AN EXPERIMENTAL APPLICATION OF INDUSTRIAL ENGINEERING TECHNIQUES TO DEPARTMENT STORE OPERATIONS

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CHAPTER I

INTRODUCTION

The Problem

The basic problem is to answer the following questions:

1. Are there any characteristics which are common to both department store operations and industrial work?
2. Can industrial engineering techniques be applied to department store operations?

Definition of Industrial Engineering Techniques

The term "industrial engineering techniques" as used in this thesis is defined as the application of the scientific method to production or operational problems. The industrial engineer uses the scientific method for the determination of methods of most efficient production; carrying out and interpretation of time and motion studies; establishment of production standards and rates of pay; control of inspection, quality, inventory, time, payroll, and materials. He is further concerned with planning production flow through various assembly line operations, developing machine loads, production routing, scheduling and dispatching, and the design and application of wage payment systems.

The Department Store

The organization.--The usual form of department store organization is

depicted in Fig. 1. The principal line activities in retailing are

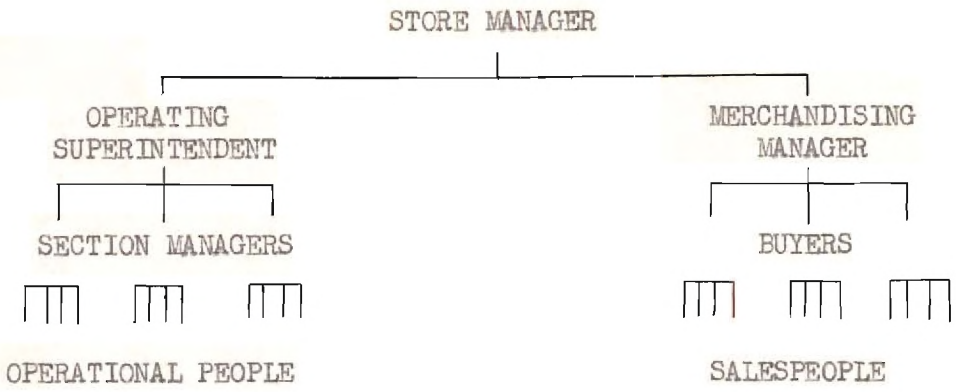


Fig. 1. TYPICAL DEPARTMENT STORE ORGANIZATION.

merchandising and operating.

Operation activities.--The operating people are generally responsible for all the non-selling activities such as receiving and delivering the merchandise, operation of store equipment and properties, problems of personnel, record keeping, and so on. Some of their responsibilities are to see that the store is kept clean, that records are kept, that customers are billed and money collected, and that customer complaints are properly handled. All these routine details are vitally important to the daily operation of the store.

Merchandising activities.--The merchandising people are concerned with the problems of obtaining the right merchandise and selling it. The function of any merchandising organization is to sell. This fact is foremost in the thinking of management. This group, among other selling activities, plans sales events and develops promotional ideas.

Efficiency of operation is generally thought of as secondary to achievement of sales. This does not mean that efficiency as such is not considered important. Efficiency of operation is usually thought of as the means by which profits are made after sales have been achieved. Make the sale first, then make a profit based on how efficiently operations are carried on. There is no profit until the sale has been made.

Background of the Problem

The history of the increased application of industrial engineering to industrial operations and the resulting increase in productivity over a long term due to the impact of scientific management is familiar to all.

Competition and industrial engineering.--The scientific management movement began in an industrial environment and has made, and continues to make, its greatest contributions in its application to industrial problems. This historical emphasis upon industrial operations is understandable since the early practitioners of scientific management were engaged in manufacturing. Over the years it has been easy to look at the multitude of processing activities with their large number of employees and to endeavor to lower the cost of production, to increase per man hour productivity, and to improve the quality of the product. Intense competition between manufacturers has compelled managements to apply industrial engineering techniques to their particular problems. The concentration of industrial engineers upon industrial activities has left many potential fields of industrial engineering application

virtually untouched. One of these fields of application is that of department store operation.

Paralleling the rise of large factory production units has been the increase in the size of individual retail establishments and the growth of chains of stores.

As is true of all other types of business activities so it is of department stores: cost reduction can be accomplished. But cost reduction here and there in the total operation should not be the goal of an industrial engineering program. A broad, long term industrial engineering program should be developed and be executed by the most competent personnel obtainable. The "hit it a lick" or "put out the fire" type of approach can get cost reduction results of a sort but such a program lacks coordination.

The effect of industrial engineering.--A broad-gauge industrial engineering program should affect the operation of the store in many ways. It should affect planning with regard to manpower needs, work load assignments, and the methods or procedures used to achieve the planned goals. It should further affect control standards such as costs, budgets, and supervision. A broad industrial engineering program will indeed affect the entire department store. The greatest worth of such a program is that with the facts laid bare the interrelationships between the parts of the whole problem are displayed for analysis.

Slow adoption of industrial engineering by department stores.--In spite of the increasing need for a program of critical analysis of the problems in department store operation brought about by the increase in the

unit size of such operations during recent years, relatively few of the large and medium size department stores have such a program.

We are faced with an inconsistent situation. On one hand manufacturers as a whole are constantly striving to reduce their costs of operations and increase their productivity per man-hour of labor while on the other hand the costs of distribution of non-food goods are not, on the whole, as assiduously attacked.

There are, of course, many reasons for retailers not practicing more widely the industrial engineering techniques that have been available for many years. Objections of retailers have been that their operations are not similar in any way to industrial operations, or that they have that vague, indefinable controlling person the "customer" always to consider.

Another prime reason for the reluctant adoption of industrial engineering techniques by retailers is the human reaction of resistance to change. Traditional methods have existed in many stores for long periods with little change. Any attempt to improve and simplify methods is met with a defensive, often antagonistic attitude. Constructive suggestions are misinterpreted as criticisms. The belief has been expressed that clerical procedures which involve numerous variables do not lend themselves to analysis and standardization and cannot be resolved to the same extent as are industrial operations. As Mundel puts it, "There is little question but that the top executive attitude toward change and the procedures used to bring about change is one of the human factors affecting the success of an industrial engineering program."(1)

There is no doubt that the department store manager should be concerned with the quantity and quality of the production of his non-selling staff, the control of time and costs, and the conservation of effort and good-will. He thinks in terms of costs, but in many cases he does not have the essential data which will permit unit cost analysis and comparison. Is it not possible that department store operations, which are concerned with the flow of goods to the customer, may be imagined as a continuation or extension of those of the factory and as such are susceptible to similar engineering analysis and treatment?

Literature Survey.

Two approaches found in the literature.--The literature which appears to be applicable to the problem is divided into two major categories of information. One is that of office procedures, mechanization of operations, forms and the systems approach. The other group is the literature of the industrial engineering field. The former deals with the average office manager's problems of effecting cost reduction through devising effective procedures and suitable forms. The industrial engineering literature is replete with the philosophy of and the procedures for the measurement of work; for methods analysis; for control of production, personnel, and materials; and for organization. The main difficulty with the immediate adoption of this literature to the problem is that it is primarily concerned with manufacturing. There is very little concern for the management problems of non-manufacturing enterprises that could conceivably utilize industrial engineering techniques. For example, in Mundel's excellent bibliography there is

but one reference to a publication concerned with department store operations and it is entirely devoted to work methods and does not consider work measurement.(2) Minor examples were found in periodicals of specific applications of industrial engineering techniques to some particular minor department store problem. But there is nothing in the literature that indicates the belief that the operational activities of a department store are within the province of the industrial engineer.

The mechanistic procedural approach.--Office work procedure studies have been carried on for many years. The techniques to be used for collecting facts, analyzing them and developing an improved procedure are well described in several excellent texts.(3)(4) Periodical literature is filled with references to particular applications of office work procedure improvement which have been successful under varying circumstances. On the whole, this approach to procedures improvement appears to be mechanical, shallow and generally conducted from the technician point of view.

A typical viewpoint is that "The office extends to all areas."(5) Communications within an enterprise travel on pieces of paper. These pieces of paper become the focus of cost reduction effort and attention. This is the basis of the paperwork simplification and the forms and procedures analysis approaches to cost reduction. There is a need for cost reduction as such, but would not cost control also be beneficial to an even greater degree? These paperwork procedures do not lead to establishing a basis for cost or production control.

A specific example of the mechanistic approach found in the

literature and one which the technician so frequently is guilty of using is represented by the "specific improvement formula" of work simplification for records and other office clerical work promulgated by the Standard Register Company.(6) The formula consists of seven analytical steps. However, there is no mention of time study or work measurement as part of the analysis or as a basis for determining how long a job should take as compared with the time it does take. Productivity may be increased by this procedure, but a true measure of it is not obtained.

Probably more important than the limitations of these techniques is the philosophy behind them--cost reduction not cost control through work measurement.

Another insight into the limitations of the procedural approach is the belief that

> Soundly conceived control (paperwork) procedures... permit delegation of authority to subordinates. Thus, bottlenecks are eliminated and action facilitated, while control is retained by reports to ensure that performance is satisfactory. (7)

The result is that procedures, or patterns, are established for carrying out repetitive tasks. The thought is that the more definite the pattern, the more effective the operating executives become. The procedure rejects and calls attention to those things which do not fit the established pattern. Control is sought through exceptions from a procedure rather than by setting up a measured standard task and obtaining control by comparing an actual performance with this standard, expected performance.

The broad industrial engineering approach.--Contrasted with the over-all mechanical procedural approaches to work analysis without work measure-

ment is the typical broad industrial engineering program of the control of cost through work measurement and the establishment of work standards. This would result, in a department store operation, in the application of the principle of control through cost standardization. Literature search has revealed that little attention has been given by department stores to predetermine accurately what amount of time a given amount of work should take and what it should cost to accomplish. Certainly work is work wherever it is found. Clerical and other operations should be measureable in terms of man-hours even though the product is clerical transactions in the operational phase of department store management rather than a tangible manufactured product.

If time study is used for work measurement and job analysis, then standard production times will result. These standards have a widely felt organizational and operational influence. Mundel points out that standard times determined by time study may be used for the following purposes:

1. To set schedules.
2. To determine supervisory objectives.
3. To determine operating effectiveness.
4. To set labor standards.
5. To determine the number of machines a person may run.
6. To balance the work of crews, co-ordinate or in sequence.
7. To compare methods.
8. To determine standard costs.
9. To determine equipment and labor requirements.
10. To determine basic times or standard data.
11. To provide a basis for the setting of piece prices or incentive wages.(8)

If, on the other hand, improvements are made through work simplification without time study, management remains uninformed about the time and effort required to accomplish the work. Many valuable and

useful improvements may be made by using work simplification techniques, but no information vital to contol is obtained. Improvements may be made, but standards of work performance have not been determined so that goals for accomplishment may be set and used. Such standards would be determined in a broad industrial engineering program in a department store because of the nature of the techniques used. The result is both control and cost reduction.

