USE OF INDIVIDUAL AND GROUP PERSONNEL PERFORMANCE STANDARDS IN SMALL BUSINESS

by

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CHAPTER I

INTRODUCTION

This study is designed to further understanding of the applicability of some of the techniques of scientific management to small business. The principle of standardization has been widely proclaimed as a method of cutting costs and promoting efficiency.[1]

The present century has seen many developments in techniques of work study[2] and of determining performance standards.[3] Several authors have pointed out that performance standards are applicable in small business as well as large business.[4]

This study investigates the employment of performance standards by small manufacturers in Tucson, Arizona. It was designed to discover

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[1]Franklin E. Folts, Introduction to Industrial Management (New York: McGraw-Hill Book Company, Inc., 1954), Ch. IV.

[2]A detailed study of work procedures of every operation of employees. Payment by Results (Geneva: International Labour Office, 1951), p. 33.

[3]"Standard: A unit of measurement expressing a desired level of performance which it is necessary to attain . . . ." Glossary of Terms In Methods Time Study and Wage Incentives (New York: Society for the Advancement of Management, 1952), p. 23.

[4]Folts, op. cit., p. 111.

Phil Carroll, "Is Small Business Managed?" Society for the Advancement of Management, Vol. 21, No. 6 (June 1956), p. 22.

Edwin C. Mead, "Methods Engineering For the Small Plant," Management Aids for Small Business, Annual No. 1 (Washington, D. C., January 1955), p. 107.

(1) how extensively such standards are employed, (2) in what types of work they appear most applicable, (3) what methods of setting standards are used, and (4) management attitudes toward the usefulness of such standards in small business.

It is essential that the broad field of standardization be outlined before a segment is selected for study. Accordingly, the literature of performance standards is analyzed in the following pages to (1) set the study in its proper perspective and (2) make use of any related research in designing this study.

The Scientific Management Movement

During the past half century many changes have taken place in the attitude of businessmen toward problems that face them, and the factors that they control. Increased competition has cut the margins of profit, and if the industries of America were to continue to expand, methods had to be devised for lowering the costs of production. The struggle for lower costs directed the attention of a few businessmen to a study of the internal workings of their enterprises. The discovery was soon made that almost the entire operation of their business undertakings was based on guesswork and ignorance, rather than knowledge. It was found that men in executive positions, as well as workers, had little knowledge of how best to perform operations, and what was most conducive to best performance. The businessmen were amazed at the great amount of work that was performed haphazardly, and by guesswork.[5]

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[5] Dexter S. Kimball, Industrial Economics (New York: McGraw-Hill Book Company, Inc., 1929), pp. 1-6.

The methods found in the average business enterprise were not the result of carefully and properly conducted investigation, but what were guessed to be best by the management and the workers. It was seldom that in the same plant the same movements in the performance of similar tasks were found. The old way was to allow men to learn by observing others. They were not taught what methods were best, but left to choose their own. The goal was to reach the one result, the performance of the task, and each worker was left the choice of his own movements in reaching this goal. Men, when left to themselves to discover methods of work by observation, do not discover the best methods of performance.[6] It has been only during the last half century that a few progressive businessmen have realized that there are many opportunities for better ways of doing things, ways which bring greater efficiency and increased profits. The great need is to make all businessmen realize this necessity, and have work performed by properly directed movements and by scientifically discovered methods.[7]

Every operation in a business enterprise may be performed in a number of ways, and it is evident that all are not equally efficient. As a rule, many are so inefficient that if only a slight investigation were made they would at once be discarded. There is at any point in time one best way to do a piece of work and the discovery of this one best way is needed in every business enterprise.

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[6] Ralph M. Barnes, Motion and Time Study, 1st Edition (New York: John Wiley and Son, Inc., 1937), p. 4.

[7] Harold B. Maynard and G. J. Stegemerten, Operations Analysis (New York: McGraw-Hill Book Company, Inc., 1949), p. 9.

A management should decide what is the best method of doing work, and then introduce it in its plant. F. W. Taylor, the father of scientific management, gave the key for performance of work in stating that you should know exactly what you want men to do, and then see that they do it in the best and cheapest way. The best way is the one best with existing conditions in the particular plant where it is to be adopted. There should be a clear understanding of what is to be done, and nothing left to chance. The one best method should be made standard, should be the only one allowed, and should be constantly and consistently followed.[8]

The only way to determine the best method of performance of work is to analyze the work by scientific investigation, because if not found in this manner, differences of opinion would exist as to which is the best.[9]

Experience has proved that the average worker, skilled or unskilled, has little accurate knowledge of the amount of work that he can perform in a given time, or of his efficiency. Neither the worker nor management in the average plant knows the best method of performance, nor how much an individual can accomplish at his chosen work, without careful investigation of the work. With no understanding as to the best methods, how is it possible to obtain the greatest efficiency and best results with the least waste? Not only the best method, but what constitutes a reasonable day's work can be determined only by

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[8] L. M. Gilbreth, The Psychology of Management (New York: The Macmillan Company, 1919), pp. 102, 129, and 148.

[9] Ibid., pp. 97-99, 111, and 147.

scientific investigation and close observation.[10]

Even today, many businessmen believe that it is a waste of time to study theoretical principles underlying business activities, and declare that scientific investigation and methods have their place elsewhere than in business.[11] They have yet to realize that no operation is so simple that it does not in some way involve the application of a theoretical principle. The sooner businessmen realize that scientific investigation and research are as necessary in business as in the sciences, the greater will be the advance in efficiency.[12] They must realize that properly applied theory goes hand in hand with practice. The theoretical principle should be known, and its application should be the result of scientific investigation and careful experimentation.[13]

In business enterprise, efficiency demands that all work, regardless of its character, should be performed in the way that gives the best results with the least expenditure of energy, materials, and time. The discovery of the best way, and making it standard for every kind of work, is as important to the small establishment as to the million-dollar corporation.[14] The sooner businessmen realize that there is one best way of doing every job, and that it means greater efficiency, lower costs, and higher profits, the greater will be their chance of

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[10]Frederick Winslow Taylor, Shop Management (New York: Harper and Brothers, 1911), p. 30.

[11]Gilbreth, op. cit., p. 144.

[12]Harold B. Maynard, Industrial Engineering Handbook (New York: McGraw-Hill Book Company, Inc., 1956), pp. 1-6.

[13]Gilbreth, op. cit., pp. 181-182.

[14]Carroll, op. cit., p. 22.

success in profit-making. They should also realize that the best way is not based upon guess, but upon careful knowledge, acquired by scientific investigation.

Methods

The method used by Taylor and his followers to find the one best way of doing work and standard time was motion and time study. Motion study provided the necessary information for discovering the most efficient way to perform a task.[15] Once the standard procedure was established, steps could be taken to measure the work performed, and the personnel on the jobs could be put on standards of time--time needed to do an operation at a "normal" pace under "normal" conditions.[16] In recent years measurement techniques have been employed through (1) improvement of time and motion study techniques and (2) development of other techniques, in some cases derivatives of time and motion study and in others entirely new techniques. A brief explanation of these techniques follows.

Motion and Time Study

Motion and time study may be defined in the following manner: "The analysis of the methods, of the materials, and the tools and equipment used, or to be used, in the performance of a piece of work--an analysis carried on with the purposes of (1) finding the most economical way of doing this work; (2) standardizing the method, materials, tools and equipment; (3) accurately determining the time required by a

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[15] Maynard and Stegemerten, op. cit., p. 10.

[16] Carroll, op. cit., p. 23.

qualified person working at a normal pace to do the task; and (4) assisting in training the worker in the new method."[17]

"The objective of motion-time analysis is to eliminate lost time by training workers to do their work the right way, by improving methods and equipment, and by providing management with correct standards of both methods and time on all operations."[18] The relationship between time study and motion study is: "In motion study 'the one best way' is determined and operators are trained to follow these methods; in time study the best method is also determined, but emphasis is placed on setting time standards for cost purposes, wage incentives, production standards, etc."[19]

There are many different techniques used to make time and motion studies, of which the following are the most common.

Motion Study: "Motion study consists of dividing work into most fundamental elements possible, studying these elements separately and in relation to one another; and from these studied elements when timed, building methods of least waste."[20]

There is a wide variation in the extent to which motion studies are made. "Motion study may vary in extent from a cursory analysis followed by a general application of motion-economy principles to a

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[17]Barnes, op. cit., p. 1.

