

# PERSONNEL AND INDUSTRIAL PSYCHOLOGY

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## PREFACE

National emergencies, such as the recent war, create numerous problems relative to the classification and placement of workers, their training and morale, and the methods and procedures of work through which they become effective producers. It is unfortunate but true that advancement in the development and use of scientific personnel and industrial methods is greatest under such abnormal conditions. At these times attention is focused upon methodology in order to achieve rapid solutions to the urgent problems of production and transportation. After the emergency has passed some of the newer scientific procedures are continued in force with the result that business, industry, and labor employ to a greater extent sounder procedures in dealing with human problems. Thus it is said, and perhaps with some justification, that it was fortunate that the United States suffered a severe economic depression only a relatively few years before it was drawn into the recent armed conflict, because the measures adopted as a result of this emergency placed the country in a better position to deal with the personnel and industrial problems arising as a consequence of the war.

While the rate at which scientific employment methods are adopted is, in the minds of many industrial psychologists, so slow as to cause despair, it nevertheless is true that if a long-term view is taken significant increments will be revealed. It is difficult to measure exactly and in quantitative terms the trends toward the use of scientifically developed personnel procedures. However, some surveys have been conducted which have shown increasing application of such procedures, *e.g.*, the increased use of psychological tests in selection. But more than this, some psychologists who have worked with business, industry, and labor have discerned through the years an increasing interest in a genuinely professional approach to the problems. Certainly if university teaching has had any effect whatsoever upon its students the thousands who have been exposed to courses in industrial psychology and personnel methods must have carried away with them some understanding of the usefulness of psychological methods and

findings which later has contributed to their thinking about the personnel problems with which they have been confronted.

In writing this book the authors have, of course, emphasized the need of using scientific methods and procedures. The choice of topics discussed no doubt is biased by the kinds of specific experiences that they have had in working with personnel problems in business and industry, but the endeavor has been to sample all the major fields that currently demand further study. The reader will find that certain approaches and emphases have broken from the traditional, and attempts have been made to reorient the thinking and analysis in terms of what appear to the authors to be the primary problems of the future. There is no doubt but that the development of many topics in the book is greatly influenced by the problems that have been met throughout the years in the teaching of courses in personnel and industrial psychology at the University.

It is the authors' hope that this book will meet the needs both of university students and of those in business, industry, and labor, who desire to obtain a foundation in the basic principles involved in the application of scientific psychology to problems of the worker. The extent to which this hope will be realized will, in part at least, be a function of the degree to which the reader will be willing in the beginning to consider basic underlying principles before seeking solutions to his immediate problems.

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## CHAPTER I

### THE SCIENTIFIC STUDY OF HUMAN FACTORS IN INDUSTRIAL PROBLEMS

To say that human problems in industrial development have received no consideration would be a gross misstatement of fact. Throughout the past century there has been an increasing amount of exploration, investigation, and discussion of the role played by the worker in industry. To affirm, however, that these endeavors have resulted in a maximum exploitation of the mutual productive power possessed by management and labor would be far from the truth.

To be sure, most workers no longer are required to toil 12 or 14 hr. a day. In an increasing number of industrial organizations the worker cannot be fired or transferred except for due cause. The chances of being injured on the job or of incurring some other type of occupational disability have been greatly reduced. If a worker is injured, there is a fair chance that he will receive some compensation for his disability. These benefits are illustrative of some of the gains derived from a consideration of the worker's part in production—gains not solely to the advantage of the worker but also to society in general, actually significant contributions to the general welfare.

Despite these recognized gains, questions may be raised concerning the human phases that have been neglected, or the undesirable social consequences that have sometimes occurred. No one will champion the view that the benefits to either the worker or society have been sufficient, and this can be taken to mean simply that the task is not finished. Questions still remain, however, concerning the appropriateness of the direction taken by past efforts, and the adequacy of the psychological factors upon which these efforts have been spent. Shorter hours of work provide the opportunity for a fuller life, but they do not ensure that the worker will attain this fuller life. Improvements of working conditions may prevent the worker from becoming completely exhausted, but they do not guarantee that the work will come within the psychophysiological limits of the worker. Protection against accidents and compensation for disability may lessen the



worker's fears, but they fail to ensure freedom from worry. Something, then, is lacking.

