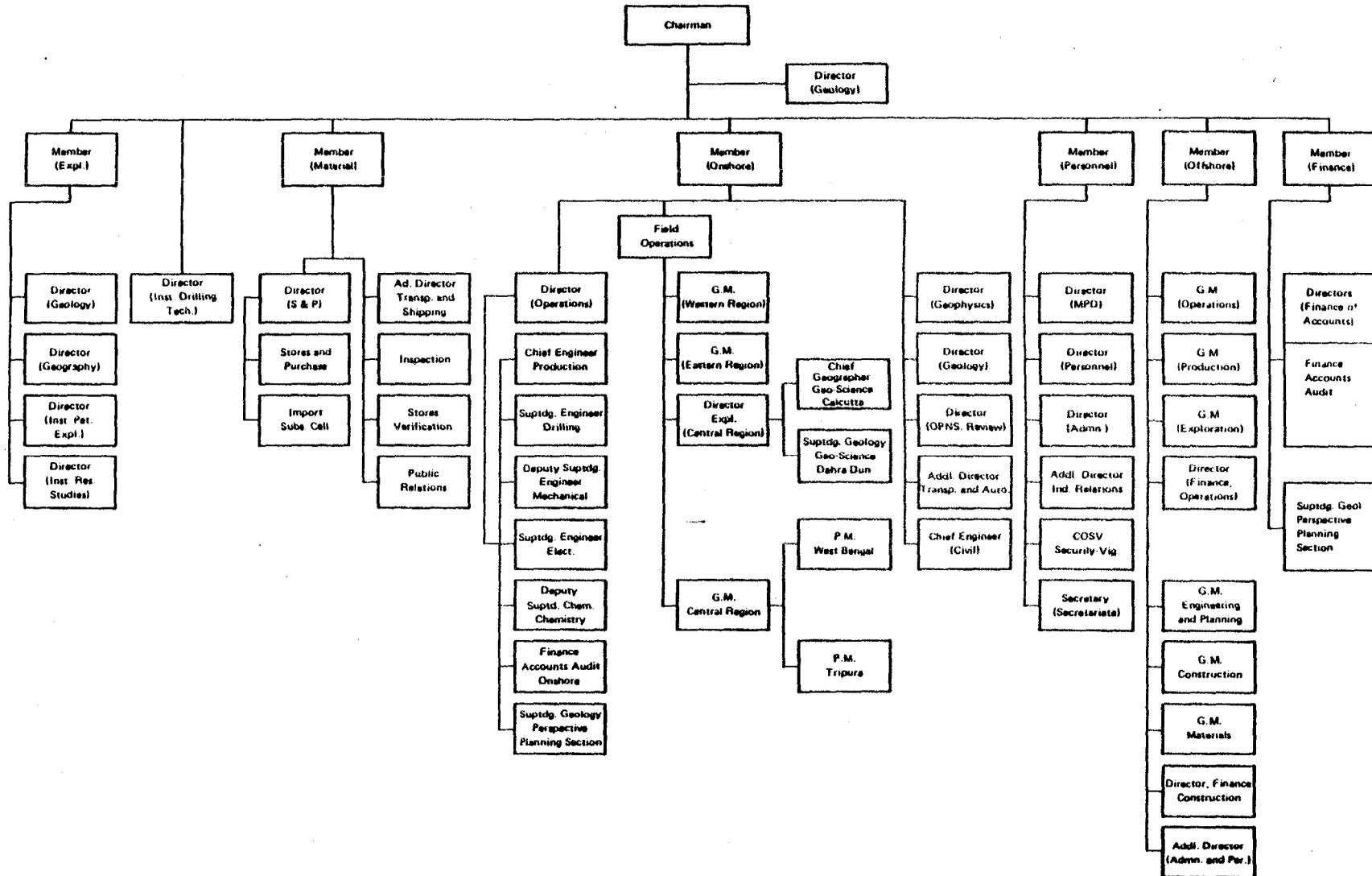
Phase 2

ONGC Organization Chart



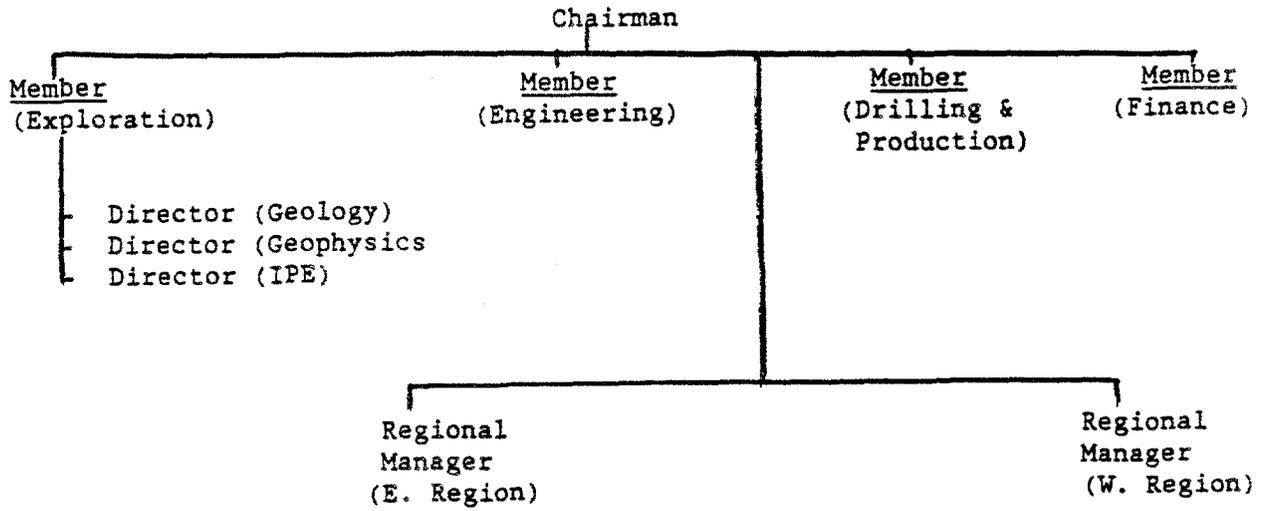
Phase 3

OIL AND NATURAL GAS COMMISSION (ONGC)
ORGANIZATION CHART



Phase 2

ONGC Organization Chart



natively, they can keep on purchasing the latest, developed technologies and accept a progressive reversion from attained levels of active involvement in the industry's development along with increasing reliance on imports of technological and managerial expertise. In either case, the initial success in building up the technological capability indigenously will become a short lived achievement.

Strategies for developing technological capability, as distinct from capacity, and then for managing it will vary from country to country. The structure of the prevailing offshore oil industry, the nature and form of technology and change in the industry, the relative nature of the change at different phases of operations, will all be important determinants of an effective strategy for a country. An examination of the offshore oil industry shows that though in one sense it is highly integrated, the high degree of vertical integration is matched by considerable inter-firm specialization and horizontal "disintegration" of production activities at various stages. The oil companies--including the IOCs--do not carry out all the activities involved in exploration and development themselves but they rely on a host of specialized supplier firms. Outside their core activities, the oil companies, it turns out, are primarily users of other firms technology. Though this structure of specialized suppliers operates internationally, and any oil company in any country can obtain the full range of goods and services in even the most remote and inaccessible places, the oil companies still play an extremely significant role as "assemblers" of the technology and "managers" of the systems operations. The initial impetus for acquisition of technological capability in the national oil companies (NOCs) usually comes from their commercial interests to deepen and broaden their expertise and experience in order to take the owner/operator role in development. This role of "assembling" the inputs required for offshore projects is played initially at the relatively indirect level of monitoring and coordinating the small number of primary suppliers of goods and services. But the fact is offshore technology has passed and is still passing through a phase of accelerating and increasingly diversified change. Its present pattern of development, for example, is focusing increasingly on increasing efficiency and decreasing costs in addition to pushing to new frontiers of the environment. It is also the nature of offshore industry that innovation does not cease when the new systems have been installed, indeed, technical changes continue through the life of the facilities. The changes are incremental and take place in "steps" rather than in any massive bursts of changes of technology. Managing offshore technology, thus, requires not only integrating technology in the form of goods and services supplied by other firms or being mere "informed buyers" of other people's technologies but also the integration of technology in the form of knowledge and information. Because of the complexity of the technology involved, the structure of inter-firm specialization in the industry, the relative newness of industry and the highly developed international operations of the industry, the national oil company has, thus, to play a role not only in choosing and using technology efficiently, but also in changing it. The policy framework and strategies that a developing country pursues become important determinants in its success to develop technological capability and to manage its operations.

