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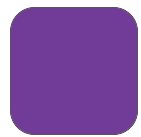
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SUPPORTING MANAGEMENT DECISION-MAKING:

Costing and cost analysis in the lean enterprise can provide business management insight on developing more efficient production processes and aid in product pricing and marketing practices.

COST ANALYSIS IN THE LEAN ENTERPRISE

MARK PICKERING

Lean accounting is evolving to provide information that effectively and efficiently supports management decision-making in lean organizations.¹ Lean accounting practices seek to address long-observed issues with traditional management reporting and costing, which are magnified in lean companies.² A significant component of lean accounting is the calculation and analysis of costs. This article explores lean enterprise costing and, in particular, how costs are analyzed to support different types of management decisions. Cost analysis methods used in lean companies essentially apply and refine general cost analysis approaches that have gained more traction in lean environments than in other companies. Understanding costing and cost analysis in lean organizations is therefore of interest to financial professionals in both lean and non-lean organizations as they seek


to better the quality of cost information and analysis to improve management decisions.

This article first discusses some of the major uses of cost information. It then provides an overview of the lean philosophy and the attributes of lean that impact costing requirements. How cost analysis is performed to support decisions in lean companies is then identified and compared with cost analysis generally recommended in accounting education. Potential conditions in which this analysis would be most suited and issues to be avoided are also identified. Finally, the relevance of activity-based costing (ABC) in lean enterprises is discussed.

Common purposes of costing and cost analysis

In most organizations costing is performed for a number of reasons:

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**PRODUCING TO
CUSTOMER
ORDERS AND
IMPLEMENTING
CONTINUOUS
FLOW RESULTS IN
GREATLY REDUCED
AND STABLE
INVENTORY
LEVELS.**

1. to value inventory in order to allocate costs between inventory as an asset on the balance sheet and cost of sales as an expense on the income statement;
2. to control costs by allocating cost to cost centers and comparing actual costs to expected costs (for example, through standard costing and reporting actual versus budget); and
3. to provide management with information to support decisions such as:
 - On which product/services and/or customers should we focus sales and marketing efforts?
 - Should we take on a special order?
 - Which products/services and/or customers should we reengineer or potentially rationalize?
 - Should we make products/components in-house or outsource to other suppliers?
 - How should we price our products/services?
 - How efficient are our processes?
 - Where should we focus improvement activities?

While the focus of this article is on the third of these purposes, the different needs of lean enterprises for costing information to support inventory valuation and cost control are important in enabling lean organizations to approach costing for decision-making differently than non-lean organizations. The next section provides an overview of lean.

An overview of lean

Lean is an enterprise-wide philosophy that emphasizes providing customer value through meeting expectations of product and service attributes (including price and quality) and timely delivery.³ Core principles of lean include:

- continuous improvement through enhancing processes, eliminating waste, and reducing inventory levels;
- pulling production through the system based on customer demand rather than making inventory for future sales;
- developing one-piece flow (the ideal), a system of flow with batch sizes minimized;

- emphasizing respect for people through training employees to be cross-skilled and empowered to improve processes and solve problems; and
- moving controls to the shop floor and visual controls rather than detailed top-management reporting.

Lean organizations are restructured from traditional functional silos to value streams, which include all of the resources (dedicated production and support staff, among others) required to produce a family of products from order to delivery. This involves replacing large pieces of equipment (known in lean parlance as monuments) that have worked on multiple types of products with smaller, more flexible machines within each of the value streams. Implementing lean has been reported to result in substantial reductions in inventory (up to 90%) and space (up to 50%), increased speed of delivery of customer orders, and improved employee productivity.⁴

While lean originated in manufacturing, evolving from the Toyota Production System, it is increasingly being implemented in service industries such as financial services, health care, and government.

