

ABCs of Batch Processing



Assign the batch cost to the product that required the batch activity? Maybe not!

by Alan Vercio and Bill Shoemaker

When it comes to adding or reducing products or services, accurate cost information is critical. Activity-based costing (ABC) provides solutions to measuring costs that traditional methods do not address. Rather than simply dividing costs among the number of widgets manufactured or services provided, ABC acknowledges that not all costs are driven by output volume. As a result, ABC identifies activities related to batches, products, customers, administration and related costs that are not driven by volume (or unit production).

As a general rule, if non-volume related activities and their related costs are not isolated, high-volume customers and high-volume products will subsidize low-volume customers and low-volume products. Minimizing this type of inaccuracy is a priority of cost measurement systems designed to support strategic decision making.

Batch activity costs are particularly susceptible to unintentional cost subsidies. This article reviews different types of batch activities, provides examples, reviews how batch activity cost is assigned under traditional costing, and how batch costs should be assigned using ABC to minimize cost distortions.

BATCH PROCESSING IN BRIEF

Batch processing occurs when one or more units enters a work activity, is changed by the work activity and exits the work activity. For example, a furnace may heat 50 units at a time or a process for handling paper currency may use 100-unit batches.

In many cases, batch processing promotes economy. For instance, it is more economical to transport 60 people in a bus than in 60 automobiles. In other cases, however, where there is economy in batch processing, the end-to-end

process may be suboptimized with large amounts of inventory, longer cycle times, and more rework and scrap. Just-in-time processes reduce batch sizes, in some cases to lot sizes of one, to minimize waste.

THE SETUP

In most cases, a batch requires a setup to prepare the material for processing. Common setup activities include data recording, quality control and material handling. These activities could be performed by a person or a machine. In most cases, data is captured, stored and analyzed, then used for process control and future problem resolution. Different factors cause setups. They include volume, time, control, product and customer requirements.

Operational volume setup takes place every time a lot passes from one work station to the next. The volume could be one or more than one. Volume-driven setups normally do not change any machine settings.

Operational time setup takes place based on a calendar event. The setup could require a quality-control batch to be processed.

Operational control setup takes place based on quality-control requirements. For example, in check processing, 300 checks are grouped into a batch with a control document containing the value of the lot. This is used for reconciliation throughout the process.

Product or conditional setup is only required to run a different product through the process, in this case, the conditions for

processing change. Differences could be based on temperature, process time, energy input, chemical input or color.

Customer-based setups occur when a customer requires some degree of customization such as a private label or custom color. Another example is electronic check processing in which a bank cus-

Whether the setup's cost is included as a service and therefore listed as a separate line in the invoice varies by customer and industry. If customer P&L reporting is not performed by the company and there are material customer-driven setup costs that are unequally distributed between products, there will be product-cost subsidies.

Batch processing occurs when one or more units enters a work activity, is changed by the work activity and exits the work activity.

tomers sends a payroll deposit file. Setup work is required to recognize and process the file regardless of how many deposits are in the file.

The operational setups—volume, time and control—do not lead to cost measurement distortion. These types of setups exist in processes that include only one type of product. For example, production may decide that a lot size of 50 units optimizes cost, time and quality. Fifty units are released to production whether there is one product type or many product types. A 1,000 volume unit product incurs 20 setups whether it is the only product produced in this facility or is one of many product types.

The types of setups that can lead to material cost measurement distortion include product-conditional and customer-based setups. Customer-driven setups will not cause product-cost subsidies if the setup's cost is assigned to the customer P&L.

This article focuses on product-driven conditional setups and not customer-driven setups.

TRADITIONAL COST MEASUREMENT

Traditional cost measurement assigns all costs to the production unit. In manufacturing, these costs usually equate to those costs that can be entered into inventory. In service organizations, these costs typically equate to the cost required to execute the process.

If the traditional cost measurement system uses labor time, the time to perform the setup may or may not include the time to process the part or material. This is determined in the engineering labor standards. If the setup time is not included in the engineering labor standard time, that time is assigned to overhead cost and calculated as a percentage of labor time.

EXECUTIVE SUMMARY

- **In batch processing**, if costs are not isolated, high-volume customers and products tend to subsidize lower-volume ones.
- **This article reviews different types of batch activities** and how they would be handled under traditional costing and two different variations of activity-based costing (ABC).
- **Traditional costing equally distributes** overheads by unit across all products, which clearly

- subsidizes lower-volume products.
- **ABC systems often assign setup costs** to the product for which the setup is prepared. Higher-volume products, which are likely to be more frequently interrupted by lower-volume products, have setup costs assigned to them that are not a necessary cost to producing the product.

- **An alternate and preferred ABC design** assigns conditional setups (those setups only required to run a different product through the process) as a product-level cost based on the number of different products rather than on the number of batches produced of each product.
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Cost Measurement department, provides guidance to the company's ABC methodology, and is active in the CAM-I Cost Measurement Systems Consortium. Bill Shoemaker, CPA, is a faculty member of the College of Business at the University of Dallas, where he is the director of Graduate Accounting Programs. Their e-mail addresses are alan.vercio@bankofamerica.com and shoe@gsm.udallas.edu, respectively.

