

placed in just this location on the organization chart. If it were subordinated to any other than the prime official of the company, there would have been lesser assurance, it is felt, of rapid progress toward administrative control. The combination of responsibility for the interpretive reports of the remote and more immediate past business with the responsibility for estimating the future of that same group of activities has been a very happy combination of responsibilities.

In our particular business it did not take very long to realize that estimating the future for budgetary purposes could not be very favorable unless some recognition were taken of the conditions which cause the future to vary from the present or past. This particular paper is to concern itself with the methods which were subsequently developed to enable determination of the probable future course of the many activities of the business, in order that, when budgets were calculated, they would have a sound basis of probability as to their execution.

There is yet some background material necessary before a real conception can be gained of the problem which we are attempting to solve. We had connected together two axioms: first, that our business was a staple bread and butter business; and second, that bread and butter businesses usually had a normal continuous flow of demand. We still feel that it is true that most staple bread and butter businesses have a fairly consistent, continuous normal demand in all years. We shared with others the feeling that the only reason orders did not come in, in such a continuous flow of demand, was that some accidental, unforeseeable circumstances were constantly occurring to upset the normal flow, and that we simply had to make the best of a bad, erratic situation. To quote the words of our president in describing the development of business forecasting in general as well as our situation in particular: "Before the war the usual description of a capable executive was 'he has remarkable ability in meeting the situation,' the assumption being that such a man was bound to have, to a large extent, quick brain action, courage and great common sense. It will not be long before this definition will be obsolete. Already other characteristics are required of the successful manager. Among the first of these comes intelligent foresight. An executive's qualification today is measured by his ability to anticipate rather than to meet a situation."

Still there are hindrances in the way of progress toward such an ideal. To review only part of the detail order demand records of the thousands of items, carried on finished stock balance of stores cards, would make the head swim. Even a summary of the annual totals of order demand over a period of years for a group of items seemed to suggest no consistent individual, or combined action in the time, extent or assortment of variations in demand. Most summaries seemed to be simply a heterogeneous mass of data, meaningless as to any valuable implications concerning the future.

Even considering the grand total of all this detail there are still some startling variations. In the case of billings in dollars, since the war the average drop of December billings to the January billings level has been 31 per cent. In the short span of five years this is an average of a high year when January billings were 10 per cent greater than December billings and a low year when January billings were 53 per cent under the previous December billings. Upon an annual average basis, one calendar year's billings have averaged 50 per cent under the previous year's billings. In the case of other annual averages, one year has shown 42 per cent increase over its previous year and another year, 35 per cent increase over its previous year. Some months of some years have registered a volume of billings just double the volume in the same months of the previous year, and yet, after the elapse of but six months, the then monthly figures would be registering volumes barely equal to the volumes of billings in the same months of the previous year.

These comparisons have all been of sales in terms of dollars. Ordinarily it might be presumed that dollar figures would vary more widely over a period of years than figures in physical units. The physical unit which we use when measuring totals of order demand is tonnage. It would then be presumed that order tonnage figures would show less violent variations than the billings figures, because there would not be the effect of changes in value of the dollar. This is not true, however, as comparisons will presently show, for the reason that in dealing with orders we are dealing with a factor which exhibits itself much more erratically than the smoother shipments or billings. Now, still thinking about total demand for our product, but in terms of the tonnage of orders, in two instances since the war it has been true that, within the span of only

nine months, the first three months registered an order volume double the volume levels of the previous three months; the second three months of the period were stabilized at this 100 per cent increased level and the last three months of the nine months period registered a drop to one half the peak volume levels. Again, on two occasions since the war, the fourth quarter order volume has averaged but 40 per cent of, or 60 per cent under, the first quarter average in the same year, in spite of the fact that the fall has been considered the normal buying season in the trade.

It is evident that if there be such variations in totals and grand averages there would be almost inconceivable detail involved in analyzing the possible variations of any one of the 23,000 items. As an evolutionary development of our accounting control, it was early recognized that the human mind cannot conceive of such a wide assortment of product, and, for the purposes of cost accounting, a grouping of many items into one product class had been made upon a rational basis for the purpose intended. The classification distinguishes first between produced items and purchased, or resale items. Under one major division there is the conception of a subdivision of items of our manufacture into nine major product groups. It is easy for the mind to distinguish as a group all "tools," all "Kewanee specialties," all "grey iron fittings," etc. If certain general sales price, cost, or other ruling conditions were known concerning "grey iron fittings," the mind could readily catalog and retain recollection of these conditions, or "rules," and apply them to any one of the items within the affected group. As we are becoming more and more acquainted with the use of these major groups we find it possible to think separately of, and to distinguish individually, many of their subdivisions, or, in other words, to think of their minor product classes. That is, with reference to the subdivisions of all "tools," we can retain a memory of certain costs, selling prices and other facts or rules, with reference to each of the three most important subclassifications under the major product group, "01."

The tabulation below shows the grouping of items as subdivisions gradually leading up to the grand totals. Of course, this table is designed to indicate only the method of classification. The arrangement of classes and the number of designations shown are fictitious.

WALWORTH PRODUCT CLASSIFICATION

In Total: 13 Major Product Groups
Comprising 56 Minor Product Classes

Walworth Manufacture
(9 Major Groups)

01	Tools
011	Stillson Wrenches & parts
012	Die Plates, Taps, Dies and Reamers
013	The Walworth Chain (Boston) Wrenches
014	Other Walworth Wrenches
015	Other Tools—Walworth Make
02	Kewanee Specialties
021	Nat'l Flanged Unions (only)
022	Kewanee Unions (only)
023	Kewanee Flanged Unions (only)
024	All other Kewanee Specialties
03	Grey Iron Products
31	Grey Iron Screwed Fittings
032	Grey Iron Flanged Fittings
033	Miscellaneous Grey Iron etc.
	Other Manufacture (4 Major Groups)
11	Iron & Steel Pipe
111	Blk. Steel Pipe T. & C. or P. E.
112	Galv. Steel Pipe T. & C. or P. E.
113	Blk. Gen. Wrt. Iron Pipe T. & C. or P. E.
114	Galv. Gen. Wrt. Iron Pipe T. & C. or P. E. etc.

Fortunately, this cost accounting grouping to aid the major executives has been found very acceptable for the purposes of statistical analysis. It has not yet proved possible to tie up any particular source of demand to any particular product class. In other words, any one source of demand may contribute to increase the demand of a large number of product classes. It is true, however, that the material within any one product class is thoroughly homogeneous, each item of the class reacting to essentially the same contributing demand factors, even though no one of these factors can be singled out against any one product class. Thus, it has been possible to develop many statistical control rules which can be applied logically to these individual product classes, as originally established; and these findings are being utilized, as will be shown later, in an inventory and production control, which can be conceived of and executed, to the extent of these detailed product classes, by the major executives of the company.

The first attempt to analyze these figures recognized that there must of necessity be definite contributing factors as causes of variation. Accordingly, the development of our statistical analysis of demand has been greatly aided by analyzing separ-