Service Organization Costing: A Synchronized Manufacturing Approach

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The pricing methods used today in industry and described in the leading textbooks were formulated in the Du Pont and General Motors plants as early as the 1920s. They suited the industrial characteristics of the time—mass production of standard items. Little, if anything, has changed in management accounting despite far-reaching changes in the technology and environment of manufacturing. One of the challenges facing management accounting today is the development of tools for the allocation of indirect costs. The traditional approach, which favored their allocation on the basis of direct work hours (or direct hourly wages) has a number of serious disadvantages:

- Indirect costs constitute most of the value added in production today, while the weight of direct wage costs is on the decrease. In the electronics industry, for instance, indirect costs make up 70-75 percent of the value added in production. As a result, the allocation base becomes narrower and its significance is distorted.
- The huge gap between direct work-hour costs and full pricing costs (after allocating indirect costs) can have negative repercussions on labor relations. Feelings of exploitation and windfall profits at the expense of the workers may set in, if, for example, an employee at an accounting firm whose salary is $15 an hour finds out that the firm is selling his services at $30 an hour.
- Decision-makers are not sure when to use data based on full costs (variable costs plus average unit fixed costs) and when to rely on variable costs. Proponents of direct pricing often point to cases where only variable-cost data is recommended, and the use of full-cost data leads to bad decisions.

It should be borne in mind that an organization must cover its fixed costs in the long run in order to avoid losses. The organization's purpose is to make a profit and not just to make a positive contribution. Hence, the exclusive use of direct pricing is suited to short-term, ad-hoc choices, but in the long term it may lead to inadequate decisions.

- The assumption that all resources are utilized 100 percent of the time is not valid. As will be shown later, most of the resources are non-bottlenecks, which are not, and should not be, fully utilized.

An interesting solution to the problem of overhead allocation was proposed by Hopkinson as far back as 1892. He recommended charging the consumer by means of two rates:

a) A charge for the right to use the service (which serves to cover the fixed costs of overhead establishment and upkeep) ;

b) A current charge relative to consumption (to cover variable costs).

Our electricity and phone bills are prepared in accordance with this two-rate method. Its advantage is that it attributes costs to the factors causing them. Its disadvantage is its applicability to a limited number of organizations.

But there is a different method for the allocation of indirect costs, a method based on the synchronized manufacturing method, also known as OPT (Optimized Production Technology), and its successor, MBC (Management by Constraints). For this purpose we will briefly review the basic points of the synchronized manufacturing and MBC methods as well as its pricing aspects. The synchronized manufacturing approach has, in the last few years, been successfully implemented in hundreds of American and West European plants. The approach is especially suited to the management of complex assembly lines and job-shop type plants.

In a typical manufacturing company with three stations, station A might have a maximum manufacturing capacity of ten; station B, four; and station C, six.

Obviously, the plant's maximum throughput is four units an hour, and station B is a production bottleneck. Were station A to be operated at its maximum capacity, not only would the throughput not increase, but ever-rising inventory levels would be created.

Suppose that it is possible to purchase a new machine that can increase station C's capacity from six to eight units an hour. This investment is pointless, since an improvement in station C's output will not increase the plant's throughput at all: It will remain steady at four units an hour.

With the synchronized manufacturing approach, an operation should:

- Balance flow, not capacity. Management usually concentrates on maintaining an "effective" utilization of manufacturing resources. The result is full-capacity operation of each machine. But this policy is wrong, since it causes inventory accumulation along the production line without increasing throughput of finished goods.
- The only stations to be operated at full capacity should be bottlenecks, since they in fact govern the plant's throughput (and its total sales volume).
- Full-capacity utilization of all of the plant's resources is not necessarily beneficial (or "activation is not always utilization"). The activation of a manufacturing station which cannot "flow" due to the presence of bottlenecks in the manufacturing

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process causes the accumulation of unfinished inventory and hence waste.

■ An hour lost at a bottleneck is an hour lost to the entire plant.

■ An hour saved at a non-bottleneck station is an illusion.

■ Bottlenecks govern throughput and inventory at each step in the process.

A detailed discussion of the OPT method merits a separate article. For our purposes it is important to stress its pricing aspects.

The methodology of Management by Constraints was developed from the concept of synchronized manufacturing. The methodology is:

Set up the system's goal and use the right measures. Then, follow the next five steps

■ Identify the system's constraint(s).

The constraint may be either internal (a bottleneck resource) or external (a market demand constraint). In our example the constraint is an internal one, namely, station 2.

■ Decide how to exploit the system's constraint(s).

An obvious decision would be to operate the constraint 100 percent of its available hours. Another decision may be to prefer those products that enable the maximum contribution per unit from the constraint resource.

■ Subordinate everything else to the above decision.