[18]Robert Lee Morrow, Time and Motion Study (New York: The Ronald Press, 1946), p. 12.

[19]Ibid., p. 13.

[20]Frank B. Gilbreth and L. M. Gilbreth, Applied Motion Study (New York: The Macmillan Company, 1919), p. 43.

detailed study of individual motions of each hand followed by a careful and extensive application of motion-economy principles."[21]

In operations analysis, where an investigator traces and verifies each step of the process, no expensive motion study equipment is needed. In this method the study cannot be made in a planning office, but must be conducted on the floor of the plant where the actual job is being performed.[22]

The use of a process chart may prove helpful to analyze such information. It may be broadly defined as any charted presentation of information connected with an operation or process. These charts were originally designed by Frank B. Gilbreth for industrial use and are used most extensively today by manufacturing industries.[23]

In more elaborate and detailed motion studies Mr. Gilbreth developed the method called Micromotion study. "It is the term applied to a subdivision of an operation into its basic elements or therbligs [Gilbreth spelled backwards] and their quantitative time measurement. This study is carried out by recording the operation on a photographic film and employing a means of timing each therblig. The method most often used is the motion picture film with either a microchronometer in the field or the film run at a constant speed, and the time interval for each therblig determined by counting the number of frames on the

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[21] Barnes, op. cit., p. 34.

[22] L. P. Alford and John R. Bangs, Production Handbook (New York: The Ronald Press Company, 1945), p. 550.

[23] Barnes, op. cit., 3rd Edition (1949), p. 28.

film that have elapsed between the beginning and the end of the therblig."[24]

Also used in research studies of this same nature is the chronocyclegraph: "Still pictures, often stereoscopic, with long exposures, are taken during the performance of a complete work cycle and the motion paths are traced by tiny electric lamps fastened to the hands or fingers. Time is obtained by interrupting the light circuits with a controlled frequency which produces flashes or dots on the film, which may be counted."[25]

The use of the more detailed motion study is twofold: "(1) To assist in finding the most efficient method of doing work; and (2) to assist in training individuals to understand the meaning of motion study and, when the training is carried out with sufficient thoroughness, to enable them to become proficient in applying motion-economy principles."[26]

It should be kept in mind that micromotion studies and chronocyclegraph are primarily laboratory methods and may be of little value to many companies if used solely to find the most efficient process for doing the work. But on the other hand they might prove very profitable if used to educate the organization on motion-economy principles."[27]

Time Study: "Time study consists of timing the elements of

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[24] Alford and Bangs, op. cit., p. 602.

[25] Ibid.

[26] Barnes, op. cit., 1st Edition. p. 39.

[27] Ibid.

the best method known and, from these elementary unit times, synthesizing a standard time in which a standard man can do a certain piece of work in accordance with the finally accepted method."[28]

The equipment used to determine a time standard may include the stop watch, the time study machine, and the wink-counter. The stop watches used are of three types: (1) the decimal minute watch, (2) the split-hand watch, and (3) the decimal hour watch. The decimal minute watch is adaptable to timing the entire operation or the separate elements of the process. The split hand watch is specially adaptable for snap-back recording. This process times each element of the work and after each element is timed the watch is reset at zero. If the final standard of time will be in hours, the decimal hour watch is employed.[29]

For more accurate and detailed studies the time study machine is put to use. Better known as the Marstochron, this machine is helpful when shorter time intervals are needed than the stop watch is able to record. The operator merely pushes a key on the machine that makes marks on a tape rolling from one spool to another in the machine. The rate of speed of the tape is known, and thus the time values on the tape may be measured with a transparent scale.[30]

Also used in more detailed studies is the wink-counter. It resembles a speedometer, having three revolving numbered discs to read

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[28]Gilbreth, op. cit., p. 106.

[29]Morrow, op. cit., pp. 85-86.

[30]Alford and Bangs, op. cit., p. 466.

from which time studies are made.[31]

Experiments have been made on all three devices, and it was found that, "Two to five times as many observations are necessary with the stop watch as with the wink-counter, and from ten to thirty times as many with the stop watch as with the Marstochron, for equal confidence in results."[32] Of course the anticipated savings from these methods will be a deciding factor as to how detailed and expensive the study will be.

The procedure followed in making a time study may vary somewhat, depending upon the type of operation being studied and the use that is to be made of the data collected; however, the following six steps are usually required:

1. Securing and recording information about the operation and operator being studied.
2. Dividing the operation into elements and recording a complete description of the operation.
3. Observing and recording the time taken by the operator.
4. Rating the operator's performance.
5. Determining the allowances.
6. Determining the time standard for the operation.[33]

The first three steps have been discussed. These involve finding the one best way of doing the job, training the operator to use the standard method, and timing the accepted method. After this

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[31] Alford and Bangs, op. cit., p. 466.

[32] Ibid.

[33] Barnes, op. cit., pp. 111-113.

has been completed the time study men must judge or rate the performance of the workers and adjust it to a time which might be obtained from a study on a normal, skilled operator. This procedure in the process of setting performance standards is a controversial area because of the judgment involved, but when experienced time study men are used, differences in judgment have been found to be very small.[34]

Once this leveling of the performance has been completed, allowances for personal needs, fatigue, and unavoidable delays are added to the leveled time. To scientifically measure these allowances, an interruption study can be made. Here the time study man keeps a record of the time for each and every delay that occurs throughout the entire day, at the same time recording separately the productive time. This method is very simple, but rather tedious. Ratio-delay is also another method which may be used for setting allowances.[35]

When leveling of the operation has been performed and allowances have been made and added to the timed elements, a standard time results. The standard time may be defined as "The time in which the normal skilled operator should do the work without undue fatigue." Fast workers will usually exceed the standard while the slower workers will require more than the standard time to complete the operation.[36]

The standard time shown above includes allowances for personal, fatigue, and unavoidable delay causes. Many people describe "standard time" as the time set before allowances are added and "allowed time"

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[34]Morrow, op. cit., pp. 111-113.

[35]Ibid., p. 169.

[36]Ibid., p. 112.

after the allowances have been added.[37]

Ratio-Delay Study

In searching for a new method of finding delay allowances which would result in less cost and time to the company, L. H. Tippett developed the ratio-delay method.

> In recording a ratio-delay study, a large number of observations are taken at random intervals, recording whether or not a machine is operating. Then the percentage number of readings that record the machine as working will tend to equal the percentage time it is in that state. Likewise, if random observations are taken of the operator's cycle of work, the percentage of readings recorded the operatives as performing a certain operation or group of operations is an estimate of the percentage time spent in those operations. If the readings are randomly distributed over a sufficiently long time, this relationship holds whether the machine stoppages or operations of the operatives are long or short, many or few, regular or irregular.[38]

Further application of this method other than determining delay allowances is to observe and evaluate operations of the department as a whole. From these observations reports can be given to management on the conditions of the various departments and needed improvements made.[39]

Standard Data

The origin of standard data may be traced back to Taylor and Merrick. They planned to develop a "dictionary" of fundamental elements needed to perform work, with the standard time included.[40]

Taylor stated, "All work done in a given trade can be divided

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[37] Ibid.

[38] Ibid., p.176.

[39] Alford and Bangs, op. cit., p. 512.

[40] Ibid., p. 520.

into a comparatively small number of elements or units, and with proper implements and methods it is comparatively easy for a skilled observer to determine the time required a good man to do any one of these elementary units."[41]

In the old method many errors may occur when time standards are set by time and motion studies for each new job. "A better practice is to use the indirect or standard data method. Standard times for elements compiled from many studies are the basis for the standard. By determining such standard elemental times from many studies on different operators, variations in work conditions and errors in judging how the operator worked are averaged out. The standard elements, properly combined, will give a true standard, when conditions are standardized within practical limits before the job is begun."[42]

The point is that the average job is done in the shop practically every day. When elements of these jobs can be compared to standardized elements, a great deal of re-timing is saved because correct time standards have already been set for these elements.[43]

Predetermined Elemental Time Standards

Mr. Gilbreth, in his study of the motions needed for different operations, subdivided F. W. Taylor's elements into basic motions which he called "therbligs." From these elemental motions, or therbligs, Gilbreth built up operation standards in much the same way that Taylor

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[41] Ibid.

[42] Ibid., p. 521.

