

fourth Street district of New York. In a department store, the purely clerical operation are comparatively few, but practically every operation is semi-clerical in its nature.

c. *The Bank.* This is a trust company and bank in the downtown district of New York. In a bank or trust company practically all operations are clerical, semi-clerical or administrative, and the clerical work is so bound up with general operations as to make it practically impossible to separate one from the other. The problem therefore, is to apply scientific management principles to the whole business.

6. THE DEVELOPMENT OF SCIENTIFIC MANAGEMENT A COOPERATIVE EFFORT

It must not be thought that everything mentioned in this paper is a result solely of the direct work of the writer and his associates. In fact, one of the greatest results of scientific management is that it arouses, on the part not only of executives but also of employees, a greater interest in good management than existed before. Suggestions, ideas, new methods, greater interest, greater cooperation follow as a natural course. Many members of the organizations of our clients have had a part in the accomplishments. The most we can claim is to have instituted and taught scientific methods; to have formed in each organization a small group of students who assisted in the development of the work and who will carry it on after we have finished our preliminary steps.¹

7. PLAN OF THE PAPER

No attempt has been made to describe the work chronologically. This would have served no good purpose. Neither have we listed all of the accomplishments in each place. We have, rather, endeavored to cover the subject in a logical manner, dividing it into five broad phases:

¹"I feel strongly that work of any account, in order to be done rightly, should be done through cooperation, rather than through the individual effort of any one man; and, in fact, I should feel rather ashamed of any achievement in which I attempted to do the whole thing myself." (Frederick W. Taylor, *Engineering News*, 1907.)

Specific mention should be made of the following persons who have cooperated with us in the work here outlined: J. S. Beer,* W. T. Birdsall, R. G. Forbes, C. C. Hawley, W. W. Kirk,* N. L. McCully,* J. O'Connor, Paul M. Quattlander,* R. F. Riblet,* Louis Stewart, Jr.,* J. A. Valentine,* Our own engineers who have contributed to the work covered in this paper are C. W. Griffin,* Warren D. Bruner,* S. E. Goltra,* E. Franklin,* H. F. Jones* and Francis Goodell.*

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- I. Planning and Control;
- II. Standardization, the basis of Planning and Control;
- III. Investigation and Research, the basis of Standardization;
- IV. Inspection and Maintenance of Quality;
- V. Scientific Office Arrangement.

II. PLANNING AND CONTROL

1. CASUAL PLANNING AND CONTROL ALWAYS PRESENT

We have described scientific management as being "the application of the highest degree of coordination and control by the use of scientifically determined standards of policies, material, equipment, tools and methods." It would be difficult to find an organization without any planning or control; it always exists to a greater or lesser degree. But rarely is this planning and control scientific; it is usually the result of years of growth and a process of casual selection of imitated methods. Effective planning of any kind involves a more or less exact knowledge of what is to be done. Control, as the word is used by management engineers, signifies that a routine has been established to insure that what has been planned is done as it was originally planned. It is needless to remind those present that we do not refer to what is commonly understood as control (authority), neither do we wish to imply that such control of operations is entirely absent. It cannot be said that planning and control methods have been developed where none existed before, but rather that methods already in existence have been improved or that new methods which are superior to the old ones have been substituted, and that these improvements or inventions are the result of the application of certain definite principles.

It may be well to mention that there is a difference between the control methods of a factory and those of an office. Inasmuch as, in most instances, factory planning, preparation and scheduling usually cover batches of similar work, rather definite and precise control is possible. Even in most jobbing work, the value of the job is sufficient to stand the expense of the necessary individual job planning. In office work, however, because the unit tasks are so varied, small and inexpensive in themselves, the business cannot stand the expense of individual task control, and it would be folly in most cases to plan precisely the work to be done before it is started; though, of course, the law of averages enables certain broad preplanning to

be done. The planning in other words must usually be general and not specific.

However, knowledge of work that has been done, exact knowledge of the practical capacity of a department or of an individual, complete performance records of past and current volumes of business done, expressed in work units, offer a control method of which advantage is rarely taken.

It is these essential things of planning that are neglected in the usual office.

Without this knowledge, there can be little preparation. The manager goes blithely on giving assignments, and executives, sub-executives and workers accept them without any knowledge of the amount given, or any attempt to stop the steady flow. The latest assignment given usually gets immediate attention, and those forgotten by the manager for the moment are neglected, only to be remembered when it is too late to get them done on time.

Without this knowledge there can be no scheduling of work in relation to its importance, or to the amount of time required.

The first step in getting such knowledge is the establishment of records of accomplishment which give a basis for control. Control records must be based upon some controlling unit, such as orders or transactions. Accomplishment records must not be considered in figures of time and pieces, but in their relation or ratio to the controlling unit.

2. THE FACTORY OFFICE

In this case we found records showing both the number of orders received and the volume in money and yardage; but while the use was made of these data by both the sales department and the manufacturing department, no use was made of them by the office for determining the total amount of clerical work to be performed. We made the order the controlling unit, for it was evident that most of the clerical work in the office depended neither upon the volume of sales nor the yardage, but upon the *number of orders*. We determined by reference to previous records that the average number of orders received per day was 100. We then calculated the number of clerical minutes, using only the clerks whose work was influenced by the number of orders received, and found that 36 clerks used 450 minutes each, or a total of 16,200 clerical minutes to handle 100 orders. Dividing the total clerical minutes by the number of orders handled, we learned that the average number of clerical minutes

per order was 162. As it was incomprehensible that an average order would require 162 minutes to perform all the operations involved, this furnished us a basis for further investigation, which will be taken up later.

Executive control reports were then prepared. These are now issued monthly by each division of the office. (See Figure 1).

REPORT OF THE ORDER DEPARTMENT		
Period Ended Oct. 1, 1921		
	This period	Last period
Average No. of Members	9	10
Average Weekly Salary	\$ 23.25	\$ 24.00
Total Salary Paid	1032.60	1162.60
Total Orders Received		
Salesmen	1518	1224
Mail	526	469
Telephone and Telegraph	87	70
Average Orders Received per Day		
Salesmen	66	51
Mail	23	20
Telephone and Telegraph	4	3
Total Sales Orders Written		
Regular	2672	1815
Card	117	124
Average Sales Orders Written per day		
Regular	112	76
Card	5	5
Total Change Slips Written	289	181
Total Export Orders Handled	34	64
Cost per Order Written	\$.3940	\$.5955
Average Minutes per Order Written	36.3	54.4
Signed		Department Head

Fig. 1. Executive Control Report.

It will be noticed that the number of clerical minutes per order is shown. By comparison with previous months, the management shows exactly how much work is being performed and its relation to the volume of orders. This furnishes a control which did not exist before.

3. THE DEPARTMENT STORE

Most department stores are well supplied with control records concerned with finances, expenses and movement of merchandise. The store in question had a very complete set of records of this sort, but its records of the volume of work per individual were inadequate.

The first step was to establish a controlling unit. It is an almost universal custom in department stores to speak of the ratio of expense to sales in dollars. So general is this practice that it required a great deal of persuasion to get all concerned to see that the dollar