If machine time is used to assign cost, the setup time might be included if the machine is actively involved in the setup. If most of the setup work is performed while the machine is processing the prior batch or when the machine is sitting idle, the cost is not based on machine time but

a different product through the process) within that production center.

DISTORTION FROM TRADITIONAL COSTING

Consider two products—A and B. Product A is a high-volume product. Product B is

Product B incurs about 9%. Under this method, product A and product B are each allocated about \$0.18 of cost per unit.

However, if the setup activity cost is identified, product A is assigned 10 cents per unit, and product B is assigned \$1 per unit. Notice the cost subsidy that occurs when the volume of units in the batch is not considered.

To further illustrate this distortion, consider the data in Exhibit 1. Traditional costing does not differentiate product-level and batch-level costs. The result is that product-level and batch-level costs are buried in the cost per unit (see Exhibit 2).

ABC COST DRIVERS

ABC is an alternative to traditional costing that focuses on activities that have different drivers. Activity-based costing researcher Robin Cooper, whose work was manufacturing based, documented four types of activities that have different drivers. Because they have different drivers,


When production center overhead rates are used instead of a plantwide overhead rate, cost subsidies are reduced.

is assigned through an overhead allocation.

In some factories, overhead is assigned plantwide. In others, overhead is assigned to each production center. When production center overhead rates are used instead of a plantwide overhead rate, cost subsidies are reduced. However, production center overhead rates do not reduce cost subsidies that result from conditional setups (those setups only required to run

a low-volume product. The batch size for product A is 100. The batch size for product B is 10. The activity cost to perform a conditional setup is \$10. If the setup activity cost is not identified and the activity cost is included in overhead, product A incurs the majority of the conditional setup costs. In this simple example for the two batches, product A incurs 100/110 or about 91% of the \$20 for the two setups.

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their costs should not be combined as if there is only one driver.

Unit activities occur every time a unit is processed. Examples include grinding, finishing, assembly and painting.

Batch activities occur every time a batch—lot size of one or greater—enters and exits a work station. These will include operational and conditional setups.

As a general rule, conditional setup activities are not related to the volume of the units in the batch. For example, if a furnace must be heated or cooled to run

a batch of another product, there is only one temperature change regardless of how many units are in the batch.

Product activities include all the activities to ensure that production—manufacturing or service—has the capability to produce the product. These activities include maintenance of routings, recipes, test programs and software, as well as product-specific training. These activities do not vary with the number of units or the number of batches.

Facility activities include the plant

Exhibit 1 Monthly Costs and Production Statistics

January	Total	A	B	C
No. units*	1,350	1,000	200	150
No. conditional setups	30	20	7	3
Product activity costs**	\$135,000			
Conditional setup costs	165,000			
Unit activity costs	700,000			
Total costs	\$1,000,000			

*For this example, units require the same amount of processing time.
 **Product activity costs include activities required to ensure the factory has the capability to produce the product. These activities include engineering specifications, bill of material specifications, test programs, software application maintenance and training.
 Notice: For simplification, this example has excluded the facility or administration cost.

Exhibit 2 Traditional Approach—Allocate All Costs to Units Based on Units

January	Total	Product		
		A	B	C
No. units	1,350	1,000	200	150
Price per unit		\$800	\$900	\$1,100
Revenue	\$1,145,000	\$800,000	\$180,000	\$165,000
Cost				
Product activity (overhead)	135,000	100,000	20,000	15,000
Conditional setup (overhead or process time)	165,000	122,222	24,445	18,333
Unit activity	700,000	518,518	103,704	77,778
Total Costs	\$1,000,000	\$740,741	\$148,148	\$111,111
Unit Cost		\$740.74	\$740.74	\$740.74
Profit	\$145,000	\$59,259	\$31,852	\$53,889

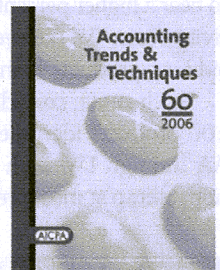
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manager, security and grounds management. They are usually less than 10% of the total cost.

ONE APPROACH TO ABC

ABC systems typically assign product-level activity costs equally to each product.

this mix of products there are a few that have high volumes. Most have relatively low volumes. The factory did not manufacture 100 products in the beginning. It began with the high-volume AA product. This product was very successful in the market and achieved wide distribution.

product, representing 70% of the total factory output. Because it is the highest volume product, it is likely to incur most of the conditional setups because it will be produced more often. This is because customer requirements, warehousing, distribution channels and inventory cost limitations rarely allow a factory or service provider to optimize its production solely to minimize conditional setups.

ABC is an alternative to traditional costing that focuses on activities that have different drivers.

