CHAPTER II

IMPORTANCE AND PLACE OF RESEARCH AND DEVELOPMENT DIVISION IN THE ORGANISATION STRUCTURE OF INDIAN INDUSTRIES

In the previous chapter we have already discussed how Research and Development activities are gaining ground in the Indian industries especially under the public sector. In the context of these developments and also keeping in view the scope and objectives of the present study, in the discussion that follows an attempt has been made to locate the position of Research and Development division in the organisation structure of the Indian industries in general.

Organisation as a Concept:

Conceptually, organisation is the process of so combining the work which individuals or groups have to perform with facilities necessary for its execution so that the duties performed provide the best channels for efficient, systematic, positive and co-ordinate application of available effort.

Whether an organisation is simple or complex in every organisation there is always an impersonal system of coordinated human efforts; always a purpose as the co-ordinating and unifying principle; always an indispensable ability to communicate; always the necessity for personal willingness and for effectiveness and efficiency in maintaining the integrity of purpose and the continuity of contribution.

Herbert A. Simon visualised organisation as a system of inter-dependent activity, encompassing at least several primary groups and usually characterised at the level of consciousness of participant by a high degree of rational direction of behaviour towards ends that are objects of common knowledge.

Based on the above concepts, it can be said, that the organisation consists of a tightly knit, effectively functioning social system. This system is made up of interlocking work groups with a high degree of group loyalty among the members and favourable attitudes and trust between superiors and subordinates.

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it has a structure especially so when attempt is made to describe it in the form of a flow chart.

An organisation structure has to be designed in order to clarify the environment so that everyone knows who is to do what and who is responsible for what results; to remove obstacles to performance caused by confusion and uncertainty of assignment; and to furnish a decision making communications network reflecting and supporting enterprise objectives.

The relationship subsisting among the various working groups taking the shape of a structure, as already stated, implies that they are deliberately specified and adopted and do not evolve out of their own. It is however possible that in an unusual situation new working relationship may evolve which may later be adopted as representing the formal structure.

An interesting point to note in this connection is that, not to speak of the nineteenth century, even as late as 1950's there was hardly any systematic method available for designing and developing a suitable organisation structure. In the situation, what the managers would do was that they would look to the models of their successful competitors and use the trial and error method for developing a suitable organisation structure with some guidance as available in the works of Henry Fayol and other

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classical management writers. It was not until 1955 when Peter Drucker suggested three specific ways to find out what kind of structure is needed by a firm to attain the objectives and these three specific ways suggested by Drucker are: (1) Activity Analysis (2) Decision Analysis and (3) Relation Analysis.

Activity Analysis:

Under activity analysis it is emphasized that all the business are not common in all respects and therefore before designing an organization structure for a business it becomes necessary to make a specific analysis of the activities of the same for designing its organization structure. Once the activities have been identified and listed according to their importance, the next steps become to divide and subdivide the work into smaller homogeneous units, each of which has to be assigned to a competent individual for performance.

Decision Analysis:

Decisions which may be classified into unprogrammed or programmed one preceded by a common set of logical analysis. Once this has been done, the next step becomes (a) to identify major decisions needed to secure performance necessary for achieving the objectives and (b) to classify these decisions on the basis of their kind and character.

5. R.N. Singh, Management Thought and Thinkers, Sultan Chand & Sons, New Delhi, p.209.
There are generally four basic characteristics which determine the nature of any business decisions. And these four characteristics are (i) degree of futurity in the decision meaning the time span for which a business remains committed as a result of the decision and how fast can it be reversed; (ii) the impact of a decision on other functions, on other areas or on the business as a whole. If the decision affects only one function it is considered to be of the lowest order, otherwise it has to be made at a higher level; (iii) the number of qualitative factors entering into a decision such as the basic principles of conduct, ethical values, social and political beliefs etc., while the most important as well as the most common of qualitative factor is the human being; (iv) and lastly, the uniqueness or periodicity while recurrent decisions can be subjected to a general rule, that is of a decision in principle, rare or unique decisions are to be treated as distinct event. As such rare or unique decisions are to be thought thoroughly.

