

Scientific Management

Frederick Winslow Taylor

The Early Sociology of Management and Organizations

Volume I



THE EARLY SOCIOLOGY OF
MANAGEMENT AND ORGANIZATIONS

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ORGANIZATIONS

VOLUME I

Scientific Management
Frederick Winslow Taylor
Comprising:
Shop Management
The Principles of Scientific Management
Testimony Before the Special House Committee

VOLUME II

The Philosophy of Management
Oliver Sheldon

VOLUME III

Dynamic Administration: The Collected Papers of Mary Parker Follett
Edited by Henry C. Metcalf and L. Urwick

VOLUME IV

Papers on the Science of Administration
Edited by Luther Gulick and L. Urwick

VOLUME V

Management and the Worker
F. J. Roethlisberger and William J. Dickson

VOLUME VI

The Human Problems of an Industrial Civilization
Elton Mayo

VOLUME VII

Organization and Management: Selected Papers
Chester I. Barnard

VOLUME VIII

On the Shop Floor: Two Studies of Workshop Organization and Output
T. Lupton

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Edited by Kenneth Thompson

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INTRODUCTION TO *THE EARLY SOCIOLOGY OF MANAGEMENT AND ORGANIZATIONS*

By Kenneth Thompson

In considering the often fuzzy boundaries of any field within the discipline of sociology it has to be appreciated that sociology itself only slowly emerged as a separate discipline within the social sciences. Of the three major figures acknowledged as laying the foundations of sociology – Karl Marx (1818–83), Max Weber (1864–1920) and Emile Durkheim (1858–1917) – only Durkheim could be said to have clearly demarcated sociology as an academic discipline to which he could be solely attached (Thompson 1982/2002). This vagueness or permeability with regard to the boundaries of sociology persisted until well into the twentieth century. Some sociologists would even maintain that it is a myth ‘that there is an essence to sociology, that it has some essential characteristics that give it and its practitioners a unity, coherence and common tradition’ (Urry, 2002: 334). The sociologist John Urry maintains that sociology has always been a ‘parasitic’ discipline that feeds off developments in neighbouring disciplines and related social movements. This has both advantages and disadvantages. A disadvantage is that it is not always clear where the distinctively sociological study of any social phenomenon begins and ends. One of the advantages is that sociologists benefit from keeping a watchful eye on developments elsewhere and they are always willing to incorporate relevant insights into their own work. To put it another way: it could be said that sociology has always had a relaxed attitude towards interdisciplinarity and has not been much inclined to guard its boundaries. This explains why the early stages in the development of new sub-fields of sociological study have always been marked by interdisciplinarity.

We can observe this kind of vagueness, about where sociology begins and ends, in the early sociology of management and organizations. In the first half of the twentieth century it would have been hard to distinguish the sociological perspective on organizations from that of some of the other approaches. The field of management studies and organization studies was being populated by a proliferation of perspectives and academic disciplines: Public Administration,

INTRODUCTION

Organization Theory, Administration Theory, Industrial Sociology, Management Science (and the perspective of Scientific Management), Industrial Psychology, and so on. To some extent, because this is an area of applied studies in which there are pressing demands for theory and research to produce practical results and prescriptions, the different perspectives and disciplines still jostle each other in a mixture of interdisciplinary co-operation as well as competition for attention and support. Managers who are interested in finding academic guidance towards the solution of organizational problems have plenty of options from which to choose, as they had then.

Today, it is likely that a well-educated manager will already have some training in particular academic disciplines and have a fairly clear idea of what they might have to offer. However, in the first half of the twentieth century this would have been much less clear. Administrators in the public sector and managers in industry were turning eagerly, but more naively, to academics for guidance. They were encouraged in this by governments, which wanted to push forward with social reconstruction and sought the achievement of peaceful solutions to industrial conflicts. The often proclaimed goals were increased efficiency of administration and increased productivity. The two major impediments were seen as: lack of clarity about the principles of good administration and management, and conflict resulting from restrictions on output by workers. It was towards the resolution of these twin problems that much of the early writing on management and organization was directed.

The early development of the sociology of management and organizations has to be viewed in relation to the emergence, at the beginning of the twentieth century, of a 'Management Movement'. This movement took various forms. On the one hand, it entailed the formation of professional management associations in industrial societies, such as America and Britain, with the aim of promoting both knowledge of the principles of organization and the professional status of managers. For example, the American Association of Industrial Management was founded in 1899 as the National Metal Trades Association, ostensibly with the purpose of promoting good employee-employer relations. Similarly, the American Management Association was formed in 1923 from a merger of the National Association of Corporate Schools (founded in 1913) and the Industrial Relations Association of America (organized in 1918 as the National Association of Employment Managers). Perhaps the most significant management association, as far as management theory was concerned, was the Society for the Advancement of Management (SAM). It claims to have the oldest roots of all the professional management societies, emanating from the Society to Promote the Science of Management, formed in 1912, which changed its name in 1916 to the Taylor Society, to honour Frederick W. Taylor. It is Taylor's work in creating the theory and practice of Scientific Management at the beginning of the twentieth century that sets the scene for *The Early Sociology of Management and Organizations*.

The main figures whose works are featured in this set of volumes on *The Early*

INTRODUCTION

Sociology of Management and Organizations represent the main streams of thought that converged together in the first decades of the twentieth century to inform thinking about management. They are:

- (1) The scientific management movement, with its origin in engineering, the key figure being Frederick W. Taylor.
- (2) The development of organization theory, first in the form of traditional principles of management and administration, and later as revolutionized by interdisciplinary contributions. Key figures represented here are: Henri Fayol, Mary Parker Follett, Luther H. Gulick, Lyndall F. Urwick, and Chester I. Barnard.
- (3) The personnel, human relations, and behavioural science flow of thought. This stream was originally identified with scientific management, but it was changed by contributions from empirical studies by sociologists, social psychologists and other researchers. The outstanding figures are Elton Mayo and his collaborators in the Hawthorne Experiments, notably F. J. Roethlisberger. Their pivotal international role is reflected in the attention given to them in subsequent studies, even those which diverged from them, as illustrated in the work of a leading British researcher after the Second World War, Tom Lupton.

Of course, as the sociology of management and organizations became more clearly defined as a sub-field within sociology after the Second World War, it became distinct from these earlier streams. It was increasingly shaped by some of the broader sociological theories and perspectives, such as those concerning bureaucracy, the division of labour in society, conflict theory, structural-functionalism, symbolic interactionism, and ethnomethodology. These later contributions to the sociology of management and organizations have been well documented (cf. Salaman and Thompson, 1973, 1980). However, it is useful and important to present some of the earlier key contributions to the sociology of management and organizations, especially those that converged together in the first decades of the twentieth century to inform thinking about these subjects.

The works presented in *The Early Sociology of Management and Organizations* are representative of the three streams: scientific management, organization (and administration) theory, and human relations and behavioural science. There is also an example of the emerging, distinctively sociological studies after the Second World War, in the form of Tom Lupton's study, *On the Shop Floor* (1963), based on research carried out in the 1950s. Lupton begins his work by situating it in relation to the earlier streams, before showing how his research, informed by wider sociological theories, leads to a critique of assumptions and absences in the earlier theories.

There is no doubt that the seminal and most controversial contribution to the early phase in the development of management thought was Frederick Winslow Taylor's theory and practice of scientific management, subsequently known as

INTRODUCTION

'Taylorism'. The single-volume *Scientific Management* (1947) comprises three works originally published separately as *Shop Management* (1903), *The Principles of Scientific Management* (1911) and *Testimony Before the Special House Committee* (1912). The third of these, the *Testimony*, is singularly revealing because Taylor faced some searching questioning when summoned to appear before this *Special Committee of the House of Representatives to Investigate the Taylor and Other Systems of Shop Management*, in January 1912. The Foreword to the single volume points out that the appointment of the special committee by the House of Representatives was inspired by organized labour, which by this time was showing concern over the effects on workers and unions of the use of scientific management mechanisms to measure the productivity of individual workers against a standard rate set by often unscrupulous employers and managers (p. viii). Although the Foreword is aimed at defending and eulogizing Taylor and Taylorism, it cannot help but reveal how much conflict existed.

The irony was that Taylor and Taylorism precisely aimed at reducing conflict between managers and workers by using scientific thought to develop new principles and mechanisms of management. The traumatic experience that prompted Taylor to begin his search for ideas and methods of scientific management occurred when he was appointed boss of a gang of workers at the Midvale Steel Company, which he had joined as an ordinary labourer in 1878. (Although he had been a bright pupil at the élite private school, Phillips-Exeter Academy, and had prepared for entrance to Harvard University, eyesight problems caused him to drop out and seek a career that did not involve much reading.) Having risen to the position of supervisor, he sought to increase output by putting pressure on the workers. A serious struggle ensued and, although Taylor came out on top, he is said to have been hurt by the experience. He decided that the primary cause of such conflicts was that management, without knowing what was a proper day's work, tried to secure output by pressure or by relying on bonus payments. If management would develop methods for discovering the proper output for each operation then it could get output by demonstration. His experiments along these lines continued throughout his service with the Midvale Steel Company, then at the giant Bethlehem Steel Company, and later in various types of enterprises as a consultant.