[43] Maynard, op. cit., pp. 3-137.

used his elements to build up operation standards.[44] "The expansion of the Taylor and Gilbreth methods has resulted in predetermined elemental times for a great many factory operations. These predetermined elemental times are computed from time studies. Predetermined elemental times using the basic Gilbreth development are for motions rather than for elements of specific operations. Well-known systems using this approach are called Methods-Time-Measurement (MTM), Work-Factor, Motion-Time-Analysis, and Basic Motion Timestudy (BMT)."[45]

In predetermined elemental time studies, the operation is divided into its elements and the elements into motions. The motions are then given standard times obtained from motion-time tables. These were developed from time studies made on the basic motions needed to perform jobs. After allowances are added to the accumulated standard times, the standard of performance results.[46]

From these motion-time tables, standard elemental times are available for predetermining standards for jobs which may never have been performed before. This method largely removes the main objection to previous methods of setting standards--the number of time studies needed for new jobs.[47]

Time Formulas

L. B. Gella states, "A time formula is an algebraic expression

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[44] Ibid.

[45] Ibid.

[46] Ibid., pp. 4-6.

[47] Ibid.

of the factors determining the time for an operation. It is a set of standard data reduced to its simplest form. The simplest form may be a single table or curve, a combination of tables and curves, or the more conventional algebraic equation."[48] Thus a time formula is merely a convenient arrangement of standard data which facilitates their accurate application. Through these time formulas, improved time standards are possible through greater accuracy and consistency of the standards set.

Past Performance

The method of setting standards from past performance of the workers, though not precise, need not be unscientific. It should be based upon sound analysis of the job and a careful count of the work units. A sound program may include the following steps:

1. Determining the work units
2. Defining the job content
3. Recording time and frequency
4. Validating the standards[49]

In Step 1 the units of the job to be measured are found, and in Step 2 the definition of the steps is given. In Step 3 the information may be obtained by having operators record data on a simple form. The following is the type of information needed:

1. Name of employee
2. Date

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[48] Ibid., pp. 3-159.

[49] Lee Galloway, Office Management--Its Practices and Principles (New York: The Ronald Press Company, 1919), pp. 227-239.

3. Department

4. List of operations performed

5. Time of start and finish each time the operation is performed

6. Number of units completed each time the operation is performed

7. Elapsed time for each operation

8. Total units completed for the day for each operation

9. Total time spent during the day on each operation[50]

In validating the standard (Step 4) the following information should be taken from each report:

1. Operator's name

2. Total elapsed time

3. Total units completed

From these data, standard time per unit can be calculated. In setting standards by this method, it must be remembered that the standards of performance may be set anywhere between the average and the maximum time per unit. Also, for this type of study there should be enough unit times to develop a fair standard.[51]

Work Measurement Philosophy

In the opinion of many industrial engineers, the field of

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[50] Ibid.

[51] J. W. Neuner and Ben J. R. Hayes, Office Management--Practice and Principles, 3rd Edition (San Francisco: Southwest Publishing Company, 1953), pp. 680-686.

application of standards is virtually limitless.[52] Each year situations where the cost of measurement exceeds the specific savings involved become fewer in number. What appeared impossible or uneconomical a few years ago is now yielding to economical measurement. Today there is scarcely a type of industrial activity that someone in this country has not successfully measured and applied to it standardization with reasonably satisfactory results.

The premise upon which this broadening use of standards is based may be simply stated: All tasks, jobs, or functions must have a purpose or objective if their existence can be justified. Better performance of this purpose or closer attainment of this objective is worth money to an organization. Devising a yardstick to measure this improved performance or closer attainment will therefore permit rewarding the individual or group who achieves it.

This conception of the application of standards has encouraged much application to job shop work, maintenance and repair work, materials handling, inspection, stockroom work, janitorial work, warehousing, shipping, office work, transportation, and selling. The general approach has been (1) identifying measurable work units as yardsticks through careful analysis,[53] (2) setting standards through time study,

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[52]Richard S. MacKenzie, "The New Horizons for Wage Incentives," Proceedings, Second Annual National Time Study and Methods Conference (New York: The Society for the Advancement of Management and the Management Division of the American Society of Mechanical Engineers, April 18 & 19, 1947), pp. 69-75.

[53]For an excellent discussion of this process, see Executive Office of the President, Bureau of the Budget, Techniques for the Development of a Work Measurement System (Washington: U. S. Government Printing Office, March 1950).

use of standard data, use of ratios, past performance, or supervirors' estimates, (3) applying the standard to individuals or groups. Where an intensive effort is made to find some productive unit of measurement that is obtained economically, it is usually forthcoming. Very often control records and production counts already required for production operations yield much of the information needed.

Conditions Most Amenable to Standardization

Many methods or techniques have been developed to set performance standards.[54] These standard procedures are not always followed, but for some jobs more accurate studies may be justified. Time and money are of the utmost importance for these more detailed studies. "With any study the savings effected must equal or exceed the cost of making the study if the expenditure is to be justified from an economic standpoint."[55]

The problem to be solved, then, is determining the kind and amount of study that is justified. This should not be made offhand, but determined by the factors of the work to be studied.[56]

Many combinations of techniques have been used successfully by engineers; however, the problem of developing a procedure to fit a particular plant operation is not complicated, because certain

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[54] Maynard and Stegemerten, op. cit., p. 35.

[55] Ibid.

[56] Ibid.

techniques follow other techniques.[57] For example, an elaborate Micromotion study without setting a time standard or teaching the workers a better method could be done but would not be practical.

The application of these jobs as stated above depends on the factors of the job to be studied. The factors are procedure of production,[58] labor content,[59] and life of the job.[60] It is important that the conditions of the work to be studied be determined by all the factors together because separately they are insufficient[61] because of the various conditions possible among these three factors.[62]

Under conditions of continuous manufacturing, more elaborate studies may be employed because of the continuous nature of the work involved.[63] Here similar items are produced for an extended period, justifying a detailed study to develop the greatest efficiency possible.[64] However, if the labor content, "The portion of the operation cycle that is performed by human labor," is low, a less detailed study may be appropriate. For example, tacks are produced in large quantities; however, the labor content needed to produce these items or to run the

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[57]Barnes, op. cit., 3rd Edition, p. 17.

[58]Maynard and Stegemerten, op. cit., p. 63.

[59]Ibid., p. 64.

[60]Ibid., p. 65.

[61]Ibid., p. 63.

[62]Ibid., p. 67.

[63]Barnes, op. cit., pp. 19-20.

[64]Ibid.

machines is low, and thus a detailed time and motion study would not be justified.[65]

In jobbing shops the life of the job is an important factor. For more detailed studies much time is needed, and if the jobs are turned out in a day or even a month these studies may not prove economical.[66] For example, "Quantities are large, and the labor content of the operation is often high, but the life of the job is short. Here, the problem is one of getting the method developed quickly and then training a number of workers to follow it, so the product may be turned out in large quantities while it is in demand."[67]

Time here was of the utmost importance; thus less detailed methods of time and motion studies, standard data studies, or predetermined elemental time standards could be used.[68]

Standards in the Small Plant

Small businesses need modern management tools at least as much as big businesses. Small businesses show up more frequently in business failure figures. Lack of management ability, according to reports, is the big cause of business failure. Today firms must put forth great effort just to stay even. "This means small firms must manage better, make decisions quicker, and be right more often."[69]

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[65] Maynard and Stegemerten, op. cit., p. 64.

[66] Ibid., p. 59.

[67] Ibid., p. 65.

[68] Ibid., p. 59.

[69] Carroll, op. cit., p. 24.

Small business management also needs sound standards by which to measure results. It is as important to small firms to develop a program in this field as it is to large corporations. "While a small plant's methods engineering activities need not take precisely the same form as those in larger plants, the same basic principles are applicable."[70] In smaller shops, workers often do a variety of jobs, finding it almost impossible to specialize in one thing. The motions in these different jobs, however, will almost always involve movements that are repeated over and over again. By sorting and identifying, better methods can be developed for which standards of performance can be established.[71]

Many arguments are heard that a plant isn't big enough to justify the expense of that sort of thing, or that the work done in the plant is different. Most businesses are essentially alike, even though products or services vary considerably. Basic operating functions are pretty much the same, regardless of the size or type of concern. To build a strong organization, it is important for a small plant operator to analyze, standardize, and measure the operations. This will enable better control of the manufacturing operations. Standards show whether or not the company gets what it pays for by providing reliable figures on how much production is turned out per unit of time and the cost to the company.[72]

A previous section suggests that standardization is applicable

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[70] Mead, op. cit., p. 107.

