

INDUSTRIAL MANAGEMENT

by

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PREFACE

This book has been written with the hope that it will be useful to students of industrial management, whether they are actively engaged in the management of industrial enterprises or learning the fundamentals for the first time.

The text and problem materials contained in this book have been used effectively in teaching industrial management to students of business administration, engineering, and liberal arts during the past twelve years. Moreover, a considerable portion of the contents is based on actual business and consulting experience of the authors. The principles are not untried theory, but have been formulated and recorded after successful application in many different types of manufacturing industries.

This textbook differs from others on industrial management in these respects:

1. *Scope.* The subject matter is confined to topics of immediate and vital concern to persons who must direct the work of others in manufacturing enterprises.
2. *New Material.* A considerable portion of the subject matter presented has not appeared in organized textbook form prior to the publication of this volume. This is particularly true of the parts dealing with the Management of Physical Property, Production Control, and Cost Control.
3. *Unit Treatment.* In recognition of the fact that all topics of industrial management are closely related, the entire book has been organized so that the related aspects of any one topic in the field of industrial management are presented as a unit. For example, the subject matter of motion study is treated in two separate chapters; one chapter discusses the principles of motion study as they pertain to the organization and layout of the physical plant, in Part III, and the other chapter as they pertain to the effective use of manpower, in Part IV.
4. *Problems.* Each of the six main parts of the text is followed by problems which require solution. These problems are incorporated in this text in the sincere belief that the student of management gains a real understanding of management principles only when required to make application of them.

ACKNOWLEDGMENTS

No textbook is ever wholly the work of one or two people. It is the result of years of experience, association with others, combinations of ideas, and nearly always special debts are due particular persons who make particular contributions. Seldom is a person wholly competent to do a first-class job in every aspect of a broad subject such as industrial management. The authors are indebted to many persons for contributions to this text.

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Space prevents mention of all the others who have contributed to the completion of the manuscript. The following, however, deserve special thanks and comment: Mr. Thomas Harris, Director of Occupational Services, Boston Y.M.C.A., Huntington Avenue Branch, for preparing materials on selection and testing of employees; Mr. H. H. Kerr, District Representative, and Mr. Gilbert H. Tapley, Assistant District Representative, Training Within Industry, War Manpower Commission, District No. 1, Boston, Massachusetts, for their kind assistance in making available special materials on quick industrial training programs for war industries; Mr. H. W. Heinrich, Assistant Superintendent, Engineering and Inspection Division, The Travelers Insurance Company, Hartford, Connecticut, and Mr. Robert Clair, Supervisor, Industrial Safety Education, Liberty Mutual Insurance Company, Boston, Massachusetts, for information on safety engineering; Mr. Fred-eric V. Hetzel, author of *Belt Conveyors and Belt Elevators*, for permission to reprint his tables for solving material-handling problems; Mrs. Lillian Gilbreth and Mr. Allan H. Mogensen for permission granted to use materials on motion study principles; and Mr. Warren Ganong of the Northeastern University faculty for his suggestions contained in the chapter on Time Study.

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Many of the diagrams and pictures used to illustrate the text would not appear except for the courtesy of business and industrial organizations whose names appear as *courtesy lines* wherever appropriate.

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PART I

INTRODUCTION

The six parts of this text deal with different, but closely related subjects of industrial management. While an attempt has been made to have each part a separate unit, the reader must bear in mind constantly that each of the six parts is merely a segment of the whole book. Any one of the subjects of management can be best understood when one knows something about all the others, but unfortunately all the topics cannot be presented at one time. Consequently, in reading this text particular attention must be given to making the topics of industrial management fit together as a unit.

Part I, which is the introduction to the text, consists of two chapters. The first focuses attention on the significance of management in an industrial democracy, and who should profit from a study of management; the second chapter presents an over-all view of the scope of activities involved in carrying out management functions. More specifically, these chapters cover the following:

1. **The study of management.** This is intended to be an introduction to the subject of industrial management. It is designed to acquaint students with "the first principles of management" and to stress their significance in relation to the study of all management problems.

Attention is called in this chapter also to the importance of the study of management for students of business administration, engineering, and liberal arts, as well as others; and since most successful businesses are a reflection of the capacities of persons who have inherent qualities for leadership and direction, an attempt is made to show how management is in reality an art which has direct bearing on a great many occupations and professions.