Taylor's first publication was a paper on 'A Piece Rate System', delivered to the American Society of Mechanical Engineers (ASME) in 1895. Because wage systems were then the focal point of interest he tried to smuggle a description of his techniques of managing into a paper that was ostensibly about a differential piece rate system with which he had experimented, but which he did not consider as important as getting the principles of management right. He was disappointed when all the discussion was devoted to the piece rate system and the principles were ignored. Because of this, he devoted several years to accumulating evidence and arguments to support his ideas about scientific management. These ideas were then presented in another paper to the ASME in 1903, with the title 'Shop Management'. It is this that forms the kernel of the book, *Shop Management*, which

INTRODUCTION

is the first of the three books included in the volume, *Scientific Management*. The emphasis in this book is on the importance of coupling high wages for the worker with low labour costs for the employer, and the resulting public benefits from lower prices. The following principles are listed as guides for the best type of management:

- (a) *A Large Daily Task*. Each worker in the establishment, high or low, should daily have a clearly defined task laid out.
- (b) *Standard Conditions*. The worker should be given such standardized conditions and appliances as will make it possible to accomplish the task with certainty.
- (c) *High Pay for Success*. The worker should be sure of high pay when the task was accomplished.
- (d) *Loss in Case of Failure*. When the worker failed, it should be sure that sooner or later there would be a penalty.

The next of Taylor's books, *The Principles of Scientific Management* (1911), gave a much more extended and detailed account of the principles of scientific management that had been only briefly indicated in the earlier work. He recognized the need to separate the planning of work from its execution. Taylor made clear that management must first systematically study its work for the purpose of identifying and defining various principles. Then, it must develop adequate procedures for applying them. He suggested that in order to work according to scientific principles, management would have to take over and perform much of the work that was currently being performed by the workers. Almost every act of the worker would have to be preceded by one or more preparatory acts of management, which would enable the worker to work better and more quickly than would otherwise be the case.

Taylor stated that scientific management comprised a combination of four great underlying principles: first, the development of a true science. Second, the scientific selection of workers. Third, the scientific education and development of workers. Fourth, intimate, friendly co-operation between managers and workers. He went on to list the various tools to serve these principles, such as time and motion study, functional foremanship, standardization of tools and movements of workers for each type of work, planning rooms or departments, slide-rules and other time-saving devices, instruction cards for workers, the task idea in compensation with bonuses for above-average performance, the mnemonic classification system, routing systems, and cost accounting techniques.

The application of these principles in a specific workplace, such as a metal-working plant, would entail the following steps: first, the development and introduction of standards throughout the works and office. Second, the scientific study of unit times on several types of work. Third, a complete analysis of the pulling, feeding power, and the proper speeding of the various machine tools throughout the place with a view to making a slide-rule for properly running each

INTRODUCTION

machine. Fourth, the work of establishing the system of time cards by means of which ultimately all of the desired information would be conveyed from the workers to the planning room. Fifth, overhauling the stores' issuing and receiving system so as to establish a complete running balance of materials. Sixth, ruling and printing the various forms that would be required for maintenance of standards in all tasks throughout the plant.

It should be evident that one of the appeals of scientific management was its comprehensive and rational (critics would say 'mechanistic') approach to all the functions and processes within an organization. Taylor even suggested that supervisory functions should be divided into specialisms – what he called the 'functional foreman'. This proved impractical at the lowest supervisory level of foremen, but it did lead to the use of staff specialists in the framework of the 'staff and line' form of organization. Taylor and his supporters claimed to be substituting exact scientific investigation and knowledge for the old individual judgement or opinion, either of bosses or workers. This was his claim in testimony to the Congressional Committee in 1912. But, even if restricted to specific procedures such as time and motion study, methods analysis, and job evaluation, the claim to exact science was an over-statement. It claimed more than it could deliver. There were various areas of weakness that were pointed out by critics, opponents, and later by more sociological approaches. The first weakness was with respect to the fact that implementation of many of the procedures depended on agreement and collaboration between different parties with a stake in the organization. Many protagonists of scientific management seemed to think that compromise and negotiation could be discarded in labour management relations. This belief rested upon a common assumption of such self-proclaimed 'scientific' approaches to social behaviour: that the individual can be viewed as an 'economic man'. So, it could be assumed that if the employer scientifically determined a fair day's pay; if the employee was shown the best way to do the job and allowed to earn a bonus for above-average performance; and if the employer had sincere intentions, then 'What more could the worker want?' Trade unions would be rendered redundant. After all, the logic of 'science' dictates that the procedures be unilaterally developed and administered by experts and that any resistance from workers must be due to misunderstanding of management objectives. Taylor was even quoted at the Congressional hearing as having said that the only human element that needed to be recognized was the pride and stimulation the worker derived from competing with and outdoing fellow-workers.

The main problem was that Taylor and scientific management theory had an overly simplified view of motivation. For example, he believed that 'loafing' or 'soldiering' derived from a natural instinct in men to take it easy ('natural soldiering') or from a more 'systematic soldiering' due to group influences. His only solution was the unilateral determination by management of a fair day's pay and of a fair incentive pay system, and the application of stern discipline to those who failed to fall into line. There was little attempt at engaging workers as participants in the organization or getting them to identify with the organization.

INTRODUCTION

This lack was even more keenly felt to the extent that the planning department displaced the worker as custodian of job knowledge and then returned that knowledge to the worker only piecemeal. Matters were made worse to the extent that many employers used scientific management reasoning as a basis for speeding up the production process and raising production quota demands.

Although trade unions were fairly weak in America at the time of scientific management's heyday, there was still considerable opposition by organized labour. Some of the most well-argued criticisms were presented by Professor Robert Hoxie to the United States Commission on Industrial Relations and were published in his book *Scientific Management and Labour* (1915). The main criticism was that scientific management tended to look upon the worker as a mere instrument of production, reduced to a semi-automatic attachment to the machine or tool. Its crucial weakness was a failure to consider the human factors involved in organization.

The Human Relations approach developed from a number of contributions. The most famous were from those, such as Elton Mayo and F. J. Roethlisberger, associated with the Hawthorne Experiments begun in 1927 at the Western Electric Company in Chicago. They all rejected the over-simplified notion that economic incentives largely explain employee behaviour. However, even before the results of the experiments at the Hawthorne plant became well known and Human Relations theory emerged, a similar theme had been promulgated by others coming from the stream of organization and administration theory. One was the Englishman, Oliver Sheldon, who in 1924 wrote *The Philosophy of Management* (included in this set), which was widely read and adopted as a textbook in Britain and America. His theme was that though Taylorism had helped the development of a science of management, such work should not detract from the predominantly human job of the manager to manage.

Another contributor was Mary Parker Follett, a prominent business philosopher of that period, who agreed with Sheldon about the need to emphasize human factors in management, but placing greater stress on the need to develop a science of co-operation. According to Follett, what she called her 'Law of the Situation' could be a means for bridging the gap between the ideal of scientific management and the unilateral imposition that it seemed to involve in practice. She explained the law as a means for depersonalizing order giving and for uniting all concerned in a study of the specific situation to discover the Law of the Situation, which would secure acquiescence and support. In effect, she was proposing the same kind of collaboration between leaders and subordinates as was usually to be found between leaders of the same rank. From her point of view, the essence of scientific management should be an attempt to find the Law of the Situation. In formulating her ideas she drew on theories emanating from social psychology regarding consent and participation, and work on leadership theory.

Follett's various papers were collected together by Henry Metcalf and L. Urwick and are presented here in the volume, *Dynamic Administration: The Collected Papers of Mary Parker Follett* (1942).

INTRODUCTION

Her experience of administration and business on both sides of the Atlantic gave her insights into the human problems of industry and, specifically, of industrial relations. Some of her most distinctive contributions stem from her view of conflict as a potentially positive force, rather like friction in mechanics, that could be set to work and made to yield useful results. She used psychological theory to delve more deeply into the roots of conflict and suggested ways in which the real desires, below the level of language and symbols, could be brought to the surface. This interest in language and symbols, and what lay behind them, led her to make suggestions as to how changes could be made in the language of personnel relations. Many of her other suggestions were concerned with ways of producing 'integrative unity' within the organization, which involved changing styles of leadership, attitudes, and the structure of the organization. In some respects she anticipated later sociological interest in questions of control and ideology within organizations (cf. Salaman and Thompson, 1980).

The breadth of contributions to the organization and administration theory stream of thought is indicated by the contributions to the collection edited by Gulick and Urwick, *Papers on the Science of Administration* (1937), included in this set. In addition to a chapter by Follett on 'The Process of Control', there are important contributions by the editors, Gulick and Urwick, a paper by the leading French management writer at that time, Henri Fayol, and by leading business leaders, James D. Mooney and Henry S. Dennison. A link to the emerging Human Relations School is provided by the paper by L. J. Henderson, T. N. Whitehead and Elton Mayo, 'The Effects of Social Environment', dealing with aspects of the Hawthorne Experiments. Much of the discussion begins with arguments concerning the division of functions within the structure of organizations and how these can then be co-ordinated. Urwick's chapter on 'Organization as a Technical Problem' exemplifies this. However, as Gulick insists in the first chapter on 'The Theory of Organization':

'Any large and complicated enterprise would be incapable of effective operation if reliance for co-ordination were placed in organization alone. . . . Human beings are compounded of cogitation and emotion and do not function well when treated as though they were merely cogs in motion. Their capacity for great and productive labour, creative co-operative work, and loyal self-sacrifice knows no limits provided the whole man, body-mind-and-spirit is thrown into the program.' (p. 37).