Relation Analysis:

Developing organisation structure on the basis of relationship analysis involves identification of the relations amongst the different blocks of the organisation so that it may be possible to locate where a specific component belongs. With whom will a manager in charge of an activity have to work, what contribution does he have to make to managers incharge of other activities, and what contribution do these managers, in turn, have to make to him? The best rule in this regard is to keep the relationship to a minimum but to make each count.
Traditionally, a manager's job was defined only in terms of the activity he headed, i.e., in terms of relation with lower managers. At present this is not considered adequate. It is now found necessary to analyse the upward relationship which involves defining the contribution such an activity has to make to the larger unit of which it is a part. Lastly, it is also considered important to analyse side relations which involves a suitable analysis of the contribution a manager has to make to other managers of the enterprise. Often, this contribution may be very important to the success of an organisation, usually there are three types of relations viz, line, staff and functional, each with its separate roles.

The formal superior subordinate relationship in an organisation it is possible to describe with the help of an Organisation Chart, a chart being a blueprint of organisation its functions, line of authority, and key positions. The chart indicates who supervises and controls whom. It also shows how the various units are interrelated and serves to give visual ideas about formal relationships by showing the main lines of authority, the main lines of communication and the flow of authority (downwards) as well as the flow of accountability (upwards) throughout all the levels of management hierarchy. An organisation chart has also the unique feature of revealing management level.

The organisational design of Research and Development and its management control, needless to mention, is influenced
substantially by the structure of the organisation for the whole enterprise. In a comparatively small, functionally structured enterprise the Research and Development function may have a formation which will differ a lot from that in an enterprise with distinct profit-centre capitalising on some of the broad ideas mentioned. The position that Research and Development activities generally occupy in an organisation structure is described in the next page with the help of a typical vertical Organisation Chart.

It is evident from the Chart 2 that at the top of the echelon is the Board of Directors. There is a Chairman and Managing Director who is entrusted with substantial powers of company management subject to the superintendence, control and direction of the Board of Directors. Managing Director serves as the liaison officer between the Board of Directors and the rest of the Organisation. He is no doubt subordinate to the Board and is accountable to it, but he is also a member of the Board, and as such shares in the object and policy making functions of the Board. Again there are six divisions viz., as purchase, Marketing, Manufacturing, Finance, Personnel and Research and Development. Therefore, it is clear that in the organisation structure depicted in Chart 2 Research and Development is a distinct functional area and the chief or head of Research and Development division reports directly to the Chairman and Managing Director and like other functional heads such as the Manager Purchase, Manager Marketing etc. he is also a member of the Board of Directors of the Company and taking part in the policy making processes of the same.
Chart: 2
Organisation Chart for a Company engaged in manufacturing

Board of Directors

Chairman & Managing Director

Manager Purchase
Manager Marketing
Manager Manufacturing
Manager Finance
Manager Personnel
Director, Research & Development

Production Control
Quality Control
Procurement
Transportation & Traffic

Plant Manager I

Supervisor
Foreman
Operations

Plant Manager II

Supervisor
Foreman
Operations

Plant Manager III

Supervisor
Foreman
Operations
It is not always necessary that the organisation chart, as above, and the position of Research and Development in the same will be obtained in all the different types of organisations irrespective of their class and creed. In other words a variation from the same is not unlikely. In support of this proposition we draw below an Organisation Chart which goes by the name of matrix organisation which is a gross violation of the classical organisation structure based on the principle of 'one man one boss'. Conceptually, it is one that employs a multiple command system includes not only multiple command structure but also related support mechanism and an associated organisational culture and behaviour pattern. Therefore, a matrix organisation is characterised by many organisational overlaps not only in terms of command system but also in terms of control behaviour, or even whole of the organisational culture. As an organisation structure it is favoured when an organisation has a variety of project ranging from large to small.

From Chart 3 given here it appears that at the top there is Board of Directors. The Board has entrusted powers to the Chairman and Managing Director who is in charge of a Management Committee. Through Management Committee the Managing Director keeps his fingers on the pulse of the day to day business operations by getting into touch with the lower levels of managerial activities and transmits the information of the chief aspects of operative

management to the Board. The Management Committee is in power of three specific areas such as Corporate Functions, Business Sectors and Operating Unit. Under Corporate Functions there are personnel Director, Finance Director, Technical Director, Chief Vigilance, Company Secretary, Economic Advisor and Co-ordination. They are all accountable to the Management Committee. The responsibility of Technical Director is delegated to six important divisions viz, Planning and Development, Facilities and New Projects, Management Services, Corporate Engineering, Quality Assurance and Corporate Research and Development.