India has followed a somewhat unique policy in the development of its offshore oil sector. And, in the highly risky, technologically complex and major capital intensive sector of offshore oil exploration and production, it has made a major breakthrough. In the offshore oil sector of the economy, the country has seen tremendous growth in the last ten years where its offshore production has gone from zero in 1975 to 20 million tons in 1985 providing almost two-thirds of the total crude oil production in the country. India, which in 1980, had self-sufficiency in oil to the extent of only 33%, today is self-sufficient to the extent of 73%--all in a span of five years--and the major contributor to the increased oil production has been the offshore oil sector. In a span of five years, the peak rate of offshore oil production grew from 100,000 BOPD in 1980 to 500,000 BOPD in March 1985, i.e., a growth of five times in a span of five years. Gas utilization similarly increased in five years from 1 million cubic meters per day in 1980 to 5 million cubic meters per day in 1985. LPG production for the first time used the cryogenic process and the plant set up in 1981, has crossed 240,000 tons per day level which represents about one-third of the total LPG production in the country. And this increase in production was achieved largely through its own efforts. It is this combination of increased self-sufficiency along with self-reliance that is of major significance. The importance of this offshore oil exploration and production effort for the country lies not only in the fact that these achievements have been possible but that even in the future since 60% of total reserves lie offshore, the structures that have been created and the management styles set in place could continue to provide a solid foundation for further growth. And that certain lessons learned from this success could well be applicable to other sectors of the economy.

It is true that each sector of the economy--whether it is in ocean technology or hydrocarbon or steel--has its own special requirements and environment, and while general guidelines on technological capacity development may be valid, it is essential to recognize that solutions have to be tailored to particular requirements of the sector. The key characteristics of the offshore oil sector of particular relevance to the Indian effort can perhaps be compressed to five major factors. Firstly, it involved, and remains, an area of completely new technology. The offshore oil industry in the world started only in early 1950s and, hence, even internationally the industry is still in its infancy. India started its offshore oil effort only in 1974 in an organized form and it has been only in the last few years that it has reached the stage where a certain degree of confidence in handling the new technology has been generated. Another aspect of the newness of the technology obviously is the absence of sufficiently trained and experienced manpower. As a result, India had to enter into this new technology area with a minimum of experienced and skilled manpower not only at the senior managerial level but also at the lowest technician level. Secondly, offshore oil technology is a high risk, high investment and high return area. The cost of the exploration and development of offshore is seven to ten times that of onshore. Added to these high costs is the fact that oil exploration intrinsically is an area of risk. It may be pointed out that internationally only one well in seven is found to be productive and to find an oil field of the size of the Bombay High an average of over 400 dry exploration wells have to be drilled. Since each offshore well costs about US\$2.10 million, one can imagine the amount of investments that are required. And that these are risk investments. Thirdly, the oil sector became an area of key national economic concern in the

seventies with the trebling of the oil prices first in 1973 and then in 1979. As a result, as much as 80% of the total export earnings of the country were being utilized for the import of one single commodity--oil in 1980. This naturally gave an urgency to the entire area of oil exploration production which was unique in the Indian economic scene. Finally, offshore oil industry has one other unique problem other than those inherent in oil exploration. It deals with forces of nature much more directly. The cost of time is high and the risk of failure higher. The uniqueness of the offshore oil industry is something that is usually very difficult for the policymakers to accept. The structure and management of the offshore oil sector required policies and strategies, structures and styles which are quite different from other sectors--including the onshore oil industry. Fortunately, the need for a pragmatic approach towards organizational structure and system was recognized early.