The attack on the human factors in industry has actually been indirect. The changes introduced were centered upon factors external to the worker, and they dealt with conditions that were peripheral to the mainsprings from which his efforts arose. A homely analogy might be considered here in order to point up the nature of the difficulty. We lead our horse to water, but he does not drink. In order to induce him to drink, we attempt to improve the situation by presenting the water to him in a fresh, clean bucket. We are puzzled when he still refuses to respond. We become further perturbed when he continues his indifference after we add sugar as a further inducement. Certainly we have endeavored to recognize and take advantage of the equine factors in the situation. We think we have provided all that a horse would desire, but our inducements continue to be inadequate. Having failed in our efforts, should we maintain that we have a complete understanding of the psychological factors which are really important in the situation, and that the failure is to be attributed to the "ornerness" of the horse? Is it possible that we have overlooked something? Perhaps the horse is not thirsty!

The approach to the understanding of worker behavior should be directed to the motivational forces and the cognitive processes of the individual. Interest should be centered upon the worker as a thinking, feeling, and desiring organism and *not* as a mechanical device that responds in given ways to appropriate stimuli. Installation of a bonus system in a plant may result in no change whatsoever in production. The explanation of the failure lies not in the inadequacy of the system, but in the fact that no account was taken of the workers' attitudes toward, and understanding of, such a system. If a bonus system appears desirable to the workers and is meaningful to them, then their response is likely to be favorable, and their enthusiasm will be a function of the degree to which their personal motives are satisfied.

Reverting to our analogy: a *thirsty* horse *will* drink. To know whether or not our horse will drink, it is necessary to know whether or not he is thirsty. To know whether or not a bonus system will bring about higher levels of production, it is necessary to have information concerning workers' reactions to such a system. Rather than attempt blindly to improve production by offering shorter hours for greater speeds of work, we should center the attack upon getting an understanding of the factors the individual considers important in

the working situation. If an improvement in the accuracy of foremen's ratings of workers is desired, it should prove more fruitful to discover foremen's attitudes toward the rating of employees than to devise a better rating scale. Human problems in industry, then, should be attacked at their center, the psychological man, and less interest should be devoted to indirect ways of studying them.

It is obvious that it will be more difficult to understand the various motivating forces actuating the worker than it will be to classify suggested systems of financial incentives; that it will be harder to learn about the personal and social factors influencing foremen's ratings than to devise a new rating procedure; that it will require more effort to develop a procedure to ensure that the worker completely understands his job in all its implications than to develop a series of simple lectures on effective work methods.

Knowing that difficult problems lie ahead, we must exert greater effort. Recognizing the complexities that the human factors will offer, we become aware that it is extremely important that we keep informed as to the dependability of our methods. We must be careful with our definitions. The implications of our interpretations must be given thorough consideration. Generalizations must be made with caution. The method we use in attacking these human problems must be suitably geared to them in terms of exactness, specificity, and impartiality. The only method meeting these requirements is the method of science, which requires systematic rather than casual study and which bases its conclusions on fact rather than opinion. Nonscientific solutions to human problems in industry are possible, but their dependability can never be measured or predicted. In the following pages consideration will be given to the application of the method of science in the study and solution of human problems in industry.

#### SCIENCE AND INDUSTRIAL PROGRESS

**Contributions of the Physical Sciences.**—No one will dispute the fact that industrial progress has come about, either directly or indirectly, through the contributions of the physical sciences. Growth has come through successive technological improvements that have issued primarily from the research work of physicists, chemists, and engineers.

In the early stages of this growth, advancements came sporadically as individuals here and there gained insight into ways of improving older methods and procedures. These were bright individuals, but

they lacked formal training. Their natural bent led them to become less interested in operating their machines and more interested in understanding how their machines operated. These so-called "inventors" desired to get the work done better, and this, more often than not, meant faster. Very frequently the machines they invented would require only one or two operators and yet would produce the work equivalent to that accomplished by a score or more workers.