From what has been discussed above it is now crystal clear that under the organisation structure shown in Chart 2 i.e. 'one man one boss' principle Research and Development remains under the charge of a Director who reports to the Chairman and Managing Director. In other words he works under the control and authority of the Chairman and Managing Director. As against that under a matrix organisation structure as shown in Chart 3 Research and Development remains under Corporate Function as a distinct area under the charge of a Director Technical who reports to the Chairman and Managing Director through the Management Committee in its absence directly. Parallel to this there is Research and Development wing in each plant working under the authority and control of the respective executive head in each plant. Thus there is a dichotomy under matrix system of organisation so far as Research and Development is concerned. Directives and command in
respect of Research and Development at the plant level are received from the corporate Research and Development along with the plant Research and Development. Therefore, it is the dichotomy which obviously is the salient feature in respect of Research and Development under the matrix structure of organisation which distinguishes it from 'one man one boss' principle under the simple organisation chart.

The Position of Research and Development in the Organisation Structure of Indian Industries

In India the position of Research and Development in the overall organisation structure mostly conforms to the pattern shown in Chart 2 and in some cases to the pattern as shown in Chart 3. Further, in the commercial and industrial enterprises in India two other activities are quite commonly tagged on to Research and Development activities. These are 'Design' and 'Quality Control' or 'Assurance'. Needless to mention a single package for all these four activities namely, research, development, design and quality control or assurance cannot but have an influence on the organisational pattern of Research and Development functions in the commercial and industrial enterprises whether it is in the private or in the public sector in any country.

The place of Research and Development in the overall organisation structure of a firm in general has been explained earlier with the help of Chart 2 and 3.

Considering the fact that along with the Research and Development functions two more activities viz, 'design' and 'quality control or assurance' remain tagged with Research and Development division in the Indian industries, an organisation structure that would be most suited to meet these peculiarities of the Research and Development division, as has been suggested by one author+, is described as follows:

Under the said organisation structure Research and Development is a distinct division with a Chief or Head in charge of the division who reports straight to the Chairman and Managing Director of the enterprise. Under this Chief of Research and Development there are in fact, four divisions namely research, quality control or assurance, design and development. Under the 'Head of Research' there are two in-charges namely in-charge, Product Research and In-charge, Process Research who derive their authority from the Head of Research and report to him.

Similarly, under the Head of 'Development' there are two in-charges viz, In-charge, Product Development and In-charge, Process Development.

+ Vide S.K. Chakraborty at al, op.cit., p.27.
Chart: Research and development Organisation

Chief of Research and Development

- Head of Development
- Head of Design
- Head of Quality Assurance
- Head of Research

- In-Charge Process Development
- Research and Development Budget Accounts Officer
- In-Charge Product Development
- In-Charge Product Research
- In-Charge Process Research
Process Development. They in turn derive their authority from the Head of Development and report to him.

The Quality control or Assurance and Design are left under the charge of two separate heads namely Head of Quality Control or Assurance and the Head of Design. These two heads derive their authority from the Chief of Research and Development and report straight to him.

Besides the above four there is a separate department in charge of Research and Development budgets who reports straight way to the Chief of Research and Development.

As against the norms suggested above the actual position of Research and Development obtaining in the organisation structure of the companies both under public and private sector is sought to be illustrated here with the help of organisation chart in our three sample companies viz, Bharat Heavy Electricals Limited, a leading company under public sector, the Associated Cement Companies Limited, a leading company under private sector and also in Gwalior Rayon another leading company under private sector in India.

**Bharat Heavy Electricals Limited (BHEL)**

The first unit of what is BHEL today was set up at Bhopal in 1956. Subsequently 3 more plants were set up at Tiruchi, Hyderabad and
Hardwar with Soviet and Czechoslovakia assistance. Today BHEL has become the largest engineering organisation in the country with 13 manufacturing units and 8 service division.  

