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Donald R. Longman

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Distribution Costs—Present Methods of Cost Analysis

BY DONALD R. LONGMAN

IN A PREVIOUS article, "Distribution Costs—A New Frontier for Accounting," the extent of the contribution which accounting could make toward the development of scientific sales management was shown. There is a serious need for accurate and detailed statements of the profitability of products, customers, and units of sale. These statements permit further measures of profitability of departments or lines of product, territories, advertised as compared to unadvertised merchandise, and so on, with a startlingly effective approximation of laboratory methods. There is need also for accurate measurements of the efficiency of laborers and of the routines which they are required to perform, and there is equal want of data showing the adequacy or inadequacy of a distributor's financial strength and of the cost of his incomplete utilization of space and equipment. The latter requirements are less frequently expressed but they may be no less important for many distributors.

The work of developing or adapting techniques for these purposes and the task of instituting and maintaining them in operation provides a very broad field for accounting. It is no less complex than the determination of manufacturing costs, but it offers prospects in the near future of providing even greater contributions to efficient business operation. For this reason it is worthy of the accountant's attention.

Realization of the importance of the subject has gradually been penetrating the business community. No one knows at the moment how far this realization has been translated into active efforts to attack the subject. If one may judge from the writings on the subject and

the opinions expressed in marketing periodicals, little actual work has been done. The problems are new and difficult. No satisfactory parallels exist upon which to draw, and no laboratories for accounting or marketing are available to which the problems can be referred.

Here and there, however, individuals, firms, and trade associations have found courage to strike out for themselves and satisfy their needs. In the last twelve years the publication of their methods and their results has not only strongly confirmed their belief in the value of the undertaking but has provided an approach to the subject upon the basis of which others can build. It is the object of this article to present in a simple and much condensed form a statement and a criticism of the best known and perhaps most effective techniques so far suggested to fulfill the needs of sales management listed above.

Few of those who early recognized the importance of distribution-cost analysis felt themselves well enough equipped to devise satisfactory techniques to obtain the information they wanted. The tendency was to shunt the research upon trade associations and upon the Government. It is they who have done most of the constructive work. Such agencies suffer under a severe handicap, however, in attempting to provide methods of cost analysis which may be adopted in full as they stand by distributors of all sizes with widely varying marketing problems. The methods to be proposed had to be of the simplest kind and were limited with few exceptions to profit studies by products, by customers, or by units of sale. There has been almost no attempt to prepare an integrated distribution-cost-control system as yet;

and there has been little evident recognition of the interrelationship between the profits of products, of customers, and of units of sale and between these profit figures and the efficiency of labor, of plant utilization, of operating routines, and of financial strength. It is not until the accountant's attention is centered on standards of cost that the interrelationship is evident and the need for an integrated cost-control system clear.

Probably the best known studies of the profitability of commodities and customers have been those of the Department of Commerce. The Department has been actively interested in this field for the past twelve years.¹ Its first step was to study detailed profit-and-loss statements such as every company prepares, scrutinizing each account with care to determine what characteristic of products or customers tends to affect the dollar amounts shown. It was soon evident to the Department, however, as it has been to almost all investigators, that it is virtually impossible to find any direct relationship between the great majority of expenses as they are commonly classified and individual products or customers. Payroll, rent, supplies, telephone and telegraph, taxes, and depreciation can rarely be charged to different articles on any but a most arbitrary basis.

Such a classification of expenses was developed and has been employed with other objectives in view. These accounts are familiar, easily used, and readily understood but they are not suitable for the purpose at hand. The difficulty

may be seen in the payroll account. Such a title includes sales salaries, warehouse and clerical wages, and wages to those who do janitor or repair work and are generally responsible for the upkeep of the buildings and equipment. It may include the compensation of supervisors or foremen, research workers, advertising employees, or dozens of others engaged in specialized work. The variety of work paid for in the single payroll account makes it impossible to charge the payroll directly to products or customers on any logical basis. The same difficulty is met in any attempt so to charge other "natural" expenses.

The difficulty encountered with the payroll account, however, suggests the suitability of a different expense-classification system. It is possible to see some relationship between warehouse wages and the size and weight of the several products offered for sale. So also the cost of maintaining the accounts receivable and other customer records bears some relationship to the number of sales made to the different customers. The logical conclusion from these examples is that an accumulation of expenses by functions such as warehousing, delivery, credit and collections, advertising, and so on, provides expense accounts, the amounts in which obviously vary as between products or customers as a result of their different characteristics. There is a basis for charging such costs differently to the various products insofar as these differ in weight and bulk, in the frequency with which they are ordered, and in the amount spent directly on their promotion.