The lesson being drawn from the experience and studies of recent war efforts and industrial conflicts was that the psychology of groups and the art of leadership were just as important as structural organization. The British contributor, Urwick, in his chapter 'Organization as a Technical Problem', reflected on military experience and also the increasing intervention of the state in promoting organizational reform, concluding that the future of the Western nations depended on the capacity to improve and apply organizational knowledge. 'Divide and rule' may have been a

INTRODUCTION

sound motto for an agricultural despotism. 'For a machine-using democracy it is a passport to disaster' (p. 88).

As we have noted, it is the paper by Henderson, Whitehead and Mayo on 'The Effects of Social Environment', discussing some of the findings of the Hawthorne Experiments, that provides the most explicit link to the Human Relations theory. Whilst admiring the pioneering work of Taylor and scientific management, these authors' criticism is that 'scientific management has never studied the facts of human organization; it has accepted the nineteenth century economic dictum that economic interest and logical capacity are the basis of social order' (p. 156). The authors admit that it was by accident, during their experiments studying work groups at the Hawthorne plant, that they discovered the importance of the spontaneous social organization of the work group. A group of people who work together develop into a micro-social system and 'thereafter so act that their behaviour can only be conceived as the resultant of social forces as well as of economic forces and of those psychological forces that are private to the individuals. . . . Its mere existence disciplines the members and gives rise to sentiments, often very strong sentiments, of loyalty, of personal and group integrity, and not infrequently of pride' (p. 157).

An overview of the significance of the Hawthorne Experiments, and of how they related to other studies that preceded the Human Relations approach to organization and management, is provided by Elton Mayo's *The Human Problems of an Industrial Civilization* (1933). The official account of the entire research is given in the volume by F. J. Roethlisberger and William J. Dickson, *Management and the Worker* (1939). Although the experiments were carried out at the Hawthorne works of the Eastern Electric Company, in Chicago, and involved staff of that company, they were guided and their findings interpreted by a powerful group of professors at Harvard University. Elton Mayo was then Head of the Department of Industrial Relations Research of the Graduate School of Business Administration at Harvard. Two other significant figures, who were co-authors with Mayo of the article in the Gulick and Urwick volume, were Professor Lawrence J. Henderson and T. N. Whitehead, also of the Harvard Business School. F. J. Roethlisberger was Professor of Human Relations at Harvard Business School. William J. Dickson was Chief of Employee Relations in the Research Department of the Western Electric Company Hawthorne works.

The Hawthorne studies had a profound effect on the Human Relations movement, both in the form of the practice of industrial management and in its theoretical and methodological aspects. The studies are usually seen as being divided into three phases: (1) test room studies, involving experiments on environmental conditions in the workplace; (2) interviewing studies concerned with workers' attitudes and focusing on psychological factors; (3) observational studies of a sociological nature, aimed at describing and understanding factors influencing the informal organization of work groups. The sequence of phases can be regarded as one of progressive change of focus, beginning with physical factors (influenced by engineering concepts), then turning to psychological factors that

INTRODUCTION

might account for attitudes, and finally focusing on sociological factors concerning the informal groups as micro-social systems in their own right (and as mediating between the individual and larger social systems, such as the firm and the larger society).

The Test Room studies, or Illumination Experiments, took place in the first phase of research between 1924 and 1927. They were similar to studies carried out elsewhere on single variables in the workplace environment that might affect worker fatigue and productivity. Elton Mayo had been very impressed by the research efforts encouraged by the British government during the First World War into factors affecting worker fatigue, accidents and productivity. The British authorities had even set up a Committee on the Health of Munitions Workers during the war in 1915, which was succeeded by the Industrial Fatigue Research Board. One of the questions it addressed was why the productivity of workers increased and accidents declined after working hours were reduced. The investigators were unable to find any single physical variable to explain this, as the physical capacity of workers seemed to vary considerably. Some researchers hoped to find a single chemical discovery that might banish fatigue from industry – one suggestion was that doses of acid sodium phosphate might achieve the desired end and be preferable to reducing working hours (Mayo, 1933, p. 5). Among other factors examined were lighting and atmospheric conditions. Mayo's colleague, L. J. Henderson, was also carrying out studies in the Harvard Fatigue Laboratory into biochemical changes which might occur in the bloodstream during active muscular exercise. The main conclusion that was drawn, and as also emerged from the Hawthorne Test Room studies, was that human conditions such as fatigue or productivity were not a single limited entity characteristic of a simple causal series of events.

The Test Room studies of the relationship between variations in the intensity of illumination and the efficiency of shop floor workers came up with completely unexpected results. An increase in illumination for an experimental group of workers led to an increase in output. Then, to the researchers' surprise, output also rose in the control group where there had been no change in illumination; a decrease in illumination led to an increase in output by the experimental group, but there was again an increase in output in the control group. Other experiments gave rise to similar surprises. More importantly, methodologically, it became clear that there was no simple cause and effect relationship between the single variable, illumination, and the workers' efficiency. It seemed that other important factors had not been adequately controlled and, perhaps more importantly, that large groups in regular shop departments would always present difficulties for experimental control. This prompted the changes of approach found in the second phase.

The second phase of the Hawthorne studies took place in the Relay Assembly Test Room between 1927 and 1932. This time, a small group of average women workers, who had volunteered to be studied, were moved to a separate room, where there was exact measurement of the conditions of work, such as temperature,

INTRODUCTION

humidity and other factors, and of the workers' output and quality of work. An observer was stationed in the workroom with the task of exercising a quasi-supervisory function, but also creating and maintaining a friendly atmosphere, while still making written observations. The result was that absentee rates declined and output increased and was maintained at a high level, despite any changes that were made in the conditions of work. The female workers expressed greatly increased satisfaction with their working lives. Among the hypotheses considered were: (a) relief from fatigue; (b) relief from monotony; (c) increased wage incentives; (d) changes in methods of supervision. None of these in itself turned out to be a decisive factor. What did seem to be significant, it became evident, was the high degree of *esprit de corps* (group morale) that had developed. Part of this could be attributed to the freer atmosphere and less authoritative supervisory style.

Two other, related, facts began to be understood. The first was that the research itself had an effect on the work group's solidarity and its morale – higher management and important outsiders were giving attention to the group and considered its activities to be significant. This effect of research on the behaviour of the subjects being studied has become known as the 'Hawthorne Effect'. It is now taken into account by social researchers as a matter of course. The other important fact was that conditions of work – lighting, working hours, rest periods and even pay and supervision – could not be viewed as things that in themselves directly affected people's work. These conditions only become significant as they take on meaning in terms of the perceptions, interpretations and attitudes of those experiencing them.

These findings of the Test Room led to extensive interviewing studies on the attitudes of the workers throughout the company with regard to their jobs, working conditions and supervision. The main survey included interviews with 21,000 people – one of the largest ever undertaken up to that time. It was thought that if the attitudes survey could show which features of the work environment workers liked or disliked, improvement might be made that would enhance their satisfaction and motivation. Unfortunately, these matters turned out to be more complicated. It is seldom the case that the reason for an individual's dissatisfaction can be identified directly and objectively. It usually has to be sought in the complexity of a person's feelings and sentiments concerning what, in that person's eyes, was appropriate work, good working conditions, fair pay, and reasonable supervisory behaviour, to him or her personally. Often this related back to past experiences of the individual, to wider associations in the outside society, as well as to the present job situation. As a by-product of this research, it was found that the process of talking over these personal issues in some depth with a friendly interviewer could help the workers understand their feelings towards the work environment. This had the practical outcome of giving rise to an extensive employee counselling programme in the Western Electric Company, as well as personnel counselling elsewhere.

The final phase of the Hawthorne studies took the form of observational studies. These were not carried out on experimental groups in which working conditions

INTRODUCTION

were changed, but focused on social factors in the actual operation of existing work groups. The psychological study of individuals had proved insufficient. The workers were not isolated, but constituted a small society in which the members had routine relationships to each other, to their superiors, and to their work. The methods of research combined the sorts of observation and interviewing that cultural anthropologists had used on small societies. The findings made clear that the work group was a complex social system with well-established norms of conduct and shared sentiments over and above those required by the formal organization of their work. The norms of the group included prohibitions concerning how much and how little could be done, communications with supervisors, and relations with outsiders. What the group considered to be a fair day's work was maintained through a variety of social pressures. It might be maintained by the group despite the fact that in the process they were limiting their earnings. The micro-social system had relations with larger social systems, including those of the plant and the company, as well as the wider society. The position of the group in the social structure was one in which employees acted as though they continually needed to protect themselves from real or perceived changes emanating from elsewhere. These findings about systemic relations represented a significant contribution by the Human Relations School to a developing convergence with organization and administration theories.

The increasingly sociological direction of these studies is spelt out by Elton Mayo in the later chapters of *The Human Problems of an Industrial Civilization*, after he has finished discussing the Hawthorne studies. He begins Chapter VI, 'The Reaction of Industry Upon the Social Order. Technical Development and Anomie', by relating the findings about human relations within the Hawthorne plant to the social environment in the surrounding Chicago area, which he notes had been closely studied by Robert E. Park and his colleagues in the Department of Sociology at the University of Chicago. The Chicago School of sociologists were studying aspects of social disorganization, such as delinquency and suicide. This was a topic pioneered in sociology by Emile Durkheim, using his concept of 'anomie' (normlessness). Although Mayo agreed with Durkheim that social disorganization and anomie were a creeping pathological feature in an industrial society such as America, he believed that Durkheim failed to observe that human individuals cannot do otherwise than establish and re-establish social forms or patterns of living. He quotes Durkheim's colleague Halbwachs as offering a better guide than Durkheim, because he was more alert to the capacity of groups to adapt to social circumstances. This was the finding of the Chicago School in studies such as those on youth gangs in the inner city, which parallel the findings of the Hawthorne studies on the normative control exercised by small groups over their members.