In an organisation like BHEL it is essential that Research and Development Organisation can meet the corporate objectives of the organisation. BHEL's main objectives is to contribute maximum in the energy sector in generation, transmission, distribution and utilisation of electric power. BHEL produces power generating and utility equipments of a large variety. Often to meet the country's requirements, it diversifies its production, e.g., manufacture of Oil rigs, heat exchanges for chemical and fertilizer plants, compressors etc. To meet the above objectives and also for optimum utilization of manpower and research equipments in BHEL, it will be observed from the Chart that follows that matrix type of organisation has been considered appropriate to ensure taking up work requiring multidisciplinary assistance. With different engineering and development centres, located at all the manufacturing plants and service divisions of BHEL and being headed by experienced and specialist teams of engineers, it provides the basic product and product-engineering support, in accordance with the customer's specifications and contractual obligations. Each engineering and development centre in BHEL has been constituted in three major sub-centres, namely, product engineering, field engineering and research and product development. The research and product development sub-centres have been made

responsible for design development and applied research work oriented towards adaptation and development of designs, manufacture of prototypes and their testing, incorporating advancement in technology in specialised fields.

In addition to the above groups in its various plants and engineering divisions, there are specialised groups in corporate Research and Development division. These specialised groups of corporate Research and Development can do basic and applied research at Research and Development complex. The Research and Development staff reports to the General Manager of Research and Development. The Director Technical Overviews all the engineering and Research and Development activities in BHEL.

The Associated Cement Companies Limited (ACC):

The Organisation Chart of A C C Ltd that follows marks a variation. On analysis it is found that at the top there is Board of Directors. The Board of Directors form an Executive Committee which has two whole time Directors as members. The Executive Committee operates through the divisional heads. To this end it entrusts powers to the heads of twelve important divisions viz, Operations, Personnel, Liaison, Finance, Overseas Projects Corporate Planning & Chemicals, Controller Projects, Management Audit and Services, Marketing, Materials Management, Secretarial, Public Relations and

All activities relating to Secretarial works are in charge of a Functional Director who works also as a Company Secretary. Public Relations are headed by a Chief Manager. Projects Controlling is a separate function and is in-charge of Controller Projects. Materials Management is headed by a Controller and Research & Development is a distinct functional area which is in-charge of a Controller. The head of these twelve divisions as shown in Chart 6 report to the Executive Committee. The Controller of Research and Development reports directly to a Wholetime Director who is a member of Executive Committee of Directors.

Gwalior Rayon:

Gwalior Rayon, a leading company in the private sector specialising in the production of rayon represents a type by itself so far as the position of Research and Development in the overall organisation chart of the company is concerned.
Analysis of the structure shows that at the top of the echelon is the Joint President. Under Joint President there are Finance and Commerce Manager, Works Manager, Superintendent and Chief Engineer, and Technical Manager. They are all accountable to the Joint President. Finance and Commerce Manager has entrusted his power to two important Manager viz, Joint Commercial Manager and Joint Finance Manager. They report to the Finance and Commerce Manager. There is an interrelation between Works Manager and Finance and Commerce Manager. Works Manager is in-charge of two Superintendents namely, Production Superintendent and Joint Production Superintendent. Superintendent and Chief Engineer maintain a separate division of which Chief Engineer becomes an important member. Chief Engineer has delegated his power to Deputy Chief Engineer. Under Technical Manager there is Research, Development, Quality Control & Expansion. So Research, Development, Quality Control & Expansion are combined activities and these four are under the control of Technical Manager. For smooth functioning of Research, Development Quality Control and Expansion there is Technical Assistant which is accountable to the same.

Manning of Research and Development:

In Table 5 that follows an attempt has been made to project the educational qualifications of personnel engaged in Research and Development as on 1.6.1988. Out of 96927 Scientific and Technical
### Table - 5: Educational Qualifications of Personnel Engaged in Research and Development as on 1.6.1988

<table>
<thead>
<tr>
<th>Education Qualifications</th>
<th>Ph.Ds</th>
<th>Post-graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph.Ds</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nat Sc.</td>
<td>3399</td>
<td>3862</td>
</tr>
<tr>
<td>Agri Sc.</td>
<td>397</td>
<td>15</td>
</tr>
<tr>
<td>Med Sc.</td>
<td>897</td>
<td>58</td>
</tr>
<tr>
<td>Soc Sc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4693</td>
<td>3935</td>
</tr>
</tbody>
</table>

**Source**: Department of Science and Technology, Research and Development Statistics, 1988-89, New Delhi, Government of India, p.62