Almost all investigators have been literally forced to classify expenses on a functional basis as their first step. The Department of Commerce, in the method it has employed most frequently, aggregates distribution costs into four functions, each of which has two subfunctions. The functions are maintenance, movement, promotion, and reimbursement, which are subdivided into in-

¹For Department of Commerce Studies emphasizing the method here discussed see:

Wholesale Grocery Operations, by J. R. Bromell, Distribution Cost Studies No. 14, Bureau of Foreign and Domestic Commerce, 1932.

Costs, Markets and Methods in Grocery Retailing, by W. H. Meserole, Distribution Cost Studies No. 8, Bureau of Foreign and Domestic Commerce, 1931.

Problems of Wholesale Electrical Goods Distribution, by Wroe Alderson and Frederick Haag, Jr., Distribution Cost Studies No. 9, Bureau of Foreign and Domestic Commerce, 1931.

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vestment and storage, handling and checking or order routine, advertising and cultivation, payments and collection. Such a classification of expenses necessarily requires a certain amount of allocation of "natural" expenses. The subfunction storage, for example, includes the rent and maintenance cost for the warehouse but not the rent or maintenance of offices or even of the warehouse aisles (charged to handling). Investment includes rent, insurance, and depreciation on office space and furniture, interest on borrowed money and on investment, and taxes and insurance on inventory. Checking or order routine includes the clerical cost of order filling, routine orders taken by salesmen, telephone orders received, billing, and the handling of accounts receivable. Similar expenses and expense allocations appear under the other subfunctions.

When the new classification of expense has been made, the influence of the different characteristics of the various commodities and customers upon cost is evident. The storage expense reasonably chargeable to any given product depends on the space it requires. The checking or order routine costs, on the other hand, vary with the number of orders for each product which are filled. Specifically, the amount of storage ex-

Functions

Investment
Storage
Handling
Order routine or checking
Promotion (advertising and cultivation)
Reimbursement (payments and collection)

The general and administrative costs which do not appear in the functions listed are allocated directly to products proportionately to the total costs allocated to each from the functions. If the functional costs allocated to products A and B are \$1,000 and \$500, respectively, product A would receive twice as much of the general and administrative costs as product B. The exact amount so

allocated to any given item is the proportion of total storage expense corresponding to the proportion of total warehouse space required for the product.

For illustration, assume the total storage expense for the X Wholesale Grocery to be \$7,300, the total warehouse space occupied to be 10,426 square feet, and the storage space required for canned peaches and for laundry soap to be 166 square feet and 323 square feet, respectively. The storage cost applicable to peaches and to laundry soap may be found by the following simple proportion:

For canned peaches \times : \$7,300 :: 166 : 10,426,

or

$$\frac{\times}{\$7,300} = \frac{166}{10,426}, \text{ which amounts to } \$116.07$$

For laundry soap \times : \$7,300 :: 323 : 10,426,

or

$$\frac{\times}{\$7,300} = \frac{323}{10,426}, \text{ which amounts to } \$226.30$$

In the light of this simple illustration it is easy to see how the costs for each function are allocated by proportion to the several products, when the bases of variation in costs, as between products, have been established.

The Department of Commerce employed the following bases in determining the costs of distribution by products:

Basis of Allocation

Average inventory value
Square feet of floor space
Handling units²
Number of invoice lines or number of orders
Gross margin
Dollar sales

allocated to the individual product depends on the proportion of its total functional cost to the total functional cost of all products.

To determine costs by customers, the same costs aggregated by functions were

² An arbitrary unit of weight and bulk used as a common denominator for all products. In department stores a book or box of hosiery is 1 unit, a lamp or clock 2 units, a piano 50 units.

employed but the bases of allocation differed somewhat.

Functions

Maintenance (investment and storage)
 Movement (handling and order routine)

Advertising
 Cultivation
 Payments
 Collections

For this investigation the functions and bases were:

Basis of Allocation

Cost of goods sold
 Number of invoice lines (subdivided by delivery zones)
 Equal for all customers
 Number of promotional calls
 Number of payments
 Amount outstanding

The allocation of functional costs to customers is made by the same use of proportions as was illustrated for the allocation of storage costs to canned peaches and laundry soap above.³ So also general and administrative costs are charged to customers in the same way.

The fact that the Department of Commerce has used these functions and bases with only occasional modification over a period of ten years for its studies of retail and wholesale grocery, wholesale electrical goods, and wholesale drug costs indicates its satisfaction that the method is generally useful throughout the wholesale trade. Reports received by the Department indicate that coöperating distributors have been exceedingly well satisfied with the results of their costing work.

