

INDUSTRIAL SYSTEMS ENGINEERING
AND MANAGEMENT
IN DEVELOPING COUNTRIES

**INDUSTRIAL
SYSTEMS ENGINEERING AND MANAGEMENT
IN
DEVELOPING COUNTRIES**

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MARIO T. TABUCANON and PAKORN ADULBHAN**

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PREFACE

Development planners and decision-makers quite often encounter a wide variety of engineering and management problems which can greatly affect the vitality of the organizations concerned. Some of these problems involve huge amount of money in going toward their solutions. Others need too much time before solutions can be made. Many problems tend to be both money-draining and time-consuming. The growing field of systems engineering and management provides a guideline for better understanding of these problems and further offers alternative solutions in more economical and practical ways. The Division of Industrial Engineering and Management of the Asian Institute of Technology has been carrying out, as one of its tasks, continuing education activities in the field of industrial systems engineering and management. It is felt that holding a conference can provide a useful forum for the exchange of information related to industrial systems engineering and management and can make the government, business and academic communities of developing nations more conscious of the role of the field in national and regional development.

This volume is a collection of contributed technical papers presented at the International Conference on Industrial Systems Engineering and Management in Developing Countries venued at the Asian Institute of Technology. This contains 60 papers contributed by 90 authors from 20 countries. The papers are grouped into 8 sections. This classification in some cases is rather arbitrary since several papers could fall under more than one of the selected subject headings. To ensure uniformity of presentation, all papers have been edited and retyped for photo-offset printing. Painstaking care has been exercised to avoid any misinterpretation of the original manuscripts. For any errors in the text, the editors assume full responsibility and wish to extend their apologies.

The editors gratefully acknowledge the financial assistance of the Carl Duisberg Gesellschaft e.V. of the Federal Republic of Germany, without which this Conference would not have been possible. The collaborations of the American Institute of Industrial Engineers, the Japan Institute of Industrial Engineering, the Japan Industrial Management Association, and the Japan Management Association are also highly appreciated.

In the preparation of this proceedings success owes to many people. The editors wish to express sincere thanks to all the members of the Conference Organizing Committee for their support in many ways. Thanks also goes to the secretaries of the Division of Industrial Engineering and Management, Mrs. Pornrachanee Chuawongse, Miss Narumon Howrod, and Mrs. Sirithorn Natikool for their typing efforts, and to Mrs. Pam Stephens for her help in editing the manuscripts. Grateful acknowledgement is also due to the students and alumni of the Division who have assisted in the preparation of this volume. Last but not least is a message of thanks to AIT's Center for Continuing Education for its support in many aspects of the organization.