Conclusion.--The literature search has revealed that the usual mechanical approach to the operational problems of a department store have not gone to the heart of the problem which is control. Control is possible only if goals are established on a sound basis of work measurement. The techniques for the establishment of work standards useful for control are known. They appear to be best practiced by those qualified by industrial engineering training. There was little information which could be found directly concerned with the general operational problems found in department stores. There was no literature particularly concerned with the operation of a telephone delivery service complaint department.

CHAPTER II

CHARACTERISTICS COMMON TO DEPARTMENT STORE OPERATIONS AND INDUSTRIAL WORK

The Department Store Environment

Department store operation is concerned with "the business of assembling, transporting, storing, packing, unpacking, buying, displaying, selling, and performing the necessary services to convey goods to their utlimate consumers."(9) It would seem that some of the characteristics of the above activities, though some are intangible services, are parallel to many of the characteristics of manufacturing activity. The purpose of this chapter is to determine if common characteristics exist.

Organization orientation.--Gardner and Moore describe organizations by their functional orientation.(10) The selling and merchandising organization has its principal orientation toward the direct handling and manipulation of people. Coupled with this primary orientation is a supplementary one of handling papers and records and the following of procedures as found in the operational phase of a department store's activity. Gardner and Moore make the further point, which is important here, that

> The orientation of an organization has a very definite effect on the kind of administrative thinking and practice which develops. It determines, for one thing, the nature of the important problems which the organization must solve. It influences, for another, the kinds of people the organization will attract. More than this, it has a pervasive effect on the way key personnel think through their problems.(11)

Human relations.--The primary orientation in retailing, as has been pointed out, is that of handling and manipulating people. Selling

necessarily involves concern with the feelings and demands which the customer makes on the organization. The human relations in a department store are of utmost importance because it is essentially a human relations institution. This would indicate that the industrial engineer cannot be arbitrary about implementing his recommendations. He needs to consider the people involved as much or more than he does things.

The concern in industry is with both the human relations and the technology of the organization. The principal problems have revolved around the processing and handling of materials and the use of machines. The manufacturing enterprise can produce most efficiently only if the machines, processes and human organization is right. Although the human relations in department store work appear to be emphasized compared with industrial work, nevertheless it is a characteristic common to both department stores and industry.

Production similarities.--It has been observed that many of the operations in a department store have the basic characteristics of industrial production. Operations are found which produce a product in quantity. There are several differences between the department store product and the industrial product. One is that the department store begins its processing after industrial production has taken place. The merchandise also must be produced. Another difference is that the product of the department store is a sale and the servicing of sales. While a sale and its servicing is intangible, it is as much a product as is industry's. The operational activity of a department store is concerned with all the non-selling aspects of producing a sale and servicing

it. These activities include receiving, warehousing, marking, billing, mechanical service, delivery, and processing customer complaints. These department store activities are the production of a product or a service in quantity. This production is parallel to that found in industry and is, therefore, a characteristic common to both.

Customer service and quality control.--The function of any merchandising organization is to sell and to provide the customer with service at the time of the sale and afterwards. Thus customer service is the creation of conditions which lead to a sale, keep the merchandise sold, and cause the customer to continue to be a customer. Each person is involved directly or indirectly with the main purpose of the store--dealing with the customer. An attempt is made through employee training to have all employees agree with management on the major importance of the selling and customer service activities. The importance of customer service in retailing is analogous to the function of inspection and quality control in manufacturing. The purpose in the former is to keep the merchandise sold, while in the latter it is to get it manufactured and sold. In both cases the aim is a high volume of unit sales with as little loss of such unit sales as possible and the creation and continuation of customer and community good-will. Quality control, i.e., service, which seeks a maximum quantity of product will be considered to be a characteristic common to both industrial and department store operation.

Need for coordination and control.--Another characteristic common to industrial work and department store operation is the necessity for

organizing, coordinating, and controlling all activities in order to make the most effective use of equipment, capital, and personnel. The use of work measurement in industry results in scheduling, production control, and labor cost analysis and control. There is no doubt that department stores have a need for controlling their varied operational activities. It has been found in general that control over most department store operational procedures and production is not based upon work measurement as extensively as are industrial operations. Nor, in general, have the same available techniques been used. The need for control based upon work measurement exists in both groups.

CHAPTER III

THE EXPERIMENT

One of the questions posed as the problem of this thesis is "Can industrial engineering techniques, as used in industry or with some modification, be applied to department store operations?" In order to answer this question, a department store operation was selected for an experimental application of various industrial engineering techniques. The management of a large Atlanta department store allowed the use of one of their operational departments for such experimental purposes.

Selection of Operation

The operation selected was the processing of customer complaints concerning non-delivery of merchandise which are received each day by telephone. The department concerned with this operation will hereafter be referred to as the Telephone Delivery Service department (T.D.S.). This operation was selected because it met the criteria of containing within it work characteristics common to both department store and industrial operations. These characteristics were discussed in the previous chapter.

General Description of the Operation

The function of the T.D.S. department is to receive complaints from customers about the non-delivery of both small package and furniture merchandise. In addition to non-delivery complaints, customers also telephone to request:

1. The delivery of merchandise being held by the store until notified to deliver (hold-to-notify).
2. The pick up of undamaged merchandise at their homes for credit or exchange.
3. The replacement or repair of merchandise received in damaged condition.
4. The make-up of merchandise shortages.
5. The cancellation of an order for delivery of merchandise.

The general procedure followed is for a "complaint taker" to receive a message from the customer over the telephone and to record the pertinent facts on a "tracer" or a "pick-up" form (see Fig. 12). If the call is a request to pick up merchandise, the "pick-up" form (not shown), which is an order for the delivery department to pick up merchandise at the customer's home for return to the store, is used. The "tracer" form serves as a record of all the facts of all other complaint situations and of the actions taken to solve each one.

The "tracer" form goes to an information desk where various records are centralized. An initial check is made here to determine "Where is the merchandise?" This is the motivating question of the T.D.S. department. If the available records do not answer this question, the "tracer" form is given to a "tracer analyst" whose duty is to attempt to locate the merchandise or to solve whatever situation is presented to her on the tracer form. The tracer analyst must answer the question with facts obtainable from the customer and from within the store, since they are not in the available records.

The Procedure Followed

The writer was employed by the store as a part-time employee and underwent two days of regular employee training before being introduced to the supervisor and personnel of the Telephone Delivery Service department. The general order of the research procedure was to:

1. Make a survey of the department to determine the nature of the activities, the general character of the problems, and to get acquainted with the personnel.
2. Examine the work being done to establish a measure of production and cost.
3. Prepare graphic flow and process charts of the present procedure and a department layout of equipment and physical facilities.
4. Make time studies for work measurement and production standard setting purposes.
5. Draw conclusions from the experiences and the data collected.

CHAPTER IV

DISCUSSION OF RESULTS

The General Survey

A survey of the department was made to become familiar with the individual operations, the operators, the morale of the group, the general tempo of the work, and with the facilities. Since it was not known at this stage of the study why things were being done as they were, this period was used to jot down all "obvious" apparently improvable procedures, equipment uses and needs, and physical arrangements.

The general character of the problem in the department was varied. First, in contrast with the general factory industrial engineering approach which generally considers the physical attributes of greater importance than the people, the people working in a department store are of greater importance than the things with which they do their work.

Second, the people working in the department enjoyed considerable group social activity. The individuals had differences between themselves, but there was a group unity very much in evidence. One characteristic among the individuals was "ownership" which probably is a means of gaining individualism in a group after becoming a member. An example of this was the labeling of a chair or a pencil, similar to all others, as "this is Mary's" chair or pencil. Work places, telephone headsets, and rubber fingers took on an ownership aspect. This situation has to be considered in the over-all problem of making any suggested changes. A change which results in a worker being deprived of

her "possessions" could very well create an individual as well as a group morale problem. Such was the case when an operational department was recently moved from its long standing location to another one which of necessity physically separated into several rooms a group who had previously enjoyed a face-to-face work place arrangement in a large, open room. The group morale was observably poor for several weeks.

Third, the relationship existing between the complaint taker and the customer who makes the complaint over the telephone is a personal one. The complaint taker after listening to the pleas of the customer may feel that the customer's problem is of immediate importance. It is. However, the complaint taker does not follow through the complaint after she has recorded the facts on a complaint tracer form. A tracer analyst is responsible for solving the problem and the customer's pressure is only indirectly felt by her. It was observed that when the complaint taker's sympathy was fully aroused she would tend to become frustrated because she could not completely solve the customer's complaint without going beyond the function of her operation. If she felt compelled to aid the customer the result was a delay for the customer while she kept the telephone line open, delay in the work cycle, a tied up telephone line, and an interruption of other procedures. The problem is one of training the complaint taker to resist the appeal to her sympathy and replace it with a necessity to follow a definite procedure which is for the customer's benefit. The expense of the duplication of effort and records prevents using the employee drive described here.

Fourth, the character of the entire department is predicated upon its function of manufacturing completed complaint tracers. Information

is required to accomplish this end. The information is in what may be termed "mechanized records" and in personal and non-mechanized sources. Mechanized records are those which are made of conditions in the store which result in a particular customer's merchandise not being delivered, i.e., wrong(bad) address on the package, credit office's request that the merchandise be held pending credit clearance, customer not home when the package was first delivered, and merchandise being held for repair or refinishing before delivery. A mechanized record, in the form of punched cards, of the packages that are on the delivery route truck each day is also available. These types of records are sent to the Telephone Delivery Service department as a daily routine by the departments and operations involved in making the records. Personal and non-mechanized (non-routine) sources of information are those which reside in individuals throughout the store. Their concern with the merchandise and the customer may or may not be a personal one, but in any case they do not, as a regular routine, report their involvement to the T.D.S. department. The character of the complaint tracing procedure, when immediately available records do not furnish the answer to the department's question of "Where is the merchandise?", is one of digging out an answer from the personal sources of information in the store. The successful tracer analyst has to have the aptitudes of a detective, i.e., deductive reasoning, imagination, and a proper perspective and attitude toward question asking.