Another major sociologist referred to by Mayo was the outstanding Italian sociologist, Vilfredo Pareto, and his ideas about the circulation of élites in society over time (Mayo, 1933, p. 174), and the importance of 'non-logical' social action, such as group sentiments and rituals (p. 180). Mayo suggested that one of the

INTRODUCTION

lessons to be learned from the findings of the Hawthorne studies was that managers or administrators need to be tuned in to the social environment so as to discern how it affects the sentiments and actions of members of the work group. A new breed of managers was needed, he thought.

Pareto's sociological theories had some influence on the Harvard group involved with the Hawthorne studies through the mediation of Professor Lawrence J. Henderson, who was one of the co-authors of the paper published in the Gulick and Urwick volume. Henderson was Pareto's main disciple in America. The line of influence is also evident in another volume included in this collection on *The Early Sociology of Management and Organizations*, that by Chester I. Barnard, *Organization and Management* (1948). Barnard's most famous work was *The Functions of the Executive* (1938), which remained a bestseller for many years. The present volume, *Organization and Management*, includes an important paper on 'Concepts of Organization', which is an exegesis of the approach to the study of organization embodied in the famous book, and also a response to critics. In his exegesis he makes clear that he was putting forward a 'field' concept of organizations, 'in which activities take place in and are governed by a field of "forces", some human and social, some physical', which he thought might prove as useful in the long run as the constructs of 'magnetic field', 'electrical field', and 'gravitational field' in physical science (p. vii). This conception was developed by a number of sociologists and psychologists of industrial behaviour, such as J. F. Brown and Kurt Lewin.

Barnard's involvement with Henderson, and so with spreading Pareto's influence, began in 1937 when he was invited by Henderson to lecture at Harvard in an experimental course in 'Concrete Sociology'. This introductory sociology course was largely based on Pareto's sociology as presented in his massive work, translated as *Mind and Society*. Barnard confessed that he had for several years been a student of Pareto's work and was thoroughly familiar with his ideas (1948, p. 55). The aim of the course was to present to students a number of concrete cases of human interaction and behaviour in social situations, to convey to them something of the nature of such situations, and to furnish illustrations of a scientific approach to problems of 'human relations' (p.52). Barnard drew on his experiences as State Director of the New Jersey Relief Administration in negotiating with the leaders of the organized unemployed. He continued to participate in this Harvard sociology course for several years. In the chapter, 'Riot of the Unemployed at Trenton, N. J., 1935', he analyses his case study, using Pareto's concepts, such as that of 'residues', which make possible a classification of sentiments that provide the motives for people's actions. His chief conclusion is that it is these various non-economic sentiments or residues that motivate many actions:

'In innumerable instances I have observed, even when the subject matter is economic – for example in business transactions – the behaviour manifests chiefly non-economic sentiments. Since the language used is so largely of economic character, this is not obvious. But this language is

INTRODUCTION

largely derivation (Pareto's term for non-logical or illogical statements and arguments), rationalization, and frequently approaches ritualistic symbolism . . . ' (p. 77).

These are contentious conclusions and they have drawn many criticisms from subsequent sociologists. However, they are interesting because they mark a decisive step away from the previous mechanistic or 'economic man' theories, and they emphasize sociological factors that were being conceptualized by theorists such as Max Weber and Emile Durkheim, as well as Pareto. They also coincide with theoretical and methodological contributions emanating from social anthropologists, such as W. Lloyd Warner at Harvard, who had been carrying out community studies in Newburyport, Massachusetts, including a study of cultural factors impacting on local industrial organization. Warner was encouraged in this work by Harvard Business School and his ideas are discussed extensively by Elton Mayo in *The Human Problems of an Industrial Civilization*.

It should begin to become clear that the early sociology of management and organizations was evolving out of a mixture or cross-fertilization from a number of previously separate and disparate sources: engineering, physiological studies, organization and administration theory, psychology, social anthropology, and various strands of sociological theory and research at Harvard and Chicago in America, as well as theorists such as Durkheim and Pareto. The writings of another great sociological theorist, Max Weber, were less often mentioned in the early stages, but his ideas on bureaucracy and authority were to become prominent in the later developments of organization theory.

The final work in *The Early Sociology of Management and Organizations* is Tom Lupton's *On the Shop Floor* (1963). This is a good example of post-Second World War empirical research that also attempted to continue the theoretical development of industrial sociology and the study of management and organizations. It was explicitly intended to follow up and test the kind of findings and Human Relations theories stemming from the Hawthorne studies, but focusing on real work groups rather than experimental groups. Lupton's study was based upon research carried out from the Department of Social Anthropology at the University of Manchester during 1955 and 1956. It was sponsored by British and American government research funds (including United States Economic Aid). However, Lupton stated that he also 'relied heavily on the help and advice' of the trade unions as well as the managers of the factories where he worked. This closeness to the unions and awareness of the point of view of organized labour was something that was missing from the Hawthorne studies. It was characteristic of much of the post-war industrial sociology in Britain, which gave it a more sympathetic and informed appreciation of the reasoning behind the positions adopted by workers in their dealings with management, compared with the more management-oriented view of American counterparts. As Lupton put it, when he described the Hawthorne studies of the Bank Wiring Observation Room:

INTRODUCTION

'Before summarizing the results and conclusions of the Bank Wiring Observation Room researches it is necessary to point out that the investigators were University men working in close collaboration with the management of the firm. Research activities were accordingly directed to problems defined by management – or jointly by managers and research workers. There is no evidence that workers were consulted *before* investigations were planned to discover what they considered to be problems worth investigating, although at every stage *afterwards* the workers were kept fully informed and their co-operation sought. It would be fair to say that the investigation into restriction of output was undertaken in the hope that out of it would emerge conclusions that would enable management to devise policies to help close the gap between expected and actual output.' (p. 4).

The Hawthorne researchers eventually rejected the original suggestion that workers deliberately restricted output, preferring to hypothesize that it was certain 'non-logical' group solidarity sentiments that led workers to behave in ways that frustrated the management. The Bank Wiring Room investigators rejected the argument that restriction was the outcome of a shrewd calculation of their situation by the workers; this was despite the fact that, when the workers were interviewed, these were the very reasons they gave. The investigators resolved this apparent paradox by calling the reasons 'rationalizations'. The conclusion of the researchers was that restriction of output was the outcome of a discrepancy between two logics. Management logic was viewed as a logic of efficiency. Workers, on the other hand, were 'groupish', adhering more to custom and tradition, and their logic was that of sentiment.

Lupton said it was to be expected that managers, and those who accepted their definition of the problem of restriction of output, would be preoccupied with the development of 'human relations' techniques for winning over the workers to an acceptance of management norms and expectations, especially since it was clear that workers do not always accept a 'moral obligation' to submit completely to technological and administrative controls. This approach rested upon the belief that there was something sacrosanct about management goals and norms. It also tended to assume that the interests and goals of managers and workers coincided, if only workers could be persuaded to shed irrational fears. The American sociologist and advocate of a conflict theory, Lewis Coser, had pointed out that this approach 'robs workers' claims of their legitimacy' (quoted by Lupton, 1963, p. 9). Lupton rejected this human relations approach explanation, both on the basis of his own experience of working in factories and: 'Most of all, as a sociologist I suspected the simplicity of some of the interpretations' (p. 9).

Lupton proceeded to develop an approach that focused on controls over behaviour in organizations. These controls could be technological, administrative, quasi-legal, or merely customary. Since the kind of controls which operated to regulate behaviour helped to define the roles which individuals were expected to

INTRODUCTION

play, and how they performed them, the existence of discrepant or conflicting controls could produce conflicting role expectations. The operation of controls was likely to be influenced by changing environmental conditions, such as market forces, as well as by forces within the organization. According to Lupton, therefore, the most important task of the sociological researcher was to map out the particular field of forces which operated to produce certain kinds of behaviour in a particular organization and unit. Organizational behaviour should be considered as 'a kind of moving resultant of the interplay of social forces in a field of economic, technical and administrative, and customary controls' (p. 10). This has some resemblance to Barnard's approach to organizations in terms of a 'field of forces', although shorn of his attachment to Pareto's concept of 'non-logical' sentiments.

The theoretical conclusion reached by Lupton was that the field of forces approach was superior to approaches which regarded the organization solely in terms of its internal functioning. The organizational unit had to be analysed as a system of social relationships included within wider systems – the factory, the market for the product, the local community, the political system, and so on. The difficulty with this kind of analysis, and it was one that Warner had also found, was that it was difficult to take account of all the intersecting systems. It required a constant reference to sociological findings about all the relevant social systems and their components, such as family and gender roles, the economic system and consumer roles, etc. The best sociologies of management and organization have been those that have sought to incorporate these broader sociological aspects within their analyses of the field of forces within which a particular organization is situated. The less productive approaches are those that focus solely on the organization as though it is a self-contained entity, whilst at the same time adopting senior management's perspective on the goals, norms and functioning of the organization. Lupton's final point is that management's attempts to promote among workpeople a sense of 'belonging' will not necessarily lead to greater co-operation, especially if there are conflicts of interest. This is a salutary caution to many management consultants who promote 'human relations' techniques as a 'one-size-fits-all' solution to organizational conflicts. The sociology of management and organizations provides plenty of evidence that more varied and complex approaches are required (Salaman and Thompson, 1980).