2. **Budgeting — an over-all view of management.** In order to grasp basic management principles, one must have a clear understanding of the total range of the subject matter of the field. The study of budgeting is a means of accomplishing this because it embraces all the branches of activity involved in organizing and controlling an industrial enterprise. In many respects, *budgeting is synonymous with management* since both are concerned with the system-

atic, intelligent planning and control. Moreover, all management decisions must be sound from the budget standpoint, as well as technical standpoint.

In particular, Chapter II acquaints students with the classifications and interrelations of budgets together with techniques for developing budgetary procedure and control. Special attention is given to budget reports which deal with the control of the fundamental purpose of a manufacturing enterprise — finished goods.

The discussion of budgeting as an introduction to this text, therefore, provides an opportunity to obtain a knowledge of fundamental management principles and at the same time to get an over-all view of many of the objectives sought through application of management principles.

CHAPTER I

THE STUDY OF MANAGEMENT

Management is unique among the arts and sciences. The need for management is universal and the application of its principles determines to a large degree the success of any undertaking. A home must be well-managed before it can be neat and attractive; an industry must be well-managed in order to prosper.

A manager must possess both knowledge of the thing he is managing and skill in the application of management principles. *Industrial management* is the profession of planning and controlling the use of men, materials, money, and machines for production. The industrial manager, therefore, must possess a broad knowledge of business and industry, as well as a complete understanding of basic management principles which have application in the solution of manufacturing problems.

Unlike other professions, that of industrial management must never become too highly specialized. If it does, it ceases to become management in the full sense of the word; management is concerned with the harmonious coordination of all the parts of a business to the end that all its parts function smoothly as a unit. Many of the arts and sciences are continually being subdivided into highly specialized branches. Each is so complicated that a lifetime can be devoted to its study. A mechanical engineer may become a specialist in power plants, aircraft structures, or ventilation in order to become more proficient in some one thing and thereby command a high salary. Similarly, men may devote their lives to becoming specialists in particular branches of law, chemistry, merchandising, art, and music. Contributions of all of these experts are indispensable to progress in modern industrial society. There is a great need also in an industrial society for specialists in particular phases of industrial management to give purpose and direction to specific aspects of a production program — methods, training, cost control, and so on.

Those who would become professional managers and rise to the top of their profession, however, must guard against specializing in any one branch of the management field, and must develop the faculty to see all of its branches as interrelated units. When persons who aspire to become members of top management confine their knowledge to only a few aspects of the thing being managed, they are at a loss in handling

those aspects of the work with which they are less familiar. They lack the broad knowledge necessary to control or manage the enterprise as a whole effectively. For example, when a sales manager is promoted to the position of general manager he must cease being a specialist in sales and obtain a more general knowledge of the entire business in order to control other activities such as research and production planning.

The more general and widespread a man's knowledge, the higher the managerial position he is qualified to hold, provided he is also able to apply management principles. If a man's knowledge is limited to machine tools, he may be qualified to be a foreman in a machine shop. If he knows something about the financing of a business, dealing with people, and also machine-shop practice, he may then be qualified to manage the entire machine-tool business. If he understands history, human nature, modern social and industrial problems, he may be qualified to manage the affairs of state, achieving a high position in the government of the nation.

At first the manager must concern himself with the management of less important things. The personal management of one's own affairs and activities is a starting point. This leads naturally to a trade or profession in order to earn a living. Some people are so constituted that they prefer to become specialists in one particular thing such as microbe biology or thermodynamics. To these people we owe our modern progress in science and invention. Others find that they prefer to deal with the more general aspects of many general topics, and if these people apply management principles, they are able to enlarge the scope of their activities, becoming responsible for departments, whole business organizations, and perhaps the affairs of the entire community. When they begin their careers they must have a somewhat specialized knowledge of one particular job, whether it be that of an office clerk, draftsman, bellhop, or lathe operator. They must prove their ability to manage themselves on minor jobs before they can go up the management ladder and assume the responsibilities of directing others. At each rung in the ladder they have the choice of staying and becoming specialists, or continuing to maintain a broader viewpoint and going up higher. For example, some instructors become proficient in their field and are promoted to professorships and perhaps the leadership of their departments. Others do not maintain an intense interest in one field only, but spread out their knowledge so that they see one field of knowledge in relation to others and qualify for general administrative positions. Both types are essential for a well-rounded academic organization.