Fifth, since the relationships in complaint solving are with people in and out of the store who individually tend to act differently under similar circumstances, it is indicated that no positive, unalter-

able pattern of work standardization can be established for the employee to follow under all circumstances. This problem was reflected in establishing a standard time for production control and as a measure of the work done. Therefore, a characteristic of the work is its variability due to human relationships which are outside of control possibilities. This variability and its control is perhaps the biggest general distinction between department store operation and factory work. This same variability requires a considerable amount of non-routine decision making by the employee. The extent of the requirement to make decisions is the most important factor in differences between jobs. The decision-making abilities required for the various operational jobs may be used as a key factor in a job evaluation program. The impression gotten from department store work is that a higher level of decision making is expected of the average employee compared with what is expected of the average industrial worker.

A Measure of Productivity

The unit used to measure production performance and costs in a manufacturing plant might be the number of units of product turned out or cost per unit. There is no standard unit of product in a department store in the same sense as there is in manufacturing. A new concept of "product" had to be adopted for use in this experiment. There could be as many products as there were major classifications of operations in the store. For example, the number of each type of complaint processed in a given number of man-hours could be used. This measure would be entirely different from that of the number of customer bills processed

or alterations of clothing of each type accomplished per man-hour. There would also be differences in the cost of performing each of these operations. The differences exist not only in quantitative terms, but also in qualitative terms. Thus, the experience in the Telephone Delivery Service department indicated that each major operation must measure its production and its unit costs on an individual basis peculiar to the product of that operation. Each of the operations of a department store is a service operation conducted for the benefit of the merchandising group, therefore, there is no end-product of a concrete nature as there is in manufacturing. The unit of the service itself is measured.

The problem of determining the measure of production in the T.D.S. department was approached from the viewpoint of what was being done and what was the end result. These two factors appeared to be inseparable. It has been pointed out that a completed complaint tracer was the end result of the department's operation. The present method of measuring production is to lump together all completed tracers of whatever type and divide the total number of completed units by the total number of man-hours taken during the period covered. The quotient is the production of completed tracers per man-hour. This production figure has been used by management for some time. However, close analysis of how tracers were processed and subsequent time study indicated that such a production measurement procedure does not indicate the true state of affairs in the department. The analysis of the processing procedure indicated that tracers tended to be completed at certain definite points in the processing sequence. That is, some

tracers are completed at the initial point of the procedure because the merchandise was found to be on the delivery truck for that day. If this was the case, the customer was called and told to expect the merchandise during the day. Other tracers require considerable time for the merchandise to be located, or for some conclusion to be reached as to its whereabouts. There are, of course, other tracers which are completed at some stage between these two extremes. A random sampling of various past periods was made to determine what percentage of the tracers, on the average, were completed at the point in the sequence of operations where internal records are checked. This point is known as the record center. The results are shown in Table 1.

Table 1. Per Cent of Total Tracers Completed By Checking Internal Records.

Sample No.	1	2	3	4	5	6	7
Number completed by checking internal records	26	27	17	25	20	39	22
Per Cent of total	41	29	20	29	30	41	29
Number completed by other means	38	67	68	61	47	57	55
Per cent of total	59	71	80	71	70	59	71
Total number	64	94	85	86	67	96	77
Per cent of total	100	100	100	100	100	100	100

Average per cent completed by checking internal records: 31 per cent.

The average per cent of tracers completed at the point in the sequence

where internal records are checked was 31 per cent. This means that about one-third of the present measure of production is composed of the type of complaint which requires the minimum total time for processing. The present report figure may hide the influence of a large number of short time tracers or a disporportionate number of long time tracers. Such an over-all figure does not give the department supervisor or management the information required for control over the operation. The subsequent time study analysis indicated that there was no pattern of tracer completion beyond that already indicated.

The conclusion based on the analysis made to find a measure of production for the department was that the operation resulted in two groups of product: (a) tracers completed when they were checked at the internal record point and (b) all other types of tracers. The discussion of standard times expands on the unit of measure theme and indicates how a standard time was determined for these two classes of complaint tracer production measurement. Of course, the over-all average production figure now used is the only practical measure under circumstances where work measurement is not done. Without work measurement a time to be allowed for each of the two classes of tracer production is not known and can only be guessed.

Work Measurement

Criteria.--The problem of work measurement in the department store environment required considerable attention. Standard times for production and cost comparisons were required after the unit of production was determined. Criteria for both the work and it measurement had to be

established before the work could be measured. It has already been demonstrated that there are characteristics common to both department store and industrial work and that such characteristics exist in the work of the telephone delivery service department. The criteria for the measure of the work, i.e., time standards, in this department were as follows:

1. Attainability. Any time standard set as a normal time for comparison should be attainable.
2. Applicability. The standard should be applicable to the operating conditions or environment in which measurement takes place.
3. Permanence. Standards cannot be subject to casual change, but should change only as operating conditions and methods themselves change. Consistence of determination is implied.
4. Equitability. Any standard time set for a particular operation should be a basis for comparison between the time demands of other operations on workers.

These criteria should have equal applicability in all department store operational activities.

Statistically determined standard times.--Consideration was given to two methods of work measurement--statistical and stop-watch time study. The statistical approach has much to recommend itself to department store application. First, it is "safe." The standard time may be determined

to be an average of the past production times or a time may be selected which is the lowest time in the upper-quartile of an array of past production times.(12) Both times have been attained. The drawbacks of the average time are that it may be considerably improved upon by a substantial number of employees and it offers little incentive. The upper-quartile time provides an incentive to a majority of workers. It is also attainable, because 25 per cent of the times are above it. Thus if a statistically established upper-quartile time is used as a standard time, it is an attainable time, it is based on reliable experience data, it is realistic in terms of special operating problems, and it can be quickly determined. There are several objections to setting standard times on either of these bases. One is that the data reflect conditions which are accepted as they exist. This acceptance of existing conditions is implicit in the use of past performance records. Another objection is that a standard time determined statistically is an entirely subjective conclusion which is not based on any concept of "what should be" as compared to "what is." The standard time is based on the considered judgment of management which, in turn, is not based on any objective study. A third objection is that the standard time is based on a statistical mixture of skill, effort, pace, delays, methods, conditions, and results. It is not based upon a synthesized defined norm of each of these qualitative and quantitative attributes. The standard time is a product of each of these, but their individual contribution to the final time is hidden. The various elements of a task are not separated, identified, and their influence analyzed. Although the statistical procedure is easy to use and its simplicity attractive, it was discarded

as a means of measuring work in a department store.

Synthetic time standards.--The recent development and publication of synthetic time standards for elemental motions known as Methods-Time Measurement has created a challenging situation.(13) These data may be applied to all work of a manual nature and yield consistent standard times through the organization. Its use required special training which eliminated it from this experiment. It does represent, however, an approach to work measurement which is applicable to many department store operations.

Stop-watch time study.--In developing engineered time standards an individual job or operation is analyzed, its elemental motions identified, needless ones eliminated, others combined as appropriate, and tools, equipment, work-place layout, and work flow are standardized. This analysis and standardization of the job may be done either before or after the time study. The time study of the T.D.S. department was done before standardization, but after job descriptions were made.

By accumulating the time readings for all elements of the job and applying a "leveling" or normalizing factor to compensate for abnormal skill or effort on the part of the worker, a rate is derived which is a normal time for an operation. By allowing for personal time and other delay factors the normal time becomes the standard time for all workers performing the same operation under standard conditions.

There are five distinct steps in the setting of a standard time by means of time study. Mundel describes them as:

A. Defining the standard of measurement.
B. 1. Recording the standard practice.
   2. Observing the time taken by a particular operator.
   3. Rating or relating performance to the standard.
   4. Application of allowances.(14)

A discussion of each of these steps as it is related to the department store environment follows.

Definition of the standard of measurement.--A standard time has been defined by Mundel as being:

> A specified proportion of the amount of time necessary to accomplish a unit of work, using a given method, under given conditions of work, by a worker possessing a specified amount of skill on the job and a specified aptitude for the job, when working at a pace that will utilize, within a given period of time, the maximum physical exertion such a worker could expend on such a job without harmful physical effects.(15)
>
> Within this definition, the following word meanings are intended:
> Skill--the ability to do a job in the proper manner; the ability to repeat a definite muscular pattern. Other worker characteristics being constant, the higher the skill, the faster the possible pace before muscular co-ordinations fail.
> Aptitude--physical fitness for the job.
> Harmful physical effects--muscular and mental deterioration, caused by the work, which is not dissipated during the typical usage of the interval between work days.(16)

An addition may be made to Mundel's definition of skill to use it in department store work. In addition to being able to follow a definite muscular pattern, the skilled worker should be able to follow a definite mental process pattern which is exclusive of motion. This consideration is based on the assumption that a mental process pattern can be determined and that it is exclusive of motion. The mental process pattern situation considered here exists when responses of a part routine and

part creative, and creative nature are forthcoming from the analysis of the facts involved. The degree of an individual's capacity to analyze facts which may vary from situation to situation and to act upon the analysis in a predictable pattern could be a measure of skill. This concept of skill could be applicable to jobs which have a high degree of mental demand, but practically no manual demands.

Recording standard practice.--The flow chart and the department layout (see Figs. 11, 2 and 8) represent the broad conditions under which the work was done. Job descriptions represent the demands of the job upon the worker. The process chart (see Fig. 11) represents the work content of the jobs and indicates what the operation's elements might be. These forms were used to record the existing conditions. After a study was made of all the operations and their major elements, recommendations were formulated. The recommendations did not result in a standard practice, as such, but indicated that standard practice recommendations could be derived.

Observing the time taken by an operator.--Continuous stop-watch readings were made. This method was adopted for all time study work in the T.D.S. department. It was adopted because it forced the observer to see and record everything that occurred during an operation. Numerous delays and interruptions occur in department store work because so many of the operations are not isolated from other workers, the telephone, clerical errors in recording information, and the customer. It was felt that the delays, interruptions, and other variables were just as important to the analysis as the times for the work elements. Continuous timing tended

to force the recording of these variables. Snap-back timing presented temptations for occasionally skipping the recording of variables. Continuous timing seemed to allow for greater concentration upon the division of the operation into elements and upon the skill and pace of the operator as the timing was being made rather than upon the mechanical handling of the watch.

The relationship of the worker and the customer in many department store operations presents a time study problem peculiar to such work. The "maximum physical exertion" expended by the worker is limited by the effect the customer or the procedure has upon the worker's efforts. When the customer does control worker effort, a situation is created which is analogous to a machine controlled operation. In such an operation no matter what the operator does in pace or skill the machine time portion of the operation cycle cannot be shortened. The analogy ends there, however, for unlike the machine time being out of the control of both the operator's pace and skill, the customer's pace may often be increased by the skill of the department store worker. This may be done in spite of the limitations of predicting customer behavior. A measure of skill in customer relations may be the ability of the employee to increase the customer's pace and thus reduce the time spent to give a definite normal amount of service. This idea holds only for non-selling operations which involve communication with customers or other employees.