Implications of lean practices for costing for inventory valuation and control

Producing to customer orders and implementing continuous flow results in greatly reduced and stable inventory levels in lean organizations. The reduced materiality level of inventory can enable the use of simple inventory valuation methods that value inventory in the aggregate as opposed to individual products. Including all resources related to a product family within a value stream makes average costing much easier with few allocations of overhead or shared resources. For example, methods can include the number of days of stock in raw materials, work-in-process, and finished goods, incorporating material usage costs and conversion costs for each value stream (or the number of units on hand) as a proportion of the number produced for the month, multiplied by total value stream costs for the month.⁵ Under such methods, it is not necessary to have an accurate cost for each product in order to value inventory.

Standard costing has traditionally been used as a tool to manage costs by reporting and investigating variance against standards. However, standard costing is counterproductive to lean organizations by motivating overproduction (to absorb fixed costs) and providing information on issues (in the form of variances) well after month end and in a form that is not easily understood by staff on the factory floor. Lean enterprises often move from standard costing to visual control, regular reporting on the floor, and monitoring value stream costs.

Cost analysis for decision-making

Lean accounting professionals generally advocate moving away from the traditional approach of costing and analyzing costs at a product level to analyzing costs at a value stream level.⁶ This includes evaluating the incremental financial impacts on both revenues and costs of decisions, such as whether special orders should be accepted, products or customers should be rationalized (exited), or products or components should be manufactured in-house or outsourced. How different is this from how financial analysis for decision-making is generally taught in accounting education? The short answer is: not much. Contemporary accounting textbooks recommend that revenues and costs incremental to a decision are considered in that decision — either by examining contribution margins or looking at the absolute change in revenues and costs associated with the decision.⁷ This approach to analyzing the financial impacts of decisions is not new and was taught over 35 years ago.⁸

In my career consulting to organizations, I have observed that many finance and accounting staff in non-lean enterprises

LEAN ACCOUNTING PROFESSIONALS GENERALLY ADVOCATE MOVING AWAY FROM THE TRADITIONAL APPROACH OF COSTING AND ANALYZING COSTS AT A PRODUCT LEVEL TO ANALYZING COSTS AT A VALUE STREAM LEVEL.

do not follow what they have been taught in terms of using relevant costs (or those that differ across the decision options) and continue to use inappropriate product costs to inform management decisions. I would theorize a number of reasons for the greater embracing of incremental cost

analysis rather than finance system product costs in decision-making in lean organizations:

- A reduced reliance on individual product costs for inventory valuation and control makes these costs less accessible for inappropriate use in decision-making. Many executives and managers want to know *the* cost of a product and struggle with the concept that the relevant costs differ based on the specific decision.
- Implementing lean often creates substantial excess capacity. Managers are looking for opportunities to productively fill this capacity to improve profitability and engage underutilized staff. They quickly realize that fully absorbed product costs run counter to this.

There are a number of key principles to keep in mind when performing cost analysis to support decisions within lean and non-lean enterprises. These include the following:

- Financial analysis represents only part of the information required for the decision; strategic factors are also important.
- Cost analysis must focus on the costs that are likely to differ across options being considered.
- The cost analysis must reflect the underlying behavior of costs, including capacity utilized and the range of volumes for which the analysis is valid.
- The cost analysis needs to reflect the period for which the decision relates. A potential decision to take on a once-off, short-term special order utilizing currently available capacity of resources for which the company is already committed needs to be considered differently than a decision to take on a multiyear supply contract over a period during which the company could potentially reduce capacity.
- Costing and cost analysis need to provide information that adds more value to decisions than the costs of maintaining the costing system.

While the principles for cost analysis are the same in lean enterprises as in non-lean organizations, there are some differences

FINANCIAL ANALYSIS OF THE DECISION USING UNIT COSTS, SUCH AS STANDARD COSTS, WILL UNDERSTATE THE FINANCIAL BENEFITS OF RETAINING OR BRINGING PRODUCTION BACK IN-HOUSE.

in assumptions of cost behavior and business complexity that can lead to some variations in how cost analysis is performed.