A second interesting method of allocating distribution costs to products was devised by the National Wholesale Druggists' Association in 1929.⁴ As in

the previous case, expenses are aggregated by functions the performance of which has some directly measurable relationship to the differing characteristics of the products or departments normally present among wholesale druggists. These functions are: receiving and shipping, city delivery, buying, storage, handling, carrying, selling, billing and pricing, and executive and general. Credit costs were added separately.

All "natural" expenses commonly found in the everyday profit-and-loss statements (except the financial costs of extending credit to customers) are charged to the functions. The expense of performing each function is then expressed as a percentage of company sales. Differences between individual commodities with regard to their need for the several functions leads to a larger or smaller than average expense (in per cent of sales) applicable to them. The problem is one simply of finding

³ The list of bases given above is that suggested by Wroe Alderson, then director of the distribution-cost section of the Department of Commerce, in an address before the American Marketing Society, December, 1931. Later modification is indicated in *Wholesale Druggists' Operations*, by E. J. Carroll, Domestic Commerce Series No. 86, Bureau of Foreign and Domestic Commerce, 1934, and in *Distribution Cost Accounting for Wholesaling*, by H. F. Taggart, published by the Department of Commerce in May, 1939. The functions and bases listed in the former are as follows:

<i>Functions</i>	<i>Basis of Allocation</i>
Maintenance	Dollar sales
Handling	Number of handling units
Order routine	Number of invoice lines
Advertising (direct mail)	Equal for all customers

Advertising (space)	Gross margin
Promotion	Number of promotional calls
Payments (routine credit and collection activities)	The customer weighted by credit rating
Payments (customer accounting)	Equal for all credit customers
Collection (bad debt and agency fees)	Credit customer weighted by credit rating

⁴ *A Method of Cost Analysis by Commodities for Wholesale Druggists*, Bulletin No. 2, Statistical Division, National Wholesale Druggists' Association, 1929.

Expense Analysis of a Wholesale Drug House, Bulletin No. 4, Statistical Division, National Wholesale Druggists' Association, 1929.

Cost Analysis for Wholesale Operations with Special Reference to Wholesale Druggists, by H. J. Ostlund, National Association of Cost Accountants Bulletin, December 1, 1930.

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the need of any commodity relative to the need of all commodities for each function and correspondingly allocating to it a greater or less charge in per cent of sales for the function. This method of allocating costs to commodities is essentially a short cut avoiding the allocation of dollar costs (by functions) to products and subsequent expression of these dollar costs as a percentage of the product's sales.

To illustrate, the Wholesale Druggists' Association is of the opinion that receiving and shipping costs depend primarily on the weight of the goods handled. As between products the cost of receiving and shipping will be propor-

tional to their relative weights. Inasmuch as the primary objective of the Association, however, is the determination of the distribution costs by commodities *in per cent of sales*, it is not the comparative weights of products that matters but their weights in comparison to their sale prices.

Assume that for the Y Company receiving and shipping costs amounted to .5 per cent of sales. Assume, further, that the average sale price per hundred pounds of merchandise handled is \$60, and the sale price per hundred pounds of item H is \$90. The receiving and shipping expense allocable to product H and expressed as a per cent of its sales is

$$\frac{\text{Average \$ value per hundred pounds}}{\text{Product H \$ value per hundred pounds}} \times \text{Average expense percentage for the function}$$

or

$$\frac{60}{90} \times .5\% = .33\%$$

The expenses of city delivery, general selling and billing and pricing are thought to vary directly with the number of invoice lines. The greater the value of the order for a given product the lower its delivery, selling, and billing costs will be in per cent of sales. The cost for these functions in percentage of sales may be found, therefore, by multiplying the total function costs in per cent of sales by the ratio of the average dollar value per invoice line to the particular product's dollar value per line. This is the same method as that for receiving and shipping except that invoice lines replace pounds in the calculation.

A slight variation in method is required for the allocation of handling costs. Here the cost for the function is that for handling broken case lots. The average percentage of sales required for such broken case handling may be reduced by the percentage in which the product in question is sold in full case lots. The remainder is then treated as the average expense percentage in

previous cases and is multiplied by the ratio of average product value per line extension to the particular product's value per line extension. The carrying cost is allocated by use of a ratio of average to product turnovers with which to multiply average carrying cost in per cent of sales.