The normal operator.--The basis of all time standards is the work expected from an average operator working under defined conditions, using defined methods, and applying himself with a defined skill at a defined

pace. Pace and effort are synonymous. The greater the pace or speed the greater the effort required. The normal or average operator has to be defined as well as the conditions under which he must work. A definition of a normal worker was required for use in normalizing, or rating, time studies made in the department store. A return to fundamentals was required to reach such a definition. The normal man is a mental image for each job for which a standard time is to be determined. The normal man for a particular job should be an average "qualified" employee. The qualifications can be defined by a job description which spells out the requirements for skill and knowledge. Thus the defined average qualified employee is one who meets the minimum requirements of the job description and receives the base pay for the job. The standard time should be set for this defined individual. The work standard measures the amount of work that should be done for the base pay. Carroll believes that "Fair standards should be based on the normal skill of the job class that includes the work being measured."(17) Carroll also points out that "the elements allowed in the standards must correspond with those required of the normal qualified worker."(18)

The normal pace.--Normal times are equivalent to the observed time multiplied by the ratio of the observed pace and the defined normal pace. The normal pace to be used as a reference point cannot be described with any success. Industrial engineers may be trained to compare observed pace with examples of a predetermined normal pace. Such an example may be a man of average build walking three miles per hour. Another is a man dealing 52 playing cards in four piles in .45 minutes.

These definitions of normal pace are objective.

Pace in the manual, semi-manual, and machine controlled operations in the store was easily observed and rated. Such ratings, when applied to the observed times, should result in standard times which are directly comparable to standard times for similar work in industry. There is an indication in the literature on setting time standards for office work that an office job's standard time would not be comparable with the standard time for an industrial job with similar work content not on incentive. It was observed that department store workers tended to work at a lower level of pace than generally prevails in industrial work. That is, at a pace generally lower than that displayed by a man walking at a speed of three miles per hour. Such a lower level of pace seems to be sanctioned by general custom. There is no other reason for its acceptance. The existence and recognition of a general pace which is slower than the general industrial pace raises a question of policy. Should time studies of department store operators be rated on the same pace scale used for industrial time studies? If department store work is rated on this scale, the time standards established will be too high for accomplishment by any significant number of operators. This will be true, if the assumption that a lower pace level generally exists in department store work is true. Will time standards, to be useful in department stores, have to be computed with ratings which are based on a concept of normal at a lower level of pace than is now generally accepted--say a walking speed of 2.4 miles per hour (80 per cent of three miles per hour)? Or should the present pace scale be continued, but the standard time be set at 66,75, or 80 per cent of the normalized

time? One practitioner states that a satisfactory work load for office work is

> the number of units of work at the applicable standard unit time rate that can be produced by an average employee at the rate of six standard man-hours of work per eight-hour day. With the addition of certain allowance factors for fatigue, personal needs, etc. the result is interpreted as a standard minimum operating efficiency of 87.5 per cent.(19)

This efficiency is expected without any financial incentive being involved. Some office managers indicate the belief that management should expect production to be around two-thirds to three-fourths a full potential days work in return for the payment of base wages alone.

The conclusion to be drawn from the above discussion as it applies to work measurement in the department store environment is that the production to be expected of workers working without financial incentive on worker paced operations is approximately 80 per cent of the standard normal time before adjustment for allowances.

Allowances.--Allowances for delays, interruptions, and personal time were considered next for determining the standard time from the normal time.

The definition of the standard of measurement indicated that the standard time was a time value which permits the operator to produce work in the specified time or less throughout the normal working day. The rating of the individual provided for the fatigue involved in the operation. However, such rating does not consider personal time requirements, delay due to irregularly occurring elements, or allowances for machine time. The data presented by Mundel was used as a guide to allowances.(20) There is a twenty minute rest period given full-time

workers during the day in the T.D.S. department. This time is equal to 4.2 per cent of a 480 minute day. It was observed that personal time in addition to this was necessary during the day so an allowance of 5 per cent was used.

Where a machine time type of element occurred in the T.D.S department, the operator was actually attending to her work and little or no rest resulted. Her attention was invariably demanded so mental alertness was required. Waiting for the telephone to be answered may have been classified as a "machine controlled" element. It was, however, considered to be an unavoidable delay caused by the environment and inherent in the operation. This view was taken of this particular element for the sake of analysis. When its analytical usefulness was ended the element could have been considered to be a part of the cycle during which time the operator rested and should be charged for it by a negative allowance. Such delays are inherent in most department store operations where a human-to-human relationship exists to a considerable extent. Compared to an industrial human-to-machine time relationship which is measureable and predictable, the person-to-person relationship delay times are measurable, but not as predictable. Person-to-person delays in department store work seemed to have limits of time used. Such limits were probably caused by the work demands upon both individuals and a business-like attitude, rather than a social attitude, between the individuals involved. Because there was evidence of limiting factors characteristic of each type of delay observed, an average of each type was used for application to the normal time.

Making the time studies.--The application of the generally accepted time study techniques was experimentally attempted in an environment which presents several important difficulties. One of these is the mixture of activities that occur in a department store. An employee can have a job that ranges from an entirely creative activity such as fashion photographer or advertising layout to the entirely manual activity of sweeping the floor or moving merchandise in the warehouse. Work measurement, to be successful, must be applicable to the entire range of department store operational activities. Work which is entirely creative can be measured, but it is difficult to control. The work in the Telephone Delivery Service department is not creative as such. It does, however, require a high degree of imagination and an aptitude for deductive reasoning, i.e., reasoning from the general to the particular, in certain phases. These two abilities are required so that an answer could be found to the question "Where is the merchandise?" The measure of skill used was the pattern followed in attacking a complaint problem. The mental pattern was displayed by the hesitation that occurred between the expected procedural steps, the sources questioned, the phrasing of questions, backtracking, sureness in approach, and interest in the work. Another difficulty encountered was the small amount of physical pace existing in the operations. It was finally determined that pace would be judged by both physical movement and the apparent tempo of the mental aspects of the work. There was an observable direct relationship between the operator's mental skill and the pace of her physical movements. Care was taken, however, not to allow the judgment of one attribute to unduly influence the judgment

of the other. It is admitted that the concept of pace having both physical and mental aspects is qualitative. But it is a useable reference of a defined state.

Determination of Standard Task Times

Normal time for processing tracers.--It is believed that the complaints that were processed while time studies were being made are representative of the average types of complaints encountered in the daily work. A comparison was made between a random sample of the types of complaints flowing through the department and the types of complaints that were processed while time studies were made. The results of the comparison are shown in Table 2. This comparison was made to test the acceptability of using a weighted average of the element normal times to calculate the normal time for the total tasks being measured. Direct addition of normal element times to get the normal task time was not possible because the frequency of occurrence varied between elements. The calculation of a weighted average of normal element times surmounts the varying elemental frequency occurrence problem in determining the normal time for the tasks studied. The results of the calculation of the normal weighted element times, which add up to the normal time for the tasks, and the data used are found in Table 3. The normal time for processing furniture complaints is 3.13 minutes. The normal time for processing small package complaints is 5.32 minutes.

The normal time for furniture complaints does not include any of the work done at the furniture warehouse necessary to processing certain types of furniture complaints. A trial time study was made of the ware-

house operation. This study indicated that time contributions could vary from .80 minute to seven minutes per tracer request received at the warehouse. The time depended on the type of tracer problem involved and the depth of the search necessary to locate the merchandise. The method used to search for the merchandise involved considerable walking and searching for both merchandise and people as well as a record search. It was felt that although a time study could be made an unrepresentative standard time could result from an attempt to time study the operation under present conditions. Complaint processing time contributed by the warehouse personnel was deemed to be a variable time and its measure beyond the scope of this study.

Allowances.--The normal times calculated for furniture and small package complaints were adjusted by allowances for personal time and delays to determine the standard time for each of these two tasks.

An allowance of five per cent for personal time was indicated in earlier discussions of allowances. The calculations shown in Table 4 indicate that an allowance for delay of 29 per cent should be made for furniture tracers and 26 per cent for small package complaints. The delay allowance for the record center proposed in the "Concentration of Records At One Point" section which follows appeared to be 19 per cent.

Calculation of the standard times.--The following standard times were calculated as shown:

Standard time equals:

(Normal time) plus (Normal time)(Allowances in per cent)

1. Furniture complaint:

   3.13 plus (3.13)(29 plus 5) equals 4.19 minutes.

2. Small package complaint:

   5.23 plus (5.23)(26 plus 5) equals 6.85 minutes.

3. The record center:

   1.64 plus (1.64)(19 plus 5) equals 2.03 minutes.

Determination of standard time to write a complaint tracer.--Work measurement was applied to the tracer taking operation. The operator has direct contact with that creator of variability--the customer. The tracer taker receives complaints over the telephone and records facts pertinent to the complaint problem on a complaint tracer form. The operation is essentially one of questioning the customer to get the information required for a tracer analyst to follow-up the complaint and to solve it (see Figs. 11 and 12). The operation was not broken down into elements.

Time studies were made of six operators on four different days of a week over a period of three weeks. There were 107 observations made covering a period of 320.32 minutes (see Table 5). The shortest time recorded was one minute and the longest time was 7.90 minutes. The modal time was 2.35 minutes. These details of the study are given to preface the following remarks on rating with an indication of the depth of the study.

An attempt was made to determine a basis for rating the operator taking complaints. Analysis of the factors involved in the situation forced the attempt to rate the operator to be dropped. The

conditions were such that it was assumed that the operator was working at 100 per cent normal. First, within the limits of the range of observed times, the operation time was not entirely under the operator's control. Second, a frequency distribution of the observed times indicated that the times fell within a normal distribution curve which was skewed toward the shorter times. The data were assumed to represent fairly a sample of a variable normally distributed rather than a sample of an operation under the control of the operator greater than the population characteristics allowed. The tracer taker knows what facts must be obtained, but the customer usually does not know what facts are wanted. In the case of most operators, the customer's reactions to the necessary questions are apparently beyond the operator's control to a significant degree. The conclusion reached was that it would not be possible to rate the operator's performance under the circumstances and that an arithmetic average time per tracer filled out would be representative of the standard time it should take a normal operator to accomplish the task (see Table 5).

It was observed that one forceful operator was often able to pace the customer's response to her questions. The questions were well put with regard to their sequence and inference. This operator was very polite and made a game of withdrawing the information from the customer. The operator had developed a skill which resulted in relatively high productivity. The observer could not, however, relate this skill and its effect to any useful scale. It would appear that a study of this operator's technique by the training department might produce an ideal procedure to be used in questioning customers over the phone.