Lean cost analysis treats direct labor costs and other conversion costs as relatively fixed rather than variable, as in other costing approaches. Whether this is appropriate in non-lean organizations depends on the nature of the shifts, contracts with employees (e.g., full-time versus casual employees and minimum shift requirements — length and per employee), and management philosophy regarding employees. The lean philosophy includes respect for employees including staff input for continuous improvement, which would hardly be forthcoming if staff are expected to improve themselves out of a job. Therefore, the focus in lean organizations is on retaining and seeking to provide meaningful work for employees rather than reducing capacity.

Where lean is fully implemented with almost all resources in the value streams, and the products manufactured within each value stream are very similar to each other, the costs of implementing and maintaining more complex cost systems can exceed the benefits. Some lean organizations retain more variation in the value stream products, share more resources across value streams, and deal with customers in a variety of different ways, and thus can benefit from introducing more complex costing.

Cost analysis for different management decisions is now examined.

Special orders

Sometimes managers need to decide whether to accept a special order to produce a large volume of product for less than the price at which the company normally sells the product. The order may require more work than current products, such as further processing or added delivery effort. Whether the order should be accepted or not depends on the short-term financial impact of the decision and on strategic factors.

From a financial analysis perspective, it is important to understand current value stream capacity and the behavior of costs. Using a per-unit cost based on standard costs (where standard costing is used) or

on average unit costs through the value stream will underestimate the potential benefits of accepting the order, as the cost calculated will include fixed costs that will not change. Even costs traditionally considered as variable, such as labor costs, can be relatively fixed in the short term with established shifts. Where there is excess capacity, which is often the case in lean enterprises, a special order may be produced at little additional conversion cost to the cost of materials required. Financial analysis of the attractiveness of the order involves identifying incremental costs that will be incurred if the order is accepted and comparing these to the revenue for the order. This is often performed by modeling revenues and costs with and without the order.

An example will demonstrate the different outcomes from using a value stream costing approach compared to standard costs. SP Electronics has just received a query from a potential new customer as to whether they are willing to accept a special order to supply 10,000 units of component X for \$15 per unit. SP Electronics currently has spare capacity to produce the special order. Component X normally sells for \$22 per unit, and the standard manufacturing costs are \$16 per unit (made up of material costs of \$7, direct labor costs of \$4, and total overhead costs of \$5), giving a gross margin of 27%. Under the special order, SP Electronics will incur costs of \$1 per unit in shipping costs. Should they accept the special order?

If SP Electronics management used standard costs to analyze the special order, clearly they would decline the order. The price proposed of \$15 per unit is less than the standard cost of manufacturing the product (\$16) and shipping it (\$1), suggesting a loss per unit sold of \$2. But what would the real impact be on SP Electronics' profitability if the special order were accepted? Exhibit 1 uses a value stream costing approach to model expected changes in revenues, cost, and profits. Because SP Electronics has excess capacity, accepting the order increases material costs by \$7 per unit, but there is little change in other costs of the value stream. The company can produce the additional units within existing shifts and therefore there is no increase in

SIDEBAR 1: CASE A: A SPECIAL ORDER GONE WRONG

A textile company's general manager identified that the factory had spare capacity of about one shift available per week and was looking for ways to productively use this capacity. He and his sales manager decided to approach one of their department store customers with the offer to produce a special order of mattress protectors very aggressively priced at the cost of materials and direct labor, with a very small profit margin on the top. The department store agreed to the special order and took advantage of the low cost of the mattress protectors to offer low prices to its customers. The mattress protectors were a huge success. Soon the textile manufacturer's factory was running night and weekend shifts to keep up with demand. Is this a great example of the appropriate use of marginal pricing to utilize available excess capacity? Well, no. It is more of an example of the risks.