[71] Ibid., p. 108.

[72] Ibid., p. 109.

to a small firm providing the costs of measurement do not exceed the returns from standardization. The problem would seem to be (1) to find situations where complex measurement techniques may be used and still yield savings or (2) to develop less complex and less expensive methods in situations where the potential yield is less. To date little has been done to show the small manufacturer how to make a less detailed study of his operations and make it pay. The literature on the subject is scarce and research done in these plants is extremely limited, except for a few progressive companies that have developed performance standards in their organizations. For example, in one company nine different departments were studied, measurable units of the jobs found, standards of performance established, and incentive plans set up. The jobs studied were in the Production, Maintenance, and Boiler Room Departments, foreman and superintendent jobs, Engineering Department, Office employees, Sales Division, Laboratory, and also standards were set for executives of the company. All jobs had measurable factors and these were located through the time and effort of the management of the company in order to carry on a progressive organization.[73]

Units of measure for these jobs were not all found by time and motion studies, but the methods employed were not unscientific. The company used past records and budgetary controls in the separate departments and found adequate standards of performance for their

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[73]Ford R. Larrabee, "Nine Incentive Plans in a 200-Man Plant," Proceedings, the Annual Fall Conference on Principles, Methods, and Techniques for Increasing Productivity, Reducing Costs, and Improving Human Relations (New York: The Society for the Advancement of Management, November 2 & 3, 1950), p. 22.

employees.[74]

Other methods proven successful in many industries may also be used by the smaller firms. Prominent among these methods are the following:

1. Use of performance ratios and turnovers
2. Use of percentages
3. Use of rates and ratings
4. Use of experiential factors
5. Application of methods of comparison
6. Application of engineering efficiencies
7. Measurement in physical quantities[75]

To cite examples, in the purchasing department performance may be measured through efficiencies that show proven savings through purchase of goods bought at prices below current market prices. Also, expenses of operating the purchasing department and expenses caused by Purchasing department failures may be set up to be measured against a

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[74] Ibid., p. 27.

[75] Alford and Bangs, op. cit., pp. 1398 & 1400. "Ratios, percentages, and rates are simple mathematical quantities. Ratings are made use of through rating scales or evaluation sheets.

"By experiential factors is meant values or quantities determined from experience. They are aids in setting up attainable standards of performance.

"Comparisons are made in various ways, principally by tabulations, tables, and charts. Budget comparisons are a common application of tabulations and tables.

"Efficiencies and physical quantities used in measurement of operating results are of engineering origin and application. In general they show the relation of input to output of an operating factor."

standard.[76]

Unanswered Questions

What is needed for setting standards of performance is measurable units of work. Much is to be done in this field in big business as well as in the small firms. Many questions involving standards remain unanswered.

1. Which techniques should be used for small manufacturers?
2. Which methods are best for jobbing shops?
3. How economical should a study be and still provide accurate standards?
4. Who should conduct the study in small firms?
5. To what extent should performance standards be established throughout the organization?
6. Are detailed methods justifiably used in departments other than production?
7. How can opposition and criticism of standards of performance be overcome?
8. Are studies economically justified for jobs that occupy only part of the time for one individual?
9. Do standards found by past performance adequately measure workers' performance in small firms?
10. Are there other factors of the job that might determine the employment of a more detailed study?

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[76]Patrick Lee Chapmen, Surveying and Controlling Executive Time (Washington: Small Business Administration, September 1956).

These questions cannot, of course, be answered in one study. Some light may be shed on a number of them, however, by seeking an answer to the following question: "To what extent have the small manufacturers of Tucson developed objective standards of performance for tasks and jobs within their organization?"

CHAPTER II

METHOD

The previous chapter outlined in a general way the subject of standardization, which is the subject matter of this study. This chapter spells out in detail the design of the study--the data sought, the firms selected for study, the questionnaire, the interview method, and the procedure of analysis.

The Hypothesis

The hypothesis that this study seeks to test, stated in question form, is: "To what extent have small manufacturers in Tucson developed objective performance standards for tasks and jobs within their organization?"

To obtain a useful answer to this question, several subsidiary questions appeared to require answers.

1. Is number of employees related to extent of standardization?
2. In what departments are standards most likely to be found?
3. What methods are used to set standards?
4. Does the type of production process influence standardization?
5. What type of job is most likely to be standardized?
6. Where standards were not employed, what reasons were given for the lack of standardization?

Firms Selected for Study

In order to insure reliable results, it was decided to include in the study all the small manufacturers in Tucson rather than a sample. Accordingly, a list of companies was obtained from the Tucson Chamber of Commerce.

From this list all manufacturers with more than twenty employees but less than one hundred were selected. These limits were selected arbitrarily. The upper limit is believed to be an acceptable breakpoint between small and medium-sized firms. The lower limit was set because it was believed that employers of less than twenty were very unlikely to employ objective standards of performance. To check this decision, however, ten employers of less than twenty were included in the study. Five of these were called on in person and five by telephone.

Using the above criteria, thirty-five firms were selected for study in addition to the ten just referred to.

Questionnaire

To secure information by interview, a questionnaire was developed. Because reasons for actions as well as reports of actions were required, before the questions were worded the literature of public opinion polling was sampled.[1]

Suggestions from these sources were used to word questions

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[1] A. B. Blankenship, Consumer and Opinion Research. New York: Harper, 1943.
George Gallup, A Guide to Public Opinion Polls. Princeton, New Jersey: Princeton University, 1944.

and to design the general form of the questionnaire. The language used was simplified to eliminate all possible misunderstanding.

The general form of the questionnaire may be called "funnel-shaped." First, a broad question was asked which introduced the subject and could serve to elicit all the information required. Below this question were subsidiary questions which were used only if necessary to keep the interview going into the areas where information was sought.

The questionnaire was pre-tested by interviewing four companies. The pre-test showed that the questions were understood and yielded the needed information with a minor exception. It was found necessary to include a question asking why standards had not been set where this was the case. It was found that the information needed in this area was not forthcoming unless specifically asked for.

The final questionnaire is reproduced on the following pages (Fig. 1).

Figure 1

QUESTIONNAIRE

Name of the Organization _____

Type of Industry _____

Number of Workers _____

1.0 Do you know how much work an employee should turn out in a certain period of time on every job in the company?

Yes _____, No _____.

1.1 If yes, how were these standards set?

1.11 In the production dept.—Motion and time study _____, Std. data _____, Past performance _____, Others _____

1.12 Purchasing Dept.—Schedule of purchases _____, Written instruction cards _____, Others _____

1.13 Financial Dept. _____

1.14 Sales Dept.—Quotas _____, Sales expense _____, Margin of profit _____, Time budgeting _____, Others _____

1.15 Planning and Research Dept. _____

1.16 Office workers—Time and motion study _____, Std. data _____ Past performance _____, Others _____

1.17 Dept. Heads—Policy as a standard _____, Time budgeting _____, Others _____

1.18 Executives—Policy as a standard _____, time budgeting _____ Profit or loss _____, Others _____

1.19 Other Departments _____

Methods _____

1.2 If some, what jobs have standards been set on? (See 1.11-1.19)

1.3 If none, then how do you know if your workers are doing a good job? _____

_____

1.4 Is there any reason why standards have not been set? _____

_____

2.0 Is your production line one of jobbing where a small volume of different items are turned out? High_____, Med._____, Low_____.

2.01 Is it one of continuous production of a few items?

High_____, Med._____, Low_____.

2.02 How many items are turned out?_____

2.03 Are there any items that are produced more than others?

_____

2.1 How long does it take to turn out a specific number of items called for by a contract or other specifications?

Over 12 mo._____, 6-12 mo._____, Under 6 mo. _____.

2.2 Are these items made mostly by hand or by machine?

High_____, Med._____, Low_____.

2.21 On machine jobs how much of the total time is the worker busy, the machine busy, both busy? (per cent)

Method of Interview

Whenever possible, the personnel manager of the firm was interviewed. In firms where this position did not exist, the general manager or president of the company was interviewed.

The interview was conducted in the office of the manager. This manager furnished all of the information requested in most cases. In a few instances, production foremen were summoned to supplement the knowledge of the manager interviewed.