Concentration of Records At One Point

Picking up tracers.--It was observed that the department supervisor picked up tracer forms from three baskets on the tracer taker's counter. An average of three pick-up trips were made each hour. The movement of the supervisor in doing this is found in Fig. 8. The average distance covered during each pick-up was 80 feet, which is equal to 1900 feet or .36 mile each day. The average time consumed was .70 minute, or approximately 17 minutes each day. This activity was both tiring and time consuming. It tended to reduce the supervisor's attention to her job of supervision.

Operation description.--A work flow diagram (see Fig.11) was drawn and descriptions of the operations were made. The diagram and the operation descriptions are extremely useful for the purpose of analyzing the elements of each job and to see the interrelationships between them. A diagramatic representation of the activities of the operators is also an ideal training aid, since it is a visual and concise statement of the work being done. Job descriptions may be drawn from the data shown.

An analysis of Fig. 11 indicates that the second operation in the complaint tracer sequence was the same for both small package tracers and furniture tracers. It was reasoned that the two similar operations should be done by one person working full time instead of the present two operators spending part of their time on the operation. It was further considered that not only should one operator do all the record checking operations, but that the records should be consolidated at one work place. In order to reduce the traffic in the department

and to eliminate the present necessity of walking to pick up and move tracers, it is proposed that a record desk be placed at the work place "B" location in Fig. 2. As shown in Fig. 8, locating the record desk at work place "B" would eliminate carrying tracer forms to work place "H." The proposed movement of the tracer forms is shown in Figs. 8 and 9. By placing the record desk at work place "B" the tracers may be brought to the work place by either having the tracer takers hand the tracers down to the desk by hand or by installing a conveyor belt (see Figs. 8 and 9).

Time studies were made to see if the work load at a centralized record checking desk would be too much for one operator. The standard time per tracer processed at the record center should be 2.03 minutes. This time is based on data given in Tables 3 and 4.

Proposed Conveyor Belt Installation

It was indicated in the preceeding section that a conveyor belt could be used to carry the tracer forms from the tracer taker down to a record desk (see Fig. 8). It is suggested that a simple conveyor belt be constructed over the tracer taker's counter and supported on the wall as shown in Fig. 9. The belt would be eighteen feet long, about eight inches wide, and about four inches deep. It could have a light weight fabric belt driven by a small electric motor connected to a V-belt drive. The estimated parts cost is twenty dollars. The belt would be quiet, safe, and would eliminate all present handling of tracer forms up to the record desk.

Revision of the Complaint Tracer Form

It was observed during the work measurement period that certain types of information were being written repeatedly and that such writing was not a special message to anyone, but rather the recording of facts or the result of an action. The facts usually were a date, a time, or a sales check number. The result of an action usually was a "yes" or "no" answer, or the finding of a bit of information which was not actually recorded.

Every tracer is the basis for the action of checking route cards to find out if the merchandise in question is on the delivery truck for delivery that day, or if it has been on the delivery truck during the past five days. Every complaint tracer also forces the checking of recorded bad addresses, credit office holds, and a list of deliveries sent out short certain merchandise (ship shorts). Each of these checking actions were formerly recorded on the tracer by a written notation. It was obvious that at least one notation and often several had to be made on every one of a daily average of 150 tracers. The time used for these repeated notations was eliminated by the placement of "message boxes" on the tracer form (Fig. 12) which may be quickly checked by the clerk. The result is a saving of time, writing effort, and an increase in attention to the job itself.

Other less important changes were made in the format of the tracer form. The word "Date" in the upper left-hand corner was moved so that the operator's pencil could proceed directly to the point of recording the customer's name without the pencil point having to be moved about three inches as was formerly required. It was also noticed that the vertical placement of the words "Mail, Phone, and Person" on

the bottom line of the left-hand side of the tracer form (see Fig. 12) put these words so close that the appropriate word had to be circled rather than checked. Circling with a pencil, in this case, required a longer time than checking a word with a pencil because of the positioning and attention time required. The revised form reduced the time for recording this information by spreading the three words on one line for easy and quick checking. The tracer form was also altered so that more writing space was available on the face of the form.

CHAPTER V

CONCLUSIONS

Specific Conclusions

The following specific conclusions were drawn on the basis of the present investigation of a particular department store operation:

1. Work standards based on past records rather than on work measurement based on time study are an imperfect basis for control purposes in the Telephone Delivery Service department.
2. The work done could be measured by time study with pace and skill judged against a standard scale. The result was a record of the present operation and a measure of task times. Both form a basis for proposed changes and for managerial control.
3. Standard times for department store clerical operations can be determined by work measurement, i.e., complaint tracer processing.
4. The operations in the Telephone Delivery Service department could be improved with the following changes:
   A. Concentrate record checking operation at one desk.
   B. Install a conveyor belt to carry tracer forms to the end of the tracer taker's counter and thus eliminate all present manual handling of the tracer form up to that point.
   C. Revise the tracer form so that writing is reduced.

Use message blocks for checking to replacing writing.

General Conclusions

The following general conclusions were drawn from this experimental application of industrial engineering techniques to department store operations:

1. Industrial engineering techniques can be used outside of the industrial environment. Industrial engineering (scientific management) is a way of thinking about and solving business problems and is applicable to all business activities.
2. There is an indication that the operator's analytical skill is as much a part of the basis for rating the operator as is manual skill in industrial work.
3. Skill in department store work involves not only being able to follow a definite muscular pattern, but also being able to follow a definite mental process pattern which is exclusive of motion.
4. The degree of an individual's capacity to analyze facts which may vary from situation to situation and to act upon the analysis in a predictable pattern could be a measure of skill applicable to jobs which have a high degree of mental demand, but practically no manual demands. This is an area for further research.
5. Some way, perhaps statistical, should be found for separating the effect of variability due to human relationships which is characteristic of department store work from the

job variables so that the job elements themselves may be measured.

6. The operational activities in a department store are fertile ground for the application of industrial engineering techniques.
7. There is a need for job analysis and job standardization as well as production, cost and manpower control based on work measurement in the department store.
8. There are characteristics common to both department store operations and industrial work which permit individual department store operations to be analyzed and measured as are industrial operations.
9. The people working in a department store are of greater importance than the things with which they do their work.
10. There is little information in the literature to guide personnel interested in work measurement in the department store environment. Synthetic time standards may be an answer to such work measurement.
11. The problem of rating an operator's performance, in terms of effort, skill, and pace, in the department store environment is only partially solved. Many tasks are mental in character rather than manual.
12. Department store workers tend to work at a lower level of pace than generally prevails in industry when the work is on a non-incentive basis. This pace seems to be lower than the industrial pace expected for day-work wages.

13. Time standards based on a rating of pace as used in industry may prove to be consistently too high for attainment by the average department store employee.

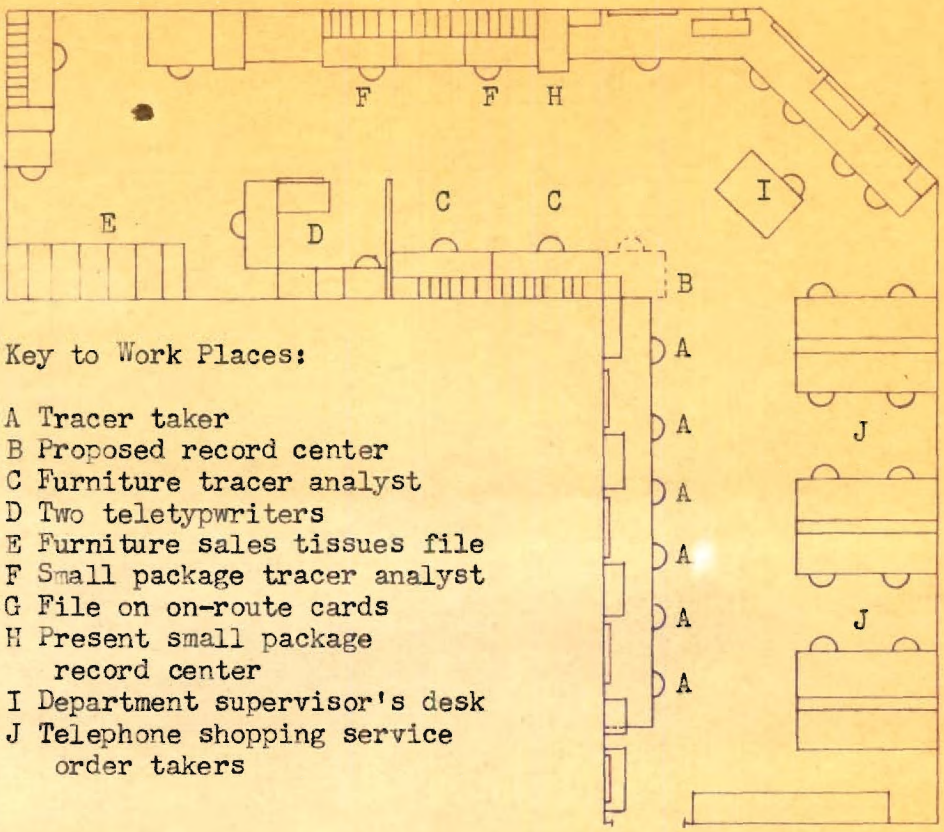
14. The concept for normal pace may perhaps be set at 80 per cent of the generally accepted normal walking speed of three miles per hour, or 2.4 miles per hour.

15. The production to be expected of workers working without financial incentive on worker paced operations in a department store is approximately 80 per cent of the industrial standard normal time before adjustment for allowances.

16. Standard task times may be determined for most department store operational jobs by the application of time study techniques and the isolation of variables affecting the operation being measured.

17. Continuous stop-watch readings seemed to force the observer's attention upon both work elements and the delays.

APPENDIX



Key to Work Places:

A Tracer taker
B Proposed record center
C Furniture tracer analyst
D Two teletypwriters
E Furniture sales tissues file
F Small package tracer analyst
G File on on-route cards
H Present small package record center
I Department supervisor's desk
J Telephone shopping service order takers

Scale: 1/8" is 1'

Fig. 2. TELEPHONE DELIVERY SERVICE DEPARTMENT LAYOUT AND WORK PLACE IDENTIFICATION.

Fig. 3. AN INDIVIDUAL TRACER TAKER'S WORK PLACE AT THE TRACER TAKER'S COUNTER. ONE WORK PLACE "A" IN FIG. 2.

Fig. 4. A VIEW OF THE TRACER TAKER'S COUNTER AND THE LOCATION OF ALL "A" WORK PLACES IN FIG. 2. THE PROPOSED CENTRALIZED RECORD DESK IS IN THE RIGHT-HAND FOREGROUND.