Batch-level conditional setup costs are assigned to products based on the number of batches produced of each. Conditional setups are often treated as batch-level costs. This is an improvement over traditional cost measurement. But in Exhibit 3, Approach A, again using the data in Exhibit 1, we see that product A continues to bear a higher percentage of the batch activity costs. We believe product A is subsidizing products B and C.

Over time, engineering, marketing and customer requests brought about the introduction of product variations beginning with AB. When AB entered production the first time, a conditional setup was necessary. The next time AA was produced, another conditional setup was necessary—but only because AB had been produced. AB was a low-volume product and a few conditional setups did not have a material impact on production. Today this is no longer the case. Long before the 100th product DV was added, conditional setups became frequent.

Notice: Some cost measurement systems are designed to support regulatory requirements. These systems should focus first on compliance and then on efficiency. Subsidy costing across individual products generally does not affect compliance reporting.

To illustrate, consider a factory that has 100 products identified alphabetically as AA through DV, each requiring a conditional setup at most production centers. In

Product AA remains the high-volume

TAKING ABC TO THE NEXT LEVEL

In a manufacturing environment like the one described above, we believe the root cause of conditional setups is product diversity. To best reflect this cause, we

Exhibit 3 Two ABC Approaches

Approach A: Allocate batch costs to units based on number of batches and unit costs to units based on units.

Approach B (preferred): Allocate conditional setup costs to units based on number of products and unit costs to units based on units.

Month	Total	Product			Product		
		A	B	C	A	B	C
No. units	1,350	1,000	200	150	1,000	200	150
Price per unit		\$800	\$900	\$1,100	\$800	\$900	\$1,100
Revenue	\$1,145,000	\$800,000	\$180,000	\$165,000	\$800,000	\$180,000	\$165,000
Cost							
Product activity	135,000	45,000	45,000	45,000	45,000	45,000	45,000
Conditional setup	165,000	110,000	38,500	16,500	55,000	55,000	55,000
Unit activity	700,000	518,518	103,704	77,778	518,518	103,704	77,778
Total Costs	\$1,000,000	\$673,518	\$187,204	\$139,278	\$618,518	\$203,704	\$177,778
Unit Cost		\$674	\$936	\$929	\$619	\$1,019	\$1,185
Profit	\$145,000	\$126,482	(\$7,204)	\$25,722	\$181,482	(\$23,704)	(\$12,778)

believe conditional setups should be accounted for not at the batch level but as a product-level cost that is equally distributed among the total number of products or services in a production facility. Using this approach in the above example, product AA and all other prod-

ent variations of ABC. Some ABC methodologies include the cost subsidies described in Exhibit 3, Approach A, and others embrace the preferred method that distributes conditional setup costs as we recommend in Exhibit 3, Approach B.

Any costing approach should apply

From an operations perspective, the cost of conditional setups as well as all other types of setups should be measured for their use in setup-quality and cost-tradeoff decisions.

ucts each would incur 1/100 or 1% of the total conditional setup activity cost.

If the annual cost of conditional setups is \$1 million, product AA is assigned \$10,000, as are all other products. For the high-volume product AA, \$10,000 is not a significant cost burden. For the low-volume products, \$10,000 may be a very significant amount. The low-volume product managers have incentive to consider strategic options such as lowering prices, increasing volumes, reducing expenses, raising prices to cover the product-level cost, migrating customers to higher-volume products, or abandoning the product.

In Exhibit 3, Approach B, again using data from Exhibit 1, product-level activity costs are assigned equally to each product. Batch-level conditional setup costs, though still shown separately, are treated as a result of product diversity and assigned equally to each product. We believe this ABC approach minimizes high-volume to low-volume cost subsidies.

CONCLUSION

There is no standard for ABC. As a result, practitioners may be familiar with differ-

ent variations of ABC. Some ABC methodologies include the cost subsidies described in Exhibit 3, Approach A, and others embrace the preferred method that distributes conditional setup costs as we recommend in Exhibit 3, Approach B.

Any costing approach should apply by including conditional setup activity cost as a product-level activity cost.

Another strategy for minimizing cost subsidies is a round-trip assignment of conditional setups. Under such a system, both the setup to produce the low-volume product and the setup to return the equipment to its high-volume configuration are charged to the low-volume product. But in an environment where volumes frequently fluctuate and the high-volume product of today becomes the low-volume product of tomorrow, this approach becomes difficult to maintain.

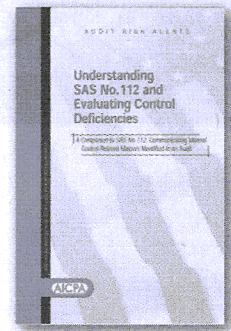
From an operations perspective, the cost of conditional setups as well as all other types of setups should be measured for their use in setup-quality and cost-tradeoff decisions. This cost measurement should not interfere with providing the most relevant cost measurement for customer and product profitability.



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