**Note**: Sc. - Science
Table 5 Contd......

<table>
<thead>
<tr>
<th>Diploma Holders</th>
<th>Others</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>20 21 22 23 24 25 26 27 28 29 30 31</td>
<td></td>
<td></td>
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<tr>
<td>2487 2 2489 1321 4967 1639 27 70 8024 12245 15907 10627</td>
<td></td>
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<tr>
<td>1818 0 1818 472 3 3260 0 45 3780 2025 34 10435</td>
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<tr>
<td>2251 3 2254 972 69 2359 68 63 3531 16329 365 11006</td>
<td></td>
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</tr>
<tr>
<td>6556 5 6561 2765 5039 7258 95 178 15335 20599 16306 32068</td>
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</tbody>
</table>
personnel engaged primarily in Research and Development activities as on 1st April 1988, it would be noted from the Table that academic qualifications were available in respect of 71679 i.e. for about 74% of the Scientific and Technical personnel engaged in Research and Development activities in India. Out of these, 45% had engineering and technology background, 29% had natural sciences, 23% agricultural sciences, 2% had medical and rest 1% had social sciences background. Analysis according to level of qualifications shows that 14% were doctorate degree holders, 29% were post-graduates, 27% were graduates, 9% were diploma-holders and rest 21% were with other qualifications. In natural sciences, 59% had post-graduate or above qualifications, 28% had graduate degree and rest 13% had other qualifications. It would be observed from the Table that a similar trend exists in case of medical and social sciences. In agricultural sciences, 63% had post-graduate and above qualifications, 6% had graduate degree and rest 31% had 'other' qualifications. In engineering and technology, 21% had post-graduate and above qualifications, 36% had graduate degree, 20% had diploma and rest 23% had 'Other' qualifications. It would also be noticed from the Table that in the field of agricultural sciences, natural sciences, medical sciences and social sciences there was sizeable proportion of post-graduates and doctorates whereas in case of engineering and technology only 21% were post-graduates and above and there was a sizeable proportion of diploma holders.
Table 6: Salary Structure of R & D Personnel Employed in Public Sector and Private Sector as on 1.4.1988

<table>
<thead>
<tr>
<th>Salary Scale</th>
<th>Public Sector No. of Personnel in Position</th>
<th>Private Sector No. of Personnel in Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than Rs. 1,000</td>
<td>1482 (12.5)</td>
<td>1174 (6.8)</td>
</tr>
<tr>
<td>Rs. 1,000 to Rs. 2,000</td>
<td>5898 (49.6)</td>
<td>4241 (24.7)</td>
</tr>
<tr>
<td>Rs. 2,000 to Rs. 3,000</td>
<td>2974 (24.9)</td>
<td>4311 (25.1)</td>
</tr>
<tr>
<td>Rs. 3,000 to Rs. 4,000</td>
<td>848 (7.1)</td>
<td>3323 (19.4)</td>
</tr>
<tr>
<td>Rs. 4,000 to Rs. 5,000</td>
<td>487 (4.1)</td>
<td>2065 (12.0)</td>
</tr>
<tr>
<td>Rs. 5,000 to Rs. 6,000</td>
<td>165 (1.4)</td>
<td>1065 (16.2)</td>
</tr>
<tr>
<td>Rs. 6,000 to Rs. 7,000</td>
<td>40 (0.3)</td>
<td>536 (3.1)</td>
</tr>
<tr>
<td>Rs. 7,000 to Rs. 8,000</td>
<td>7 (0.06)</td>
<td>214 (1.2)</td>
</tr>
<tr>
<td>More than Rs. 8,000</td>
<td>1 (0.01)</td>
<td>247 (1.5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11902 (100.0)</td>
<td>17176 (100.0)</td>
</tr>
</tbody>
</table>

**Source**: Department of Science and Technology: Research and Development Statistics, 1988-89, Government of India, New Delhi, p.64.
Again in Table 6 an attempt has been made to show the salary scale of 29078 out of the total of 31145 Research and Development personnel employed in the inhouse Research and Development Units of public and private sector industries. It is evident from the Table that the proportion of Science and Technology personnel engaged in Research and Development activities of public sector industries in the pay scale up to Rs.1,000 was 12.5%. Almost half of the Research and Development personnel were in the scale between Rs.1,000 to Rs.2,000. In case of private sector industries a little less than one third of the personnel were in the scale of less than Rs.2,000. About 45% were in the scales between Rs.2,000 to Rs.4,000 and a little less than one-fourth of personnel were in the pay scales of more than Rs.4,000.