With the organization of technical schools and research departments within colleges and universities, a great impetus was given to industrial expansion. Through formal school training thousands of individuals became acquainted with the general method of scientific investigation and with the special techniques and procedures by which this method could be utilized in solving a variety of problems. Armed with this knowledge and experience, many of these individuals entered industry, where, because of their greater insight, they detected and solved industry's problems at a rate far greater than that of their predecessors.

So remarkable was the contribution of these formally trained men that the larger industries saw the need and importance of establishing special departments in which such scientists could direct their efforts solely to research work. This step, although requiring considerable expenditure, proved to be of great advantage, and research divisions of larger organizations came to have as much importance as any other division of the company. At the present time some of these industrial research departments rival the best that can be found in large universities and colleges. All problems that had to do with the physical methods and processes of manufacture were brought under the surveillance of these specialists, so that a continued improvement in the processes of production was assured. Their attention was particularly focused on the discovery and development of new methods and new products. The discovery of products to satisfy old wants in new ways and to satisfy newly created wants became the major interests of these physical scientists.

**Science Applied to the Worker.**—One of the most prominent and persistent facts that has emerged from the rapid development of industry is the importance of the role played by the worker. In the early stages the worker was a mere chattel to be dealt with as a machine in any way the employer saw fit in his effort to effect the greatest output with the least cost. The fundamental function of the worker was to produce, and the more he produced the better worker he was considered to be. Changes in techniques and procedures were intro-

duced to make the human machines turn out more work. Obviously the emphasis characteristic of the physical scientist in industry was adopted by those individuals who dealt with the human phases of production.

It must be acknowledged, however, that the investigators concerned with the human problems varied widely in their backgrounds and training and in their points of emphasis. A review of the work of some of these individuals shows them to be charlatans, who entered the field solely for economic gain. They had insufficient insight to realize the complexity of the problems to be solved or to acknowledge the deficiencies and limitations of the procedures that they offered as solutions. Other individuals, who had been concerned with the physical phases of production, saw the necessity of studying the human problems and endeavored to apply scientific methods to their solution. Many sound solutions were effected by them. Some of these investigators, however, adhered too strictly to the principles of mechanical science in their analyses of human responses, with the result that some of the procedures they devised and put into operation created more serious problems than the problems they had been designed to remove.

Lastly, there were investigators whose training had been in the techniques and methods of psychology or related fields. These individuals endeavored to apply the principles of psychological science to worker problems. The success they achieved was commensurate with the complexity of the problems that they attacked and with the degree to which they adhered to the disciplines of the scientific method. Their numbers at all times were extremely small compared to the needs and opportunities for studying human problems afforded by industry.

The over-all success attained by these earlier investigators of human problems did not rival the achievements of the physical scientists. This can be accounted for rather simply. The worker must be regarded as being *more* than a machine. When new procedures and techniques were given to him, he not only adapted to them but, as a human being, underwent changes in feelings, motivations, incentives, ambitions, and ideals, and many of these psychological changes were in the direction of deterioration rather than improvement. As a human being he understood the purposes of the changes in methods of work introduced in his job, and if he disapproved of them or disliked the pressure being applied to force him to adopt them, he could balk and refuse to comply. He could go even further and combine his



efforts with those of other workers to resist the enforcement of these unwanted methods. These various steps to oppose management were within his power, and he frequently made use of them. Much dissension then occurred between the workers and their employers because of the efforts of the so-called "efficiency experts" to force the adoption of changes that the worker considered inimical to his interests. In the solution of problems involving the worker it is necessary to take account of his individual attitudes and desires. Because this simple principle was ignored, procedures that were to the advantage of both the employee and employer often failed. Yet those procedures should have proved extremely successful.

#### **SOME ERRORS IN THE APPLICATION OF SCIENCE TO THE WORKER**

The industrial unrest prevalent today arises largely from failure to resolve employee-employer differences. It was suggested above that part of this dissension can be traced to mistakes made in applying scientific procedures—and procedures that cannot be classified as scientific—to the human problems of work. To understand these mistakes is to take the first step in the prevention of their recurrence. It is not possible in a few pages to describe all the types of errors committed in the industrial applications of psychological science, but certain major errors are deserving of consideration. Just how much these errors have contributed to labor and management differences is impossible to determine, but that they contributed to the widening of the gap between employer and employee there can be no doubt.