To determine the storage costs an average is calculated of the storage cost per square foot of warehouse space occupied. This may then be multiplied by the average space required for each product to find the total product storage cost. This sum is then converted into a percentage of the product's sales. The buying and executive functions have their costs charged on the basis of sales volume, which naturally represent uniform percentages of sales for each product.

Sales commissions are charged directly to the article and a credit charge of one per cent of sales is added for customer financing for sixty days.

A summary of the functions and bases is as follows:

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<i>Functions</i>	<i>Method of Allocation</i>
Receiving and shipping	$\frac{\text{Average value per cwt.}}{\text{Product value per cwt.}} \times \text{Functional cost as a \% of sales}$
City delivery	$\frac{\text{Average value per invoice line}}{\text{Product value per invoice line}} \times \text{Functional cost as a \% of sales}$
Buying	Equal percentage for all products
Storage	$\frac{\text{Ave. sq. ft. for product} \times \text{ave. cost per sq. ft.}}{\text{Sales for the product}}$
Handling	$\frac{\text{Ave. value per line}}{\text{Product value per line}} \times \text{(Ave. cost for broken case—\% of product sold in full cases)}$
Carrying	$\frac{\text{Average turnover}}{\text{Product turnover}} \times \text{Functional cost as \% of sales}$
Selling—commissions	Direct charges to the individual products
Selling—general	$\frac{\text{Average value per line}}{\text{Product value per line}} \times \text{Functional cost as \% of sales}$
Billing and pricing	Same as above
Executive and general	Equal percentage for all products
Add 1 per cent of sales as a credit charge.	

Although in appearance this method of cost allocation differs substantially from that of the Department of Commerce, it is in fact identical except in (1) the expression of allocated costs as a percentage of the product's sales and (2) in the particular bases used. In operation it is likely to be easier and less expensive because it deals in percentages. For the same reason it is more valuable to trade associations interested in relative differences in the cost of distributing the various products sold by its members. It would be meaningless to members to learn only that the cost of distribution for the representative wholesalers studied was \$463 for product M and \$819 for product N. It would be very valuable, however, to know that the cost of distribution in per cent of sales was twice as great for M as for N and that, therefore, a mark-up roughly twice as great should be obtained from M as compared to N if that is possible under the circumstances. The fact that the cost structure of individual wholesalers may vary from that of the representative firm does not invalidate the conclusions drawn by the Association *if* they are acted upon judiciously.

The Association proceeds by similar methods to find the effect of order size

upon cost. Assuming a product which is average in all other respects and which would have costs, therefore, exactly the same as those of the company as a whole (when both figures are expressed in percentage of sales), calculation is made of the alteration in cost percentage to be expected from orders for 1/12 dozen, 1/6 dozen, 1/2 dozen, 1 dozen, and a full case. The difference in size of order can affect four functions: city delivery, handling, selling, and billing and pricing, all of which are charged to products on the basis of value per invoice line. All other percentages would remain the same irrespective of order size. Substitution of the sales price for the average product (ordered in the various quantities listed above) in the equations for delivery, handling, selling, and billing make possible the calculation of the different percentages of sales for these functions applicable on the several order sizes. To these percentages may be added the company percentages for other functions. The results of such an experiment indicated a variation in cost of from 75.79 per cent of sales for orders for 1/12 dozen (of a mythical average commodity) to 8.93 per cent for orders for case lots.

A method similar to this but employing the functions listed by the Depart-

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ment of Commerce is reported to be in use by the National Electrical Wholesalers' Association. Even using approximations and subjective estimates in lieu of detailed computations, a wholesale hardware firm reported exceptionally valuable results: a reduction of 30 per cent in items carried, a 35 per cent increase in dollar profit, and a 68 per cent increase in the profit percentage obtained per dollar of sales. Operating costs were said to have been reduced 4 per cent below the average for similar firms.⁵

Quite a different mode of attack on the problem of determining distribution costs has been made by Howard C. Greer of the Institute of Meat Packers, who computes cost by unit of order and by products.⁶ He recognizes four functions: order taking; packing, loading and shipping; delivery; and customer record keeping. Subheadings under these functions are:

Order taking

- Salaries of route salesmen
- Salaries of house salesmen
- Salesmen's travel expense
- Salesmen's telephone expense
- Other selling expense

Packing, loading, and shipping

- Labor—picking, weighing, and marking
- Shipping containers
- Dock expense

Delivery

- Drivers' wages
- Truck expense
- Garage expense

Customer record keeping

- Labor, billing
- Labor, posting
- Forms, postage
- Office expense

Other functions and marketing costs exist but are thought not to be of immediate importance for the particular study. Presumably the objective is to determine the difference in variable cost as between units of order and as between products and to determine the contribution made in each case to non-variable expense.