The questionnaire was used as a guide during the interview. The interviewer was careful never to supply or suggest answers. He was also careful to keep from expressing opinions on the approaches used by the company. The interviewer said as little as possible, expressing interest in areas he wanted expanded and briefly guiding the conversation to areas not yet covered. In no case did he suggest methods which might be used to solve the problem raised.

Much of the information received was recorded during the interview. After each interview, however, the interviewer immediately upon leaving the firm completed recording the information received.

The average time taken to conduct an interview was twenty-five minutes. For individual interviews, the time varied from thirty-five to fifteen minutes in duration.

Methods of Analysis

As indicated in Chapter I, although few studies have been conducted in small firms, authorities insist that not only are small firms amenable to standard-setting, but the methods of setting

standards employed in larger firms are in many cases directly applicable. It was also pointed out in Chapter I that production jobs are the logical place for standardization to begin and that certain types of production operations make the task of setting standards easier than others. For example, firms producing a few standard products on a continuous basis find standardization easier than job shops producing only a limited number of a large variety of products (usually manufactured on special order). Also, jobs which require much labor time are more likely to be standardized than those where machine time is large and production is largely a function of the speed of the machine. Finally, unless a job exists in the organization for a considerable period of time, it may not be worth studying, i.e., a firm where the work keeps changing rapidly may not find it profitable to set performance standards.

To aid in the analysis of the data, a tabulation was constructed from the literature to be used as a guide in determining which method is economically justified under any production operation. The production operation in the firms interviewed was classified in terms of these factors. For example, Col.1, firms were classified by number of items produced into:

Low . . . . . 1 to 35

Medium. . . . . 35 to 100

High . . . . . 100 and over

and size of lots into:

Large . . . . . 100 units or more

Medium . . . . . 35 to 100

Small . . . . . 1 to 35

Also, the portion of the operation cycle that is performed by human labor was classified as high, medium, and low. The labor content is at a maximum when all work is performed by human labor and at a minimum when the items are produced entirely by machinery. The following are the classes into which all jobs will fall with respect to labor content (Col. 2):

High . . . . . Over 75% human labor
Medium . . . . . 25% to 75% " "
Low. . . . . Under 25% " "

Again, the life of the job was classified by the period of time the job had existed as follows (Col. 3):

High . . . . . Over 12 months
Medium . . . . . 6 to 12 months
Low. . . . . Under 6 months

The fourth column, East of Setting Standards, indicates the ease of finding the measurable units of the job in different types of production operations. For clarity, numbers were used to show degrees (No. 1 being the easiest production operation in which to find measurable work factors and becoming progressively more difficult through No. 11).

Column 5 indicates the proper methods to be followed for the different types of production operations (see Proper Methods, pp. 36-37).

It must be remembered that this tabulation is a judgment, but is a reasonably accurate guide to follow in determining the proper procedures in standardizing production jobs.

Figure 2

METHODS AND EASE OF SETTING STANDARDS

Production Procedures: Jobbing – Items	Jobbing – Lots	Continuous – Items	Labor Content	Life of the Job	Ease of Setting Standards	Proper Methods
Low	Large	Low	High	Over 12 months	1	A
				6 to 12 "	2	A or B
				Under 6 "	3	B or C
			Medium	Over 12 months	2	A or B
				6 to 12 "	3	B or C
				Under 6 "	4	C
			Low	Over 12 months	3	B
				6 to 12 "	4	B or C
				Under 6 "	5	C
Med.	Med.	Med.	High	Over 12 months	4	B
				6 to 12 "	5	B or C
				Under 6 "	6	C
			Medium	Over 12 months	5	B or C
				6 to 12 "	6	C
				Under 6 "	7	C or D
			Low	Over 12 months	6	C or D
				6 to 12 "	7	D
				Under 6 "	8	D
High	Small	High	High	Over 12 months	7	C, D, or E
				6 to 12 "	8	D, E, or F
				Under 6 "	9	E - H
			Medium	Over 12 months	8	C - F
				6 to 12 "	9	C or E
				Under 6 "	10	E - I
			Low	Over 12 months	9	C, E, or F
				6 to 12 "	10	E - I
				Under 6 "	11	E - I

PROPER METHODS

Type A

1. Written job analysis
   a. Analysis sheets
   b. Process charts
2. Motion study - micromotion
3. Standardization - written instruction cards
4. Time study
5. Allowance

Type B

1. Written job analysis
2. Motion study - analysis and observation
3. Standardization - written instruction cards
4. Time study

Type C

1. Written job analysis
2. Motion study - analysis and observation during the general survey
3. Standardization - written instruction cards
4. Time study
5. Time formula

Type D

1. Mental job analysis
2. Standardization - verbal instructions
3. Time study

Type E

1. Standard data method

Type F

1. Predetermined elemental times

Type G

1. Time budgeting

Type H

1. Past performance

Type I

1. Bargaining

Another method of analysis consisted of classifying the data by industry, size, methods employed to set standards, departments employing standards, reasons for not employing standards, and management attitudes and comparing the findings in Tucson firms with the literature.

Limitations of the Study

There are certain limitations of this study that must be brought to the attention of the reader. First, the list of Tucson firms obtained from the Chamber of Commerce was about four months old at the time this study was conducted. It is possible that a few firms started business in this period and were not interviewed.

Also, the size of a small firm was set from 20 to 100 workers in order to complete the research problem within a reasonable length of time.

CHAPTER III

RESULTS

This chapter presents the results from the interviews with local firms. As Chapter II pointed out, an effort was made to determine the extent to which the small local manufacturing firms set performance standards, in what departments such standards were set, what methods were used in setting such standards, and management reasons for lack of existence of performance standards.

Extent Standards Were Set

A comparison between the number of companies interviewed and the number of companies that have set standards suggests that management has neglected the opportunity of gaining greater efficiency through the medium of production standards, not only in the production department but other departments as well. Out of the thirty-five companies in the study only eight had developed performance standards, and even within these eight, no evidence appears of setting standards by recommended methods. Table I illustrates the extent to which standards have been set.

It is seen that most of the companies setting standards were in the garment industry. Of the six garment firms interviewed, five have found measurable units and developed standards. The three remaining companies were in the Bottling, Glass Door, and Plastic Bag

TABLE I

EXTENT STANDARDS SET

Industry	No. of Companies Interviewed	No. of Companies That Set Standards
Blinds	1	
Bookbinding	1	
Boots	1	
Bottling	2	1
Bricks	5	
Garments	6	5
Glass Doors	1	1
Heating & Cooling	3	
Milk Products	1	
Milling	1	
Millwork	1	
Plastic Bags	1	1
Painting	1	
Printing	2	
Signs	1	
Structural Steel	2	
Tool & Dye	5	—
TOTAL	35	8

industries. This indicates that standards of performance are possible in various kinds of small organizations.

Influence of Production Process on Standardization

Chapter I served to point out the possibilities available for standardization. It was found, for example, that although it is possible to set performance standards in all types of departments in all types and sizes of companies, they are most likely to be found under the following conditions (see Fig. 2 and Proper Methods, pp. 36 & 37):

1. In continuous production of a large volume of one or a limited number of different products,
2. Where labor time is high in proportion to machine time,
3. Where the job exists for a long period of time.

And, even in jobbing operations,

4. Where a large volume of one or a limited number of different products are produced,

(2) and (3) above are also true. Any departure from these conditions makes standard-setting more difficult.

5. In jobbing operations with many different items produced in small lots, or continuous manufacturing of a large number of different items, the ability to find measurable work units is at its lowest degree. This situation renders greater difficulty because of the number of items produced and the time involved in locating measurable elements. Table II shows the relative ease of finding measurable units of jobs in the firms of this study. This table was developed by comparing the characteristics of the firms studied to Figure 2, Chapter II.

