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# Work Measurement: A Valuable Tool for Management

Frank M. Rachel

Donald L. Caruth

*Work measurement with the eventual setting of time standards is not new, although its use in office areas is still relatively novel. For this reason, this thorough review of the whole area is presented —*

# WORK MEASUREMENT: A VALUABLE TOOL FOR MANAGEMENT

*by Frank M. Rachel and Donald L. Caruth*
*North Texas State University*

MORE THAN 75 years ago, Frederick W. Taylor observed widespread conflict between management and workers. He reached the conclusion that much of this conflict could be resolved if management could only determine what is "a fair day's work" and then provide a "fair day's pay" in return. Taylor's interest in this idea of a "fair day's pay for a fair day's work" led him into pioneering work in the time study field. He quickly learned that, before time standards could be set and a fair day's work determined, the methods of doing the job, the equipment and materials used, and even the qualifications sought in men for doing particular work had to be standardized and brought under control.

With the benefit of hindsight, and in the light of technological and social changes since Taylor's pioneering efforts, scholars of today can find some limitations in the "fair day's pay for a fair day's work" concept as a solution to many management problems. But the value to management of knowing how long a work assignment should take is probably even greater now than in Taylor's day. In particular, this is true for the office, where the number of workers is rapidly increasing and costs soaring.

### *Uses of work measurement*

Work measurement provides information that management can use in planning, organizing, controlling, and measuring. Essenti-

ally, work measurement, through the establishment of time standards, provides a sort of standing plan as to how long any given work, or phase of work, should take. Thus, work measurement can serve a number of specific planning needs of management. At the same time, work measurement provides the basis for assessing results actually achieved, taking corrective action, bringing work activities under control, and organizing work so that the most efficient and effective combination of men, machines, and materials is achieved.

### *Specific purposes*

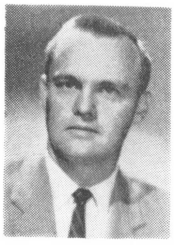
More specifically, work measurement can be used in office and administrative situations for the following purposes:

*To Determine Manpower Requirements* — Time standards provide the basis for determining how many people are required to staff a particular function. If, for example, the standard for processing invoices is 80 per day per employee and a billing department, using a cycle billing approach to level work, processes an average of 400 invoices a day, then it is apparent that five clerks are needed at the present level of operation. Future manpower needs can be determined in the same way by applying the time standard to forecasted volume. Thus, if next year's anticipated daily volume is 800 invoices a day, then an additional five clerks will be needed. Similarly, the need for reductions in staff can be determined by the application of time standards to work volumes. In addition, time standards can be used to justify overtime requests or the use of temporary employees to cope with seasonal increases in workloads or problems caused by employee illness or vacation.

*To Schedule and Distribute Workloads*—Time standards provide the basis for scheduling workloads. By knowing precisely how much time is required to perform various jobs, a supervisor can more effectively determine in advance the sequence in which priority tasks must be accomplished in order to meet certain deadlines. The supervisor can then allocate a sufficient number of people to the performance of these high-priority tasks. Knowing in advance how long it will take to process various items makes it easier to anticipate and plan for fluctuations in volume, such as peak loads. Work measurement can also be used as a means of distributing workload more evenly among the employees of a particular work center or among different work centers. In the absence of time standards, any work center is likely to have some employees who are overworked while at the same time there are other employees with less than a full workload. Work measurement provides the basis for correcting such inequities. By the same token, uneven workload distributions among work centers can be corrected once time standards for performing the work have been established.

*To Compare Performance* — One of the basic performance indicators established by work measurement is the utilization index. This index is determined by dividing the number of standard hours

***Work measurement can be used in office and administrative situations for the following purposes:***
***To determine manpower requirements.***
***To schedule and distribute workloads.***
***To compare performance.***
***To determine costs.***
***To pay incentive wages.***



FRANK M. RACHEL, D.B.A. is professor of business administration at North Texas State University in Denton. He is co-author of a 1964 book called **Office and Administrative Management** and a forthcoming book entitled **Compensation Theory and Practice.** Dr. Rachel is a graduate of Oklahoma State University and received his doctorate from the University of Illinois. He is a member of the Industrial Relations Research Association.