Because the type of sale is likely to have an important bearing on the analysis the costs of performing the four functions are charged first to street sales, house sales, peddler sales, and platform sales. Many of the expenses are directly chargeable to the different types of sale. Where this is not the case, however, Mr. Greer has not made clear his method of allocation, except to indicate that time studies were made for certain allocations. Separate analyses of costs per order size are found for each type of sales.

The order size classes for which separate costs are desired are: under 25 pounds per order, 25 to 50 pounds, 50 to 200, 200 to 500, 500 to 1,000, and over 1,000 pounds. The objective is the determination of the costs per hundred pounds for handling orders of each different size class. All expenses are then separated as between those varying with the number of orders, those varying with the number of items, those with the weight of the order, and those having no measurable variation on any of these three bases. Totaling the costs varying on the first three bases, costs per order, per item, and per hundred pounds are computed. Costs showing no measurable variation with order size on any basis are also computed per hundred pounds. In practise there is no separation of these latter costs from those varying according to the weight of the order.

The order cost and the hundred pound cost are of course the same irrespective of the size of the order. The item cost varies, inasmuch as the number of items found on large orders is so

⁵ *Analyzing Wholesale Distribution Costs*, by J. W. Millard, Distribution Cost Studies No. 1, Bureau of Foreign and Domestic Commerce, 1928.

⁶ *Distribution Costs as Factors in Pricing Policy*, by Howard C. Greer, National Association of Cost Accountants Bulletin, November 1, 1937.

much greater than the number on orders totaling 25 or 50 pounds. To find the item cost for orders of different sizes it is first necessary to determine the average number of items per order for each order size class. This found, it is necessary only to multiply the per item cost by the number of items per order for each size of order to obtain the item cost allocable to various order sizes. To this may be added uniform cost per order.

It is still necessary, however, to consider differences in the weight of the various orders. To do this an average

number of orders per hundred pounds is found for each order class. The total cost per order for each size of order (shown above) may then be multiplied by the number of orders per hundred pounds to convert the costs per order into costs per hundred pounds. Addition of those costs varying with the weight of an order (which includes costs not varying measurably in any way with order size) yields final cost per hundred pounds for each size of order.

Mr. Greer illustrates his technique and results in the following table:⁷

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Order group	Item cost per item	No. items per order	Item cost per order	Order cost per order	Total direct cost per order	No. orders per cwt.	Direct cost per cwt.	Over-head cost per cwt.	Total cost per cwt.
Under 25 lb.....	\$.102	1.3	\$.13	\$.61	\$.74	6.25	\$4.63	\$.17	\$4.80
25-50 lb.....	.102	2.1	.21	.61	.82	2.78	2.28	.17	2.45
50-200 lb.....	.102	3.3	.34	.61	.95	.96	.91	.17	1.08
200-500 lb.....	.102	5.1	.52	.61	1.13	.32	.36	.17	.53
500-1,000 lb.....	.102	7.4	.75	.61	1.36	.13	.18	.17	.35
Over 1,000 lb.....	.102	9.8	1.00	.61	1.61	.06	.10	.17	.27
All orders.....	.102	2.8	.29	.61	.90	.88	.79	.17	.96

A simple extension of this work makes possible the calculation of cost per hundred pounds for different products. The steps required for the product analysis are as follows:

1. Find the average quantity (in pounds) of each product sold per order.
2. Dividing 100 pounds by the amount of the average sale for each product, find the number of orders per 100 pounds.
3. Determine the ratio of orders per 100 pounds for each product to the orders per 100 pounds for all products.
4. Multiply the ratio found in step 3 for each product by the average cost per 100 pounds for all products.

While Mr. Greer's methods may appear difficult, they are basically simple. The fact that many costs are assumed to vary with the unit order on only two bases, weight and number of items,

while the remainder are uniform as between orders, indicates the fundamental simplicity of the allocation. The greatest difficulty in practise results from the fact that not all of the costs of a single function or subfunction may be allocated to order sizes on a single basis. Thus, the time and expense of traveling by salesmen is charged to all orders equally, although the actual time spent with customers is charged per item. To separate the sums in such cases may require time studies. The same problem is occasionally met in the allocation of certain "natural" expenses to functions.

The determination of costs by products involves a simple and logical extension of the study by unit of sale.

⁷ From "Distribution Costs as Factors in Pricing Policy," by Howard C. Greer, N.A.C.A. Bulletin, Vol. XIX, No. 5, Section I, Nov. 1, 1937, p. 275.