One other important component in the successful offshore effort was the development of technological capability for engineering design in the country. The consulting and engineering design capability in a country can be developed in an independent engineering firm or a design department of a manufacturing, operating or research institution or, indeed, as a part of the NOC. This unit has to be situated at the crossroads between the selection, planning and execution of projects, the development and subsequent acquisition of technology and, in general, the integration of a large number of elements. These elements include pre-investment studies, selection and acquisition of technology, purchase of machinery, supervision of plant construction and installation and training of personnel for maintenance, all of which are needed to bring an investment from its concept to commissioning. Such a unit helps prevent a developing country being burdened with experimental or obsolete technologies from abroad, which often happens when a developing country imports technology a number of years behind the date of its first introduction. Besides this, it can also prevent the importation of experimental technologies where the exporter uses the purchasing country as a guinea pig for the testing of new designs. The local engineering unit usually provides the country with increased skill and bargaining power when foreign technology is purchased since technology "packages" can be broken down in a more meaningful manner. This can lead to competitive prices since maximum local participation in goods and services can be built into the total package being developed for a project. Most developing countries have found that the research done in local research and development (R&D) institutes tends not to be utilized in the productive sectors of the economy. If local R&D is to be utilized, it will be necessary for an organizational structure to be developed which provides a package of services similar to that which is provided by foreign companies to the entrepreneurs in a developing country. Thus, the development of indigenous R&D is considerably enhanced by the creation of an efficient engineering capability. Again, many developing countries have found that buying turnkey plants is easier than running them. In the absence of local competence to run, maintain and service these plants, the country finds itself at the mercy of the foreign company that supplied the package in the first place. In other instances, the foreign company may no longer manufacture the components or spares, having progressed to newer and more complex plants. The existence of a CEDO (consulting and engineering design organization) and its involvement in the importation of any technologies often ensures that adequate local competence exists to run, maintain and service these

plants. It should also be possible through them to create local industry for spare parts and replaceable machinery. With their detailed knowledge of the working of the plant, it may also be possible for them to innovate solutions using locally available components and equipment. Thus, the development of CEDOs usually becomes an important first step in the creation of technological capability in the country. In the Indian case, the engineering capability for offshore design was developed in a public sector company which was a sister company of the national oil company. And by 1985, not only was almost all the engineering work for the offshore oil program being done locally, but a sizeable portion of equipment and supplies including platforms, rigs, vessels, drilling services, materials, etc., were being provided by the local industry.

It is with this backdrop that one must analyze the spectacular growth and development of the Indian offshore oil industry. What were the reason that such a rapid increase was possible in such a short period of time? What was the strategy that made it possible for India to enter into an area of high technology and high risk and perform successfully? What were the key components which enabled public sector organization to achieve these results? How was this growth possible simultaneous with the development of adequate local capability?

This analysis is best done using case studies in the two key areas of the development of engineering capability and the management of the offshore sector by a national oil company.

Development of Engineering Capability

In the early 1970s, Oil and Natural Gas Commission, India's national oil company (NOC) discovered oil in their offshore area. The NOC had more than adequate experience in oil production on land but none in the offshore area. For the first contract for the setting up of an offshore oil complex, the NOC decided to award a lump sum, turnkey contract worth about \$100 million to an international company. The reasons for this were the need for speed and the absence of technology in NOC and the country itself in this area. But NOC management, with an eye to the future, wanted to build this capability within the country. They examined the possibility of building it "in-house" but in the end, turned to another government-owned company which engaged in the engineering design and consultancy of petroleum refineries and chemical plants.

This engineering consultancy company (ECL), Engineers India Limited, had started to build up a nucleus group in the area of ocean engineering with the objective of getting into the offshore area. By the early seventies, this engineering company had built up a reputable track record in the refineries and petrochemicals sectors of the country. Its decision to move into the offshore area was, thus, consistent with its corporate objective of providing engineering services to the entire oil sector from upstream to downstream. Moreover, it already had a group involved in various port and harbor work and had invested some effort in R&D work on offshore platform design. The approach followed by this company in its internal development effort is of some interest. First, it staked out its position a number of years before any offshore oil was actually discovered in the country. The manager for its offshore division was recruited in 1970, a full four years before the

discovery of Bombay High. The initial impetus to the effort had come from observing the government's efforts to negotiate offshore concessions with various IOCs in the late sixties with negligible local technological capability. This group was, thus, designed to provide the technical knowledge and skills which were absent. The investments made were, in one sense, speculative, and in another, far-sighted and prescient. But it is one of the major function of a CEDO to predict the emergence of new technologies and to develop capabilities to absorb and to build-on them, well in advance of their actual need. This innovative role is too often forgotten by a CEDO. Not only do emerging technologies need to be identified, and that well ahead of time, the necessary resources to grow and nurture the local capability development need to be provided. In this case, the commitment and resources stemmed from the chief executive of the CEDO who took a direct interest in its development. The nurturing of new initiatives in an institution seems to need the direct and personal support of the top management to succeed. In the early years of this divisions functioning, there was still an insistence that they generate some revenues for the company. The profit objective compelled the division to search for allied fields where the offshore technology being developed by them could be utilized. Thus, they undertook marine surveys to locate sewage outfalls at sea, to build offshore lighthouses and design iron-ore submarine pipelines. The combination of an overall lofty objective of technology development with a "down to earth" profit motive seemed to provide the right mixture of stimuli. Another element in the strategy was an aggressive recruitment program directly from the universities--both local and foreign. The focus on human resource development was continued through a liberal policy on training and attendance at international seminars. But the most important element in its strategy of technological capability development was the way it worked with the NOC over the next few years after the oil discovery.