Fig. 5. WORK PLACES "I" AND "C" IN FIG. 2. THE SUPERVISOR'S DESK IS IN THE IMMEDIATE FOREGROUND AND THE FURNITURE TRACER ANALYST IS ON THE LEFT.

Fig. 6. THE WORK PLACES OF THE SMALL PACKAGE TRACER ANALYST. WORK PLACES "F" IN FIG. 2. NOTE THE CENTER TELEPHONE. IT IS A TIME SAVING DIRECT LINE TO THE SMALL PACKAGE DELIVERY SERVICE DEPARTMENT.

Fig. 7. THE PRESENT SMALL PACKAGE RECORD CENTER. WORK PLACE "H" IN FIG. 2. NOTE THE FILE DRAWER ON THE COUNTER TO THE OPERATOR'S LEFT AND OTHER RECORD FILES TO HER RIGHT. A TELEPHONE TURRET IS IN FRONT OF HER FOR CALLS TO CUSTOMERS FOR MORE INFORMATION OR TO INFORM THEM OF THE STATUS OF THEIR MERCHANDISE.

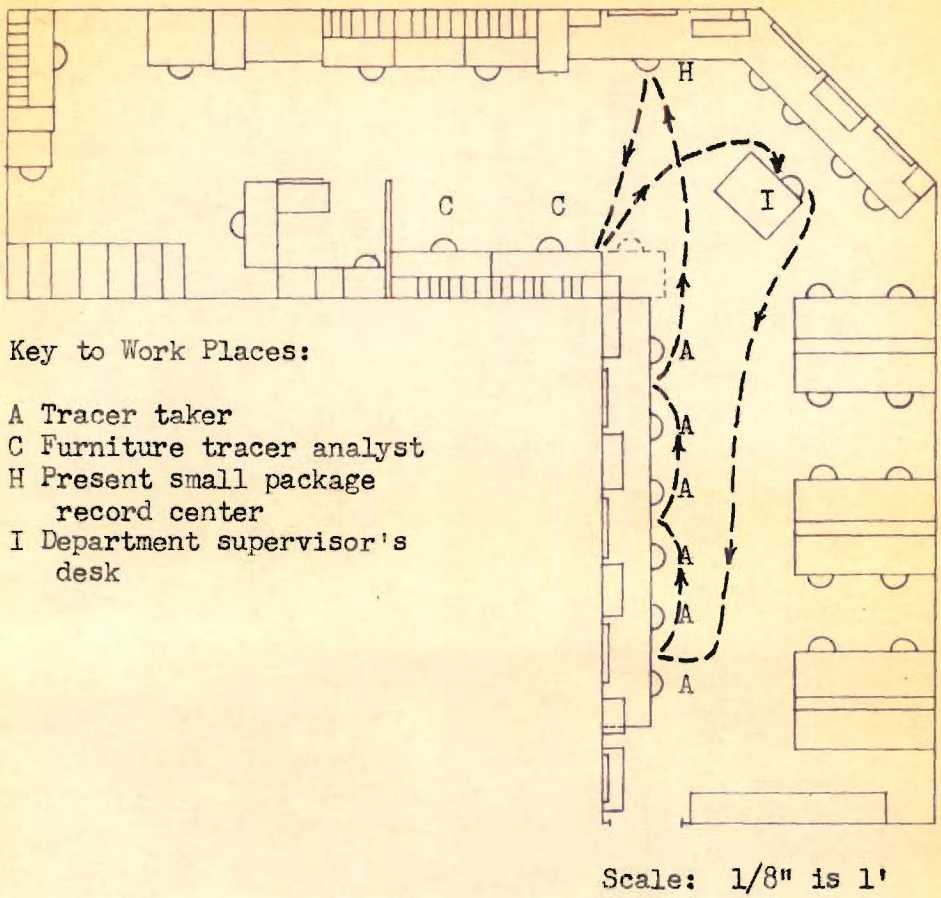


Fig. 8. THE PRESENT MOVEMENT AND PATH OF THE SUPERVISOR IN PICKING UP TRACERS, SORTING, AND DISTRIBUTING THEM.

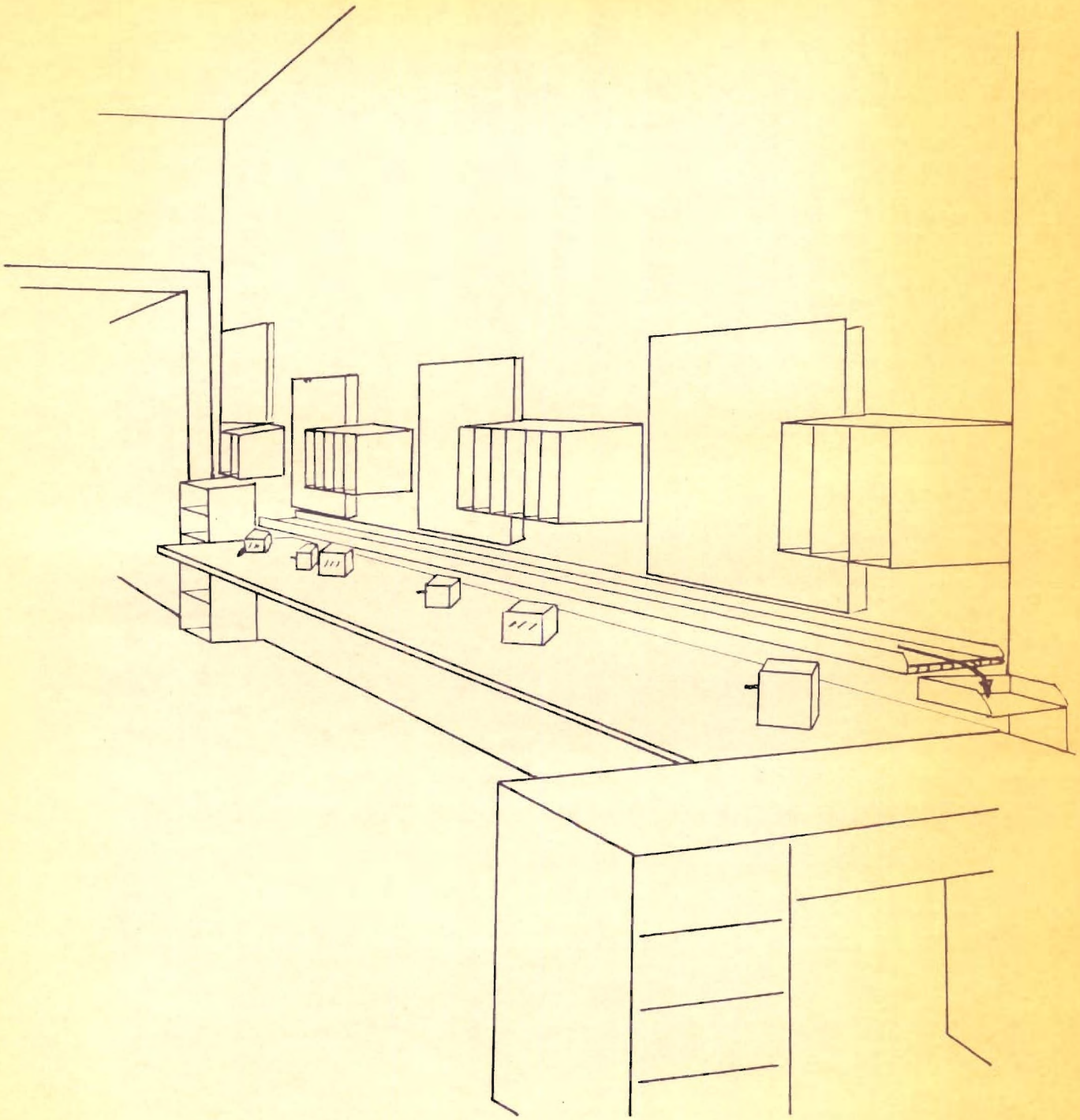


Fig. 9. A SKETCH OF THE PROPOSED CONVEYOR BELT PLACED ABOVE THE TRACER TAKER'S COUNTER. THE TRACER FORMS ARE CARRIED TO THE PROPOSED RECORD CENTER DESK IN THE FOREGROUND.

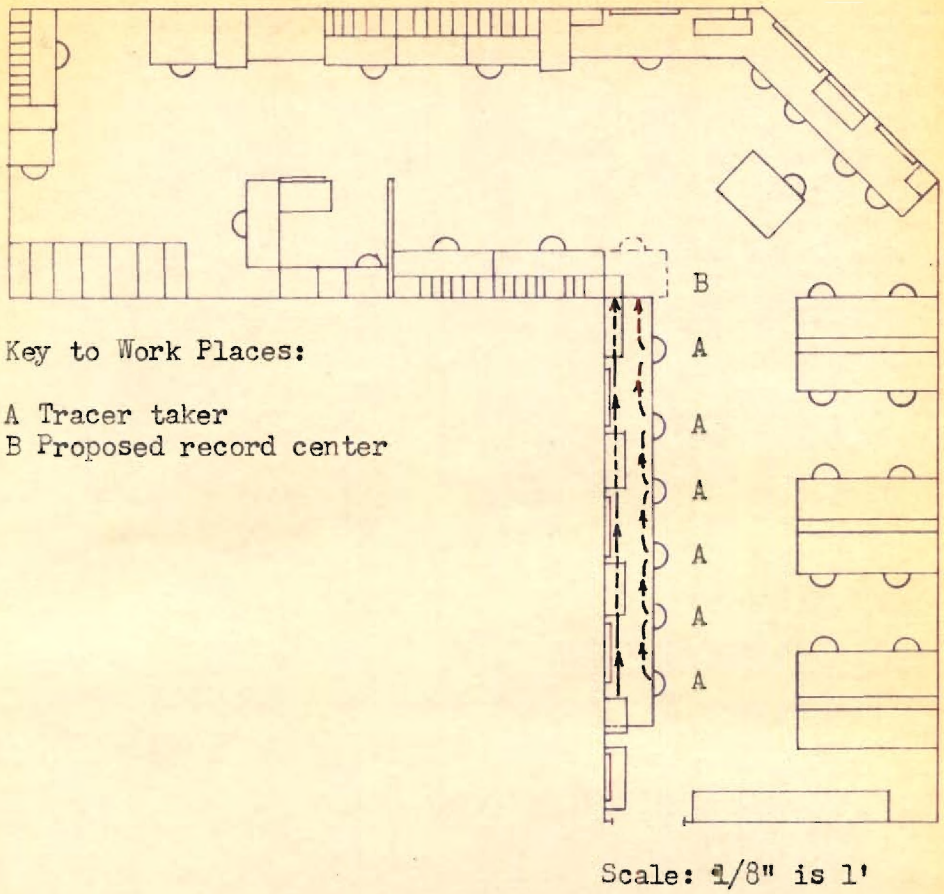


Fig. 10. THE PROPOSED MOVEMENT OF THE COMPLAINT TRACER FORM FROM OPERATOR TO OPERATOR BY HAND OR BY CONVEYOR BELT TO THE RECORD CENTER