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The number of items on an order may affect costs by order size, but in determining costs by products number of items per order has no bearing. Omitting this factor leaves only the two variables, number of orders and weight. Mr. Greer's method of cost allocation by products is a simple statement that costs tend to vary inversely and proportionately to the size of the order for the product in pounds. Differences between products in bulk (except as proportional to weight) or in value of the average inventory, both recognized by the Department of Commerce and by the National Wholesale Druggists' Association, are ignored by Mr. Greer.

Despite the obvious simplicity of method in these studies the data obtained are far superior for management purposes, if properly used, to the accounting data now generally available to distributors. At least the presence of several factors tending to differentiate marketing costs by products and by units of sale is recognized so that rough indications of cost differences are available.

A very similar but much easier way to achieve the same ends has been presented by Eldon Wittwer, of the National Wholesale Hardware Association.⁸ The regular profit-and-loss accounts were separated into those varying with orders, with items, and with dollar value per order (commissions were treated separately). The costs per order, per item, and per dollar sales were then computed. Instead of proceeding to establish costs by order sizes, however, the unit costs were employed to determine the costs of distribution for products and customers. With the information that the cost per order was 66 cents with an additional cost of 31 cents per item (invoice line) and 3.9

cents per dollar of sales it was easy to calculate the costs of dealing with any given customer for whom past invoices were on file. Similarly, the cost of handling any given order could be estimated in advance by simple multiplication and addition. Assume, for example, that an order calling for five different products is received, the total sale amounting to \$10. The cost of handling it would be 66 cents (the cost of handling any order) plus \$1.55 (the cost of filling an order for five items at 31 cents per item) plus 39 cents (the cost of handling a \$10 order at 3.9 cents per dollar). The total cost of the order would be \$2.60, or 26 per cent of the sale. This cost may be deducted from the gross margin to find the profit or loss on the order.

Probably the most completely defensible method of determining costs by products which has so far been published is that of the H. S. Dennison Company.⁹ In basic theory it differs little from those of Mr. Greer and Mr. Wittwer. The difference lies in the thoroughness with which costs are analyzed, segregated by functions, and allocated to products. Only office, warehouse, and shipping expenses are charged to the commodities. The expenses of making sales, advertising of all kinds, sales salaries and traveling expenses are not believed in their case to bear immediate relationship to any of the 6,000 items. Customers rather than product characteristics determine such promotional costs.

An outstanding feature of the Dennison method is the large number of functions recognized. Fifteen are listed under the general heading "Office" and eleven under "Warehousing and shipping" as follows:

⁸ *Cost Study of a Wholesale Hardware Business*, by Eldon Wittwer, National Wholesale Hardware Association (no date).

⁹ *Distribution Cost Analysis and Its Influence on Pricing Policy*, by E. S. Freeman, National Association of Cost Accountants Bulletin, September 1, 1933.

The Development of Standard Order Handling and Order Filling Costs, by Frank J. Naumaun, National Association of Cost Accountants Bulletin, January 15, 1933.

Methods of Determining Distribution Costs, by E. S. Freeman, National Association of Cost Accountants Bulletin, November 15, 1929.

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Office

Credit
Bad and overdue accounts
Correspondence
Order records
Pricing and invoicing
Accounts payable
Accounts receivable
Cash receiving
General accounting
Factory accounting
Sales accounting
Sales statistics
Order and letter files
Postage
Office management

Warehousing and Shipping

Balance of stock records
Receiving stock
Space for stock
Getting out stock orders
Assembly and checking
Packing
Packing material
Stencil or label
Loading cars or trucks
Storing hold orders
Warehouse management

Each of these functions was studied in the greatest detail to determine what costs are incurred for it and how they arise. Objective standard costs were prepared for each operating detail in the function and were recorded together with the basis of cost variation. Such a study indicated that in many cases the costs of performing a function were affected not by one but by several product characteristics. The amount of the cost affected by each was listed separately and totals were obtained for all functions according to the characteristics or bases of cost variation. In a few cases, part (occasionally all) of the costs of a function were incurred for the benefit of the factory, of general administration, or of sales promotion. Segregation of these sums avoided inclusion in the product cost study of expenses which could not properly be called warehouse and office costs chargeable to products.