DONALD L. CARUTH is a candidate for a Ph.D. degree at North Texas State University. He has had experience in cost analysis and work measurement at Texas Instruments, Inc.; The First National Bank, Dallas; the United States Air Force; and the Republic National Bank, Dallas. Mr. Caruth has contributed articles to business publications and made numerous speeches on work measurement and the improvement of work methods.

**Delay in applying work measurement had often been blamed on the "special" characteristics of office work that distinguish it from factory work**

(number of units produced times the time standard) produced in a work center by the number of actual hours expended. Thus, if a work center produced, in a given month, 1,936 standard hours while expending 1,760 actual hours, its utilization index would be 110 per cent. This figure would indicate that this work center is working efficiently and producing its work in less than the standard time. By comparing the utilization indices of different work centers, management can determine which centers are operating efficiently and utilizing their personnel and which are not. Those work centers that consistently fall below 100 per cent can be examined more closely for any trouble spots that may exist. Because work performance can be equated to a percentage figure, work measurement makes it possible for management to compare the performance of heterogenous work centers.

*To Determine Costs* — Time standards provide the basis for determining the costs of various work units. Once a time standard has been determined for an operation such as invoice processing, the application of accounting data makes it possible to develop a cost for processing invoices. The determination of unit costs also makes it possible to determine the cost of performing an entire function even though parts of the function are performed by several departments in the organization. For example, in a commercial bank one of the major functions performed is the handling of checks written by the bank's depositors. Many departments, such as tellers, collections, installment loans, proof, transit, bookkeeping, and files, may handle these checks. By combining the costs of handling these checks in each of the departments, a total cost of performing this entire function can be determined. The conversion of time standards into cost standards makes it possible to do a more effective job of quoting prices and bids, budgeting, comparing alternative methods for getting a job done, and determining funds to be needed.

*To Pay Incentive Wages*—Time standards provide the basis for paying employees for the number of units produced. The type of incentive plan used may vary from a straight piece rate whereby each employee is paid a given amount of money for each item produced to some type of bonus plan whereby earnings are expressed in terms of time saved. Regardless of the specific plan used, the idea is the same: The employee or the work group earns in proportion to productivity. Where effectively used, incentive wages can reward extra effort, increase production, aid in assigning merit ratings, and allow each employee to evaluate his own progress.

### *Office work characteristics*

Slowness in utilizing work measurement as a tool of administrative management has often been attributed to the special characteristics of office work that differentiate it from factory work, where work measurement has been used extensively for years. The special characteristics of office work are these:

- More mental work is usually required, which makes tasks difficult to measure.
- There is greater variability of work from case to case, with more variable factors to contend with.
- There are numerous small low-volume, low-frequency tasks not thought to justify standards.
- Work flow is irregular in much office work.
- It is difficult to obtain accurate counts of items processed; frequently there is a lack of a concrete product.
- It is difficult to apply a leveling factor, essential to some techniques of work measurement, to work where there is little or no physical effort.

Analysis of these characteristics suggests that while the difficulties of measuring and standardizing office work are real, they are frequently exaggerated or are of such a nature that they can be overcome without undue difficulty. There is a certain amount of truly creative work for which time requirements may be unpredictable. There is other work into which judgment enters to such an extent that it is difficult to establish standard times for cases or transactions, yet usable standards can be set by study over a long enough period to take in normal variations. There are unquestionably some tasks that are too inconsequential in time and cost to justify much effort toward measurement. And certainly there are tasks where it is difficult to count production. But despite such considerations, it seems probable that more than 75 per cent of all office work is subject to measurement and standardization and that such efforts would yield good returns.

In the past, management saw little prospect of significant return from office work standardization and measurement. Production and

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**Just as important as the definition of the task to be measured . . .**

other primary operative work was more inviting. Today, with clerical workers and costs burgeoning, management interest in office work measurement is mounting rapidly. Mechanization and computerization, which require standardized formats and procedures in order to take advantage of the speed of the equipment, have emphasized the need for standardizing all of the office activities of a firm. If a computer is costing $100 an hour whether in use or not, there is an obvious incentive to keep it in operation. This means a tightening of input data schedules. It means that, to a considerable extent, many of today's office activities are machine-paced. Thus, there is an increasing need for development of time standards as a means of scheduling clerical activities in order to take full advantage of high-speed equipment.