No one profession has a monopoly on furnishing leaders. Engineers, lawyers, businessmen, musicians, and many others have contributed

to the progress of management and to the direction of society. Each contributor has been more than a specialist in one field only. He has supplemented a general knowledge with the advice of experts. His success in management is a result of an ability to use *management principles* in balancing conflicting opinions of advisor specialists in order to arrive at decisions which are advantageous to all concerned.

THE FIRST PRINCIPLES OF MANAGEMENT

The fundamental principles of management are universal and hence can be stated in many different ways as well as languages. For purposes of analysis, the following statements are given as guides to understanding these universal principles:

1. SEE THE SITUATION AS A WHOLE. IT IS FIRST NECESSARY TO OBTAIN A PROPER PERSPECTIVE.
2. PICK OUT THE MOST IMPORTANT ASPECTS OF THE SITUATION AS SEEN IN STEP 1.
3. DEVOTE TIME AND EFFORT TO THE ASPECTS OF STEP 2 IN PROPORTION TO THEIR IMPORTANCE.
4. ESTABLISH ROUTINES TO TAKE CARE OF CONSTANTLY RECURRING DETAIL.
5. ESTABLISH METHODS OF NEW PROCEDURE FOR THE ANALYSIS AND THE SOLUTION OF THE MORE DIFFICULT ASPECTS.

Application of First Principles throughout Text

This text covers the application of management principles in the organization, planning, and control of manufacturing. It assumes that students have a general knowledge of existing society, and understand the significance of industry in our social structure.

The most important aspects of manufacturing are indicated in this text by the part and chapter titles. It will be observed that the table of contents differs from that of other books on the same topic. Some aspects of the subject that are considered important by one author are not stressed by others, and vice versa. Probably expert manufacturers could not agree on the importance of various topics. This merely indicates the predominance of judgment involved in all management, whether it be organizing a book or running a town meeting. Some of the major topics in this text are unorthodox, but they were developed in an effort to obtain a comprehensive approach in accordance with the first principles of management listed above.

In general, the length of the chapters indicates the time and effort that the beginning student should spend on each topic. Some of the topics are cumulative — they continually recur in successive chapters.

and hence are built up as the book progresses. Others can be learned only from practice, rather than discussion. The chapter on budgeting applies to every other problem discussed in the text. Hence, importance is not indicated by the number of pages alone, but rather by the general emphasis throughout.

In many of the chapters, forms are suggested for the handling of routine details. The finished goods budget report (Fig. 6, page 23), for example, facilitates communication between the storekeeper and the planning department and specifies certain definite information which should always be supplied. The blank columns on the card remind the storekeeper what is required and also promote neatness and accuracy so that it is not necessary for him to think these things through each time he makes a report.

The general outline of any chapter is a pattern which may be followed to guide a conference discussion on the topic problem. To illustrate, the chapter on Job Evaluation discusses in successive order the steps in developing a job-evaluation program. When the development of a job-evaluation program is under consideration, a conference leader should be able to reach an understanding more smoothly and quickly if the discussion of the group is directed according to this outline.

IMPORTANCE OF SOUND INDUSTRIAL MANAGEMENT

There is no field of knowledge for which a greater need of understanding exists today than that of industrial management.

Manufacturing industry is one of the main streams of the lifeblood of our nation. Upon its existence depend the livelihoods of millions of people. To them industry is the sole means of support and they prosper in proportion to its success or failure. No longer are there frontiers — homesteads and free lands to which workers may turn in time of need or when they become dissatisfied with their lot. Instead, they are shackled to their jobs and have little chance of working out their salvation except through selling their services to an employer.

In fact, the number of persons in this category — those dependent upon industry for their livelihoods — is sufficiently large that the welfare of the entire nation is becoming increasingly dependent upon continued industrial prosperity. This is reflected in the fact that when one industry curtails operations, the neighboring industries suffer; and also in the agricultural communities, for if the farmers cannot sell to industrial workers at prices which pay their costs of production, they in turn cannot continue to buy the goods made by the industrial workers, such as farm machinery and home appliances.