November 1980

Mario T. Tabucanon and Pakorn Adulbhan

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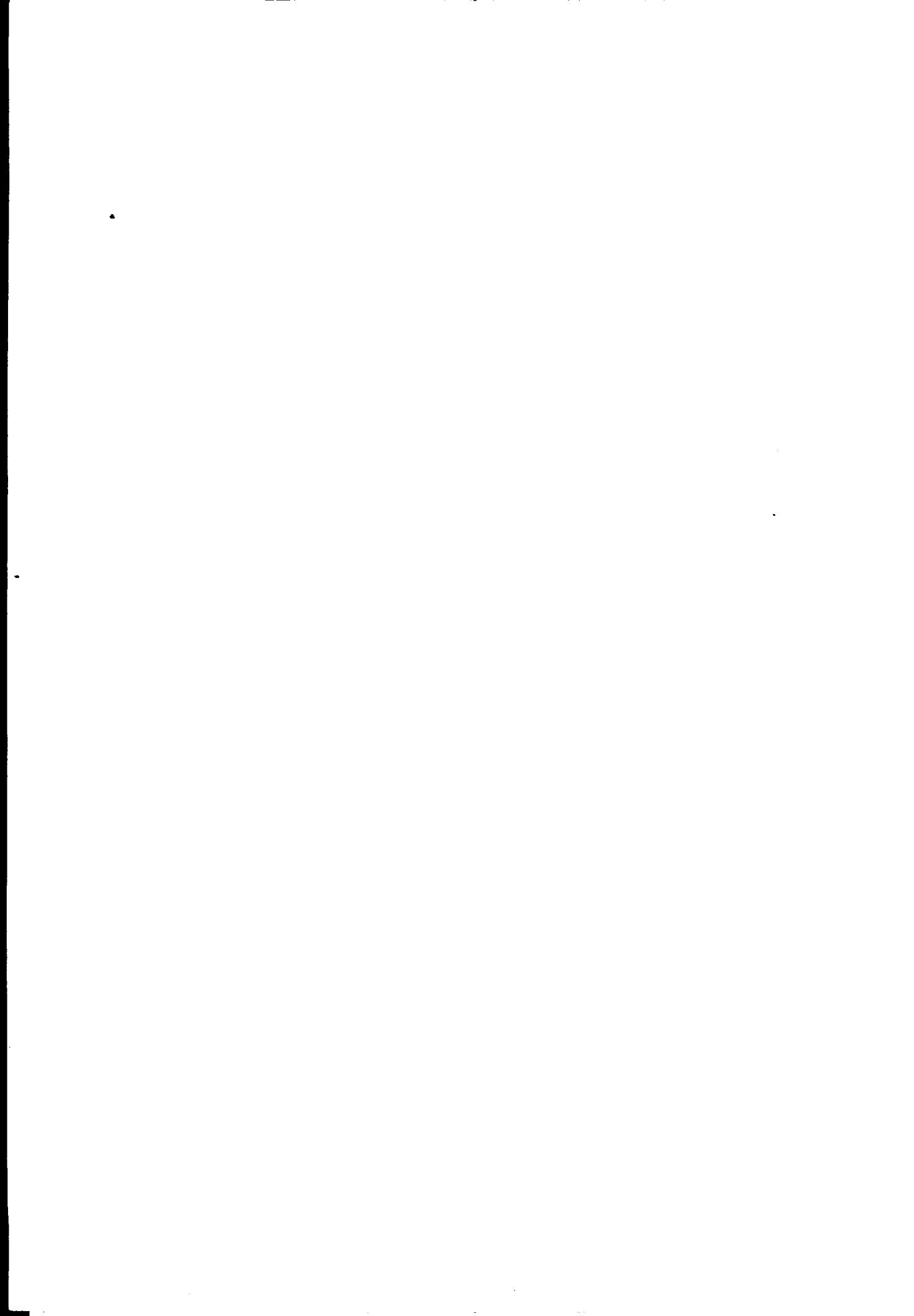
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PART I

INDUSTRIAL DEVELOPMENT



INDUSTRIAL DISTRIBUTION SYSTEMS' MANAGEMENT :
A KEY ISSUE OF INDUSTRIAL DEVELOPMENT

K. Moll
L.F. Biritz

ABSTRACT

Distribution Systems are the lifelines between the manufacturers on the one hand and markets and customers on the other. Where sales volume or company policy justify this, enterprises in industrialized countries often sell directly to retailers and consumers. Others rely upon modern and efficient industry-independent system. In most developing countries, the many small retail and wholesale operations which are operated in an inefficient and uncoordinated manner have induced even small industrial manufacturers to set up their own direct distribution systems at the cost of the consumer and the economy. Inefficiency of distribution particularly affects the rural areas where there are no adequate assortments of either industrial consumer goods nor industrial supplies. It is suggested to create industrial distribution outposts as a basis for rural industrial development.

K. Moll and L.F. Biritz are with the Factory Establishment and Management Section, United Nations Industrial Development Organization, Vienna, Austria.