### *Approaches to measuring work*

Certain preliminary steps are of prime importance: (1) improvement and standardization of work methods, (2) determination of tasks to be measured and establishment of a unit of measurement, and (3) establishment of procedures for reporting production counts and other data.

The improvement and standardization of work methods should precede the setting of a time standard. Such action assures that the tasks to be measured are being performed in the most efficient way possible. Additionally, it means that all employees performing the same task are performing it in the same manner. If all possible improvements are made before work measurement begins, the time standards established should be valid for a much longer period of time because methods changes are, assuming good system work, less likely.

The determination and classification of the tasks to be measured also constitute an important preliminary step. In order to measure a task accurately, care must be taken to include within the task all the elements or parts to be measured. This means that beginning and ending points for each job must be identified and defined. For some types of work measurement studies, this means that a detailed description of each task must be drawn up before measurement begins. Normally, these task descriptions are approved by the work center supervisor before the study begins.

Just as important as the definition of the task to be measured is the determination of the unit of measurement. If the task to be measured is the preparation of a report, what best reflects the effort required to produce this report? Care must be taken to determine what will best reflect effort expenditure because in office activities the obvious unit of measurement is not always the best unit of measurement. On the other hand, on many occasions counts cannot be obtained on such things as line entries because excessive time or cost is required to obtain such data. In these cases, resort must be had to the next best unit of measurement. In any event, the unit of measurement must be carefully selected and defined before time standards are established.

A final preliminary step is to establish a means whereby the necessary production counts, actual hours worked, and other data are collected and reported. Generally, the work center supervisor is assigned the responsibility for accurately reporting this information on a continuing basis.

Basic approaches to setting time standards include (1) stop watch time study, (2) predetermined elemental time standards, (3) work sampling, and (4) time logs. Sometimes a fifth approach, subjective standards (which includes best judgment, historical experience, and observation of one "good operator"), is also listed. But it is doubtful that results of this approach should be called standards because they are merely estimates based upon supervisory observation or past performance. It is easy to be misled concerning the productivity of individuals when judging by appearances; work variations may show up only over a period of time.

### *Stop watch time study*

Stop watch time study, although widely used for establishing standards for factory tasks, has not enjoyed extensive usage as a technique for setting work standards for many types of office tasks.

The type of stop watch used is normally one of the decimal-minute variety. Time is registered on two dials. The larger outer dial is divided into one hundred units, each representing .01 minutes. The smaller inner dial registers time in terms of a minute. The capacity of the inner dial is usually thirty minutes.

The first step in making a stop watch time study is to break the job down into its basic elements. Care must be taken to classify elements so that each has an obvious beginning and ending point. It is generally conceded that, in terms of time, elements should range between .05 and .50 minutes. An element much shorter than .05 minutes would be difficult to observe and record. An element over .50 minutes might well include several steps that should be separated for

**. . . is the determination of the unit of measurement to be used**

purposes of analysis. However, whether an element is .50 or 2 minutes is probably not critical. The critical point is the consistency with which the element is classified and recorded.

### *Basic approach*

The time study data sheet in Figure 1 on page 28 indicates the basic approach. In this illustration an order-processing operation is broken down into four principal elements: editing customer orders for conformance to company policy and price; pulling the customer's card from the file; posting the order; and checking for accuracy. The stop watch is started at the beginning of the first element and allowed to run continuously, with a reading made at the end of each element and recorded under the "R" column. The watch continues to run as the operator goes through successive cycles of the four elements, each cycle being the processing of a different customer order. At the end of the study the observer computes the differences between cumulative times in the "R" column to arrive at individual element times, which he enters in the "T" column.