In the first stage, NOC retained ECL to carry out a design review of the turnkey contractor,s work and also to supervise the work on its behalf. With the help of NOC, the turnkey contractor was compelled to submit all his calculations and drawings to ECL for approval. ECL's approval was also made compulsory before payments to the contractor could be made by NOC. This approval by the local CEDO was an important tool in the hands of ECL, not only during design but also during subsequent phases of the work of fabrication and construction. It also enabled ECL to pick up a great deal of "know-how and know-why" in a short time. In view of the fact that ECL had no prior experience of handling such a large offshore contract, they obtained back-up consultancy from an experienced foreign engineering company for payment of only \$1.5 million--1.5% of the total contract value. In this first stage, the following benefits accrued:

- (a) a direct saving to NOC of the order of \$2 million. This arose from the fact that the man-hour charges for the foreign company were of the order of \$40/man-hour as compared to only \$7 for ECL. During this stage, ECL, even with its lack of offshore experience, was able to substitute 30-40% of the total manpower required from abroad. In addition, payment to ECL was in local currency, thus saving foreign exchange;
- (b) an indirect transfer of know.how to the local CEDO took place;
and

- (c) a group of 20-30 local engineers in ECL were trained on the job who could, and did, form the nucleus of local CEDO's future growth in this area of technology.

In the second stage, NOC decided to entrust ECL along with its associated foreign engineering company with the joint responsibility for carrying out the basic engineering for the offshore projects. These projects--each of the order of \$30.50 million--were given to ECL. During the second stage, the NOC saved itself about \$3 million per project, in foreign exchange, by using the local CEDO. More expertise was accumulated by ECL, and a group of 60-70 engineers trained who later designed and engineered their own offshore platforms at a saving of \$3.4 million per project. Since 15-20 projects were envisaged, the NOC saved itself in all \$60.80 million in direct costs.

In the third stage--and this is the most important facet in developing a local CEDO capability--local manufacturers were introduced. A local shipyard--owned by the government--was located and was encouraged by ECL to develop its facilities for fabrication of the platforms. The local shipyard was reluctant to make the investment of \$6.8 million required for setting up the special facilities needed. It also had no experience of offshore platform fabrication. At this stage, ECL offered to help it plan and set up the facilities as their consultant. NOC, on their part, offered to take their production if they could meet international quality standards and were competitive. In a space of two years, this company was able to set up its yard, and execute orders for 4.5 platforms, each at a cost of about \$7 million. These platforms were to be designed by ECL and fabricated under its supervision. Thus, the experienced manpower developed by ECL in the previous four years was directly utilized to help set up the local shipyard in business.

There are, clearly, a number of different ways in which the local CEDO's could start acquiring technology and participating in the subsequent projects of the design and installation of process and well platforms. Hence, the strategy followed by this ECL is of some interest. In the conventional development of technology in most LDCs, the scientists tend to place a great deal of emphasis on basic engineering and attempt to develop technological self-reliance by starting their efforts at the basic engineering stage. As an alternative, ECL decided that the process could be accelerated by starting this process initially through performing detailed engineering and integrating backwards into basic engineering. For manufacturing companies, of course, the step is normally to start fabrication and then integrate backwards successively into detailed and then basic engineering. In this case, ECL adopted the strategy of first starting to work in the third stage--supervision of design, fabrication and installation on behalf of the owner company as a means of acquiring technology. Since the local CEDO did not have the necessary expertise even to supervise the turnkey contractor's work. ECL decided to retain a foreign consultancy firm having expertise in this field as their "back-up consultant." This was done with the objective of successfully completing the project and transferring technology through "on-the-job" training. In the second stage of ECL's strategy, the proportion of work being done by the foreign back-up consultant was reduced in direct proportion to the technology and confidence gained by the local consultancy firm. In the third stage, the entire work was done by the local company who then also started

attempting to design the platforms in a manner such that local manufacturers and suppliers could provide equipment and instrumentation for them. A parallel strategy was adopted for development of the local fabrication capability by transferring to it whatever technology was available with the local company. This four-stage strategy was successfully implemented by ECL and this case study illustrates the key catalytic role a local CEDO can play in the development of technological capability. There were other important impacts as well--a cadre of professionals were trained in the handling of the new technology over a short period of time. Though located in the CEDO, and not in the NOC, they provided valuable staff support to the government as well as the NOC in the future development of the offshore oil sector.

Management of Offshore Technology

The development of local technological capability in the CEDO over a five-year period was an achievement of some note but the success that the NOC was able to attain over the next five years provided the national economy with significant benefits. In one year, a noted critic of the government was moved to note that the national budget was "floating on oil." Let us now move to examining how the NOC--in this case the Oil and Natural Gas Commission of India--was able to quadruple its offshore oil production in five years and thereby change the degree of self-sufficiency from 27% in 1980 to 73% in 1985.