Industry to exist, however, must operate at a profit. There must be a sufficient return on the capital invested in industry both to warrant its continued investment and to attract new quantities. Unless this profit is forthcoming, not only will existing industrial plants cease operation, but also there will be no expansion and growth in the community itself.

The profitable operation of industry is dependent upon good management. This means more than knowing just the principles underlying the managing of a manufacturing enterprise. It requires an understanding of their application so that each branch of the business is a part of an efficient working organism, each function properly conceived, coordinated, and executed. It demands discrimination in selecting the things to be done and the people to do them. It demands the elimination of the unnecessary and the inefficient, and a constant striving to preserve and improve the devices of demonstrated value and usefulness.

The attainment of these ends requires both competence and courage in management — rare qualities which are born only of knowledge and experience, backed by sound judgment.

It requires, in addition, what Oliver Sheldon calls “a social responsibility.”

It is occasioned, [he says] rather by its control of men than its application of technique. The student of economics does not bear the same responsibility as the manager who applies his economics. Whether management knows much or little of its own science, its responsibility remains unaffected. The responsibility of management resides in the fact that the industry which it directs is composed of human as well as material elements. Furthermore, that responsibility is enhanced by the fact that industry exists for the satisfaction of human needs. Management has, therefore, a responsibility not only to the human element within industry, but also to the human element which industry serves.

Consequently, in considering the social aspect of management, there are two broad divisions; firstly, the relation of management, as an integral and directive force in industry, to the general body of the community; secondly, the relation of management to the human element engaged in industry. In the one, management bears the responsibility of industry as a whole, since it holds the reins of industry; in the other, it bears the responsibility of its own service to those whom it directs.

In its relation to the community, management is representative of industry as a whole. For management is, as it were, the helmsman of a giant schooner, which it steers, amid winds and waves, towards the harbour of its communal end. This is the fundamental purpose of management.¹

¹ Oliver Sheldon, *The Philosophy of Management*, Sir Isaac Pitman & Sons, Ltd., London, 1930, pp. 72, 73.

WHO SHOULD STUDY INDUSTRIAL MANAGEMENT?

In the light of the foregoing, there will be few who will not acknowledge the importance of good industrial management in our present social order. As a field of study, however, it is of special concern to all students whether their major interest be business administration, engineering, or liberal arts.

The *student of business administration* who plans to become an industrial administrator must understand the principles underlying the organization, operation, and control of the manufacturing enterprise; and even if he has no plans for a career in industry, a well-rounded business education must include an understanding of the business principles by which the industrial structure of the nation is kept alive. For this latter type of student, great benefit will be derived also through an understanding of the problems of economical production. To cite a few examples — the salesman who can understand his firm's manufacturing problems becomes a better, more dependable salesman; moreover, the cost accountant who does not understand inventory, production control, and shop management is handicapped; and few are the businesses in which the principles of production efficiency cannot be applied.

The study of industrial management for the *student of engineering* is no less valuable; there will be few engineers, regardless of their special branch, who will not be concerned with manufacturing processes of industry. Increasingly, the engineer in industry is being called upon to perform work for which a technical background alone is insufficient. There is also required a knowledge of the principles underlying organization, planning, and controlling production from the angle of good management.

The engineer who is concerned with technical research and design, as well as the factory engineer, will also profit by a general understanding of industrial-management principles. Even though he may never be called upon to assume management responsibilities, he needs a background which will give him a sympathetic understanding of the requirements and limitations which managers place upon him and his work. He needs to understand the problems which new designs create for production managers and even for sales managers, so that he can balance technical perfection with the limitations imposed by production and sales requirements. This broader viewpoint will make it easier for him to get along with his associates in other departments and therefore become a more valuable man to the company. In addition, he will be developing the qualifications for promotion to higher salaried managerial positions.

Moreover, the study of management is extremely valuable to those engineers who have little or no interest in factory production. A striking example of this is found in the work of the civil engineer whose job is that of construction. His services are greatly enhanced through understanding the principles of efficiency in plant layout. Moreover, in planning, estimating, and controlling operations, the principles of material handling, cost finding, and production control are no less valuable to him than to engineers who concern themselves solely with manufacturing businesses.