References

- Barnard, Chester I. (1938), *The Functions of the Executive*, Cambridge, Mass: Harvard University Press.
- Barnard, Chester I. (1948), *Organization and Management*, Cambridge, Mass., Harvard University Press.
- Gulick, Luther and Urwick, L. (eds) (1937), *Papers on the Science of Administration*, New York, Institute of Public Administration.
- Hoxie, Robert (1915), *Scientific Management and Labour*, New York, Appleton.
- Lupton, T. (1963), *On the Shop Floor*, Oxford, Pergamon.

INTRODUCTION

- Mayo, Elton (1933), *The Human Problems of an Industrial Civilization*, New York, Macmillan.
- Metcalf, H. C. and Urwick, L. (eds) (1942), *Dynamic Administration: The Collected Papers of Mary Parker Follett*, London and New York, Harper.
- Roethlisberger, F. J. and Dickson, W. J. (1939), *Management and the Worker*, Cambridge, Mass., Harvard University Press.
- Salaman, G. and Thompson, K. (eds.) (1973), *People and Organizations*, London, Longman.
- Salaman, G. and Thompson, K. (eds.) (1980), *Control and Ideology in Organizations*, Milton Keynes, Open University Press, and Cambridge, Mass., MIT Press.
- Sheldon, Oliver (1924), *The Philosophy of Management*, London, Pitman.
- Taylor, F. W. (1911), *The Principles of Scientific Management*, New York, Harper.
- Thompson, K. (1982/2002), *Emile Durkheim*, London, Routledge, 2nd edn, 2002.
- Urry, John (2002), 'Sociology as a parasite: some vices and virtues' in P. Hamilton and K. Thompson (eds), *The Uses of Sociology*, Oxford, Blackwell, pp. 334–43.



FREDERICK WINSLOW TAYLOR

SCIENTIFIC MANAGEMENT

COMPRISING

Shop Management

The Principles of Scientific Management

*Testimony Before the
Special House Committee*

BY

FREDERICK WINSLOW TAYLOR

With a Foreword by

HARLOW S. PERSON

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FOREWORD

By Harlow S. Person, Consultant in Business Economics and Management, New York; formerly President and Managing Director of the Taylor Society, New York.

IT IS a matter of significance that continuing demand for explanations of Scientific Management in Taylor's own words, earlier printings of which have for several years been unavailable, should induce the publishers to offer a new printing. It is of even greater significance that the publishers have decided to include under one cover "Shop Management," "The Principles of Scientific Management," and Taylor's testimony at "Hearings Before Social Committee of the House of Representatives to Investigate the Taylor and Other Systems of Shop Management." Prepared at different times for different audiences and under circumstances that inspired different emphases, a study of all three is essential to one who seeks understanding of the dominant force that has guided the development of twentieth century management.

Taylor's papers might well be classified as "occasional papers." He was in temperament, training and experience an engineer-executive, a doer. He was not interested in writing for its own sake, and, although he wrote painstakingly, he found the proc-

ess laborious. Furthermore, he did not believe that management could be learned from reading or taught in the classroom; it had to be learned in the doing. The preparation of a formal, comprehensive treatise on Scientific Management would never have interested him. Each of his expositions was the result of a challenge of circumstances. That is why each represents a particular approach and emphasis.

"Shop Management" is a paper presented at the Saratoga, N. Y., meeting of the American Society of Mechanical Engineers in 1903. Because the audience was a group of engineer-executives, and because ASME was particular that all papers should be concise and free from what it then conceived to be extraneous matter, technique was emphasized and principles and social significance were touched lightly. The audience consisted chiefly of industrial executives in a position of authority to adopt and develop his technique, once they grasped the interrelation of details, and for that reason he emphasized the mechanist aspects.

"Principles of Scientific Management" was published during the early months of 1911. At that time circumstances were different. During the intervening years discussion of the technique had progressed and inevitably questions of principle were raised. The concept of Scientific Management had become controversial. Consequently in 1909 Taylor prepared a paper designed to emphasize principles and submitted it to the proper committee of ASME for consideration. This committee held it without action for nearly a year. During this period—the latter

part of 1910—rate case hearings before the Interstate Commerce Commission in Washington had aroused an intense public interest in what during the hearings was for the first time labeled “Scientific Management.” The press and monthly magazines found news value in the matter identified by this striking label. Special writers began to interview Taylor and his associates and to prepare special articles. Taylor felt that an authoritative statement, emphasizing aspects of public interest, was essential. Consequently he withdrew the paper from ASME. He published at his own expense, to meet professional requirements, an edition which he sent to all members of the society, and then authorized Harper and Brothers to print an edition for the public. As the title indicates, Taylor’s emphasis was on principles, with enough of technique and of results for illustration.

Viewed in present-day perspective it was not an adequate presentation of principles. On the one hand, Taylor’s mind was pretty much the opposite of the academic type of mind that thinks in terms of generalizations; he was interested in action and its immediate measurable results. On the other hand, at the time “Principles” was prepared there had been no external force to extract from him what capacity for generalization he possessed. That external force presented itself during the winter months of 1911-12 at hearings before a special committee of the House of Representatives, and the publisher has wisely included in the present volume Taylor’s testimony at those hearings.

The appointment of this special committee was inspired by organized labor, which by this time was showing concern over the effect on its organization and procedures of measured individual productivity in even the best examples of Scientific Management, and especially over the use of its mechanisms (which Taylor said could be employed for good or bad) by unscrupulous employers and managers. Because Scientific Management had been developed in several arsenals of the army, labor asserted that the matter was one of Congressional concern, and the special committee was appointed.

It is the fact that generally committees appointed to "investigate" are not entirely objective, and sometimes not fair. Their appointment may be inspired by interests against the matter of investigation whose power of suggestion reaches through to influence the constitution of the committee. The committee with which we are here concerned is not free from criticism on that score. Yet its establishment was a public service insofar as its questioning inspired Taylor to utterances concerning philosophy, principles and technique that he would never have thought of writing into a professional paper. Some of them are eloquent as well as clarifying; for example, the famous passages concerning what Scientific Management is not, as well as what it is, beginning on page 26 of this edition.

Frederick Winslow Taylor was born in 1856 in a cultured and well-to-do but not wealthy family in Philadelphia. His parents desired that he enter the law and sent him to Phillips-Exeter Academy to

prepare for Harvard entrance examinations. Although not a brilliant student, by seriousness of purpose and hard study he led his class at the Academy. But he paid the price of serious impairment of vision because of too much study by kerosene light. The doctors advised against Harvard and any career involving close study. So young Taylor returned to his parents' home uncertain as to his future activity.

Energetic, conscientious and restless, he looked for a career that would not call for too much reading. Accordingly in 1874 he began an apprenticeship as a pattern-maker and as a machinist in a small shop in Philadelphia. In 1878 he had become a journeyman machinist and journeyman pattern-maker. Attracted by the reputation of William Sellers, president and general manager of Midvale Steel Company, he applied for and secured a job at the works of that company. However, this first job was neither as machinist nor pattern-maker, but as an ordinary laborer. His energy and genius are manifest in the following promotions: within a period of eight years he progressed through the stages of ordinary laborer, time keeper, machinist, gang boss, foreman and assistant engineer to chief engineer of the works. By night study in absentia, his eyesight having improved, he earned the M.E. degree at Stevens Institute. In the course of his day-to-day work he developed and proved the value of that technique of management which he identified as the task system, which his associates termed the Taylor System, and everybody eventually designated as Scientific Management. The development of this technique came about in the

following manner. When he was appointed gang boss he sought to increase the output by putting pressure on the men. A serious struggle between gang boss and workers ensued. Taylor finally won in the struggle, but the experience hurt him. He gave the matter thought and decided that the primary cause of such conflicts is that management, without knowing what is a proper day's work, tries to secure output by pressure. If management knew what is a proper day's work, it could then get output by demonstration. He decided by experiment to discover what was a proper day's work for every operation in the shop. His experiments along this line continued throughout his service with the Midvale Steel Company, then at the Bethlehem Steel Company, and later in various types of enterprises as consultant. Within a few years he had developed a technique of managing that in its factual basis and scope was more effective both in productivity and in good worker relations than any management elsewhere.

This new technique of managing involved two major elements. First, discovery by experiment of the best way of performing and the proper time for every operation and every component unit of an operation: in the light of the state of the art, the best material, tool, machine, manipulation of tool or machine, and the best flow of work and sequence of unit operations. These data were classified, indexed and lodged in the data files for use as new orders came along. Second, a new division of labor as between management and workers: the assignment to man-

agement of the responsibility for discovering these best ways of performing units of operations, and the further responsibility of planning operations and actually making available at the proper time and place, and in the proper quantity, the materials, tools, instructions and other facilities required by the workers. The great gains in productivity accruing from this technique of management come not from greater exertion on the part of workers (it is generally simplified and reduced) but from elimination of wastes—waste of workers' time and machine time through delays of misapplied effort, of failure in coordination of quantities, and so forth.