THE PROBLEM AND THE FALLOUT

As expected, sales of the mattress protector increased company sales significantly. However, falling profitability and increasingly urgent cash flow problems were not anticipated. A detailed analysis of the costs associated with the mattress protectors identified the following:

- The small margin that the company had built into the price was eliminated by volume and payment discounts taken by the customer.
- Distribution costs had increased substantially as the customer required regular small deliveries at each of its locations so that the manufacturer could restock its shelves. These additional costs were not considered in pricing the special order.
- The unanticipated high volumes of mattress protectors sold created substantial issues. Production moved outside the available 'normal' excess shifts into overtime shifts at nights and on the weekends. During these periods, overtime increased the labor costs between 1.5 and 3 times what was included in the pricing. Even worse, these additional costs were hidden in the accounting system for a period with production costs coded to inventory and the standard (normal time) cost transferred to cost of sales. By the time management noticed this, almost \$1 million had been lost — a huge amount for a small company.

THE LESSONS

Marginal pricing can be beneficial when there is excess capacity. However, it is crucial to ensure that the volumes and prices offered or accepted consider the amount of spare capacity available and the implications of exceeding that capacity. Understanding utilized and available capacity is a very important aspect of lean. Normal industry and expectations of the customers regarding discounts for volume or early payment are important to ensure the actual price received exceeds marginal costs. It is also crucial that, when considering marginal costs of special orders, the analysis goes beyond manufacturing costs and includes additional costs throughout the supply chain. Finally, it is vital to understanding the accounting and costing system and how transactions are recorded.

labor costs. The increased conversion costs include additional electricity costs (\$5,000) and shipping costs (\$10,000). Accepting a special order that would appear to be loss-generating using standard costs would generate an additional \$65,000 in profit and increase the company's return on sales measure from 27.2% to 30.25%.

This approach of analyzing revenues and costs under the different options rather

than using standard costs is not unique and is consistent with analysis taught in contemporary accounting education.⁹ As shown in Case A (see Sidebar 1), it is important to understand the capacity available and place limits on order volumes when accepting a special order priced using incremental or marginal costs.

This analysis assumes that there is spare capacity to be utilized, which is common

EXHIBIT 1 Revenues, Costs, and Profit Without and With Special Order

	Current state (without order)	Future state (with order)
Revenues	\$650,000	\$800,000
Costs		
Material costs	\$207,000	\$277,000
Conversion costs	\$266,000	\$281,000
Total value stream costs	\$473,000	\$558,000
Value stream profit	\$177,000	\$242,000
Return on sales	27.2%	30.25%

*Adapted from McVay, G., Kennedy, F., and Fullerton, R., *Accounting in the Lean Enterprise*. (Boca Raton, F.L.: CRC Press, 2013).

in lean enterprises. Financial analysis for situations where there are capacity constraints and accepting a special offer will impact the ability to produce other products is considered in the later section “Product mix with capacity constraints.”

Strategic considerations include forming a view as to whether the sale at a discounted price is likely to affect existing customers, erode the market price of the product in the minds of buyers, or kick off a price war with competitors. If accepting the order will affect the company’s ability to deliver to existing customers, potential impacts on customer relationships need to be considered. In lean, an important principle is to balance orders with the flow of production, by generally avoiding lumpy orders that can affect this flow.

Make-versus-buy

Make-versus-buy decisions typically involve deciding whether to outsource manufacture of a product, component, or some other activity, or to retain the activity within the organization. This can free up capacity that can be used in a more profitable or strategic manner. As introducing lean creates excess capacity, the analysis of make-versus-buy is often centered on examining what products, components, or services currently

purchased externally can be brought back in-house.

The concepts in analyzing make-versus-buy are similar to those described in the previous section on special orders. Financial analysis of the decision using unit costs, such as standard costs, will understate the financial benefits of retaining or bringing production back in-house by including fixed costs that may not change (see Case B in Sidebar 2). Modeling the value stream costs with the activity performed in-house versus externally (like the special-order analysis shown in Exhibit 1) will address this issue.

As indicated earlier, decisions to bring the manufacture of purchased components back in-house is usually driven by managers seeking to utilize capacity freed through implementing lean. Financial analysis when capacity is constrained is considered in the following section.

