PLANNING AND ORGANISING INDUSTRIAL RESEARCH AND DEVELOPMENT FOR IMPROVED ORGANISATIONAL EFFECTIVENESS

BY

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THESIS SUBMITTED TO THE
INDIAN INSTITUTE OF TECHNOLOGY, DELHI
FOR THE AWARD OF THE DEGREE OF

DOCTOR OF PHILOSOPHY

DEPARTMENT OF CIVIL ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY, DELHI

FEBRUARY 1985

CERTIFICATE

This is to certify that the thesis entitled "PLANNING AND ORGANISING INDUSTRIAL RESEARCH AND DEVELOPMENT FOR IMPROVED ORGANISATIONAL EFFECTIVENESS" being submitted by Shri Rakesh Kumar PANGASA to the Indian Institute of Technology, Delhi, India, for the award of the degree of DOCTOR OF PHILOSOPHY under the Civil Engineering Department is a record of bonafide research work carried out by him under our guidance and supervision.

To the best of our knowledge, the thesis has reached the requisite standard fulfilling the requirements of the regulations relating to the said degree.

The material contained in this thesis has not been submitted, in part or in full, to any other University or Institute for the award of any degree or diploma.

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ACKNOWLEDGEMENTS

It is my privilege and pleasure to express my sincere regards and profound sense of gratitude to Prof. P. Natarajan and Dr. H. C. Visvesvaraya (Supervisors) for their invaluable advice and encouragement throughout the course of Study.

I am indeed indebted to the Chairman and Director General of Cement Research Institute of India for sponsoring me for the Ph. D. Programme and permitting me to use the resources available in the Institute.

The cooperation extended by a large number of R&D Organisations and Companies having their own R&D Centres, who actively participated in the questionnaire survey, is gratefully acknowledged.

The advice and suggestions from a large number of experts through personal communications and discussions have been of immense value in finalizing and corroborating the Study; special thanks to each one of them.

Last but not the least, my thanks go to Shri Mehar Chand and Shri V. K. Bansal who have helped in bringing the Thesis to its present shape.

While appreciating the advice, encouragement, cooperation, suggestions and help rendered by individuals referred above, the responsibility for any errors or omissions will be entirely mine.

28 February 1985

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S Y N O P S I S

1 Process of Planning and Organising for Industrial R&D

It is generally claimed, not only in India but also in many other countries, that industrial R&D Organisations have much larger capabilities - available readily off-the-shelf or potentially developable - than are being utilised for technological exploitation in the respective industrial sectors. This apart, neither does there seem to be any successfully demonstrated mechanism or criterion for evaluating the contributions of industrial R&D Organisations towards technological developments. Investigations on possible ways and means of drawing on the utility potential of such industrial R&D Organisations to the industrial sectors in particular, and to the nation in general, could be considered a plausible necessity.

In the absence of any common yardstick to relate the output of R&D with its inputs, efforts to plan anticipated achievement of pertinent outputs from R&D, and to deploy the necessary infrastructural resources for achieving the thus-defined output, would become the most important component contributing towards the success of the R&D Organisation. The worthwhileness with which the proposed output is planned to be realised is symbolised as the 'effectiveness' of the R&D Organisation in the environment in which it exists. The pattern of deployment of the infrastructural resources, read with the systems and procedures adopted by the R&D Organisation in these pursuits, on the other hand, is distinguished as its 'efficiency', quite apart from the effectiveness.

Identification of such anticipated outputs through R&D efforts would need to cover the spectrum of activities ranging from establishment of a set of distinct objectives to work for at one end to the selection of appropriate activities to be implemented to accomplish the established objectives at the other end. This whole spectrum of activities starting from those which enable to comprehend the aims of the R&D Organisation in establishing objectives, through the intermediate activities of formulating, appraising and evaluating proposals, to the selection of the appropriate activities to be implemented - is the gamut considered as 'the process of planning industrial R&D'. By these considerations, the success of any industrial R&D Organisation would be greatly improved by attending to this process in planning R&D. With a view, therefore, to influencing improvements in the process of planning for R&D activities through all the logically sequential steps till the selection of R&D projects for implementation, the Study investigates the whole range of this planning process and suggests a methodology which, when adopted, would augment the effectiveness as well as the efficiency of the R&D Organisation. As a follow-up, attention has been given as to how such selection of R&D projects is also to be complemented and sustained through organising the needful resources in a timely and phased manner; and this upholds the validity of the selection methodology. This underscores the fact that these ramifications of the planning effort are not only worthwhile but have virtually become a dire need of the day.

2 The Objectives of the Study

This study aims at the following objectives:

1 Constituting a syntax of attributes and criteria for defining the worthwhileness of R&D projects beyond the pale of ad-hocism in their choice - i.e., to introduce 'objectivity' to replace 'ad-hocism'.

2 Ascertaining the recent status in respect of planning and organising industrial R&D activities in India.

3 Developing an objectivity-model for enriching the process of planning for industrial R&D activities, and of organising the resources for implementing the planned R&D activities.

4 Validating the developed model based on related considerations (e.g., epistemology of objectivism) and substantiating it through a case study, as well as through ascertaining contemporary rationale in planning industrial R&D activities.

5 Suggesting possible adaptations of this validated and substantiated model for improving the process of planning and of organising the resources under certain typical environments.

3 Development of Objectivity Model

The methodology adopted starts with, as its a-priori reference base, the professional experience gained over the last decade (1974-83) in planning, programming, monitoring and evaluation of typical industrial R&D projects in India, with a case study at the Cement Research Institute of India (CRI). The recent status in relation to planning and organizing industrial R&D activities in the country has been corroborated through a questionnaire survey; and the state of the art assessed. The several activities that an R&D Organisation would need to pursue are broadly classified within those that contribute either to the effectiveness of the Organisation or to its efficiency. Postulating that to ensure 'effectiveness' is relatively more important than even 'efficiency' in most R&D Organisations, this Study investigates to greater depth those activities which

contribute to effectiveness. However, the activities contributing to efficiency have also been considered - though only to a limited extent. In such an objectivity-based conceptual framework, ad-hocism in selection of R&D projects gets replaced by objectivity considerations. In the background of both the continuing experience in planning, programming, monitoring and evaluating R&D projects at CRI, and the discussions held with several directors/managers of industrial R&D Organisations, the conceptual framework has been cast into an Objectivity Model; this Model is demonstrated as capable of promoting effectiveness and, of course, also efficiency. The development of the Model has been augmented concomitantly with an organisational structure embodying categorization and deployment of infrastructural resources.

4 Validating the Objectivity Model

To validate the Objectivity Model, firstly the epistemology of objectivism - as expounded by Ayn Rand - is briefly reported; this highlights that concepts represent a cognitive system of classifying, condensing and integrating an ever-growing body of knowledge; that human beings retain concepts in their minds by means of definitions; and that the rules for correct definition are derived from the process of concept formation. Thereupon, the concepts representing various attributes of the Objectivity Model (such as Purpose, Mission, Projects, etc.) are shown to conform to, and to be an adaptation of, the processes of concept formation.

The validity of the Objectivity Model has been corroborated through a case study at the Cement Research Institute of India (CRI) by studying the devolution of the Institute's 'Purpose' into 'Objectives' and thence into specific 'Projects'.

Comments were also sought from a few experts in related fields to add contemporary corroboration to the Objectivity Model; these comments have largely vindicated the principles and the scope of the Objectivity Model in planning and organising industrial R&D.

The usefulness of the Objectivity Model in improving organisational effectiveness thus gains relevance, validity and utility.

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