In the process of industrialisation, knowing how to operate efficiently industrial manufacturing plants is only one, albeit a key step, to arrive at a truly industrial economy. But, it is just as important that materials reach the plants in time, their products the customers and that the various operations and steps moving these goods are carried out in an efficient and economic manner. These operations are generally referred to cumulatively as "industrial distribution systems" and involve a multiple, interlocking set of individual operations, such as transportation itself, changing from one to another mode of transportation, warehousing, inventory control, dispatching operations, etc. Such distribution systems are essentially the lifelines between the manufacturers on the one hand and the markets and customers on the other. Fig. 1 is a greatly simplified visualisation of an enterprise within the flow of products processed by it. In the example given, the enterprise has direct contact with 120 sources of supply and 2050 intermediary distributors which would not be atypical for a food processing company in a country with 10 million inhabitants. Distribution system costs are usually high, frequently higher than direct manufacturing costs, and require a specialised and highly sophisticated management system for optimum economy.

The cost attributable to the distribution of consumer goods varies from product to product, from place to place and from country to country. Thus, it was found in a study of 57 products that the mark-ups charged by retailers in Caracas for different industrial food products, varied from a low 4% for 1 litre bottles of vegetable oil sold by supermarkets to a high 125% for figs. In this study, markedly lower prices were found in supermarkets than in normal stores. A study carried out in Bolivia by the Michigan State University resulted in the following cost breakdown of the price paid by the consumer for milled rice when sold on the farm to the assembler/miller:

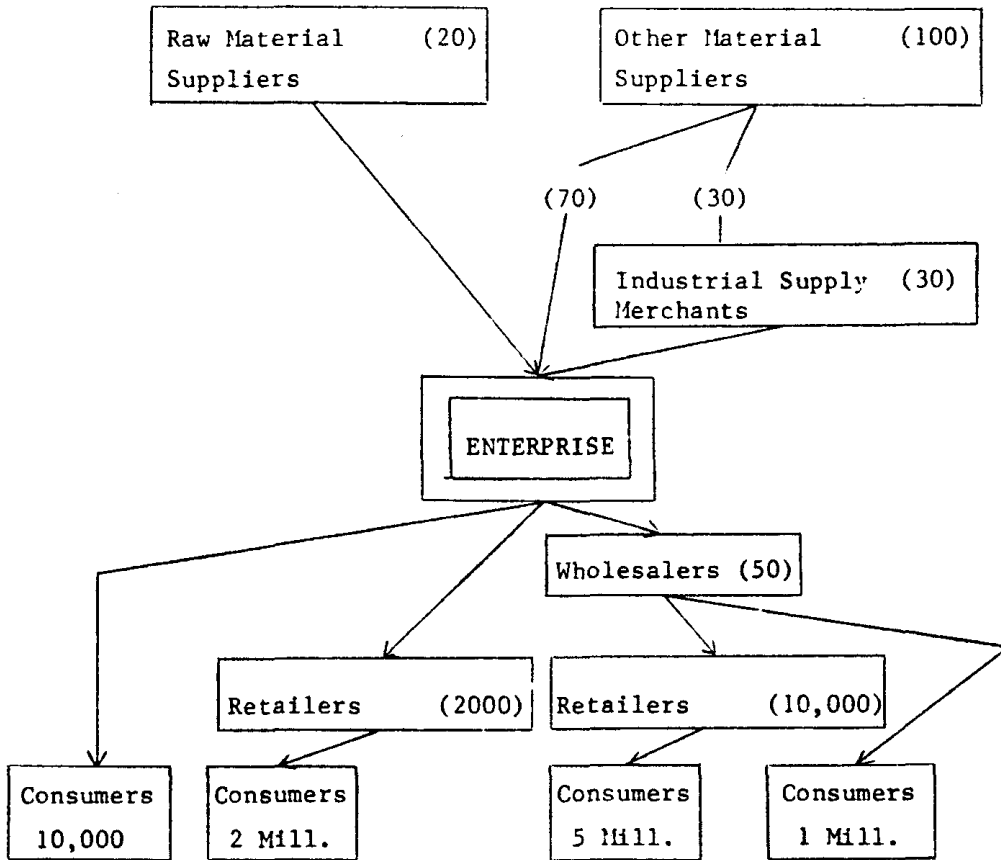


Fig. 1 Flow of Processed Products in an Enterprise.