Moving beyond the short-term financial impacts, the decision to outsource or bring activities back in-house has a number of important strategic considerations. These include: Do we still have the expertise in-house? Will suppliers remain viable with reduced volumes? Are we creating a potential competitor by outsourcing? Are there any potential reliability or quality issues associated with outsourcing?

SIDEBAR 2: CASE B: MAKE-VERSUS-BUY: THE COST IS NOT THE COST

Management of a food manufacturing plant had just completed a costing exercise to determine the actual cost of each of the products made. When presented with the final costs, the plant manager said, "This is great. I see that the price to process and bag a 2-kg bag of rice (not including raw materials) is 22 cents. I have a quote on my desk from a company that says they can do it for 17 cents. Sounds like a good deal — we can make some substantial savings by outsourcing."

THE PROBLEM

The 22-cent internal cost included overhead and fixed costs, which would not change if some of the production were outsourced. The manager was shown that if he did proceed to outsource, he would pay 17 cents per bag to the outside supplier but only save 12 cents of direct internal costs. He would be 5 cents *worse off* for each bag outsourced. He did not proceed.

THE LESSONS

A poor decision was averted in this case, but it indicates how easily managers can make poor make-versus-buy decisions using fully allocated product costs.

Product mix with capacity constraints

Deciding which product to manufacture when there is not enough capacity to meet demand has both financial and strategic components. One common mistake made when performing the financial analysis is comparing the profitability of each product or component that could be produced and sold. For outsourced units, this is the difference between the costs of buying the product externally versus the costs of producing it in-house. This approach suffers from multiple issues, including product costs from the costing system incorporating fixed costs, which do not change with the decision, and excluding nonmanufacturing costs, such as distribution costs that may change. A major issue with this approach is that it does not take into account how much of the constrained resource is needed to produce the profit generated per unit of each product.

General accounting practices and lean accounting have remedies for these issues to improve decision-making. The approach taught in management accounting is to select and manufacture as much of the product with the highest contribution margin per unit of constrained resource as can be sold and then move to the next highest.¹⁰ The contribution margin is the selling price minus any variable costs associated with the product. These variable costs are the costs that change with volume of product produced and typically include direct mate-

rial, direct labor costs, variable overhead, and delivery costs. For example, assume that a company has a constraining factor of machine hours. Product A has a contribution margin of \$5 per unit, with each product taking 20 minutes of machine time to produce, while product B has a contribution margin of \$8 and requires 40 minutes of machine time to produce. Product A produces \$15 contribution margin per machine hour (\$5 per unit multiplied by three units per hour [60 minutes divided by 20 minutes per unit]), while product B produces \$12 contribution margin per machine hour (\$8 per unit multiplied by 1.5 units per machine hour [60 minutes divided by 40 minutes per unit]). Therefore, the analysis suggests that the company should focus on producing product A rather than product B even though product B has a higher contribution margin per unit.

The analysis recommended by lean accountants is very similar to the method just discussed.¹¹ The approach uses the concept of relative profit generated through the constrained resource (or bottleneck) for each product. Of course, the number of units processed through the entire value stream per hour should be the same as that processed through the bottleneck. A key difference in the analysis is that in lean accounting, labor and direct overhead costs are considered fixed in the short term and removed from the calculation. Per-unit direct material costs are subtracted from

SIDEBAR 3: CASE C: BEWARE THE RATIONALIZATION DEATH SPIRAL

A struggling food manufacturing and distribution company brought in management consultants to advise on how to turn the company around. The consultants performed an ABC analysis by product category and customer segment. The recommendation included rationalizing product lines and two major customer segments that the ABC had shown were not profitable.

THE PROBLEM

The ABC had allocated all company costs, including head office and other fixed costs, to products and customers. Further analysis indicated that portions of the business recommended for closure were contributing to fixed costs, profits, and cash flow when head office and fixed costs were removed from the analysis. Implementing the recommendations would have contributed to significantly higher losses in the short term. Worse still, if these parts of the business were exited, then head office and fixed costs would be reallocated to remaining parts of the business leading to further deletions as the extra costs made other lines unprofitable, resulting in a downward spiral that would end in all business lines being rationalized. Instead of making the recommended cuts, management worked on understanding customer requirements and buying behavior and the drivers of company costs, and implemented initiatives to improve the profitability of these segments.