A variation to this approach is the "snap-back" method, in which the observer, instead of allowing the watch to run continuously throughout the entire study, returns the watch to zero at the end of each element. Under this method the observer reads the time at the end of each element, snaps the watch back to zero, and records the elemental time in the "T" column. The advantage of this method is the elimination of computation time. However, greater skill and concentration are required on the part of the observer.

Ten cycles of the operation are shown in Figure 1. This will often be a sufficient number, but it is necessary to include enough cycles to indicate a cluster of element times, with most being nearly equal. Where great precision in standards is required, the precise number of observations needed for each element can be derived through mathematical formulas.

### *'Selecting' an average*

To arrive at a standard, a selected average is computed by throwing out any times that are extreme or greatly separated from what seems to be the cluster, then averaging the rest. In the illustration, note that times obtained for the editing element of the sixth cycle and the checking element of the ninth cycle were excluded, on the premise that something of an unusual nature happened in each instance that could throw the average off too greatly if these elements were included. An interruption occurred in the editing step of the fifth cycle; as indicated, the time involved was omitted.

Adjustment of the selected average times was then made in the form of a rating factor of 1.10 (which simply means that the typical worker can be expected to require 10 per cent more time for the operation than this one did). This adjustment gave a base time for the operation of 1.110. A further adjustment was then made in the form of a fatigue and delay allowance of 12 per cent. The purpose of this allowance is to build into the operation a factor to cover unavoidable delays and operator rest periods. The base time (1.110) plus the fatigue and delay allowance (.133) established a standard of 1.243 minutes for performing the order-processing operation.

While stop watch time study is regarded by many persons as the most scientific approach to the setting of time standards, there is also widespread agreement that it is the weakest from a psychological standpoint. Insecurity, defensiveness, fear of personal criticism, and many other forms of hostility are common results of stop watch timing; employees may try to "outguess" the analyst and pace themselves at rates that they can live with comfortably in the future; the analyst, in turn, must try to make adjustments and allowances—and the whole process may require a tremendous amount of subjectivity in judgment, more than is suitable to a "scientific" approach. This is not to suggest that stop watch time study is not a valid and useful technique for establishing office time standards; it is merely to emphasize the need for well trained analysts, policies that protect worker interests, and painstaking efforts to communicate the objectives of and the necessity for the program.

### *Predetermined time standards*

Predetermined elemental time standards have been developed for a wide variety of basic body motions common to many tasks. Criticism of the subjectivity and inconsistency of time study and other forms of work measurement was the motivating force behind development of predetermined time standards. A number of such time systems have been in use for years. Among the best known are Work-Factor, Methods-Time Measurement (MTM), Basic Motion Timestudy (BMT), and Dimensional Motion Times (DMT).

All of these systems have two beliefs in common: (1) that all work consists of certain basic elemental motions and (2) that through scientific analysis times

**FIGURE I**

TIME STUDY DATA SHEET

Operation Order Processing

Operator's Name Barbara Miller

Observer J. T. Powell

Date of Study 11-15

| Element | Cycle 1 T | 1 R | 2 T | 2 R | 3 T | 3 R | 4 T | 4 R | 5 T | 5 R | 6 T | 6 R | 7 T | 7 R | 8 T | 8 R | 9 T | 9 R | 10 T | 10 R | Selected Average | Rating | Base Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Edit Order | 33 | 00 33 | 31 | 38 | 29 | 42 | 31 | 51 | (A) 28 | 449 484 | 43 | 99 | 32 | 95 | 29 | 97 | 28 | 95 | 30 | 84 | 0.301 | 1.10 | 0.331 |
| Full Customer Card | 20 | 53 | 19 | 57 | 21 | 63 | 18 | 69 | 19 | 503 | 16 | 615 | 20 | 715 | 22 | 819 | 19 | 914 | 18 | 1002 | 0.182 | 1.10 | 0.200 |
| Post Order | 25 | 78 | 26 | 83 | 25 | 88 | 23 | 92 | 24 | 27 | 22 | 37 | 24 | 39 | 21 | 40 | 22 | 36 | 25 | 27 | 0.237 | 1.10 | 0.261 |
| Check for Accuracy | 29 | 107 | 30 | 213 | 32 | 320 | 29 | 421 | 29 | 56 | 26 | 63 | 29 | 68 | 27 | 67 | 16 | 54 | 29 | 56 | 0.289 | 1.10 | 0.318 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| TOTAL BASE TIME | | | | | | | | | | | | | | | | | | | | | XXX | XXX | 1.110 |