Taylor became a member of ASME in 1885, attended its meetings and listened with great interest to discussions of management, especially as stimulated by Henry R. Towne's paper "The Engineer as Economist," in 1886. But he became impatient of these discussions and of their controlling point of view. They were chiefly about premium and other differential wage systems, reflecting the point of view of what Taylor called the management of "initiative and incentive." In this type of management the manager tried through a premium or bonus to stimulate the workers' incentive to greater productivity by their own greater efforts. No thought here of what management itself could do to increase productivity and lighten labor's efforts.

Taylor decided, therefore, to present a paper describing his technique of management. Because wage systems were then the focal point of interest he tried to work a description of his technique of managing

(which he considered extremely important) into a paper on a differential piece rate system with which he had experimented (and which he did not consider of great importance).

In 1895 he presented his paper "A Piece Rate System." The piece rate feature of the paper was given attention and discussed; the technique of managing was ignored. This was a disappointment to the young man, but he took it philosophically. He decided that he had spoken before he was really prepared. He would wait patiently and at a later date present a paper on management after he had more experience and had assembled his material properly. Eight years later (1903) he presented "Shop Management." The members of ASME generally were disposed to brush this paper to one side; but a few of them—men of vision like Henry R. Towne—perceived its significance and before long it was the storm center of controversial discussion throughout the management world.

In the course of his testimony before the House committee Taylor was asked how many concerns used his system in its entirety. His reply was: "In its entirety—none; not one." Then in response to another question he went on to say that a great many used it substantially, to a greater or less degree. Were Mr. Taylor alive to respond to the same question in 1947—thirty-five years later—his reply would have to be essentially the same. Yet there is a continuing demand for his papers that calls for this new edition. What is the meaning of this paradox?

American industry, and industry in parts of west-

ern Europe, has been profoundly influenced by Scientific Management and is densely spotted with fragments of it. Practically every manufacturing establishment of stability has a planning room. Time study technicians are employed by the thousands. The sales programs, budgets and quotas of the best-managed marketing departments are in these devices utilizing the technique to a greater or less degree. General administrative schedules, budgets and standards have been inspired by Scientific Management. Modern cost accounting in terms of products, operations and processes would be impossible without it. Yet these are primarily mechanisms and they may carry with them in any particular organization little or none of the spirit of Scientific Management.

The most stirring part of Taylor's testimony before the House committee is that section in which he develops the thought that true Scientific Management requires a mental revolution on the parts both of management and of workers. They must accept the philosophy that, except for minor adjustments to keep different desirable products in balance, the interests of both and of society in the long run call for ever greater output of want-satisfying commodities. Output requires expenditure of human and material energies; therefore both workers and management should join in the search for discovery of the laws of least waste. They should join in these rearrangements which under division of labor are required to make these laws effective.

In the small plants with which Taylor was concerned in his active life these joint efforts came about

informally; every worker was a participant observer in the development of standards. Taylor was never in a situation which called for consideration of formalized collective bargaining. Yet he did not disbelieve in collective bargaining as an institution, and since his day Scientific Management has in places been developed under collective bargaining auspices. While Taylor was not unsympathetic to bargaining whether the development of Scientific Management should be undertaken in an establishment, he was not tolerant of the concept that one might discover by bargaining a particular fact that lends itself rather to discovery by research and experiment. Recognition of the need of ever greater productivity, recognition of the necessity of discovering by scientific methods the laws governing the conservation of human and material energies in achieving the greater productivity, arrangements jointly by management and workers to give effect to these laws, and patience, and ever more patience—these were what Taylor considered the corner stones of true Scientific Management.

Therefore, true Scientific Management calls for a unifying point of view and a unity of interests and of efforts seldom present in a particular establishment. The directors must understand it in purpose and principle; that it is a matter of development, not installation; that it is in the nature of an investment the returns from which, though great, may be deferred; that the development takes time and patience. The active managers, all of them, must understand these things and have great skill in developing new

standards to supersede obsolete standards, and in substituting the new for the old without interrupting orderly processing. And especially must management be skilled in aiding workers to understand the purpose and meaning of Scientific Management and in maintaining their confidence in the purpose and in the management. Taylor said in his testimony that it takes two to five years—more frequently five years—to develop Scientific Management in an enterprise. It must be planted, and cultivated and fertilized, and pruned and shaped, like a shrub or tree. It is not something to be bought and installed like a boiler or a machine.

It is because of a recognition or sensing of all these conditions to a development of Scientific Management “in its entirety” that there are so few examples of such developments. Directors and managers are inclined to be more opportunistic and make the most of mechanistic fragments of the technique.

The continuing and, of late, increasing demand for Taylor’s papers seems to indicate that not only industrialists but students of social problems sense that they have failed to explore the values of Scientific Management as a great social force. It has been appraised generally in terms of its first emphasis; as a technique for conserving energy and increasing productivity by the use of scientific methods at the individual workplace. But since “Shop Management” was written nearly half a century ago, this technique of conservation has been applied to coordination of all the workplaces of great departments of huge enterprises, and in a few instances to coordi-

nation and conservation of the energies of entire enterprises. Some industrialists sense the fact that if we explore what is potential in Scientific Management with larger perspective, we may discover that the philosophy, principles and technique are applicable to conservation problems of entire nations, and perhaps of an entire world.

Never was the need greater for evaluation of every means of recovery from the vast wastes of war, of preservation of remaining human and physical energies, and of reorganization looking towards a new coordination of the surviving fragments of shattered economies. The very survival of democratic institutions may depend on a lifting of productivity to new degrees of adequacy which will rapidly eliminate starvation, establish a feeling of a greater economic security, and destroy impulses to follow false leaders along the paths of violence toward a totalitarian world.

Shop Management

Shop Management

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WITH AN INTRODUCTION BY

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HARPER & BROTHERS PUBLISHERS
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FOREWORD

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Late President of the Yale and Towne Manufacturing Company

AS a fellow-worker with Dr. Taylor, in the field of industrial management, I have followed the development of his work, almost from its commencement, with constantly increasing admiration for the exceptional talent which he has brought to this new field of investigation, and with constantly increasing realization of the fundamental importance of the methods which he has initiated. The substitution of machinery for unaided human labor was the great industrial achievement of the nineteenth century. The new achievement to which Dr. Taylor points the way consists in elevating human labor itself to a higher plane of efficiency and of earning power.

In a paper entitled "The Engineer as an Economist," contributed to the *Proceedings* of The American Society of Mechanical Engineers in May, 1886, I made the following statements:

"The monogram of our national initials, which is the symbol for our monetary unit, the dollar, is almost as frequently conjoined to the figures of an engineer's calculations as are the symbols indicating feet, minutes, pounds, or gallons. The final issue

of his work, in probably a majority of cases, resolves itself into a question of dollars and cents, of relative or absolute values. . . . To ensure the best results, the organization of productive labor must be directed and controlled by persons having not only good executive ability, and possessing the practical familiarity of a mechanic or engineer, with the goods produced and the processes employed, but having also, and equally, a practical knowledge of how to observe, record, analyze, and compare essential facts in relation to wages, supplies, expense accounts, and all else that enters into or affects the economy of production and the cost of the product."

As pertinent to the subject of industrial engineering, I will also quote the following from an address delivered by me, in February, 1905, to the graduating students of Purdue University:

"The *dollar* is the final term in almost every equation which arises in the practice of engineering in any or all of its branches, except qualifiedly as to military and naval engineering, where in some cases cost may be ignored. In other words, the true function of the engineer is, or should be, not only to determine how physical problems may be solved, but also how they may be solved most economically. For example, a railroad may have to be carried over a gorge or arroyo. Obviously it does not need an engineer to point out that this may be done by filling the chasm with earth, but only a bridge engineer is competent to determine whether it is cheaper to do this or to bridge it, and to design the bridge which will safely and most cheaply serve, the cost of which

should be compared with that of an earth fill. Therefore the engineer is, by the nature of his vocation, an economist. His function is not only to design, but also so to design as to ensure the best economical result. He who designs an unsafe structure or an inoperative machine is a bad engineer; he who designs them so that they are safe and operative, but needlessly expensive, is a poor engineer, and, it may be remarked, usually earns poor pay; he who designs good work, which can be executed at a fair cost, is a sound and usually a successful engineer; he who does the best work at the lowest cost sooner or later stands at the top of his profession, and usually has the reward which this implies."

I avail of these quotations to emphasize the fact that industrial engineering, of which shop management is an integral and vital part, implies not merely the making of a given product, but the making of that product at the *lowest cost* consistent with the maintenance of the intended standard of quality. The attainment of this result is the object which Dr. Taylor has had in view during the many years through which he has pursued his studies and investigations. The methods explained and the rules laid down in the following monograph by him — probably the most valuable contribution yet made to the literature of industrial engineering — are intended to enable and to assist others engaged in this field of work to utilize and apply his methods to their several individual problems.

The monograph which is here republished was Dr. Taylor's first great contribution to industrial engi-

neering, the second being the paper entitled "On the Art of Cutting Metals" (248 pages, with 24 insert folders covering illustrations and tables) which he presented as his Presidential Address to The American Society of Mechanical Engineers at its meeting in December, 1906, in the discussion of which at that meeting I made the following comments:

"Mr. Taylor's paper on 'The Art of Cutting Metals' is a masterpiece. Based on what is undoubtedly the longest, largest, and most exhaustive series of experiments ever conducted in this field, its summary of the conclusions deduced therefrom embodies the most important contribution to our knowledge of this subject which has ever been made. The subject itself relates to the foundation on which all of our metal-working industries are built.