**One-sided Use of Scientific Results.**—The first error to be discussed is an error in the direction of the focus of scientific studies, with a consequent one-sided application of the results obtained. This can be made plain simply by saying that the focus of most of the scientific work was upon a reduction of manufacturing costs and an increase in profits. It will be remembered that the physical scientist was hired by management and was therefore responsible to him. The scientist's task was to invent methods and machines that would shorten and speed up manufacturing processes and at the same time reduce the costs of production. As a result of his work, there was a tremendous industrial expansion, which provided the necessities and luxuries of life in such abundance that a marked increase in the level of the standard of living resulted for everyone. No one questions the fact that this was a superlative achievement of the physical scientist. The primary motive of management in hiring the scientist, however, was not to raise the standard of living. Rather the aim was increased



profits, but as an accompanying result there were profound improvements in the standard of living.

When nonscientists and scientists entered industry to develop the worker phases of production, they adhered to the same philosophy. They were hired by management to step up the worker's production in order to increase profits. They were responsible to management, and the tenure of their jobs rested primarily on their ability to develop higher levels of production or lower costs. It is not intended to paint a one-sided picture, as is sometimes done, depicting the industrialist as a greedy profiteer who is solely interested in bleeding the worker in order to guarantee himself a life of luxury. Happily this has not been characteristic since the early days of the industrial revolution, even though a few situations reminiscent of the early exploitation of the worker occasionally still exist. The argument being made is not against increasing profits but rather against directing all studies of the human phases of work toward the increase of economic returns.

The scientific method, which many investigators championed as containing the only promising solutions, was fettered from the beginning by this misdirected focus. The problems needing solution were not restricted solely to problems of production and profits. In so restricting their studies, these early investigators failed to collect facts on other problems that have contributed greatly to present day employee-employer dissension.

#### **Misconception of Worker Factors Contributing to Production.—**

This error refers to the failure to isolate and study all the various human factors influencing production. Attention of early investigators was centered mainly upon those human factors objectively observable and directly concerned with productive activities, such as the sensorimotor coordinations required to perform a task, or the speed with which the hands or fingers could manipulate materials. Likewise their attention was focused upon those activities which had immediate consequences in production and which, if improved, would register their effects on production within a few days rather than within a few months or years.

It should be apparent that this error was in part a result of the misdirected focus already discussed. Holding immediate profits uppermost in mind would be conducive to increasing the attention values of the factors just described and would decrease the attractiveness of the more intangible factors that might still be of great significance to the man actually performing the work. In part the error is also to be ascribed to ignorance on the part of the investigators

concerning the fundamental principle of the unity of the human organism. This can be attributed to their lack or narrowness of scientific training and preparation, and to their willingness to champion and advance false systems of analysis not soundly based on facts.

Most of these investigators conceived of the worker as a producing machine, capable of the reception of certain stimuli and the execution of certain responses. Since these two activities were the only ones that the investigators considered to be logically and mechanistically necessary for work, they were the only ones exhaustively studied. This marked restriction of the field blinded the investigators to the importance of the less obvious, less mechanical, and more intangible, more remote psychological factors determining the effectiveness of human work. Personal motives, individual feelings of pleasure from creative work, self-satisfaction from achievement, and the necessity of the job fulfilling remote individual goals and purposes were not even recognized; therefore the investigators did nothing to learn about the influence of these factors on the worker's behavior. As a consequence, they overlooked the fact that these are the most important factors determining the productivity of workers. Indeed, it is only in relatively recent years that the importance of such factors has been recognized.