Allowance for Fatigue and Delay 12 % 0.133 minutes

Standard Time per Unit (Base Time plus Allowance) 1.243 minutes

Standard Output in Units per Hour 48.309 units/hour

Notes (interruptions, irregularities, other comments):
(A) Asked supervisor about possible price discrepancy, from 4.49 to 4.84 minutes

can be determined for performing each of these basic motions. However, the systems differ considerably from each other in the way they identify or classify basic motions.

Most of the predetermined time systems have been developed by photographing operations and studying these in great detail in order to determine the basic motions and to develop standard times for these motions. Time study and laboratory analysis have also been used. The culmination of such work is the development of a catalog of standard motions with a time value assigned to each.

In order to set a time standard using predetermined times, the analyst would observe an operation, classify and record the basic motions used, and then apply the standard time values to these mo-

**FIGURE 2**

WORK SAMPLING OBSERVATION RECORD

Date: JUNE 19, 1968

Organization: CONTROLLER | Function: PAYROLL | Subfunction: | Work Center: PAYROLL SECTION

Observer: A.E. NEUMAN | Available Manhours: 86 | Assigned Manhours: 120

| Hours Available | Names of Assigned Personnel | Leveling Factor | CATEGORIES | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Posting | Balancing | Filing | Check Preparation | Personnel Records | Typing | Payroll Report | | | | | | Delay | Personal | Idle | Not Observed |
| 8 | WILLIAMS | .20 | | 1 | 1 | | | 1 | | | | | | | 1 | | | |
| 8 | SMITH | .10 | 1 | | | | | 1 | 1 | | | | | | | 1 | | |
| 4 | LASKY | .25 | 11 | | | | | | | | | | | | 1 | | | |
| 8 | VETTER | .05 | 1 | | | 1 | | | | | | | | | | 1 | 1 | |
| 8 | PRICE | .00 | 11 | 1 | | | | | | | | | | | | | 1 | |
| 8 | JACKSON | .25 | 1 | 1 | | | | 1 | | | | | | | | 1 | | |
| 4 | WILLIS | .15 | | 1 | | | 1 | | | | | | | | | | 1 | |
| 8 | AVIS | .25 | 1 | | | | | | | | | | | | 1 | | 11 | |
| 0 | SIMS (SICK) | — | | | | | | | | | | | | | | | | |
| 8 | STEIN | .25 | | | | | 1 | 1 | 1 | | | | | | 1 | | | |
| 0 | OTT (VAC) | — | | | | | | | | | | | | | | | | |
| 7 | BELLOWS | .15 | | 1 | | | | | | | | | | | | | 111 | |
| 5.5 | CRICK | .05 | 1 | 1 | | | | | 1 | | | | | | | | | |
| 6.0 | BLACK | .00 | 1 | | 1 | | 1 | | | | | | | | | 1 | | |
| 3.5 | CRAVEN | .25 | | | | | | | | | | | | | | 1 | 11 | |
| | | | | | | | | | | | | | | | | | | |
| 86 | TOTAL | 1.95 | 10 | 6 | 2 | 1 | 3 | 4 | 3 | | | | | | 4 | 5 | 10 | |
| | DAILY p | 1.15 * | 20.8 | 12.5 | 4.2 | 2.1 | 6.3 | 8.3 | 6.3 | | | | | | 8.3 | 10.4 | 20.8 | |

$\Sigma p'$ Productive Direct and Indirect .60 | Total Observations for Day (n') 48