"About sixty years ago American invention lifted one of the earliest and most universal of the manual arts from the plane on which it had stood from the dawn of civilization to the high level of modern mechanical industry. This was the achievement of the sewing-machine. About thirty years ago, American invention again took one of the oldest of the manual arts, that of writing, and brought it fairly within the scope of modern mechanical development. This was the achievement of the typewriting-machine. The art of forming and tempering metal tools undoubtedly is coeval with the passing of the stone age, and, therefore, in antiquity is at least as old, if indeed it does not outrank, the arts of sewing and writing. Like them it has remained almost unchanged from the beginning until nearly the

present time. The work of Mr. Taylor and his associates has lifted it at once from the plane of empiricism and tradition to the high level of modern science, and apparently has gone far to reduce it almost to an exact science. In no other field of original research, that I can recall, has investigation, starting from so low a point, attained so high a level as the result of a single continued effort."

The investigations on which the report last referred to was based extended over a period of twenty-six years and involved the expenditure of some \$200,000, the funds being contributed by ten industrial corporations. No other argument is needed to demonstrate Dr. Taylor's thoroughness and inexhaustible patience than the simple fact that he pursued these investigations continuously through that long period before deciding that he was ready and prepared to make known to the world his conclusions.

The conclusions embodied in Dr. Taylor's "Shop Management" constitute in effect the foundations for a new science — "The Science of Industrial Management." As in the case of constructive work the ideal engineer is he who does the best work at the lowest cost, so also, in the case of industrial operations, the best manager is he who so organizes the forces under his control that each individual shall work at his best efficiency and shall be compensated accordingly. Dr. Taylor has demonstrated conclusively that, to accomplish this, it is essential to segregate the *planning* of work from its *execution*; to employ for the former trained experts possessing the right mental equipment, and for the latter men

having the right physical equipment for their respective tasks and being receptive of expert guidance in their performance. Under Dr. Taylor's leadership the combination of these elements has produced, in numberless cases, astonishing increments of output and of earnings per employé.

We are proud of the fact that the United States has led all other nations in the development of labor-saving machinery in almost every field of industry. Dr. Taylor has shown us methods whereby we can duplicate this achievement by vastly increasing the efficiency of human labor, and of accomplishing thereby a large increase in the wage-earning capacity of the workman, and a still larger decrease in the labor cost of his product.

The records of experience, and the principles deduced therefrom, set forth by Dr. Taylor in this book, should interest and appeal to all workers in the industrial field, employer and employé alike, for they point the way to increased efficiency and earning power for both. We are justly proud of the high wage rates which prevail throughout our country, and jealous of any interference with them by the products of the cheaper labor of other countries. To maintain this condition, to strengthen our control of home markets, and, above all, to broaden our opportunities in foreign markets where we must compete with the products of other industrial nations, we should welcome and encourage every influence tending to increase the efficiency of our productive processes. Dr. Taylor's contributions to this end are fundamental in character and immeasurable in

ultimate effect. They concern organized industry in each and all of its infinite forms and manifestations. If intelligently and effectively utilized, they will greatly enhance the incomes of our wage-earners.

Believing profoundly in the truth of these statements, I express the hope that all who are concerned in our national industries, of every kind, will study and profit by the new science of Scientific Management, of which Dr. Taylor is concededly the leading investigator and exponent, and of which the basic principles are set forth in the following pages.

PREFACE

“SHOP MANAGEMENT” is a handbook for those interested in the management of industrial enterprises and in the production of goods. It was first published in 1903, under the auspices of The American Society of Mechanical Engineers, having been read at a meeting of that society held at Saratoga, N. Y., in June of that year.

The growing interest in scientific management on the part of the lay public has seemed to call for a new edition of this book. The demands upon the author's time have been such as to preclude his personally giving much attention to seeing the book through the press. No material changes in the text have been found necessary. At several points words have been added to make the author's meaning clear to those with no technical knowledge of the subject. A number of inconsistencies as between the text and the tables and figures have been removed; some minor additions to the time-study data have been made; the illustrations have been redrawn or reset, and a comprehensive index appended. That part of the discussion of the monograph which took place at the meeting at which it was presented, and which seemed pertinent, has been worked in with the text.

“The Principles of Scientific Management,” published uniform with this book, is simply an argument

for Mr. Taylor's Philosophy of Human Labor, — an outline of the fundamental principles on which it rests. In "Shop Management," however, the effort is made to describe the organization and some of the mechanisms by means of which this philosophy and these principles can be made effective in the workshop, or on the market place.

Mr. Taylor has written "Shop Management" in such a way that everything in it should be intelligible to any one with a high school education. It is the general testimony, however, of those who have used the book in actual practice that, with each re-reading, a larger significance attaches to its industrial program.

We are indebted to Mr. Calvin W. Rice, the distinguished Secretary of The American Society of Mechanical Engineers, for his encouragement in bringing out this new edition of "Shop Management."

THE EDITOR.

MAY, 1911.

Shop Management

Shop Management

THROUGH his business in changing the methods of shop management, the writer has been brought into intimate contact over a period of years with the organization of manufacturing and industrial establishments, covering a large variety and range of product, and employing workmen in many of the leading trades.

In taking a broad view of the field of management, the two facts which appear most noteworthy are:

(a) What may be called the *great unevenness*, or lack of uniformity shown, even in our best run works, in the development of the several elements, which together constitute what is called *the management*.

(b) *The lack of apparent relation* between good shop management and the payment of dividends.

Although the day of trusts is here, still practically each of the component companies of the trusts was developed and built up largely through the energies and especial ability of some one or two men who were the master spirits in directing its growth. As a rule, this leader rose from a more or less humble position in one of the departments, say in the commercial or the manufacturing department, until he became the head of his particular section. Having shown especial ability in his line, he was for that reason made manager of the whole establishment.

In examining the organization of works of this class, it will frequently be found that the management of the particular department in which this master spirit has grown up towers to a high point of excellence, his success having been due to a thorough knowledge of all of the smallest requirements of his section, obtained through personal contact, and the gradual training of the men under him to their maximum efficiency.

The remaining departments, in which this man has had but little personal experience, will often present equally glaring examples of inefficiency. And this, mainly because management is not yet looked upon as an art, with laws as exact, and as clearly defined, for instance, as the fundamental principles of engineering, which demand long and careful thought and study. Management is still looked upon as a question of men, the old view being that if you have the right man the methods can be safely left to him.

The following, while rather an extreme case, may still be considered as a fairly typical illustration of the *unevenness of management*. It became desirable to combine two rival manufactories of chemicals. The great obstacle to this combination, however, and one which for several years had proved insurmountable, was that the two men, each of whom occupied the position of owner and manager of his company, thoroughly despised one another. One of these men had risen to the top of his works through the office at the commercial end, and the other had come up from a workman in the factory. Each one was sure that

the other was a fool, if not worse. When they were finally combined it was found that each was right in his judgment of the other in a certain way. A comparison of their books showed that the manufacturer was producing his chemicals more than forty per cent. cheaper than his rival, while the business man made up the difference by insisting on maintaining the highest quality, and by his superiority in selling, buying, and the management of the commercial side of the business. A combination of the two, however, finally resulted in mutual respect, and saving the forty per cent. formerly lost by each man.

The second fact that has struck the writer as most noteworthy is that there is no apparent relation in many, if not most cases, between good shop management and the success or failure of the company, many unsuccessful companies having good shop management while the reverse is true of many which pay large dividends.

We, however, who are primarily interested in the shop, are apt to forget that success, instead of hinging upon shop management, depends in many cases mainly upon other elements, namely, — the location of the company, its financial strength and ability, the efficiency of its business and sales departments, its engineering ability, the superiority of its plant and equipment, or the protection afforded either by patents, combination, location or other partial monopoly.

And even in those cases in which the efficiency of shop management might play an important part it must be remembered that for success no company need be better organized than its competitors.

The most severe trial to which any system can be subjected is that of a business which is in keen competition over a large territory, and in which the labor cost of production forms a large element of the expense, and it is in such establishments that one would naturally expect to find the best type of management.

Yet it is an interesting fact that in several of the largest and most important classes of industries in this country shop practice is still twenty to thirty years behind what might be called modern management. Not only is no attempt made by them to do tonnage or piece work, but the oldest of old-fashioned day work is still in vogue under which one overworked foreman manages the men. The workmen in these shops are still herded in classes, all of those in a class being paid the same wages, regardless of their respective efficiency.

In these industries, however, although they are keenly competitive, the poor type of shop management does not interfere with dividends, since they are in this respect all equally bad.

It would appear, therefore, that as an index to the quality of shop management the earning of dividends is but a poor guide.

Any one who has the opportunity and takes the time to study the subject will see that neither good nor bad management is confined to any one system or type. He will find a few instances of good management containing all of the elements necessary for permanent prosperity for both employers and men under ordinary day work, the task system, piece work, contract work, the premium plan, the bonus

system and the differential rate; and he will find a very much larger number of instances of bad management under these systems containing as they do the elements which lead to discord and ultimate loss and trouble for both sides.

If neither the prosperity of the company nor any particular type or system furnishes an index to proper management, what then is the touchstone which indicates good or bad management?