THE LESSONS

ABC can provide extremely valuable management information on how and where organizations make and lose their money. It is particularly insightful when many different products/services are produced and substantial shared resources are used. However, as indicated in this case, it is very important to understand the underlying resources and behavior of costs when using ABC information to make management decisions and only include those costs that will change with the decision.

the per-unit selling price and multiplied by the number of units that can be processed per hour through the bottleneck to determine the throughput dollars generated per hour under the different options, with the product generating the greater throughput per hour selected.

Of course, it is not all about the short-term financial implications; strategic considerations come into product mix decisions. These include any potential relationships between products (e.g., razors and blades or printers and ink, where one product is underpriced to stimulate demand for the other); expected long-term demand for each product; the risk of impacting customer loyalty if demand for one of the products is not met; or the possibility that a competitor will gain a stronger market position.

Product/customer rationalization

Organizations sometimes seek to reduce complexity or increase margins and profitability by eliminating less profitable

products and customers. It is a surprise to management that eliminating products with lower-than-average profit or gross margins results in firm average margins going down rather than up. There can be good reasons for replacing existing products and customers when organizations are at capacity (see previous section). However, when companies are not at capacity and use standard costs, gross margins, or product/customer profit margins to determine products/customers to be rationalized, the analysis generally includes an allocation of fixed costs that will not disappear with the product or customer. As indicated in case C (see Sidebar 3), eliminating products/customers can result in a substantial short-term fall in profitability when the products/customers generate revenues higher than the incremental costs associated with them.

To analyze the potential short-term financial impacts of eliminating less profitable products or customers, it is important to model revenues and costs in value streams with and without them

(similar to the example for the special order — see Exhibit 1). The incremental costs are often less than expected. For example, direct labor is often considered a variable cost in traditional accounting, but is relatively fixed in lean. One food manufacturer found this out the hard way when they eliminated products with low gross margins but did not see direct labor costs fall (or profit margins rise), as they were now paying for a full shift (under union requirements) with only half a shift of production.

In the longer term, there may well be strategic reasons for exiting some products or customer segments. However, from a financial perspective, profitability will only improve if these products/customers are generating revenues less than the incremental costs associated with them, if they are replaced with products/customers that generate higher incremental profits (under capacity constraints), or if the capacity and associated costs are reduced. Customers are hard to win and product sales difficult to generate. It is often financially wiser to seek to understand (through analysis) why some products and customers are not as profitable and seek to improve the economics through actions such as price changes, product and process redesign, or service delivery method changes.

Of course, strategic factors are important in deciding whether to exit specific products or customer segments. For example, is the product an integral part of a bundle of products purchased by key customers? Does a specific customer provide knowledge, reputation, and the opportunity to develop products relevant to those in the industry? Do customer segments migrate from unprofitable to profitable over time?

Pricing decisions

Lean accountants argue that product pricing is based on market forces rather than the costs of producing the product, which reduces management's value of understanding individual product costs.¹² Clearly, many factors affect pricing decisions, including economic conditions, the company's strategy and those of its competitors, and the perceived relative capabilities and quality of competing products. In lean, these factors drive target

costs, rather than having costs be the core input into price.

Target costing provides a crucial input into the development of new products and processes and the continuous redesign of existing ones in lean enterprises. The target-costing process captures the essence of lean. This includes creating products to meet customer needs (in terms of product features and satisfaction) and producing them by using processes that enable the company to meet market price requirements and generate a profit. This requires careful analysis of the customers to be served, their expectations for the products, the features that they value, and how the company's products meet those needs in comparison to competitors.

Decisions are made on the product's features and price. The target profit is deducted from the price to determine the target cost, which is then broken down by component. Costs are then compared to process costs in the value stream, cost targets are established for each process, and plans are made to reduce costs. In target costing, full value stream costs are used in the analysis rather than the incremental costs used in analyzing special orders, representing the longer-term nature of the decision and the need to cover all costs.