The entire system should be subordinated to the constraint. For example, station 1 should work according to the system constraint's rate, which is the pace of station no. 2 (four per hour). The release of raw materials should also be according to the system's constraint (four per hour).

■ Elevate the system constraint(s).

Once we have exhausted the constraint and are operating it properly, we can gain more throughput by

- Adding more units of the constraint.
- Making some organizational changes.
- Making technological improvements to save some of the constraint time.
- Off-loading the constraint by assigning the some of its jobs to non-constraint resources.

5. If, in the previous steps, the constraint has been violated, go back to step 1, but don't let inertia become the system's constraint.

The synchronized manufacturing rules can be viewed as special cases of the five steps of MBC where internal constraints exist. MBC and synchronized manufacturing also use three operational measures of performance:

■ Throughput is the rate by which an organization generates revenue through sales. If the system produces something that has not been sold, it is not considered throughput.

■ Inventory is defined as all the money the system invests in purchasing things that it intends to sell. This definition of inventory deviates from traditional definitions since it excludes the added value of labor and overhead for work in process. This makes inventory measurement much clearer and enables management to watch the difference in WIP (Work in Process) and raw material without the overhead allocation noise.

■ Operating Expenses - all the money the system spends in order to turn inventory into throughput. This definition of operating expense includes not just direct labor, but also management overhead, computers, and so forth, thereby adding all production overhead to the operating expenses.

Little, if anything, has changed in management accounting despite far-reaching changes in the technology and environment of manufacturing. One of the challenges facing management accounting today is the development of tools for the allocation of indirect costs.

From cumulative experience of implementing synchronized manufacturing in plants, we suggest two additional control indicators:

■ Lead Time - the time between the decision to initiate production and delivery to the customer.

■ Quality - the product's quality is reflected in its competitiveness. Each decision should be considered in light of its impact on quality levels. A way to measure this might be to look out for changes in the proportion of rejected items, quality costs, or any other parameter found suitable by management.

In organizations where the constraint is internal (i.e., a bottleneck resource), we may view the sale of products as selling bottleneck hours. Thus, an important costing rule is that the organization's overhead should be allocated solely to the bottleneck. It assures full recovery of the overhead, since the bottleneck operates 100% of the time.

This simple costing rule can be equally applied to industrial plants and to service firms. It requires a sound definition of the production process (or the supply of services) and the identification of its bottlenecks. Moreover, it requires a policy of exploiting the bottleneck. It does not require any investment spread on software and hardware.

Picture a medium-sized accounting firm, composed thus:

■ Four "senior" accountants in regular supervision, counseling, and representation tasks; a junior staff of 12 supervision workers and apprentices. The number of supervision workers can be changed according to the work load at any point of time. We will consider their salaries as variable direct cost.

■ A professional department made up of a senior accountant and a junior employee.

■ A tax department made up of a senior accountant and a junior employee.

■ Four clerks/secretaries/typists.

The firm's monthly operating costs are:

$5,000 for a senior accountant's salary (including social and other expenses),

$1,500 for a junior employee/secretary's salary (including social and other expenses),

$11,400 for office upkeep (rent, utilities, municipal taxes), supplies, postage, phone and computer maintenance. The accountants' fees are based on the control department employees' direct work hours. Other expenses (wages, upkeep and office supplies) are considered indirect costs. The firm's direct costs are therefore $38,000 a month (12x1,500 + 4x5,000). Indirect costs are $30,400 (6x1,500 + 2x5,000 + 11,400).

Experience shows that each control department employee spends about 100 hours a month in regular tasks. The rest is taken up by professional courses and updating, arrangements, and travel time. Hence a senior accountant's work hour costs 5000/100, or $50 in direct costs, and a junior employee's costs 1500/100, or $15.

Indirect costs constitute 30400/38000, or 80 percent of direct costs. Thus the natural trend is to multiply direct costs by 180 percent in order to arrive at the full costs. In this way a senior accountant's full work hour costs $90 and a junior employee's $27.

These figures may result in wrong decisions. In order to apply the pricing rule formulated earlier (whereby overhead is allocated entirely to bottlenecks) we must identify the firm's constraints.

In our case, the constraint is internal. Due to considerations of professional caution, the firm's senior accountants constitute its bottleneck. The firm cannot afford to publish reports or professional opinions without having a senior accountant thoroughly

Authors' note: The data used here is solely for purposes of illustration, and does not necessarily reflect accounting firms' actual average costs.

check them in order to verify their compliance with professional standards.

If we allocate overhead to the senior accountant's direct work hours we arrive at a full work hour cost of $126, or 50 + 30400/(4x100), whereas the junior employee's cost will be $15 as before.