The art of management has been defined, "as knowing exactly what you want men to do, and then seeing that they do it in the best and cheapest way." No concise definition can fully describe an art, but the relations between employers and men form without question the most important part of this art. In considering the subject, therefore, until this part of the problem has been fully discussed, the other phases of the art may be left in the background.

The progress of many types of management is punctuated by a series of disputes, disagreements and compromises between employers and men, and each side spends more than a considerable portion of its time thinking and talking over the injustice which it receives at the hands of the other. All such types are out of the question, and need not be considered.

It is safe to say that no system or scheme of management should be considered which does not in the long run give satisfaction to both employer and employé, which does not make it apparent that their best interests are mutual, and which does not bring about such thorough and hearty coöperation that they can pull together instead of apart. It cannot

be said that this condition has as yet been at all generally recognized as the necessary foundation for good management. On the contrary, it is still quite generally regarded as a fact by both sides that in many of the most vital matters the best interests of employers are necessarily opposed to those of the men. In fact, the two elements which we will all agree are most wanted on the one hand by the men and on the other hand by the employers are generally looked upon as antagonistic.

What the workmen want from their employers beyond anything else is high wages, and what employers want from their workmen most of all is a low labor cost of manufacture.

These two conditions are not diametrically opposed to one another as would appear at first glance. On the contrary, they can be made to go together in all classes of work, without exception, and in the writer's judgment the existence or absence of these two elements forms the best index to either good or bad management.

This book is written mainly with the object of advocating *high wages* and *low labor cost* as the foundation of the best management, of pointing out the general principles which render it possible to maintain these conditions even under the most trying circumstances, and of indicating the various steps which the writer thinks should be taken in changing from a poor system to a better type of management.

The condition of high wages and low labor cost is far from being accepted either by the average manager or the average workman as a practical working

basis. It is safe to say that the majority of employers have a feeling of satisfaction when their workmen are receiving lower wages than those of their competitors. On the other hand very many workmen feel contented if they find themselves doing the same amount of work per day as other similar workmen do and yet are getting more pay for it. Employers and workmen alike should look upon both of these conditions with apprehension, as either of them are sure, in the long run, to lead to trouble and loss for both parties.

Through unusual personal influence and energy, or more frequently through especial conditions which are but temporary, such as dull times when there is a surplus of labor, a superintendent may succeed in getting men to work extra hard for ordinary wages. After the men, however, realize that this is the case and an opportunity comes for them to change these conditions, in their reaction against what they believe unjust treatment they are almost sure to lean so far in the other direction as to do an equally great injustice to their employer.

On the other hand, the men who use the opportunity offered by a scarcity of labor to exact wages higher than the average of their class, without doing more than the average work in return, are merely laying up trouble for themselves in the long run. They grow accustomed to a high rate of living and expenditure, and when the inevitable turn comes and they are either thrown out of employment or forced to accept low wages, they are the losers by the whole transaction.

The only condition which contains the elements of stability and permanent satisfaction is that in which both employer and employés are doing as well or better than their competitors are likely to do, and this in nine cases out of ten means high wages and low labor cost, and both parties should be equally anxious for these conditions to prevail. With them the employer can hold his own with his competitors at all times and secure sufficient work to keep his men busy even in dull times. Without them both parties may do well enough in busy times, but both parties are likely to suffer when work becomes scarce.

The possibility of coupling high wages with a low labor cost rests mainly upon the enormous difference between the amount of work which a first-class man can do under favorable circumstances and the work which is actually done by the average man.

That there is a difference between the average and the first-class man is known to all employers, but that the first-class man can do in most cases from two to four times as much as is done by an average man is known to but few, and is fully realized only by those who have made a thorough and scientific study of the possibilities of men.

The writer has found this enormous difference between the first-class and average man to exist in all of the trades and branches of labor which he has investigated, and these cover a large field, as he, together with several of his friends, has been engaged with more than usual opportunities for thirty years past in carefully and systematically studying this subject.

This difference in the output of first-class and average men is as little realized by the workmen as by their employers. The first-class men know that they can do more work than the average, but they have rarely made any careful study of the matter. And the writer has over and over again found them utterly incredulous when he informed them, after close observation and study, how much they were able to do. In fact, in most cases when first told that they are able to do two or three times as much as they have done they take it as a joke and will not believe that one is in earnest.

It must be distinctly understood that in referring to the possibilities of a first-class man the writer does not mean what he can do when on a spurt or when he is over-exerting himself, but what a good man can keep up for a long term of years without injury to his health. It is a pace under which men become happier and thrive.

The second and equally interesting fact upon which the possibility of coupling high wages with low labor cost rests, is that first-class men are not only willing but glad to work at their maximum speed, providing they are paid from 30 to 100 per cent. more than the average of their trade.

The exact percentage by which the wages must be increased in order to make them work to their maximum is not a subject to be theorized over, settled by boards of directors sitting in solemn conclave, nor voted upon by trades unions. It is a fact inherent in human nature and has only been determined through the slow and difficult process of trial and error.

The writer has found, for example, after making many mistakes above and below the proper mark, that to get the maximum output for ordinary shop work requiring neither especial brains, very close application, skill, nor extra hard work, such, for instance, as the more ordinary kinds of routine machine shop work, it is necessary to pay about 30 per cent. more than the average. For ordinary day labor requiring little brains or special skill, but calling for strength, severe bodily exertion, and fatigue, it is necessary to pay from 50 per cent. to 60 per cent. above the average. For work requiring especial skill or brains, coupled with close application, but without severe bodily exertion, such as the more difficult and delicate machinist's work, from 70 per cent. to 80 per cent. beyond the average. And for work requiring skill, brains, close application, strength, and severe bodily exertion, such, for instance, as that involved in operating a well run steam hammer doing miscellaneous work, from 80 per cent. to 100 per cent. beyond the average.

There are plenty of good men ready to do their best for the above percentages of increase, but if the endeavor is made to get the right men to work at this maximum for less than the above increase, it will be found that most of them will prefer their old rate of speed with the lower pay. After trying the high speed piece work for a while they will one after another throw up their jobs and return to the old day work conditions. Men will not work at their best unless assured a good liberal increase, which must be permanent.

It is the writer's judgment, on the other hand, that for their own good it is as important that workmen should not be very much over-paid, as it is that they should not be under-paid. If over-paid, many will work irregularly and tend to become more or less shiftless, extravagant, and dissipated. It does not do for most men to get rich too fast. The writer's observation, however, would lead him to the conclusion that most men tend to become more instead of less thrifty when they receive the proper increase for an extra hard day's work, as, for example, the percentages of increase referred to above. They live rather better, begin to save money, become more sober, and work more steadily. And this certainly forms one of the strongest reasons for advocating this type of management.

In referring to high wages and low labor cost as fundamental in good management, the writer is most desirous not to be misunderstood.

By high wages he means wages which are high only with relation to the average of the class to which the man belongs and which are paid only to those who do much more or better work than the average of their class. He would not for an instant advocate the use of a high-priced tradesman to do the work which could be done by a trained laborer or a lower-priced man. No one would think of using a fine trotter to draw a grocery wagon nor a Percheron to do the work of a little mule. No more should a mechanic be allowed to do work for which a trained laborer can be used, and the writer goes so far as to say that almost any job that is repeated over and

over again, however great skill and dexterity it may require, providing there is enough of it to occupy a man throughout a considerable part of the year, should be done by a trained laborer and not by a mechanic. A man with only the intelligence of an average laborer can be taught to do the most difficult and delicate work if it is repeated enough times; and his lower mental caliber renders him more fit than the mechanic to stand the monotony of repetition. It would seem to be the duty of employers, therefore, both in their own interest and in that of their employés, to see that each workman is given as far as possible the highest class of work for which his brains and physique fit him. A man, however, whose mental caliber and education do not fit him to become a good mechanic (and that grade of man is the one referred to as belonging to the "laboring class"), when he is trained to do some few especial jobs, which were formerly done by mechanics, should not expect to be paid the wages of a mechanic. He should get more than the average laborer, but less than a mechanic; thus insuring high wages to the workman, and low labor cost to the employer, and in this way making it most apparent to both that their interests are mutual.

To summarize, then, what the aim in each establishment should be:

(a) That each workman should be given as far as possible the highest grade of work for which his ability and physique fit him.

(b) That each workman should be called upon to

turn out the maximum amount of work which a first-rate man of his class can do and thrive.

(c) That each workman, when he works at the best pace of a first-class man, should be paid from 30 per cent. to 100 per cent. according to the nature of the work which he does, beyond the average of his class.

And this means *high wages* and a *low labor cost*. These conditions not only serve the best interests of the employer, but they tend to raise each workman to the highest level which he is fitted to attain by making him use his best faculties, forcing him to become and remain ambitious and energetic, and giving him sufficient pay to live better than in the past.

Under these conditions the writer has seen many first-class men developed who otherwise would have remained second or third class all of their lives.

Is not the presence or absence of these conditions the best indication that any system of management is either well or badly applied? And in considering the relative merits of different types of management, is not that system the best which will establish these conditions with the greatest certainty, precision, and speed?

In comparing the management of manufacturing and engineering companies by this standard, it is surprising to see how far they fall short. Few of those which are best organized have attained even approximately the maximum output of first-class men.

Many of them are paying much higher prices per piece than are required to secure the maximum prod-