At the outset, it must be stated that there were certain essential features which underlay the above achievement in the offshore sector. The basic components which underlined its success and which, indeed, can be considered to be absolutely essential if any public sector is to be successful, were: political will and leadership, supportive bureaucracy which viewed its role as a friend, philosopher and guide of the public sector rather than an audit, querulous-oriented bureaucracy, and managerial autonomy in public sector unit coupled with selection of the right man for the right job. Within this external environment, the NOC developed a set of policies and strategies which were fundamental to its success. What were some of those policies and strategies?

(i) The first was the definition of clear objectives in the Bombay Offshore Project which was the operating division of national oil company assigned the responsibility for execution of the Indian offshore oil effort under a member of the Board. The objectives of the offshore project were crystalized around two major directives: (a) Implementation of an accelerated development plan. This was a new plan developed by the national oil company's offshore unit which envisaged increasing oil production from the offshore area five times in a period of five years; (b) In all areas of activities, endeavor to match the international company norms of performance. All existing norms of onshore work were eliminated and the only parameter that was acceptable to the top management was the work carried out by the international oil companies and international service contractors. The definition of clear and limited number of objectives was, thus, one of the major factors.

(ii) The second was definition of a number of strategies which were developed in various areas to achieve the objectives laid down. These strategies were meant to enable the operating staff to react and discharge their duties in a manner consistent with these objectives and, at the same time,

enabling them to respond creatively and coherently to the external pressure. One of the major areas that was foreseen as providing a possibility of conflict in execution was that of the policy of self-sufficiency at the earliest in oil production with that of self-reliance in development of technology. In answering the challenge posed by these contradictory demands of the economy, the NOC implemented a three-pronged strategy in its offshore oil exploration and production sector. The elements of this three-pronged strategy were:

- (a) the first and the most essential element of this approach was to master the core technology involved in the entire system of oil exploration and production from beginning to end;
- (b) the second element of the strategy was to accelerate the effort so as to increase the amount of oil produced indigenously, even though it meant a temporary period of hire/ purchase of services and equipment from outside; and
- (c) the third and the final element of the strategy was to build a completely indigenous capability in the entire offshore oil sector where only marginal inputs needed to be obtained from outside.

a. Mastering the Core Technology. The objective behind the first strategy of "mastering the core technology" required for offshore oil exploration from beginning to end was dictated by two elements: the first was that the country must have complete independence from external pressures in its entire venture and that it should not at any point of time be dependent upon critical supplies, goods or technology from outside; and the second was that mastery of core technology is essential if the country is to purchase or hire equipment or technology from outside in an economical and controlled manner, should such hire or purchase be necessary due to exigencies of circumstances.

The first element in oil exploration is mastery of the geosciences. In case of geology and geophysics, the NOC had, right from its inception, been almost completely independent, and all capability had been built up within the organization in the onshore oil sector. For geophysical data collection offshore, it purchased its own seismic survey vessel called, completely manned and operated by its own personnel with the assistance of a shipping company. The seismic data, which was thus obtained, is processed in its own Computer Center, and the interpretation is carried out also in-house.

The next step in the offshore oil effort is that of drilling. The NOC purchased its first drilling rig "Sagar Samrat" in 1973. In the initial stages, it was manned and operated by an American company but since 1979, Sagar Samrat has been completely owned, operated and manned by the NOC personnel without any foreign assistance whatsoever. A number of services that are required during drilling such as cementing, mud logging, etc., have also been carried out by its own personnel except for one area that of well logging, which is being used from an international servicing company as is the case in almost all oil companies around the world.

Once the commerciality of oil has been established, the next step is getting it into commercial production. The basic concept for development are now prepared in-house, while the basic and detailed engineering capability has been developed in Engineers India Limited, a sister public sector undertaking under the Ministry of Petroleum and Natural Gas. Fabrication of the well platforms is carried out by Mazagon Docks Limited, another public undertaking entity, which has, since 1975 made an effort to develop the necessary fabrication technology, in the initial stages assisted by a French company but which, since 1979, has also been completely on its own. As far as the next stage is concerned--production--these systems have traditionally been completely operated by the NOC personnel themselves. In the operation of all the production systems offshore today, thus, there are no foreign agencies involved except for marginal inputs which may be necessary and required from the vendors of equipment, for maintenance and provision of spares. The endeavor was to focus on these key elements by deploying the best available staff, by greater emphasis on training and of sustained management attention.

As a result of the above, it can be stated that the first major objective of the NOC in its offshore oil exploration and production effort, companies, has been largely achieved. Thus, there is no sector of the oil exploration and production area in which ONGC does not today have competence and in which it cannot. In association with the other Indian companies operate without foreign inputs

b. Accelerating the Effort. With the increase in oil prices in 1979 and the subsequent dependence of the Indian economy on oil imports, it became necessary to tremendously accelerate the total effort of oil production indigenously in the shortest possible time. The necessity for the increased tempo of work was further emphasized by the fact that as much as 80% of India's exports were required to pay for the import of oil. Coupled with this economic necessity was the fact that any rapid increase in capacities of the Indian organizations would take some time. Thus, while it was necessary to increase the acceleration of ONGC's effort and detailed plans were prepared for an accelerated exploration and development program in early 1981, the only means of attaining the targets laid down required the use of hired equipment and services to supplement the available capacity of the Indian organizations.

Though the period 1980-85 had envisaged a very rapid growth in activities but even these were considered inadequate when confronted by the economy's needs. Thus, the accelerated plan for exploration and production set their sights even higher. The Sixth Five-Year Plan (covering the period 1980-85) had envisaged a limited seismic effort while the accelerated effort increased the total cumulative seismic coverage of the Indian Continental Shelf and Slope from 120,000 in March 1980 to over 201,000 in March 1985. The Sixth Plan had envisaged an exploration effort of 95 wells while the accelerated plan took its sights at an increased effort amounting to 127 wells during the same period. In March 1980 there were only nine platforms installed offshore, with a total capacity of delivering 5 million tons of oil and 1.1 million cubic meter per day of gas. By 1985, the total number of platforms were to increase to 70 while the system capacity was planned to be increased to 25 million tons of oil, 20 million cubic meters per day of gas and 400,000 tons per annum of LPG.