While few organizations can determine price by adding a planned margin to the product cost, understanding the cost of products and services can be important, particularly when competitors in the market make a range of products and some products are effectively subsidizing others, and/or customers are served in different ways and through multiple channels. In these cases, there can be opportunities for those who understand their product and customer costs to target expansion in areas where the market price enables substantial margins and reduces the focus on products for which the market price is not so attractive when accurate costs are considered. Understanding costs at a more granular level is important when customers have unique requirements and pricing requires negotiation. How variation in products is addressed in lean accounting and the potential relevance of ABC in lean companies is considered shortly.

TARGET COSTING PROVIDES A CRUCIAL INPUT INTO THE DEVELOPMENT OF NEW PRODUCTS AND PROCESSES AND THE CONTINUOUS REDESIGN OF EXISTING ONES IN LEAN ENTERPRISES.

Continuous improvement

In lean accounting, continuous improvement is generally supported by monitoring and seeking to improve the average cost per unit sold by each value stream over time. Lean includes many tools to support continuous improvement, including 5S (order and cleanliness in the working areas), the 5 Whys (root cause analysis), and value stream mapping, to name a few. Target-costing exercises are performed for existing products periodically to ensure the products continue to provide customer value and to set cost improvement targets and plans.

Relevance of ABC in lean enterprises

Lean accounting practitioners have often argued that ABC is not appropriate in lean enterprises, indicating that the approach is high-cost and adds little value.¹³ However, some companies continue to use ABC alongside lean accounting methods. Why the disconnect?

ABC is often used when there is product, process, customer, and resource complexity.¹⁴ It is at its most valuable when: (a) there is substantial diversity among products produced, with extensive sharing of resources to produce and distribute these products; (b) there are significant overhead-type costs associated with resources not working directly on products; and/or (c) different channels and services are provided to diverse customer segments. Establishing and maintaining an ABC system is resource-intensive and so should only be implemented when it provides information that is of greater value than the costs associated with it.

In lean organizations, the business is restructured into value streams that include all of the activities and resources associated with designing, selling, producing, supporting, and distributing a family of similar products. These organizational changes are made to improve the accountability and flow of the value streams. In extreme lean implementations, it can reduce many of the needs for ABC, as product diversity within the value streams is reduced significantly, with all products flowing through virtually all the cells (or processes), with very little non-value stream overhead or shared equipment to be allocated.

ABC can still provide some valuable information in lean enterprises where the family of products produced by a value stream remains relatively diverse, with not all products flowing through all cells and a significant difference in the time and effort spent on products in each cell. Adaptation in lean costing (features and characteristics) measures the impacts of product differences on the throughput of products through bottleneck (capacity constrained) cells or processes to estimate differentiated costs from the average unit cost in the value stream.¹⁵ This addresses some product diversity but may not be sufficient where differences in products and processing are substantial (the circumstances that lean is trying to avoid). In some organizations, it may not be appropriate to continue value streams through to distribution, particularly when customers are serviced through multiple channels and products from multiple value streams are delivered to the same customers. It may not be economically viable to maintain duplicated delivery routes, and/or clients may not want multiple deliveries. In this case, understanding the delivery cost by channel, customer segment, and product may require more sophisticated costing, such as that provided by ABC.

When ABC is used in a lean organization, as in any organization, it is necessary to ensure that the system is designed to guarantee that the benefits exceed the costs. This includes recognizing that the information is likely to be used for strategic decisions and therefore does not need to be produced too often. It also requires care in using the ABC information for decision-making. The prior discussions in this article remain valid when using ABC data to analyze the financial implications of potential decisions. This includes ensuring the behavior of costs and capacity levels are understood, including the continuous flow of lean, which seeks to balance production across value streams rather than optimize production of each cell. Allocations of costs in ABC often assume that fixed costs can be reduced in the longer run, for example, by closing production lines or plants, and that products and customers need to pay for

ABC IS OFTEN USED WHEN THERE IS PRODUCT, PROCESS, CUSTOMER, AND RESOURCE COMPLEXITY.

these fixed costs. ABC is therefore often used for strategic planning. However, for short-term decisions or to understand the immediate implications of strategic decisions, it is crucial that only those costs likely to change under a decision are included or that total costs are projected under each of the options being considered. Otherwise, issues such as those highlighted in cases B and C are likely to arise.