* Average Leveling Factor

AF Form 1113, Sep 60

FIGURE 3

WORK SAMPLING COMPUTATIONS

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Work Activity | Number of Observations | Actual % | Actual Man Hours | Average Performance Rating | Leveled Time | Delay and Fatigue Allowance | Standard Time | Number of Units | Unit Time Standard in Hours |
| Process Vouchers | 3430 | .386 | 848 | 1.10 | 932.80 | 1.194 | 1113.76 | 3247 | .3430 |
| Prepare Statements | 2554 | .287 | 630 | 1.10 | 693.00 | 1.194 | 827.44 | 1289 | .6419 |
| Process Return Items | 421 | .047 | 103 | 1.10 | 113.30 | 1.194 | 135.28 | 750 | .1809 |
| File Checks | 450 | .051 | 112 | 1.10 | 123.20 | 1.194 | 147.10 | 4579 | .0321 |
| Customer Notifications | 210 | .023 | 51 | 1.10 | 56.10 | 1.194 | 66.98 | 395 | .1696 |
| Unavoidable Delay | 445 | .050 | 110 | | | | | | |
| Personal, Rest | 1210 | .136 | 299 | | | | | | |
| Idle | 175 | .020 | 44 | | | | | | |
| Totals | 8895 | 1.000 | 2197 | | | | | | |

* Computation of Allowance:

Allowance for Personal = 30 minutes per day
Allowance for Fatigue = 24 minutes per day
Allowance for Delay = 24 minutes per day
Total Allowance = 78 minutes per day
Total Minutes in Work Day = 480

$\frac{78}{480} = 16.25\%$

$1 + \frac{16.25}{100.00 - 16.25} = 1.194$ Delay and Fatigue Allowance

tions. Normally, to be proficient in using this technique, an analyst must have had extensive training.

The use of predetermined times requires that the operations being observed be highly repetitive. Because this condition is not met as frequently in the office as in the factory, the applicability of predetermined times for setting standards on the majority of office operations appears to be limited.

### *Work sampling*

One of the newest approaches to setting time standards for office operations is work sampling. In essence, it consists of spot checking and drawing conclusions regarding the full range of possible items on the basis of percentages developed from the spot check. Work sampling is based on the theory that a sample taken at random from a large group will tend to resemble the distribution pattern of the large group. If enough sampling is done, the characteristics of the sample will differ little from the characteristics of the population or universe from which the sample is drawn.

### *Applying the technique*

To set standards with this technique, the analyst determines in advance which operations are to be measured and the number of random observations needed and develops a list of times at which the operations will be observed. At the times indicated the analyst visits the work place and observes what each employee is doing. Normally, he would do this by making tally marks on a form such as in Figure 2 on page 29. When sufficient observations have been made, the analyst would compute the time standards.

Figure 3 on this page illustrates the basic procedure for calculating standards. The various categories of activities sampled are shown in the first column. The second column shows the number of times during the study that the analyst observed the activities being performed. The next column indicates the percentage occurrence for each activity. The total hours worked by this work center during the study period was 2,197. This figure is shown as the total of the Actual Man Hours column. To determine the number of hours for each activity the total hours figure is multiplied by the per cent occurrence for each activity. The actual hours per work activity are adjusted by a leveling factor of 1.10, which indicates that the typical worker would require 10 per cent more time for performing each task. This so-called leveled time is further adjusted by a factor of 1.194 in order to build into the standard an allowance for delays and personal needs of the workers. This adjustment results in a standard time (in total hours) shown in Column 7. In Column 8 the number of units of each activity that were produced during the study are shown. Dividing the total standard hours for each work activity by the number of units produced results in a unit time. This standard is shown in Column 8, not in conventional notation, but