But the entire effort of accelerating the effort was achieved under complete NOC management and control. Keeping into account the availability of experienced manpower, the lead times in developing the necessary indigenous manufacturers, expansion of fabrication yards, etc., the NOC supplemented its efforts through liberal use of hired equipment, services, consultancies, etc. In this accelerated effort, two key factors were kept in mind: (i) that the entire effort was at all times under complete control and management of the NOC, assisted in some cases by other Indian organizations; and (ii) that the hire of services, manpower, equipment, etc., from foreign sources was seen only as a transitory phenomenon while the indigenous capacity was being built up.

c. The Long Range Plan. The major objectives of the NOC's long range plans were, thus, to move as fast as was practicable from charter hire of services and of equipment from foreign sources towards Indian ownership. To envisage the effort required and provide a framework for investment planning by the private industry, a ten-year Perspective Plan for the offshore oil exploration and production sector was drawn up. This helped also to optimize the acquisition effort of the country.

In the shaping of this effort, three major elements were kept in view: the first was that there should be progressive Indian or ONGC ownership of the critical pieces of equipment and services required for the effort and that this should be phased with the recruitment and training of adequate manpower; the second was to ensure that a gap was still left in the services to ensure a continuing access to the latest technology through limited hire of services and equipment; and the third major element in this was to embark on an enhanced R&D program to develop indigenous technology on a long term basis.

In the effort to optimize the acquisition program and develop services, the effort was to first focus on the high value critical items. Thus, for drilling, a typical exploration well, the major components which needed to be replaced with Indian ownership were that of the rig hire, materials, supply vessels and the logging services as can be seen in Table 1 below:

Table 1: BREAK-UP OF COSTS OF A TYPICAL OFFSHORE WELL

	<u>Exploration well</u> %	<u>Development well</u> %
Rig hire including insurances, repairs maintenance and depreciation, etc.	41.0	46.5
Supply boats including depreciation, water, POL, etc.	22.0	17.0
Material costs	21.0	28.0
Logging services	6.0	3.5
Helicopter	4.0	3.0
Cementing	0.7	0.1
Diving	1.0	--
Miscellaneous services/consultancies	4.3	1.9

Similarly, for a typical offshore platform, the break-up of costs dictated a prime focus on engineering, fabrication and installation. The equipment was sought to be indigenized by reorienting the specifications during engineering as the local industry could manufacture it even on their existing assembly lines.

Table 2: BREAK-UP OF COSTS OF A TYPICAL WELL PLATFORM

Engineering and project management	7.5%
Steel fabrication	43.0%
Equipment	32.5%
Installation	17.0%

Based on this analysis, a detailed program was developed for the acquisition of equipment and for the development of support services. Some of the factors in the development of competence outside direct management control of the NOC which needed careful study were:

- nomination of appropriate institutions in areas requiring major capital investments, e.g., fabrication yards, drilling units, etc.;
- selection of appropriate technology by local firms;
- problems of pricing for a monopoly buyer;
- quality control for products in a capital market;

- continuing access to latest technology development; and
- efficiency of production systems.

The success in managing the development of these services has, however, been chequered. While a number of organizations outside the ONGC have grown: Engineers India Limited in engineering, Mazagaon Dock Limited in fabrication of offshore platforms and their installation, Bharat Heavy Electricals Limited for manufacture of land rigs, etc., by and larger the developments have tended to be in the public sector. The role of private sector has been limited though in the past two years, a few industrial houses have entered the market. While a part of this reluctance on the part of the indigenous industry can be explained by the nature of the market structure-- high capital investment with a single, government buyer--a part also, perhaps, lies in the risk-averse nature of their management. The policy and legal structure can only provide an external environment conducive to growth, it is really for the internal management of the institutions to seize these opportunities and develop appropriate systems, structures and strategies.

To return to the management within the oil company. Besides the strategies developed for tackling the problems of self-reliance, equal attention was paid to strategies for internal infrastructure--an area normally of conspicuous neglect. A major effort was made in identifying a few key areas for immediate solution. The fact that work was commenced within the first nine months on residential colonies and an office complex itself demonstrated to the staff the seriousness of the management and its effort to create an acceptable infrastructure. In 1980, there were, for example, few houses available in Bombay and no employees wanted to come to Bombay because there was neither housing available nor was there space available for office. Today, there are over 6,000 residential units either under construction or completed. A new office complex became operational in early 1985. In addition to this, the working environment was sought to be created which matched with that available on international installations. It was clearly acknowledged that the NOC, and, indeed any public sector, is not in a position to match the salary or perquisites norms available in the international industry or indeed even in the Indian private industry. The effort, therefore, was to create a work culture and environment within the organization, both in the office and at the work site which matched international norms. As a result, even today Indian rigs and platforms and indeed every installation in the offshore sector of the Indian hydrocarbon industry has facilities and work style which are identical to that obtained in any multi-national oil company abroad.

(iii) The third area was that of structure. Based on the objectives and the strategies defined above, a new organizational structure was formulated within the project. The heart of this was that a number of operating units were created, whose performance could be evaluated and who had identifiable leaders responsible for their failures and achievements. It meant that there was, for each department, an identifiable manager; each operating division and department had not only identifiable heads but even below, units were created which had identifiable heads and leaders to whom everybody who belonged to that unit reported. It was this system of blocks where people were administratively made their seniority and irrespective of their salary

drawn, that was the key component in creating a structure which was effective and efficient. Let me assure you, none of this was done overnight. It took a tremendous amount of persuasion to get people to accept that though they were 55 years old, they had to report to people who were 30 years younger!