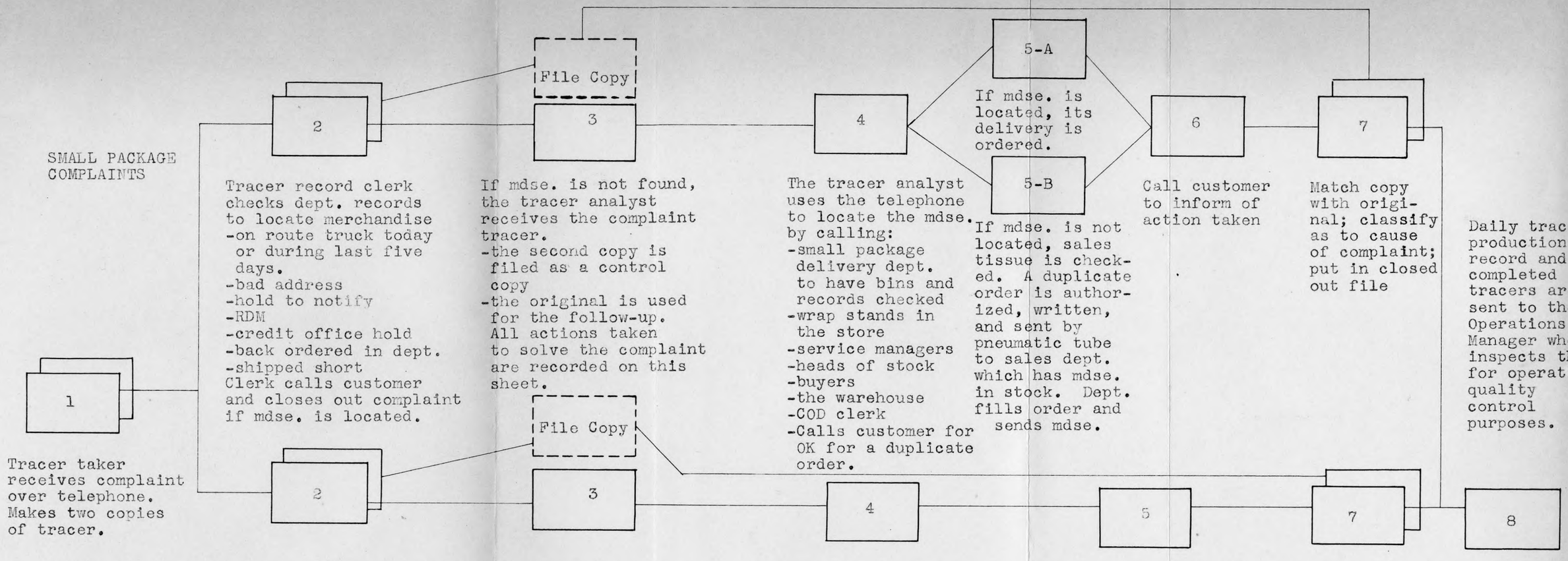
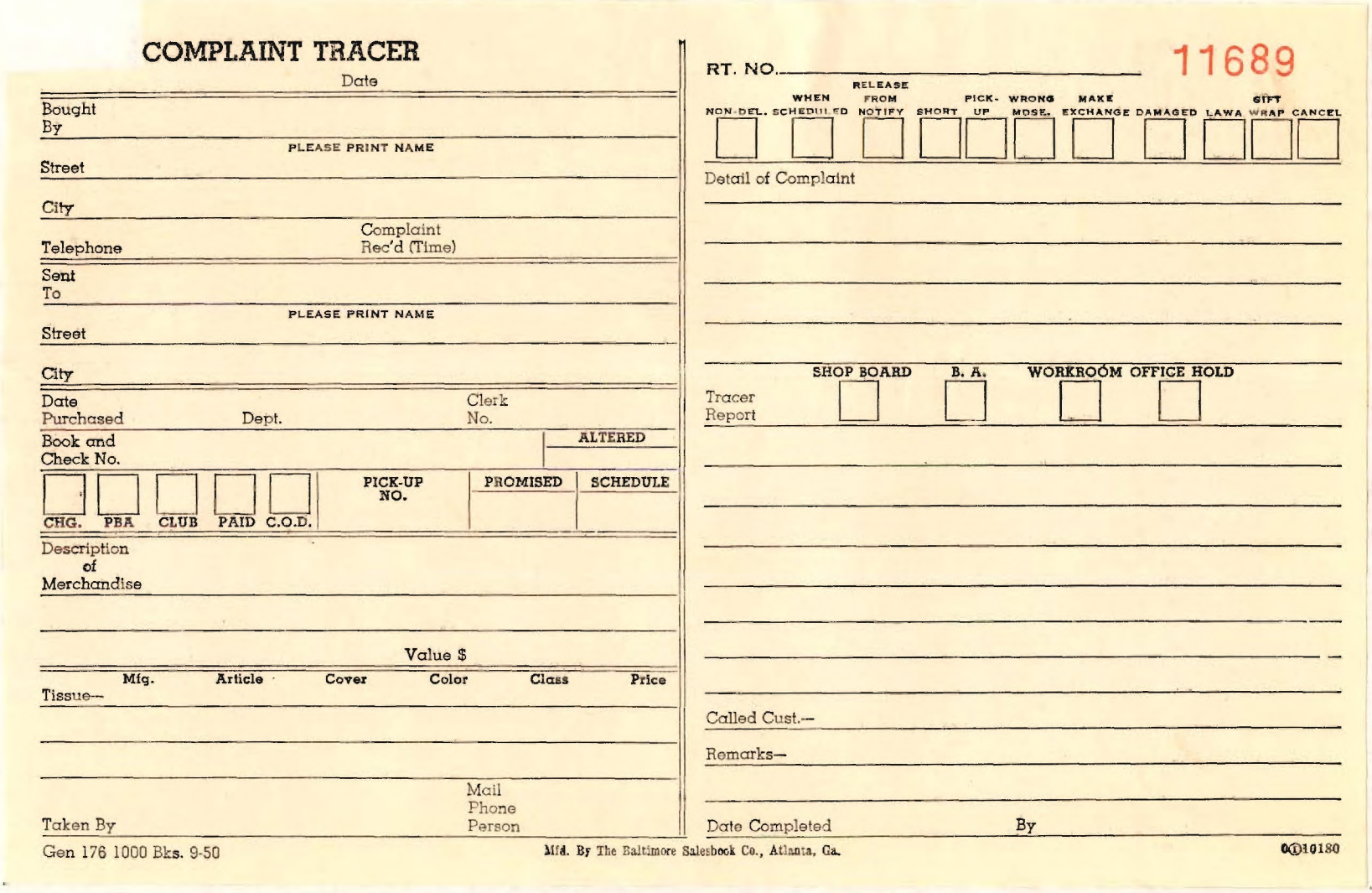


Fig. 11. THE PRESENT OPERATIONAL PROCEDURE FOR SMALL PACKAGE AND FURNITURE DELIVERY COMPLAINTS IN THE TELEPHONE DELIVERY SERVICE DEPARTMENT.



COMPLAINT TRACER

Date

Bought By

PLEASE PRINT NAME

Street

City

Telephone

Complaint Rec'd (Time)

Sent To

PLEASE PRINT NAME

Street

City

Date Purchased

Dept.

Clerk No.

Book and Check No.