TABLE II

EASE OF SETTING STANDARDS

Industry	Production Procedures	Labor Content	Life of the Job	Ease of Setting Standards	Companies that Set Standards
Blinds	Jobbing-M,S	High	Under 6 mo.	9	
Bookbinding	" H,S	"	Under 6 mo.	9	
Boots	" M,S	"	Under 6 mo.	9	
Bottling	Contin.-L	"	Over 12 mo.	1	Production & Executive
Bricks	Contin.-L	"	Over 12 mo.	1	
Garments	Jobbing-H,S	"	Under 6 mo.	9	Production
Glass Doors	Contin.-L	"	Over 12 mo.	1	Production & Executive
Heating & Cooling	Jobbing-M,M	"	Under 6 mo.	6	
Milk Products	Contin.-M	"	Over 12 mo.	4	
Milling	Contin.-M	"	Over 12 mo.	4	
Millwork	Jobbing-M,M	"	Under 6 mo.	6	
Plastic Bag	Contin.-L	"	Over 12 mo.	1	Production
Painting	Contin.-H	"	Over 12 mo.	7	
Printing	Jobbing-M,S	"	Under 6 mo.	9	
Signs	Jobbing-H,S	"	Under 6 mo.	9	
Structural Steel	Jobbing-M,M	"	Under 6 mo.	6	
Tool & Dye	Jobbing-H,S	"	Under 6 mo.	9	

As indicated by Table I, standardization was effected in the bottling, garment, glass door, and plastic bag companies. Thus the companies setting standards, as suggested by Table II, had varying degrees of ease in developing standards. They ranged from difficult situations in the garment companies to relatively easy situations in the bottling and plastic bag firms.

According to the literature, the type of production is of great importance in determining where standards of performance are most applicable, but in this study there is no indication of the importance of these variables. Of the eight firms that set standards, five had jobbing type plants, all of a different nature, and the remaining three had a continuous type manufacturing for which standards were relatively easy to establish. Apparently, from these findings, standards exist in the places where they are theoretically more difficult to set and are absent in places where they could be easily established.

Influence of Company Size on Standardization

Large corporations have been the leaders in standardization. The reason for this is the fact that even a small saving achieved at great expense will pay out in the large numbers of items produced. The following analysis compares the extent of standardization to company size.

Table III shows the extent to which performance standards have been set in comparison to company size as measured by number of employees. It appeared from this table that no relationship exists between the number of employees and the development of standards of performance within the range of firm sizes studied.

TABLE III

COMPARISON OF STANDARDIZATION TO COMPANY SIZE

Industry	Ave. No. of Emp.	No. of Comp's	No. of Comp's Setting Stds	Standardized Jobs	Ease of Setting Stds
Blinds	20	1			9
Bookbinding	25	1			9
Boots	20	1			9
Bottling	20	2	1	Production Executive	1
Brick	42	5			1
Garments	34	6	5	Production	9
Glass Door	25	1	1	Production Executive	1
Heating & Cooling	52	3			6
Milk Products	100	1			4
Milling	55	1			4
Millwork	35	1			6
Plyfilm Bags	25	1	1	Production	1
Printing	21	2			7
Paint	20	1			9
Signs (neon)	33	1			9
Structural Steel	48	2			6
Tool & Dye	30	5			9

For example, a manufacturer of glass doors having only twenty-five workers has done much in the way of setting standards for his workers. In the production department the work, beginning with the first steps in the process and continuing through packaging and loading of the manufactured goods, was subjected to standardization by company personnel to gain greater efficiency in work methods and to develop performance standards. Also, standards of management performance were constructed to make possible the analysis of accomplishments of the company management as compared to intended goals.

To cite another example of the same nature, the garment industry, consisting of six companies in this study, has an average of thirty-four employees per company, ranging from twenty to forty-eight. Here again, the size had little effect on the development of standards.

The importance of the findings in this section should be emphasized. Although there is little logical reason for this position, the lack of performance standards in small firms is often explained by their small size. These findings suggest that company size is not the variable. To illustrate further, a firm producing milk products with well over ninety workers made no attempt to set standards. Also, the brick manufacturing industry with companies ranging from ninety-five workers would seem to be a useful place for performance standards, but here again little thought was given to them. This further suggests that the size of a company or lack of it did not influence the existence of standards in this study (see Table III).

This finding is reinforced by referring to the Ease of Setting Standards column, which shows that both milk processors and brick

processors have the production requirements that make standard-setting relatively easy.

Development of Standards by Department

The departments in which performance standards have been set are analyzed in this section. Past studies suggest that much emphasis has been put on the production department, while other departments in the organizations have been neglected. It was shown in Chapter I, however, that standards are applicable in all departments.

In this study, the production departments were also given first consideration in setting standards. In fact, performance standards were limited to two areas: Production and Executive.

Production

Table III indicates that management considered the production department the key area where measurable standards of performance should be established in order to develop the highest possible plant efficiency. (This is not only natural, but as stated above reflects procedures in large business throughout the nation.)

The following tabulation more clearly illustrates the interest shown in the production department:

1. Companies setting standards 8
2. Number of departments in which standards were set 10
3. Number of companies setting standards in production 8

This indicates that all the companies setting standards showed great interest in production while little attention was given to other areas

of the organization. For example, of the six garment manufacturing firms, five employed methods to find how much a worker could turn out in a certain period of time. But in spite of this careful study in the production department, the concept of standard-setting was not carried over into departments other than production.

Executive

Of the eight companies setting standards, only two attempted measures of performance for executive positions.

As pointed out in Chapter I, one of the fruitful applications of performance standards is to the executive job. In this study every effort was made to find any type of standard for management jobs in use in the firms interviewed, but even with a very liberal definition of management standards only two organizations qualified in this area.

The first was a company in the bottling industry. It is a branch firm of a nation-wide organization, and thus stimulation for greater efficiency was pushed down from above. The executive standards were set up in profit ratios constructed from other branches with like factors. With such standards, careful analysis of the company's progress was possible, and measurable standards of performance for the manager were established.

The second company was a privately owned plant and the manager, through his own initiative, developed standards for himself by the use of daily production records. A standard of volume was set up against which the manager's performance was judged.

Methods of Setting Standards

Methods used for setting standards in small manufacturing plants may and sometimes do follow the studies made by large corporations. The time and money spent by big business in efforts made to establish performance standards is recovered through reduced costs. Small companies can also gain cost savings by using similar methods. The time and motion studies used by smaller companies are usually not as detailed as those employed by larger corporations. They should be, however, accurate enough to develop representative standards of a worker's performance and also be economically justified by the results gained. In some instances time and money are at a premium for smaller firms and the type of operations in the plant make standard-setting difficult. In such a situation, a less accurate method for setting standards can be employed. An example of this is a study of past performance. This method is, however, most exact if surrounding conditions and work methods are standardized before collecting performance records (see Chapter II). So little progress has been made in this field for small organizations that such a method may be justified, but the results gained will not equal those gained by scientific investigation of the job. Companies that must use this method will obtain a less exact standard by which to measure the employee's performance of value to the organization. A standard, regardless of how it is constructed, is better than no standard at all.

Methods by Type of Production Procedure

As suggested by studies made on performance standards in big business, the methods of setting these standards have a close relationship to the type of production carried on in the plant.

The different techniques of time and motion study are often used by companies with a continuous production operation. In jobbing operations, predetermined elemental time standards and standard data have been of great value in setting standards for jobs not yet in production. Also, simple time and motion studies may be employed in jobbing shops when the time and other circumstances do not permit a more detailed study.

Continuous Manufacturing

In the study, as shown by Tables IV and V, the existence of a continuous manufacturing process may be related to the type of method used for setting performance standards in small firms.

For example, the Bottling firm used past production records as a means of finding the measurable factors of production jobs. The Glass Door company also used production records to find standards, but for managerial positions. This suggests that continuous manufacturing may facilitate the use of production records as a method of setting standards of performance for workers in more than one area in the organization.

Jobbing Manufacturing

In jobbing operations, methods suggested by past studies to set standards for this type of production were not followed by the jobbing manufacturers that developed standards. Here a surprising result was found. Methods used by big businesses with continuous production were employed by these small firms to develop standards.

For example, the garment industry has a production operation that turns out items for style-conscious people, making it necessary

TABLE IV

STANDARDS BY TYPE OF PRODUCTION

Industry	Production Procedure	Labor Content	Life of the Job	Methods Used to Set Standards		Proper Method*	
				Production	Executive	Production	Executive
Blinds	Jobbing-M,S	High	Under 6 mo.			C-I	G or H
Bookbinding	" H,S	"	Under 6 mo.			C-I	"
Boots	" M,S	"	Under 6 mo.			C-I	"
Bottling	Cont.-L,L	"	Over 12 mo.	Type H	Type H	A-D	"
Bricks	Cont.-L,L	"	Over 12 mo.			A-D	"
Garments	Jobbing-H,S	"	Under 6 mo.	Type D		C-I	"
Glass Doors	Cont.-L,L	"	Over 12 mo.	Type D	Type H	A-D	"
Heating & Cooling	Jobbing-M,M	"	Under 6 mo.			C	"
Milk Products	Cont.-M,L	"	Over 12 mo.			B-C	"
Milling	Cont.-M,M	"	Over 12 mo.			B-C	"
Millwork	Jobbing-M,M	"	Under 6 mo.			C	"
Plastic Bags	Cont.-L	"	Over 12 mo.	Type D		A-D	"
Painting	Cont.-H	"	Over 12 mo.			C-E	"
Printing	Jobbing-M,S	"	Under 6 mo.			E-H	"
Signs	Jobbing-H,S	"	Under 6 mo.			E-H	"
Structural Steel	Jobbing-M,M	"	Under 6 mo.			C	"
Tool & Dye	Jobbing-H,S	"	Under 6 mo.			E-H	"

* See Fig. 2, page 35, for explanation.