FIGURE 4

TIME LOG

Name A E NEWMAN Department BILLING Date 3-9-68

| Time | Duty | Time | Duty | Time | Duty | Time | Duty | Time | Duty |
|---|---|---|---|---|---|---|---|---|---|
| 8:00 | A | 10:00 | A | 12:00 | B | 2:00 | E | 4:00 | A |
| 5 | A | 5 | A | 5 | B | 5 | E | 5 | A |
| 10 | A | 10 | A | 10 | B | 10 | E | 10 | A |
| 15 | 1 | 15 | 2 | 15 | 3 | 15 | 5 | 15 | A |
| 20 | 1 | 20 | 2 | 20 | 3 | 20 | 5 | 20 | 6 |
| 25 | 1 | 25 | 2 | 25 | 3 | 25 | 5 | 25 | 6 |
| 30 | C | 30 | 2 | 30 | 3 | 30 | G | 30 | 6 |
| 35 | C | 35 | 2 | 35 | L | 35 | G | 35 | 6 |
| 40 | C | 40 | 2 | 40 | L | 40 | G | 40 | 6 |
| 45 | C | 45 | 2 | 45 | U | 45 | G | 45 | 6 |
| 50 | 3 | 50 | D | 50 | U | 50 | F | 50 | 6 |
| 55 | 3 | 55 | D | 55 | N | 55 | F | 55 | 6 |
| 9:00 | 3 | 11:00 | 15 | 1:00 | N | 3:00 | F | 5:00 | 6 |
| 5 | 3 | 5 | 15 | 5 | C | 5 | F | 5 | 6 |
| 10 | G | 10 | 15 | 10 | C | 10 | F | 10 | 6 |
| 15 | G | 15 | 15 | 15 | H | 15 | F | 15 | 6 |
| 20 | G | 20 | 15 | 20 | H | 20 | F | 20 | 6 |
| 25 | E | 25 | B | 25 | H | 25 | F | 25 | 6 |
| 30 | E | 30 | B | 30 | H | 30 | F | 30 | 6 |
| 35 | E | 35 | B | 35 | H | 35 | F | 35 | 6 |
| 40 | E | 40 | B | 40 | H | 40 | F | 40 | 6 |
| 45 | 3 | 45 | B | 45 | H | 45 | F | 45 | 6 |
| 50 | 3 | 50 | B | 50 | H | 50 | F | 50 | 6 |
| 55 | 3 | 55 | B | 55 | H | 55 | F | 55 | 6 |

Duty Codes:

A -- Process Vouchers

B -- Prepare Statements

C -- Process Return Items

D -- File Checks

E -- Customer Notifications

F -- Unavoidable Delay

G -- Personal, Rest

in decimal proportions of an hour.

The key to accuracy in work sampling is in the number of observations made and how they are made. Generally, the larger the number of observations the more accurate the results. A practical balance of accuracy and expense can be obtained by deciding upon a suitable degree of reliability for intended use and then determining the sample size needed to produce this result. A mathematical formula or a nomograph can be used to make this determination.

Although a person with only limited training can be used to make work sampling observations, if performance leveling is to be used a skilled analyst will be required.

### *Time logs*

One of the most widely used techniques of setting office time standards is that of time logs or records. In this approach each em-

**FIGURE 5**

Summary of Work Measurement Techniques

| Technique | Primary Advantages | Primary Disadvantages | Type of Standard Produced |
|---|---|---|---|
| Stop-Watch Time Study | Accuracy; Speed of application; Provides detailed information | Employee reaction; Not useful on long cycle or mental operations; Requires use of subjective leveling | Very accurate; for repetitive tasks; "Tight" |
| Predetermined Times | Accuracy; Speed of application; Provides detailed information | Expense--requires specialized training; Not useful on long cycle or mental operations | Extremely accurate for repetitive tasks; Very "Tight" |
| Work Sampling | Ease of application; Favorable employee reaction; Can be used on long cycle operations | Lack of detailed information; May require lengthy sample period; Difficult to explain | Fairly Accurate for both short and long cycle operations; "Loose" |
| Time Logs | Ease of application; Can be used on long cycle operations | Difficult to summarize; Unfavorable employee reaction; Data may be inaccurate | Inaccuracies and delays built-in; Very "Loose" |

ployee maintains a record of the time he spends performing each activity and the number of units he produces. The primary advantage of this approach is its basic simplicity.

### *Steps in study*

The first step in this type of study is to develop standardized definitions of the work activities and work counts that the employees are to maintain. The second is one of explaining to the employees how the study is to be conducted and what records are to be kept. The third is the design of the forms to be used in collecting the data.

A typical form is the time log shown in Figure 4 on page 31. This particular form shows time divided into increments of minutes. In order to record the time spent on various work activities using a time log, the employee simply draws a line across the duty column whenever a change is made from one activity to another and inserts the proper activity code and the number of units produced. The activities to be recorded can be identified by code letters at the bottom of the form.