In addition this misconception of the unity of the worker as a personality resulted in failure to follow all the ramifications of the effects of the various changes in procedures, methods, and techniques that were introduced from time to time. Profits were the criterion of the value of all new changes. That a change might have adverse effects on the attitudes, interests, and motives of the worker was either not acknowledged or, if acknowledged, was considered to be of no consequence. The number of items produced at the end of the day was the only criterion that was examined. Eventually worker resentment showed itself as a culmination of the detrimental effects brought on by the changes made in the name of efficiency. At last it became necessary for the investigators to acknowledge factors other than simple production figures. Even then, however, they directed their efforts toward placating the worker, in order to get his cooperation in the adoption of further "efficiency" procedures, rather than toward a study of the effect on production of the attitudinal factors that had arisen from the enforcement of previous procedures.

Temporary expedients were used to put over new changes in the face of this rebellious attitude of the worker. In the beginning, various financial incentives were utilized to get cooperation. Bonuses,

higher wages from piece-rate payment, higher hourly rates of pay, and other similar means were used to convince the worker of the value of the new methods. These schemes were successful for a short time, but eventually they proved insufficient against the mounting discontent and resentment that accumulated. Frequently workers would refuse to cooperate, despite very "rosy" inducements in the form of financial returns. At first these refusals came as a surprise to employers. They could not understand why workers, who could readily make use of any increase in wages given them, would consider certain other objectives as being of greater value than the proffered financial inducements. What was needed was a clearer understanding of the principles underlying human motivation, and a knowledge that in the unified individual the effects of every activity ramify throughout the personality and thereby influence behavior in countless ways. Only by evaluating these ramifications is it possible to arrive at an understanding of the causes of human behavior.

**Failure to Take into Account Well-established Psychological Principles.**—A third error of significance in evaluating the outcome of the early studies of human work concerns the failure of the investigators to take into account well-established psychological principles. The reference here is solely to basic findings that had been firmly established, which were available for the consideration of the early research workers, and which, therefore, should have received their attention. By way of illustration we need here consider only three: the facts of individual differences, individual variability, and the integrative nature of human behavior.

One of the features lying at the core of modern industry is standardization. Greater effectiveness in production was achieved by the physical scientist when he devised machinery that standardized the manufactured product. This standardization also greatly increased the desirability of the product in the mind of the consumer. Procedures of work likewise were standardized, such as the time sequence of the several steps involved in manufacturing an article, or the direction or sequence followed in routing materials through different departments. Again, increased effectiveness in production followed the installation of these procedures.

The next step which followed logically, was the standardization of the particular responses made by the worker as he manipulated materials in performing his job. Up to this point the changes had involved principally the arrangement of materials and time sequences in routing materials, and the worker's responses were only indirectly

affected. Now the standardization was to require all workers doing a given job to perform that job in exactly the same way.

There was some justification for investigating the standardization of worker responses. It was noted that some workers produced considerably more than other workers. Study of the workers on the job revealed a wide variation in the specific responses utilized in accomplishing the same task. The methods of superior and inferior workers were compared and found to differ widely. This finding naturally led to the adoption of the method of the superior worker as a standard to be followed by all other workers.

Obviously the attempt to enforce all workers on a job to adhere to the particular types of coordinations, the particular sequences of responses, and the particular time relations between the responses—all determined from the best worker on the job—completely ignored the fundamental law of individual differences. No attention seems to have been given to the fact that other workers might find the standardized responses very difficult to perform and might use considerably more energy in accomplishing a given amount of work with the standard responses than if they were allowed to use their own particular responses.

The standardization of work methods also presumes a high degree of consistency in the performance of the individual worker. Complete consistency, however, is not characteristic of human performance. An individual's performance varies from time to time and under a variety of conditions. The truck driver who today is a safe and careful operator may tomorrow be involved in an accident and cited for traffic violations. The typist who is slow at the beginning of the day may pick up speed as the day progresses. The salesman who is cheerful now may be indifferent later. This is not to imply that human behavior shows no consistency whatsoever, but rather that it is far more variable than the performance of the machine that has received so much attention from the physical scientist. The latter, who is accustomed to variations in fractions of a per cent, can hardly appreciate the extent of the fluctuations in behavior of the worker who must tend the machine.

The implications of individual variability are many but were not given due recognition in earlier investigations. Following are two examples. In developing a "best method" of work the particular set of motions found to be quickest and most effective when the worker was fresh and rested was adopted. But this set of motions might not have been the best when the worker was tired and had worked