ALTERED

CHG.	PBA	CLUB	PAID	C.O.D.	PICK-UP NO.	PROMISED	SCHEDULE

Description of Merchandise

Value $

	Mfg.	Article	Cover	Color	Class	Price
Tissue—						

Taken By

Mail
Phone
Person

RT. NO. 11689

NON-DEL.	WHEN SCHEDULED	RELEASE FROM NOTIFY	SHORT	PICK-UP	WRONG MDSE.	MAKE EXCHANGE	DAMAGED	LAWA	GIFT WRAP	CANCEL

Detail of Complaint

	SHOP BOARD	B. A.	WORKROOM	OFFICE HOLD
Tracer Report				

Called Cust.—

Remarks—

Date Completed

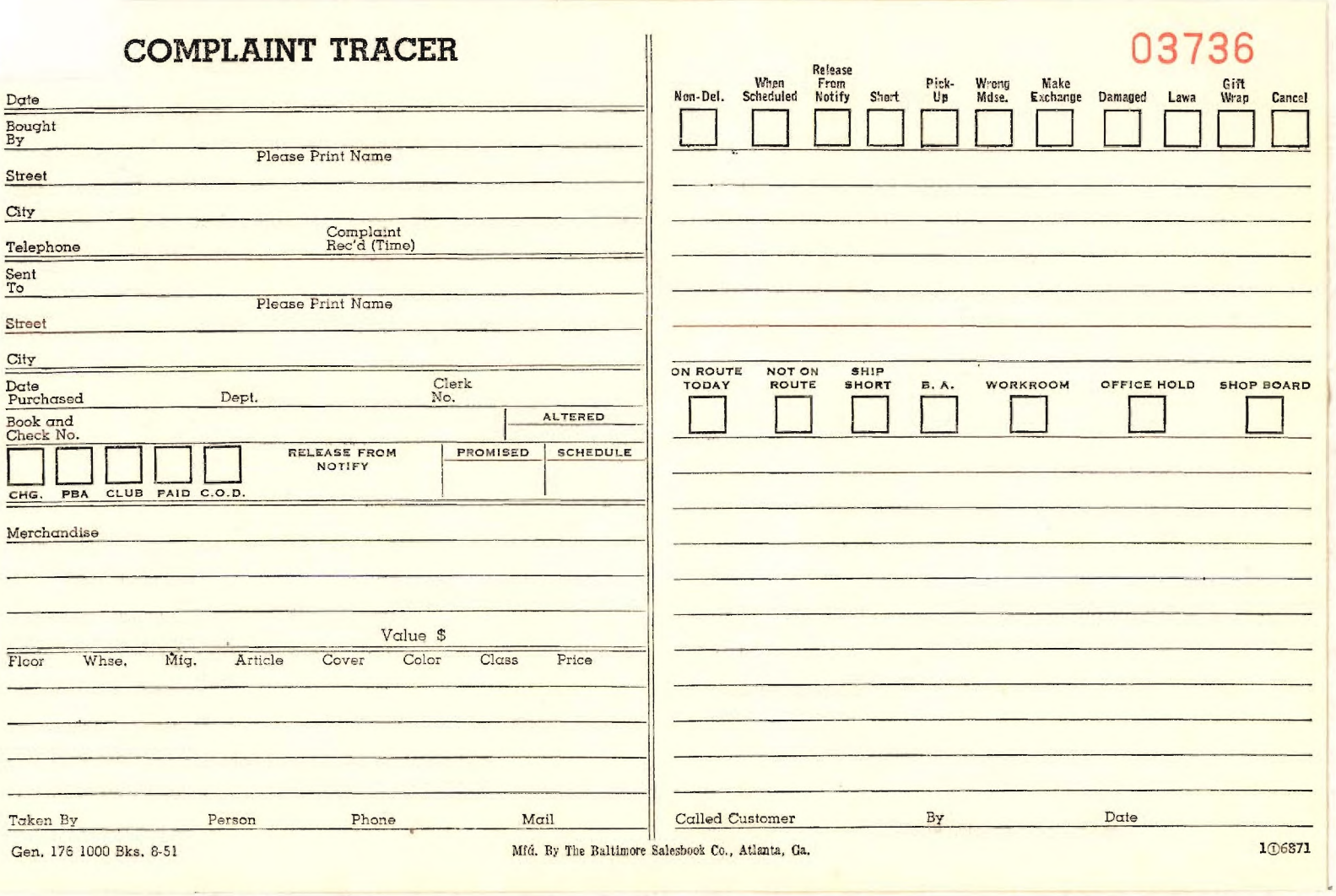
By

Gen 176 1000 Bks. 9-50

Mfd. By The Baltimore Salesbook Co., Atlanta, Ga.

0(1)10180

Fig. 12-A. COMPLAINT TRACER FORM BEFORE REDESIGN TO MAKE IT MORE USEFUL AND EFFECTIVE.



COMPLAINT TRACER

03736

Date

Bought By

Please Print Name

Street

City

Telephone

Complaint Rec'd (Time)

Sent To

Please Print Name

Street

City

Date Purchased

Dept.

Clerk No.

Book and Check No.

ALTERED

CHG. PBA CLUB PAID C.O.D.

RELEASE FROM NOTIFY

PROMISED

SCHEDULE

Merchandise

Value $

Floor Whse. Mfg. Article Cover Color Class Price

Taken By Person Phone Mail

Non-Del. When Scheduled Release From Notify Short Pick-Up Wrong Mdse. Make Exchange Damaged Lawa Gift Wrap Cancel

ON ROUTE TODAY NOT ON ROUTE SHIP SHORT B. A. WORKROOM OFFICE HOLD SHOP BOARD

Called Customer By Date

Gen. 176 1000 Bks. 8-51

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Fig. 12-B. COMPLAINT TRACER FORM AFTER REDESIGN TO MAKE IT MORE USEFUL AND EFFECTIVE. NOTE THE MESSAGE BLOCKS (RIGHT-HAND MIDDLE) THAT HAVE BEEN ADDED TO REPLACE WRITING WITH A SIMPLE CHECK.

Table 2. Comparison of Complaint Tracers Received Daily During July and August, 1951, With the Tracers Processed During the Work Measurement Period, by Reason for Complaint As Per Cent of Total.

Reason for complaint	Sample of types received daily		Analysis of complaint types in time study per cent of total				
	Number	Per Cent of total	Study 1	Study 2	Study 3	Study 4	Study 5
Non-delivery	208	51.0	46.0	44.0	85.0	72.0	57.7
When scheduled	79	19.3	37.4	30.2		14.0	7.7
Release from notify	45	11.0	8.3	2.3			11.5
Short	20	4.9	2.1	9.4	5.0		7.7
Pick-up	14	3.4		2.3			
Wrong merchandise	7	1.7		2.3	5.0		
Make exchange	12	3.0	2.1	2.3		14.0	
Damaged	8	2.0					7.7
LAWA	1	.3					
Gift wrap							
Cancel	14	3.4	4.1	7.0	5.0		7.7
	408	100.0	100.0	100.0	100.0	100.0	100.0

Table 3-A. Normal and Weighted Average Elemental Time and Frequency of Occurrence of Each Element for Furniture and Small Package Complaints.

Element	Furniture			Small Package		
	Average normal time (Min.)	Frequency of occurrence (No.)	Weighted average normal time (Min.)	Average normal time (Min.)	Frequency of occurrence (No.)	Weighted average normal time (Min.)
Read tracer	.409	23	.103	.406	48	.164
Check route card	.282	81	.247	.482	77	.312
Check route sheet	.649	6	.042	.765	2	.013
Check ship short	.194	29	.061			
Check bad address	.129	5	.007	.483	22	.090
Check tissues (sales)				4.335	33	.120
Walk to check tissues (sales)				.530	26	.012
Walk to check tissues (furniture)	.156	15	.025			
Check furniture tissues	.631	31	.213			
Check COD sheets	.515	2	.011	.859	5	.036
Check RDM's				.756	5	.032
File yellow copies of tracer	.063	61	.042	.043	31	.011
File tracer in "type over" file	.189	14	.029			
Write on tracer action taken	.171	92	.171	.262	119	.262
Check hold-to-notify sheet	.340	6	.022			
Check office-hold sheet	1.097	1	.001	.487	9	.037
File white copy in slot	.972	63	.665	.049	19	.008
Check old tracers	.621	6	.041			
Call customer-doesn't answer	.670	20	.146	.807	19	.013
Call customer-busy	.264	19	.055	.269	9	.020
Call customer-answered	1.106	36	.433	1.566	56	.737
Call sales dept. in store-busy	.420	1	.005	.397	14	.047
Call sales dept. in store-answered	2.081	8	.181	1.959	87	1.432

Table 3-A. Normal and Weighted Average Elemental Time and Frequency of Occurrence of Each Element for Furniture and Small Package Compaints (Continued).

Element	Furniture			Small Package		
	Average normal time (Min.)	Frequency of occurrence (No.)	Weighted average normal time (Min.)	Average normal time (Min.)	Frequency of occurrence (No.)	Weighted average normal time (Min.)
Call alteration department				2.485	2	.042
Call small package dept.-no answer	.230	1	.003	.638	5	.027
Call small package dept.-answered				2.701	31	.704
Call credit office-club	3.120	1	.034	2.227	3	.056
Call furniture service manager	1.840	3	.060			
Call to release from notify	1.770	1	.019	.630	1	.005
Call stock control	.220	1	.002	2.895	2	.049
Talk to tracer taker	.767	3	.025	1.097	5	.046
Classify and close out tracer	.295	19		.483	44	.179
Write out wrapping check	1.547	1	.017	3.834	8	.258
Carry wrapping check to tube and return	.264	1	.003	.667	4	.022
Walk to teletype or back to desk	.137	9	.013	1.166	6	.059
Type messages over to warehouse	.438	35	.167			
Take teletype message from machine	.228	3	.007			
Stamp date and time on messages or tracer	.177	42	.081			
Copy messages on to tracer	.496	14	.076			
Check ad on pin-up board				2.040	2	.034
Call wrapping and packing dept.	2.510	1	.027	.856	8	.058
Make pick-up form	3.920	1	.043	1.900		
Check telephone shopping tissues				1.662	3	.042

Table 3-A. Normal and Weighted Average Elemental Time and Frequency of Occurrence of Each Element for Furniture and Small Package Complaints (Continued).

Element	Furniture			Small Package		
	Average normal time (Min.)	Frequency of occurrence (No.)	Weighted average normal time (Min.)	Average normal time (Min.)	Frequency of occurrence (No.)	Weighted average normal time (Min.)
Check dept. telephone number				.306	21	.053
Check overgoods sheet				1.163	3	.029
Check special delivery sheet				1.880	3	.047
Make even-exchange and put in tube and return				.882	1	.007
Call layaway	1.490	1	.016			
Call warehouse	1.925	6	.013			
Carry tracer to service bureau tray and return	.336	2	.007			
Staple two tracers together	.239	5	.013			
Walk to check route sheets	.170	1	.009			
Stamp and file "hold-to-notify" cards	.034	4	.002			
File teletype carbon message	.136	1	.002			
Ask service bureau to mail card				2.300	1	.020
Check route number				.671	5	.028
Call COD dept.				.851	9	.064
Check back orders				1.760	1	.015
Call dept. and give info for duplicate order				1.350	2	.023
Look up customer's phone number				2.700	1	.023
Write duplicate order				.180	1	.002
Normal time(Min.) ---			3.134			5.234

Table 3-B. Normal and Weighted Average Elemental Time and Frequency of Occurrence of Each Element for the Proposed Record Desk.

Element	Average normal time (Min.)	Frequency of occurrence (No.)	Weighted average normal time (Min.)
Read tracer	.407	170	.407
Check route card	.382	127	.286
Check ship short	.194	17	.019
Check bad address	.306	3	.005
Check COD sheets	.687	5	.020
Check RDM's	.756	7	.031
Write on tracer action taken	.217	127	.162
Check hold to notify sheet	.340	3	.006
Check office hold sheet	.792	2	.009
Call customer-does not answer	.738	11	.048
Call customer-busy	.266	3	.005
Call customer-answered	1.331	43	.337
Classify and close out tracer	.389	129	.295
Check overgoods sheet	1.163	2	.014
	Normal time (Min.) ---		1.644

Table 4. Summary of Time Study, Per Cent Delay Time Is of Total Elapsed Time.

	Furniture tracer		Small package tracers	Record desk	
Total time (minutes)	165.78	219.54	736.25	36.82	113.68
Delay time (minutes)	35.92	79.16	190.38	6.65	23.82
Per cent delay time is of total time	21.70	36.10	26.00	18.05	21.00
Average per cent of delay*	19.5		26.0	28.9	

*Per cent of delay time in total elapsed working period.

Table 5. Calculation of Standard Time to Write a Complaint Tracer.

Observed time for the operation:		
Number of observations	107	
Total time (minutes	320.32	
Average time to write a complaint tracer	3.00	
Allowances:		
Delays: Number of studies	11	
Average per cent that delay time was of useful observed time	37	per cent
Allowance for personal time is 5 per cent		
Total allowances	42	per cent
Calculation of standard time:		
Standard time equals 3.00 plus .42(3.00) equals 4.26 minutes		

Note: The rate was assumed to be 100 per cent. This assumption was made due to the lack of observable phenonomena as a basis for evaluation.

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