(iv) Next came the whole area of systems and procedures and this is something that troubles very many organizations. In general, it is not easy to change systems of organizations as old as ONGC--and ONGC at that time was 26 years old. Historic memory of the institution and the accumulation of office orders over decades creates a situation when any drastic change of the system is resisted and such efforts usually end up in unnecessary conflict. As a result, a different approach towards changing of systems and procedures was followed. The essence of this approach was very simple. This was to identify some of the key areas essential to the attainment of results and in these key areas, simplified procedures were issued which overruled all previous procedures. Thus, in the area of exploration, simplified manuals were prepared and issued while in the other areas, the existing systems and procedures were allowed to be continued. This did lead to a number of inconsistencies but these were sought to be tackled as they arose rather than through issue of a completely new systems and procedure manual. There is a tremendous temptation, generally insisted upon by the Finance and Personnel departments, that if you are going to change systems and procedures, you must have a completely new system and procedure manual. That manual normally takes about two years to put together and. in that two years, all the impetus that have been generated is lost.

The entire system itself of management was redesigned to stress group building and team effectiveness through organizational mechanisms. These organizational mechanisms included the issue of a daily progress report to all sectional heads, setting up of a review meeting of all sectional heads once a weekly and monthly review meetings of all managers directly with the head of the project. For the first time, a monthly progress report was issued to all project members so that records could be kept of their performance as compared to their targets. One other system was introduced that henceforth--and this is something that most people resist--all plans were to be prepared by the people who were to finally implement them. One of the concomitant requirement to this was that once a commitment was given by the head of an operating unit to meet a particular target, the head of the project never interfered with him. All that was demanded was that once a target date had been given, it was going to be met even if it meant that people had to work 30 hours a day! The main thing was that the setting of the target was done by him. It was no a unilaterally imposed option. He was expected to examine each and all of his resource problems, what was their deployment, what were the people available to him and what he needed. But once the resource issue had been settled and the parameters set, he was then left on his own. He came to the general manager only for assistance in meeting the targets which were given to him and not for its change!

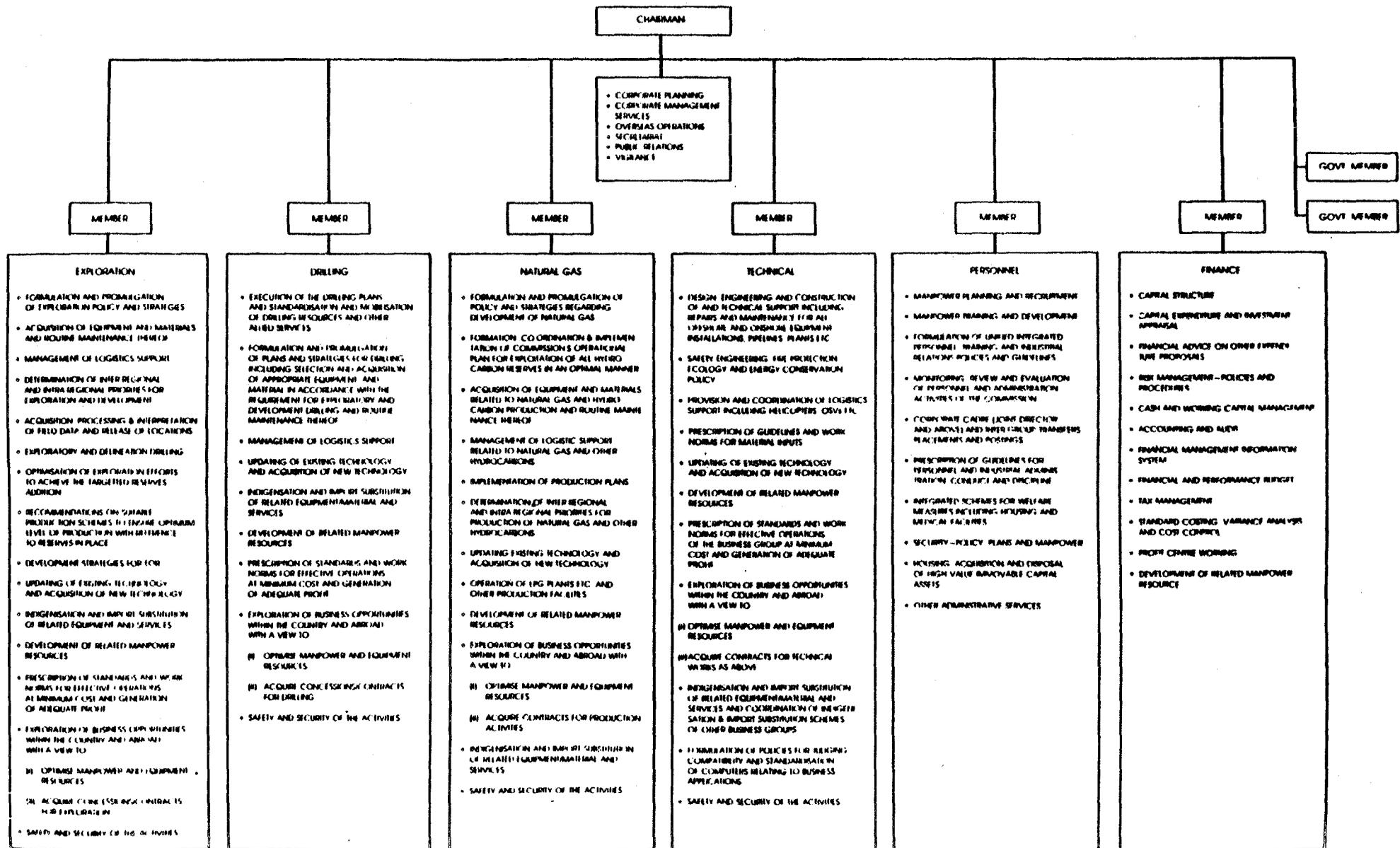
(v) The building up of any organization has to take into account the strength of the individual available to the organization. The point is that at any point in time, the organization has just the manpower resources that are there and one has to work with the resources that are available to him. It was his job as the manager, to make sure that he was able to get producti-