The analysis of the twenty-six functions indicated that there were six bases upon which office, warehouse, and shipping expenses tended to vary with products. Having already separated the standard costs in each function according to the basis of variation it was immediately possible to compute standard costs for all functions per order, per item, per customer month, per letter, per 1,000 cubic inches, and per dollar of sales, the six bases of variation. Employ-

ing average relationships of number of letters and number of customer months per order, the standard cost per letter and per customer month could be converted into standard costs per order and added to the original standard cost per order for costs varying directly on that basis. This augmented sum was then converted to a cost per item and added to the original standard cost per item by multiplying the per order cost by the average number of items per order. When this was done it left standard costs per item, per 1,000 cubic inches, and per dollar sales. Each product could be analyzed for bulk, sales, and number of orders for it and charged for the office, warehouse, and shipping costs at the standard rates.

The product sales subsequently made were charged on the books at standard cost and a variance account precisely similar to those used in manufacturing accounting indicated the efficiency of performance in the twenty-seven functions according to the amount of over, or under, absorbed office and warehouse costs.¹⁰ That so detailed an analysis could be made by a company handling 6,000 items such as labels, tags, crepe paper, glue, and so on, that objective standards could be established, that

¹⁰ Actually, separate standard costs existed for stock and special order products.

these standard costs could be satisfactorily integrated into the accounting system, and that the system should be continued in operation over a period of years, is the most amazing evidence of the practicability and value of distribution accounting that the author has so far seen.¹¹

Many methods other than those discussed have been developed by individual companies and trade associations.¹² Some are simple and inexpensive, such as Mr. Wittwer's. Others are quite detailed, involving the determination of costs by fifteen or twenty functions. In almost all cases other than those presented, however, the studies made have been limited to products alone, to customers alone, to territories, routes, types of sale, or units of sale. The limited development of distribution cost work by these organizations has been the result of their preoccupation with the perfection of a single measure of greatest importance to them. Some companies have but a limited line of similar products and have felt individual product analysis hardly warranted. Others, such as department stores, have so large a number of customers buying in small quantities that customer costing does not seem to be justified.

Despite these examples, it is probable that the majority of distributors need all the information they can reasonably obtain concerning products, customers, territories, units of sale, and so on. Where cost analysis has been made for products, alone, for example, such distributors must employ the results with great care. Ordinarily all distribution

costs are charged to the different products in such a study. When this is so, the expenses of performing many functions are allocated to products despite the fact that the product as such has no bearing upon the expense. Bad debts represent an example. It is but one of many expenses determined by the customers and varying between them as the result of differences in location, credit rating, or some other customer characteristic. Should any product happen to be sold more to one type of customer than to another, some part of the above or below average cost ascribed to the product will have been the result of the customers to whom it is sold. A fair test of the profitability of a product would be the determination of such profit as would exist if the product were sold to an "average" customer. Such a test is the only sensible one, too, inasmuch as customers are continually being added and lost and the steady customers vary from time to time in the proportion of purchases made of the different products.

The interrelationship between analyses is most clearly illustrated in the case of analysis of costs by customers. It is perfectly possible that a manufacturer might find a certain group of his retailer customers especially profitable, more profitable even than most of his wholesalers. In such a case, he might conclude that it would be wiser to omit wholesalers in favor of direct dealings with the retail trade. If, however, the retail customers found to be profitable were placing large orders, larger than were normally received from jobbers, the

¹¹ The unique plan established by the Dennison Co. for charging selling expenses to customers is also most useful and sensible. It is presented in detail in the Bulletin of the National Association of Cost Accountants, November 15, 1929, in an article by E. Stewart Freeman.

¹² Valuable material on the subject of distribution cost control may be found in the following books and pamphlets:

The Analysis and Control of Distribution Costs, by J. Brooks Heckert, Ronald Press, 1940.

The Control of Distribution Costs and Sales, by Wm. B. Castenholz, Harpers, 1930.

"Determination and Control of Marketing Costs," by H. C. Crockett, pages 248-270 in the *Handbook of Business Administration*, McGraw-Hill, 1931.

Net Profit Control for Paper Merchants, National Paper Trade Association, 1929.

Expense Distribution Manual, Controllers' Congress, National Retail Dry Goods Association, 1932.

conclusion should be that increased profits depend not on a change to direct-to-retailer selling but on increased unit orders. To have made such a change in favor of retailers might have been disastrous rather than beneficial. An analysis of costs by units of order as well as by customers would make it possible to avoid that error.

It does not avoid serious inaccuracy, however, to allocate all costs first to products and then to allocate the same costs to customers, territories, types of sale, and so on. Such double allocation can't be avoided in profit studies by units of sale and by commodities, or in studies by unit of sale and by customers. The same costs which differ as between products also differ as between the size of the orders for them, and the same is true of costs differing as between customers. Except in making profit studies by unit of sale, however, allocation of the same costs in different profit studies is most undesirable. It is obvious on the face of it that not all costs are affected by commodities, by customers, by types of transactions, etc. In the great majority of cases it is arbitrary to charge salesmen's salaries and expenses to products and no less arbitrary to charge warehousing expenses to buyers of the product.