Different allocation methods have different effects on the following decisions: a) determining the full costs of different tasks with equal direct costs; b) determining the work hour cost of a senior accountant working outside the firm (e.g. invited to give a series of lectures); c) use of outside accounting firms as subcontractors.

Example A: Suppose the accounting firm examines books for 100 direct hours, of which 70 are junior employees' and 30 senior accountants'. Direct costs expended on this task are $2550. Counselling services rendered by the firm for 72 hours, of which 42 are senior accountants' and 30 junior employees', bear equal direct costs (since $2550 = 42x50 + 30x15).

Both tasks cost the same in direct costs, even though the counselling service takes up fewer direct work hours. In spite of this, a sound pricing method ought to price it higher. Using our system, its cost will be $5742, or 15x30 + 126x42, whereas the audit task's cost comes out to $4830, or 15x70 + 126x30.

It should be noted that the counselling service uses up a bigger share of a scarce resource (42 senior accountant's work hours, vs. 30 in the audit task), and it is therefore right for it to bear a bigger share of the firm's overhead.

Example B: Suppose now that one of the firm's senior accountants is invited to give some training lectures outside the office at a rate of $90 an hour. Is the offer worthwhile? Apparently so, since the accountant-lecturer will not be requiring office services outside, so that the $50 direct hourly cost is the relevant rate in this case.

We are of the opinion, however, that the $126 full hourly cost is the relevant rate, and the offer should therefore be declined. The fact that the accountant will not be using the firm's overhead is irrelevant. Since his work hours constitute a bottleneck, his absence from the firm will restrict its ability to accept other commissions. The right price for a senior accountant's hour is therefore $126. (Note that even by loading 180 percent as before, the hourly cost would be $90 and the offer would still be considered worthwhile.)

Example C: Accounting firms commonly subcontract out work to outside accountants (a practice so common we will not deal with its propriety). Suppose our firm hands over one of its checks to such a subcontractor, who does the work in 70 hours at an agreed rate of $40 an hour. Twenty senior accountants' hours were also required for purposes of briefing, reviewing, and analyzing, and evaluating documents as well as discussing the subcontractor's findings.

TABLE 1

	Case 1	Case 2
	Audit	Consulting
Sales	(90x30+70x27)1.15	(90x42+30x27) 1.15
	$5279	$5279
Bottleneck hours	30	42
Sales per BN hour	$176	$126

TABLE 2

	Case 1	Case 2
	Audit	Consulting
Sales	$5279	$5279
Juniors' time	70x15 = $1050	30x15 - $450
Contribution	$4229	$4829
BN hours	30	42
Contribution Per BN hour	$ 141	$ 115

What is the total cost to our firm? According to our method the answer should be $5,320—a $2,800 payment to the subcontractor, and $2520 in the firm's own employees.

In many cases, where the number of "juniors" is more or less constant, they can be considered a fixed cost. According to the synchronized manufacturing approach and MBC, they should be subordinated to the system's constraint (i.e., the senior staff). Thus, they are not expected to work 100 percent of their available time. Moreover, since the jobs tend to come randomly, according to queuing theory servers should not be fully utilized. This excess capacity may gain shorter lead times and more flexibility to the firm.

For this case, we suggest allocating all costs (including all salaries—both juniors' and seniors') on the seniors' bottleneck hours. A senior's hour will cost $171, or (30400+38000)/4000. A junior's hour will not be billed.

Going back to the three previous examples, the audit job, consisting of 70 junior employees' hours and 30 senior accountants' hours, will charged at $5130, or 30 x 171.

The consulting job, consisting of 42 senior accountants' hours and 30 junior employees' hours, will be charged at 42 x 171 = $7182.

The lecturing job should be at a rate of $171 per hour.

The subcontracting arrangement should be charged to the client in the amount of $6,220—payment to the subcontractor (70 x 40 = 2800) and the full rate of the seniors' hours (171 x 20 = 3420).

These results may seem to be counter intuitive, as we are apparently giving juniors' hours for free. However, this approach does not encourage the non-constraint resources to "keep busy" even if it is not necessary just to justify their salaries. Juniors should work on a load of less than 100 percent of their time, and be available to assist the seniors.

Usually, the market determines prices according to demand and supply rules. The firm can gain a competitive edge by choosing the jobs that maximize profits. This can be achieved by calculating the contribution of a bottleneck resource for each job. In example A, according to traditional cost accounting, the decision maker is indifferent to the two options. Using bottleneck allocation of all expenses shows the results shown in Table 1 (assuming that the market price behaves according to traditional cost accounting, and the prices leave a margin of 15 percent).

Assuming that the juniors are considered variable cost (meaning they can be hired and fired according to their work load), the calculation will be as in Table 2.

Thus, the firm has some solid criteria for choosing for the most profitable jobs. **IM**

Further Reading

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