Conclusions

Principles of costing and cost analysis in lean organizations, such as moving away from product unit costs for management decision-making, are consistent with those taught in accounting courses but are more actively implemented in lean. This may be due to less reliance on individual product costs for inventory valuation and control and the focus of lean on monitoring and utilizing available capacity. Regardless of whether an organization has implemented lean or not, costing needs to represent the nature of costs, and analysis needs to consider cost behavior, costs that differ across decision options, and the timeframe of the decision. Care is required in using only marginal or incremental costs to inform decision-making, as understanding both capacity and potential strategic implications of the decisions is crucial. ABC can still be relevant to lean organizations, depending on organizational complexity, which includes product diversity in value streams, the degree of resource-sharing across value streams, and diversity of customer interactions; however, care is needed in implementation to balance benefits and costs, and in using reported costs and profitability for decision-making. ■

NOTES

¹The following books provide further information on lean accounting: Cunningham, J.E., Fiume, O., and Adams, E., *Real Numbers: Management Accounting in a Lean Organization*. (Durham, N.C.: Managing Times Press, 2003); Maskell, B., Baggeley, B., and Grasso, L., *Practical Lean Accounting: A Proven System for Measuring and Managing the Lean Enterprise*. (Boca Raton, FL.: CRC Press, 2012); McVay, G., Kennedy, F., and Fullerton, R., *Accounting in the Lean Enterprise*. (Boca Raton, FL.: CRC Press, 2013).

²Johnson, H.T. and Kaplan, R.S., *Relevance Lost: The Rise and Fall of Management Accounting*. (Boston: Harvard Business School Press, 1987).

³This article gives a very high level description of lean. There are many books that give a more detailed treatment, including: Womack, J. and Jones, D.T., *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. (New York: Free Press New York, 2003).

⁴*Ibid.*

⁵*Op. cit.* note 1 Maskell, Baggeley, and Grasso.

⁶For example, see the authors in note 1.

⁷Lean accounting's emphasis on analyzing incremental revenues and costs associated with decisions regarding product and customer rationalization, accepting special orders, or making versus buying products and components is consistent with contemporary accounting education. See, for example, Birt, J., Chalmers, K., Maloney, S., Brooks, A., and Oliver, J., *Accounting: Business Reporting for Decision Making*. (Milton, Queensland: John Wiley & Sons, 2017).

⁸See, for example, Bird, R.G., McDonald, M.G., and McHugh, A.J., *Management Accounting: Processing, Evaluating, and Using Cost Data*. (Sydney, Australia: Butterworths Publishing, 1982). Prescriptions for financial analysis for short-term decisions using the incremental or total costs under different decisions rather than unit costs go back further than this. However, this example from my undergraduate textbook illustrates that these practices are not unique to lean.

⁹*Op. cit.* note 7.

¹⁰*Ibid.*

¹¹*Op. cit.* note 1 McVay, Kennedy, and Fullerton.

¹²*Op. cit.* note 1 Maskell, Baggeley, and Grasso.

¹³For example, see: Maskell, B.H. and Kennedy, F.A., Why do we need lean accounting and how does it work? *Journal of Corporate Accounting and Finance* (Mar/Apr 2007): 60–73.

¹⁴An excellent resource for the uses of ABC is: Kaplan, R.S. and Norton, D.P., *Cost and Effect: Using Integrated Cost Systems to Drive Profitability and Performance*. (Boston: Harvard Business School Press, 1998).

¹⁵*Op. cit.* note 1 Maskell, Baggeley, and Grasso, see chapter 11.