When such allocations are made the profit figures found cannot be safely depended upon. Costs varying with product characteristics should be charged to products, and those varying with customer characteristics should be charged to customers. When the total product costs applicable to any article have been subtracted from the gross margin obtained on its sales, the balance constitutes its contribution to customer costs and profit. One should then subtract from this balance the customer costs which would exist for the average customer (total customer costs expressed as a per cent of sales multiplied by the volume of sales of the product) in order to find the profitability of the product

per se dissociated from the particular customers currently buying it.

In similar fashion the contribution which customers make to product costs and profit should be found. The customer is free to order any product, and commonly varies the number of products and the amount of each which he obtains from any one source of supply. Because this is so, the gross margin for the customer should be obtained by multiplying the sales to him (in dollars) by the percentage of gross margin for all products together. His contribution to product costs and profit may be found by subtracting the costs allocated to him from the gross margin. His profitability as dissociated from the products he is now buying may be found by subtracting from his contribution the average product costs in per cent of sales multiplied by sales to him.

In some cases, of course, it may be desirable to know not the contribution made by the product to cover customer costs and profit but rather the actual profit made on the product in the light of the customers ordering it. To find that simply requires subtraction of the customer costs for the actual customers (customer costs in per cent of sales multiplied for each customer by his purchases of the product) from the amount remaining after subtraction of the product costs from the gross margin obtained on its sales.

Another important criticism which may be leveled against most of the methods in current use (including those discussed above) is that they are oversimplified attacks upon a complex accounting problem. It is absurd to believe that marketing costs vary on only four or five bases, and available writings on the subject rarely indicate that other desirable bases are so similar that they may be omitted. The expense of instituting and operating a cost analysis system requires that it should avoid unimportant elements which might be necessary for theoretical perfection.

(There can hardly exist an *actually* perfect system.) But it does appear logical to prepare a system of cost allocation as nearly perfect as possible at the outset. If some minor expenses require individual bases of proration different from those employed for most significant expense elements, they may be included among expenses allocated on some other basis which is to be employed and which is most similar to the one omitted. Intelligent combinations of expense on a single basis of variation provide an indication of the degree of accuracy sacrificed insofar as the basis used is known to give different allocations from the one omitted. When one has such knowledge, he can interpret the results of his simplified method of analysis much more satisfactorily and can avoid being misled by profit-and-loss figures into hasty changes of policy.

The most important of all criticisms of current methods of cost analysis applies to all methods which have so far come to the attention of the author, except, in part, to that of the Dennison Company. This is the fact that allocations are made of actual rather than standard costs. Because this is so, many products or territories or units of sale appear unprofitable when they are not inherently so. Rent, depreciation, interest, and taxes allocated to individual commodities are naturally excessive when much of the space and equipment owned are idle.

They are falsely shown to be unprofitable, too, when labor is inefficient or when the operating routines are not entirely satisfactory. The products and territories cannot properly be held responsible for these things. It would be the height of folly to eliminate products on the ground that they are unprofitable when the costs allocated to them are unfairly swelled by the existence of unutilized plant capacity. Such action

would tend to hurt rather than help the situation.

What is needed is information showing the inherent profitability of products and customers. Business needs, too, measures of loss from inefficient labor and idle capacity. It is not enough simply to know that a loss is sustained on the distribution of certain articles unless there exists a causal relationship between the product and the profit or loss showing. The measures should not be measures of actual costs simply classified by products or units of sale, but rather they should be measures of the efficiency of company operation and company policies. There is no scientific validity to tests the results of which can be ascribed to any of several variable factors; there must be but one cause. Cause and effect relationship should exist logically and be measured with care. Not until distribution cost analysis has reached that point of development has business the scientific tool for which it is looking.

The criticisms leveled here against measures of a single factor (e.g., customers or types of sales) alone, against the allocation of all costs to each factor in turn, against oversimplification of method, and against allocation of actual rather than standard costs are all so serious that the results of methods subject to them must be interpreted with great care. All methods so far described in publications of the trade associations, government agencies, and professional journals are subject to one or more of these criticisms. In no case is there anything approximating a real *system* of distribution cost analysis. The problems have been grasped at and important contributions have been made. The subject has really been opened and seems ripe for a further step towards a *practical, adaptable, accurate system* of distribution accounting.