vity from them, rather than waiting for a time that he would be able to get people from outside who had the required level of experience and expertise. The strategy of systematic induction of young graduates into the organization and the delegation of authority and responsibility to the employees on the spot was, thus, a key departure from conventional approaches to organizational development. As a matter of fact, the average age in the offshore sector even today is less than 30. In the initial stages, there were less than 200 people of age above 40 in the entire organization managing the offshore sector with annual capital outlays of over US\$1 billion. In view of the fact that the growth had been rapid, this automatically implied that on rigs, platforms and plants, personnel in authority were much younger than their counterparts in other sectors of the economy. In many cases, it also meant that they did not have the necessary years of experience normally considered necessary before being given the responsibility for operating a major process plant and machinery. At one point of time, for example, the LPG plant, which cost the country about US\$200 million was being managed by an employee who was a senior engineer, only a few years out of college. This required building a flexible organization around the strengths of the manpower available. Some of the techniques that were found to be very useful were the use of the functional titles as distinct from the organizational hierarchy. Thus, at some times the head of the unit could well be a senior engineer, while the head of the similar unit in another installation might be a chief engineer. The weakness in technology and management were sought to be plugged by the use of outside consultancy which was also used to train in-house personnel. It did recognize that they were in an area of new technology and simply giving functional titles and giving responsibility to the young people was not the solution. This was sought to be rectified through a major investment in training both on-the-job and through external consultants. For example, the LPG plant at Uran was an area of completely new technology for the NOC. The approach in starting up and the initial running in of this plant was to hire 20-30 engineers from a sister organization for a period of six to nine months and simultaneously train the staff both within country and outside, with consultants. This is important. Both the consultants and the NOC staff knew that the consultants were only a stop-gap measure and as soon as the plant manager was willing to take over the responsibility for running the plant, the consultants would be removed. It was really left to the plant manager and his team to decide when they were ready.

(vi) The style of management in public sector organizations generally tends to be paternalistic. In the setting up and development of the Bombay Offshore Project, the approach was different and the style of the management that was adopted was that of a participative kind. One other of the key characteristics of the method of management adopted was that line managers were given the key responsibility and very little staff support was provided to the top management overseeing them. The entire staff support available to the head of the project, for example, consisted of a total of six engineers, for handling project works worth US\$2.5 billion. Another was accessibility, in an organized manner, to the project head and, finally there was a long term commitment to institution building, exemplified in the effort at training and management development.

The success of these strategies is evident in the performance of the institutions during this period.

Phase 4
OIL AND NATURAL GAS COMMISSION (ONGC)
ORGANIZATION CHART



FUNCTIONS AND RESPONSIBILITIES OF THE SIX FULL-TIME MEMBERS AT ONGCMember (Exploration)

1. Framing policy plans and exploration strategy.
2. Defining inter-regional and intra-regional priorities of exploration and development.
3. Acquisition and interpretation of field data and releasing locations.
4. Optimizing exploration efforts to fulfill the targets of reserves additions and laying down strategies for the optimum production of fields based on reserves in-place.
5. Laying down standards for the optimization of resource for exploration and development.
6. Development of strategies for EOR.
7. Updating of technology.
8. Development of explorationists and reservoir engineers.

Member (Drilling)

1. Defining plans and framing strategies for drilling as per the requirement of exploration/operations.
2. Standardization and mobilization of drilling resources and other allied services.
3. Updating of technology.
4. Research and development of equipment and related facilities including materials.
5. Development of drilling engineers and staff and other related manpower.

Member (Technical)

1. Design and back up for surface installations, sub-sea completions, plants, etc.

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5. Development of drilling engineers and staff and other related manpower.

Member (Technical)

1. Design and back up for surface installations, sub-sea completions, plants, etc.

2. Provide back up engineering services for drilling/production operations.
3. Services for engineering and construction activities.
4. Repair and maintenance of equipment, plants, pipeline, etc.
5. Safety engineering environment control.
6. Guidelines and consultancy for material management.
7. Development of related manpower.
8. Transport.

Member (Operations)

1. Act as coordinator of proven commercial hydrocarbon resources.
2. Plan and monitor various phases of operations.
3. To fix inter- and intra-regional priorities.
4. To optimize rate of production.
5. Updating production technology.
6. Run and maintain LPG plants.
7. Development of related manpower.

Member (Personnel)

1. Personnel planning and recruitment.
2. Training and executive development.
3. Organization development and design.
4. Laying down unified personnel and industrial relations policies.
5. Inter-group transfers and postings.
6. Guidelines for conduct and discipline.
7. Unified welfare measures.

Member (Finance)

1. Capital structure.
2. Capital expenditure and investment appraisal.
3. Financial advice on other expenditure proposals.
4. Risk management.
5. Cash and working capital management.
6. Accounting and audit.
7. Financial management information system.
8. Profit planning and budget.
9. Tax management.
10. Policies and procedures of the division.
11. Marketing of products/services.
12. Costing and cost control.