Merely because industrial management is a profession does not mean that it should be overlooked by the *student of liberal arts*. Management is one of the most important arts which man has developed, and industry is of prime importance in our existing social structure. In the past an education has been considered liberal if it acquainted the student with the great thinkers and civilizations of other years, but it cannot be said that a modern student has been given a "liberal" background of the most important knowledge if he knows nothing of the organization and conduct of contemporary industrial society.

THE ART OF MANAGEMENT

Profitable business firms and well-managed institutions are usually the reflection of some one or more persons possessing superior management ability. Most people have the ability to perform some task well, but only a few have the attributes which qualify them for the art of management. This art of management has its foundations deep-rooted within the individual. It requires an ability to initiate, direct, and control, and, even more important, the capacity to win and hold the respect and loyalty of fellow workers.

Unfortunately many people do not appreciate that management plays an important role in life — that ambitions, work attitudes, and ultimate success have their foundations in personal-management ability. These people cannot plan and control wisely their own expenditures of energy, and they spend endless effort futilely, ever wondering why it is so. However, they are no more unfortunate than those who are content to accept life as it comes, making no attempt to have a more venturesome or a more profitable existence, except as necessity may require. In fact, there are few people who have either the willingness or the courage to change the path of life when even they know too well that it has been ill chosen. Surprisingly, these same people will condemn the executive personnel of a business for adopting a similar attitude, but fail entirely to appreciate that their own life situation hinges on management policies as much as does the conduct of a business.

Successful businesses have long-range, short-range, and even daily management policies which must be formulated, adopted, and tried — so have successful individuals. Business managers must adopt policies of purchasing, inventory control, inspection, and sales promotion and in a like manner individuals must have plans for education, earning a living, home life, travel, and recreation. In both cases, these are the framework of general management policies — steps toward ultimate goals.

The action of a business in a given situation at a given time must depend upon its short- and long-run policies. So, too, individuals must act in the short or long run in accordance with their management policies. Similarly, business failures are nearly always due to faulty management or to none at all. The reasons may be stated as insufficient working capital or an inadequate sales volume, just as success may be indicated by good profits and a sound financial condition; but these are only the results of management policies as the failures or successes of the individual are indications of personal-management ability.

It is not surprising, therefore, that the well-managed business is a reflection of a person, or persons, who have inherent qualities for leadership and direction. These persons so entrench themselves in their work that the line of demarcation between their personal success and that of their work is not easily discernible. Both unite to produce a portrait of success in the *art of management*.

CHAPTER II

BUDGETING — AN OVER-ALL VIEW OF MANAGEMENT

Budgeting and records are found in practically every business organization. Records give a detailed account of what has happened in the past. Budgeting plans future activities. Nothing is more important to sound management than systematic planning based on previous performance and business judgment. In the small business, the proprietor may formulate plans in his own mind and execute them without ever writing them down, but in larger business organizations it is essential that *plans* be written down in advance item by item so that they may be discussed, revised, and later compared with actual performance.

The term “business policy” refers to the general aims and procedures which management intends to follow in carrying on the business. It is necessary that these policies be clearly defined and understood so that the actual conduct of the business may be based upon them. General statements of policy by themselves, however, are not sufficient; plans must be made to implement and carry them into effect. This is done by means of the budget. It is in the budget that general policies are given definite, concrete expression. It is in the budget also that we may look for the *exact interpretation* of general statements of policy.

Budgeting itself is not concerned with technical, engineering details; these are left to the specialists in their respective fields. Of course, when a budget is used to obtain productive and financial coordination between the departments, this often points the way to technical improvement of processes or procedures. For example, the budget considers appropriations for such an item as lighting. If the lighting costs of two similar departments show considerable difference, this calls for a justification or a reduction of the higher cost. Thus financial review will indicate opportunities for both technical and financial improvement.

Budgeting Defined

Defined in general terms, budgeting is planning the conduct of a business. This definition includes both the over-all planning for the whole business, and the detailed planning of the operations in individual departments. Budgeting is not an isolated topic in the field of industrial management. On the contrary, *the term “budgeting” is more*