The fourth step in developing time standards by use of the time log is to have all employees in the department being studied maintain logs over a period of time suffi-

**. . . the number of observations made and how they are made**

## FIGURE 6

Uses of Work Measurement Related to Work Measurement Techniques

| Use | Basic Objective | Required Precision | Techniques Related to Uses | | | |
|---|---|---|---|---|---|---|
| | | | Time Study | Predetermined | Work Sampling | Time Logs |
| Determine Manpower Requirements | To fairly accurately establish relationship between work volume and required man-hours | Standard should be accurate, but not over-precise | Very Good | Good; May be too detailed | Excellent | Not too good; Lack of accuracy |
| Schedule and Distribute Workload | Establish priority time-table for tasks; Even distribution of work among employees or sections | Standard should be accurate where production line is involved; Less precision required for distribution | Very good | Very good; May be too detailed | Very good | Good if scheduling not critical |
| Compare Performance | To evaluate output in terms of standard | Standard should be fairly accurate, but not overly precise | Excellent | Good; May be too detailed | Excellent | Not too good; Inaccuracies built-in |
| Incentive Wages | Provide for payment of wages based on output | Extreme precision required | Excellent | Excellent | Poor | Extremely poor |
| Determine Cost | Allocate costs among products or functions | Only relative precision | Excellent | Very good; Could be too detailed | Excellent | Very good |

cient to afford a representative sample of the activities performed in the work center. The fifth and final step in the study is to summarize the recorded times and units produced and develop time standards.

The time log approach is easy to explain and administer. Employees may be stimulated to higher performance by knowing that some effort is being made to "keep score" and probably will not resent this approach if they are given adequate explanation of its purposes—and if management then exercises good judgment in utilizing the information obtained.

***Where the end result of work measurement requires a precise standard, such as incentive wages, then a technique that can assure the necessary precision must be used. But where the end result need not be so precise, such as in a simple allocation of function costs, another less precise technique can be used.***

### *Potential disadvantages*

While the biggest advantage of this approach is its ease of application, the biggest disadvantage is the difficulty of summarizing the multitude of time logs that may be produced. Another potential disadvantage is the creation of employee ill will through the addition of what can be the burdensome activity of maintaining detailed records over a period of time.

Additionally, critics point out that the time log approach may be useful and even necessary for current measurement of output but that standards set by averaging past performance merely tell you what has been done, not what could or should be done. Such criticism can be valid and can justify a more systematic approach. It should be noted, however, that even past performance data can be refined by relying more upon performance achieved by selected fully trained employees than upon performance of averages; by adjusting average figures before setting standards (where a justifiable basis may exist); and by maintaining records of production experience and methods changes, through which higher standards might later be justified. This may not result in quite so high a degree of precision as a more scientific approach, yet it holds judgment to a minimum and has the special advantage of greater ease in winning employee understanding and acceptance.

No one technique of work measurement is universally applicable to all types of work. Some techniques work best on certain kinds of activities, while other techniques are better suited to other types. Failure to recognize this can result in excessive expenditures for work measurement or in the collapse of the work measurement program.

Basically, the use to which work measurement data will be put determines or limits the techniques used. This means that management must decide in advance what work measurement data will be used for in the organization. In other words, the goal or objective must first be stated and then the means of getting there determined. Unfortunately, management has not always done this in the area of work measurement. But, to a great extent, blame must be shared by the work measurement specialists who, being "technique-oriented" rather than "result-oriented," have failed to observe the relation between the uses of work measurement data and the means of collecting such data.

Where the end result of work measurement requires a precise standard, such as incentive wages, then a technique that can provide the necessary precision must be used. But where the end result need not be so precise, such as in a simple allocation of function costs, another, less precise technique can be used. One must be aware of the fact that if the technique of work measurement is selected before the uses of the data are determined, overmeasurement of work can result. Such overmeasurement is not only time-consuming but also costly.

Figure 5 on page 32 presents a summary of the techniques of office work measurement, showing the advantages, disadvantages, and type of standard produced by each technique. Figure 6 on page 33 relates the use of work measurement data to the measurement techniques.