TABLE V

PROCEDURES TAKEN TO SET STANDARDS

Industry	No. of Companies Setting Standards	Department	Procedures
Bottling	1	Production Executive	Production records Profit ratios
Garment	5	Production	Time Study
Glass Doors	1	Production Executive	Time Study Production records
Plastic Bags	1	Production	Time Study

to change the styles of goods in production overnight to meet these demands. Even with this dynamic type of production, which results in a job shop type of operation, time study was used to find standards for the production jobs in the five garment companies that set standards. This suggests that regardless of type of production, scientific methods for setting standards may be used by manufacturers who operate job shops.

Methods by Size of Company

The significance of size in terms of number of employees in relation to the procedures taken to set standards was suggested in Chapter I. The larger corporations with proportionately more employees can devote time and money to make highly scientific studies for setting performance standards. This suggests that size may have some direct bearing on the type of study made to establish standards.

In this study, as shown by Table VI, the methods used by companies in the study that developed standards had no apparent relationship to the size of the firm. Of the companies setting standards, the average number of workers was not over thirty-four, with the largest organization having forty-eight.

In the garment industry there was an average of thirty-four employees per company. Time study was the method used for developing standards on production jobs. Other small manufacturers in the study, such as the Glass Door firm and the Plastic Bag company, also used time study to set standards on their production jobs. The Bottling firm with an employment of twenty-eight used production records for its method of establishing standards. The larger companies, on the

TABLE VI

METHODS USED TO SET STANDARDS IN COMPARISON TO SIZE

Industry	Average No. of Employees	Standardized Jobs	Methods
Blinds	14		
Bookbinding	25		
Bottling	20	Production Executive	Prod. Records Profit Ratios
Brick	42		
Garments	34	Production	Time Study
Glass Door	25	Production Executive	Time Study Prod. Records
Heating & Cooling	52		
Milk Products	100		
Milling	55		
Millwork	35		
Plyfilm Bags	25	Production	Time Study
Paint	21		
Printing	18		
Signs	33		
Structural Steel	48		
Tool & Dye	30		

other hand--the Brick companies, the Milling company, the Milk Products company, and the Heating and Cooling companies--all with an employment over sixty workers, lacked standards in every department of their organization. It may be assumed from this that size in terms of the number of employees was not related to the methods used to set performance standards.

In other departments where standards were set the same is true. Two smaller companies with proportionately less capital and employees established measures of performance for executive jobs (see Table VI). Profit ratios were used to set standards in the Bottling firm by which the manager's performance could be judged. The Glass Door firm used production records to develop a standard of performance through the daily volume of goods in the production department. The methods used were not the most accurate studies known, but were sound measures of the manager's performance.

The results of this section suggest that the size of the companies interviewed was of little significance in determining the methods used to set standards in these companies.

Methods by Departments

As stated before, the past studies show that management in the big corporations had made most of their standardization studies in the production department.

The firms in this study, as shown by Table VI, also showed great interest in the production department by the methods employed to establish standards. Seven out of the eight companies that set standards in production did so by time study. The eighth used past

production records.

In executive jobs, the two companies that discovered measurable units of the jobs used records of past performance (production records and profit ratios), a less accurate method but none the less one in which observation of the executive's performance was made and recorded.

The methods used to set standards for jobs in these departments seem to follow the trend of big business. The production department has received most of management's attention for developing more efficient work methods while other departments have been largely overlooked.

Management Attitudes

As discussed in Chapter I, the literature indicated that one of the barriers slowing up the progress of standardization in American industry is the position management takes toward standardization. With the decision to initiate a program of this nature in their hands, it would appear that the lack of standards in a firm may be due primarily to the attitude management takes toward standards of performance. If this is true, then management reasons for lack of belief in standards should be brought out and answered to help further the progress of standardization in industry today.

This study also indicates that there may be a direct relationship between the existence of standards and the positions taken by management concerning this subject. It is for this reason and the significance of what proper thinking on the part of management might do for the advancement of more efficient business procedures that a separate section has been devoted to management attitudes toward standards.

Why Standards Were Not Set

Table I points out that of the thirty-five companies with an employment of twenty to one hundred, twenty-seven firms had not set standards of performance. Of these twenty-seven, two stated that because of limited knowledge of the subject of standardization, steps had not been taken to develop measures of performance for tasks and jobs within their organizations. In companies that knew of standards existing in other companies, the management of nine firms considered standards unnecessary. They stated that their businesses were too small, and that they had conducted their business activities in the same manner for years with relative success. Both of these reasons, limited knowledge and considered unnecessary, suggest that management attitudes may be one of the variables accounting for the lack of performance standards in small business today.

In eleven companies, management felt that because of the many items and styles produced in their plant, little possibility existed for measuring productivity. Past studies, however, made in jobbing shops (discussed in Chapter I) implied that the elements of a job are repeated many times during the manufacturing of different items, and that there are measurable factors for all types of jobs. An example of this is the garment companies with their jobbing operations. These firms turn out many types and styles of clothing goods each month. Even with this type of production, measurable factors of production jobs were found by time study techniques (see Table VI). This indicates that even the small jobbing manufacturers have measurable work factors by which standardization may be possible.

Of the remaining five companies that did not set standards, two gave similar reasons. Both stated that they assumed the cost of setting standards for jobs in their firms was greater than the possible dividends, but no attempt had been made to prove this. The others stressed the importance of quality, were too busy to initiate a standardization program, or had given little thought to the situation.

These reasons--limited knowledge, standards considered unnecessary, no measurable factors believed to exist, and others--were given for the lack of standards. As previously stated, past studies suggest that standards should be set if greater efficiencies are to be gained, and that there are measurable work factors for all jobs. This chapter appears to verify this and also suggests that neither the size of a company as measured by number of employees nor the type of production in the plant was the factor that determined whether or not standards were set. This again suggests that management attitudes toward standardization may be the variable that caused the lack of performance standards in these companies.

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

In this study the results of interviews with forty-five small Tucson manufacturers have been analyzed to determine their use of the scientific management principle of standardization as applied to tasks and jobs within their organizations. The managers of all thirty-five firms in the size range of twenty to one hundred employees were interviewed. In addition, ten firms employing less than twenty people were contacted. The interview was guided by a questionnaire designed to obtain complete information on the use of standards and methods of developing standards in the organizations studied. Where standards were not employed, the reason or reasons for this condition were obtained.

The data were analyzed by (1) comparing firm practice to desirable practices suggested by the literature and (2) determining trends and relationships suggested by tabulations of the data.

Conclusions

The study yielded the following conclusions:

1. Of the thirty-five small manufacturers interviewed, only eight had made an attempt to develop performance standards in their organization. This indicates that more efficient

work methods have not been developed by most of the small companies interviewed.

2. The relative ease of standard-setting for the different production procedures suggested in the literature did not appear to influence the existence of standards or the methods used to establish them within the companies interviewed. Standards exist in operations that are more difficult to set and are absent in operations where standard-setting is less difficult. Thus performance standards are probable in all companies in this study.

3. Within the range of the companies interviewed, the size of the firms seemed to have little relationship to existence of standards or the methods employed to develop the standards. In fact, the firms where standards were found were among the smallest studied.

4. The companies in this study followed the trend of big business in limiting standards largely to the production department. The application of standards to production operations did not influence management to develop standards in other areas of the plant.

5. The study indicates that the attitudes of management may be the factor accounting for the lack of standards in most of the companies interviewed. In most of the firms where standards had not been developed all of the conditions for standardization existed except a positive management attitude.

Recommendations

The great need today, as in all fields where progress is to be made, is education, and before standardization principles can be advanced in smaller organizations, widespread education is necessary. The study seems to indicate that little has been done to show these small businessmen the proper methods of developing standards; thus the following recommendations are made. The managers should (1) be sold on the measurement philosophy, (2) be shown results of simple observation and recording, and (3) have an opportunity to learn more complicated techniques after they have seen the advantages in managing by compering results against objective standards of performance.

BIBLIOGRAPHY

A. BOOKS

Alford, L. P. and John R. Bangs (ed.), Production Handbook, New York: The Ronald Press Company, 1945, Ch. 7, 8, & 22.

Anderson, A. G., J. M. Anderson, and M. J. Manderville, Industrial Management, New York, The Ronald Press Company, 1942, pp. 282-306 & 371-424.

Armstrong, G. S., Planning and Time Studies, New York: Industrial Extension Institute, Inc., 1918, pp. 177-216.

Barnes, Ralph M., Industrial Engineering and Management, New York: McGraw-Hill Book Company, Inc., 1942, pp. 125-181.

_____, Motion and Time Study, 1st ed., New York: John Wiley and Son, Inc., 1937, Ch. 1-7 & 15-19.

_____, Motion and Time Study, 3rd ed., revised. New York: John Wiley and Son, Inc., 1949, Ch. 1-5, 7-8, 18-20, & 24.

Blanken, A. B., Consumer and Opinion Research, New York: Harper, 1943.

Davis, R. C., The Principles of Factory Organization and Management, New York: Harper, 1928, pp. 177-216 & 296-300.

Dotton, H. P., Business Organization and Management, New York: A. W. Shaw Company, 1925, p. 61.

Executive Office of the President, Bureau of the Budget, Techniques for the Development of a Work Measurement System, Washington: U. S. Government Printing Office, March, 1950.

Folts, Franklin E., Introduction to Industrial Management, New York: McGraw-Hill Book Company, Inc., 1954, Ch. 4.

Froman, L. A., and S. B. Mason, Industrial Supervision, Chicago: The Foundation Press, Inc., 1942, pp. 239-296.

Galloway, Lee, Office Management--Its Practices and Principles, New York: Ronald Press Company, 1919, pp. 227-231.

Gallup, George, A Guide to Public Opinion Polls, Princeton, N. J.: Princeton University, 1944.

Gilbreth, F. B. and Lillian M. Gilbreth, Applied Motion Study, New York: Macmillan Company, 1919, p.43.

Gilbreth, L. M., The Psychology of Management, New York: Macmillan Company, 1919, pp. 102, 129, 148, 144, 181-183, & 106.

Glossary of Terms in Methods, Time Study and Wage Incentives, New York Society for the Advancement of Management, 1952, p. 23.

Harrington, Emerson, Twelve Principles of Efficiency, New York: The Engineering Magazine, 1912, pp. 261-341.

Kimball, Dexter S., Industrial Economics, New York: McGraw-Hill Book Company, Inc., Management Series, 1929, pp. 1-6 & 124-155.

Koepke, Charles A., Plant Production Control, New York: John Wiley and Son, Inc., 1941, p. 264.

Lateiner, Alfred R., The Techniques of Supervision, New London, Conn.: National Foreman's Institute, 1945, pp. 120-148.

Maynard, Harold B. (ed.), Industrial Engineering Handbook, Text ed., New York: McGraw-Hill Book Co., Inc., 1956, pp. 1-6, III-137 & 159, IV-3 & 6.

_____ and G. J. Stegemerten, Operation Analysis, New York: McGraw-Hill Book Co., Inc., 1939, pp. 1-71.

Morrow, Robert Lee, Time and Motion Study, New York: The Ronald Press Company, 1946, Ch. 1, 2, 5, 7-11, & 15-18.

Neuner, J. W. and J. R. Hayes, Office Management--Practice and Principles, 3rd ed. revised. San Francisco: Southwest Publishing Company, 1953.

Payment by Results, Geneva: International Labour Office, 1951, p. 33.

Shepard, G. H., The Elements of Industrial Engineering, New York: and Co., 1928, pp. 342-430.

Taylor, Frederick Winslow, Shop Management, New York: Harper, 1911, p. 30.

Tead, Ordway, The Art of Administration, New York: McGraw-Hill Book Co., Inc., 1940.

Walters, J. E., Modern Management, New York: John Wiley and Son, Inc., 1937, pp. 85-90 & 298-301.

B. PERIODICAL ARTICLES

Barnes, Ralph M. and Marvin E. Mundel, "A Study of Rhythm in Hand and Motions," Society for the Advancement of Management Journal, Vol. III, No. 2 (May 1938), 107-112.

Barnes, Ralph M., "Motion Study Speeds and Simple Assembly," Management Review, Vol. 77 (May 24, 1933), 338-340.

_____, "Practical Application of Time and Motion Study Research," Mechanical Engineering, Vol. 60, No. 5 (May 1938), 395-400.

Abruzz, Adam, "Determining Reliable Delay Allowances," Management Review, Vol. 37, No. 4 (April 1948), 198-201.

Brecht, R. P., "Motion Study in the Office," Society for the Advancement of Management Journal, Vol. 1, No. 5 (July-September 1936), 111-114.

Brooks, J. A., "Scientific Management in the Small Business," Mechanical Engineering, Vol. 61, No. 5 (May 1939), 373-375.

Carroll, Phil, "How Management Can Use Time Study," Society for the Advancement of Management Journal, Vol. 17, No. 8 (August 1952), 16-17.

_____, "Is Small Business Managed," Society for the Advancement of Management Journal, Vol. 21, No. 6 (June 1956), 22-24.

Engstrom, Harold, "Pre-Determined Time Standards," The Society for the Advancement of Management Journal, Vol. 17, No. 4 (April 1952), 16-17.

Freedman, Harry S., "Scientific Management in Small Business," Harvard Business Review, Vol. 28, No. 3 (May 1950), 33-54.

Lavfer, T. G., "Assembly Analysis," American Machinist, Vol. 82 (January 12, 1938), 9-11.

Maynard, Harold B., "The Foreman's Part in Motion Study," Society for the Advancement of Management Journal, Vol. 3, No. 2 (May 1938), 103-107.

Mogenson, Allan H., "How to Set up a Program for Motion Economy," Factory Management and Maintenance, Vol. 9, No. 11 (November 1935), s. 133.

Rauch, Philip B., "Small Business and Scientific Management," Society for the Advancement of Management Journal, Vol. 20, No. 4, (April 1955), 9.

Sampter, Herbert C., "Motion Study in the Factory," Society for the Advancement of Management Journal, Vol. 1, No. 5 (July-September 1936), 114-115.

Shaw, A. G., "Motion Study Applied to Small Assembly and Machine Work," Management Review, Vol. 23, No. 1 (January 1934), 24-25.

Stegemerten, B. J., "Job Standardization: Its Aims and Installations," The Iron Age, Vol. 131, No. 6 (February 9, 1933), 229.

Van Poppelin, F. J., "Over-all Motion Study," Society for the Advancement of Management Journal, Vol. 1, No. 5 (July-September 1936), 107-110.

C. BULLETINS

Chapmen, Patrick Lee, "Surveying and Controlling Executive Time," Management Aids for Small Business, No. 76. Washington, D. C. Small Business Administration (September 1956).

Gotterer, Melcolm H., "Developing Sound Production Standards," Management Aids for Small Manufacturers, No. 67. Washington, D. C. Small Business Administration (September 1956).

Larrabee, Ford R., "Nine Incentive Plans in a 200-Man Plant," Proceedings, New York City Society for the Advancement of Management (November 1950), pp. 22-28.

MacKenzie, Richard S., "The New Horizons for Wage Incentives," Proceedings, Second Annual National Time Study and Methods Conference (New York: The Society for the Advancement of Management and the Management Division of the American Society of Mechanical Engineers, April 18 & 19, 1947), pp. 69-75.

Martin, Ronald St., "Predetermined Time and Motion Methods," Management Series, No. 211, New York, American Management Association (1953), pp. 36-47.

Mead, Edwin C., "Methods Engineering for the Small Plant," Management Aids for Small Businesses, Annual No. 1, Washington, D. C. Small Business Administration (January 1955), pp. 107-113.

"Methods Engineering for the Small Plant," Small Business Management Series No. 6, Small Business Administration, Washington, D. C. (November 1953).

Roach, Loring, "A Re-examination of Methods Engineering," Management Series No. 209, New York, American Management Association, 1953, pp. 56-64.