

Improving hospital cost accounting with activity-based costing

Yee-Ching Lilian Chan

In this article, activity-based costing, an approach that has proved to be an improvement over the conventional costing system in product costing, is introduced. By combining activity-based costing with standard costing, health care administrators can better plan and control the costs of health services provided while ensuring that the organization's bottom line is healthy.

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Activity-based costing, a method designed for costing a product or service more accurately, has been implemented successfully in various manufacturing and service organizations.¹⁻⁵ By and large, the feedback from management is encouraging.

Better cost control and improved decision making are among the many benefits experienced by those who have adopted activity-based costing. In this article, activity-based costing is presented and recommended for hospital cost accounting, especially in determining the standard full-cost-per-service unit⁶ provided by the hospital. Given the more accurate standard cost data, health care administrators should be able to plan and control costs more effectively as compared to their efforts in these areas with the conventional volume-based costing systems.

First, a conventional costing system for hospital accounting is presented. Next, the activity-based costing system is described, including an application in the health care industry as well as a discussion of its potential contributions and implementation concerns. Finally, some concluding remarks are provided.

CONVENTIONAL COSTING

Because revenues or payments are fixed per discrete episode of care on the basis of diagnosis related group (DRG), per diem, or discharge, health care administrators have shifted their effort to managing the bottom line of their organization with an emphasis on cost control and management. Standard full costing, variance analysis, and bottom-line management are some of the tools recommended for planning and controlling the costs of servicing patients whose care comes under a DRG.⁷ When these techniques are used in monitoring cost performance and assessing the profitability of the different types of treatments provided, the standard full-cost-per-service unit must be determined accurately for fair evaluation.

In general, three stages of cost allocation are used in determining the standard full-cost-per-service unit⁸:

1. Stage I allocation involves the tracing of direct costs to cost objects, which may include departments, divisions, territories, or products. (Cost object is any item for which a separate measurement of costs is desired, and direct cost is a cost that can be identi-

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fied specifically with or traced to a given cost object in an economically feasible way.)

2. Stage II allocation involves allocating and reallocating costs from one cost object to another cost object (except a product cost object).
3. Stage III allocation involves allocating indirect costs to products (or services). (Indirect cost is a cost that cannot be identified specifically with or traced to the product [or service] in an economically feasible manner.)

Among these three stages of cost allocation, the tracing of direct costs to cost objects (Stage I allocation) is relatively simple as compared to the other two stages, which require the selection of an appropriate base for allocation. For instance, in determining the standard full cost per patient meal served by the dietary department, it is quite simple and straightforward to trace the direct costs of ingredients and labor to each patient meal. On the other hand, in allocating other support department costs (such as those of the maintenance department or administration) to the dietary department and applying the department's indirect costs (e.g., salaries and fringe benefits of the dietitian, costs of cooking utensils, allocated support department costs) to each patient meal, some allocation bases have to be selected. With conventional costing systems, one allocation base is generally selected for one cost pool. For example, in allocating the maintenance department costs to the dietary department, the use of maintenance hours provided as the allocation base is sufficient because a cause-effect relationship between the benefits received by the dietary department (as measured in maintenance hours) and the costs of operating the maintenance department is evident. On the other hand, if administrative costs, which include costs of operating the accounting, finance, personnel, and other administrative departments, are allocated to the dietary department on some bases (e.g., number of employees or total salaries paid), the resultant cost allocation can be misleading and unfair. This is because there is no direct cause-effect relationship between the accounting services provided to the dietary department and the number of employees (or total salaries paid) in that department. Also, this allocation scheme penalizes departments with a large number of employees (or a large amount of total salaries paid), and suboptimal decisions may result because these departments would try to reduce their share of the allocated costs by cutting headcounts and eventually reducing or eliminating certain essential services. Consequently, better schemes of cost allocation should be used in determining the standard full-cost-per-service unit.

ACTIVITY-BASED COSTING

During the late 1980s, many managers and accountants, especially those in the manufacturing industry, became discontented with their conventional costing systems. Many of these conventional systems can be described as volume-based cost accounting systems. That is, indirect costs are applied to products by using some volume-related allocation bases such as direct labor hours or machine hours. Consequently, low-volume products are consistently undercosted and high-volume products are consistently overcosted by such systems.⁹ This observation was puzzling to most manufacturing managers who believed that high-volume products should enjoy a higher margin than low-volume products simply because of the greater efficiencies achieved through economies of scale. The dissatisfaction with the costing data manifested and led to the development of activity-based costing systems.

As the term indicates, an *activity-based costing system* focuses "on activities as the fundamental cost objects and uses the costs of these activities as building blocks for compiling the costs of other cost objects."¹⁰ That is, costs are accumulated for each activity as a separate cost object and then applied to products as they undergo the various activities.

In an activity-based costing system, the allocation bases used for applying costs to products are called cost drivers, and they include any causal factor that increases the total costs of the activity. Both volume-related allocation bases (e.g., direct labor hours and machine hours) and other volume-unrelated allocation bases (e.g., the number of setups, material parts handled, and purchase orders processed) can be used as cost drivers in an activity-based costing system for applying costs to products.

For instance, when activity-based costing is used in determining the manufacturing cost of a product, the first task is to identify all activities that are required in its production. The amount of resources consumed by each activity and their costs are then traced and applied to the product. For example, in a factory that manufactures three different products, the machine has to be set up differently for each product. In this case, machine setup is

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an essential activity of the manufacturing process. If it can be assumed that setup labor time is the primary resource required, machine setup costs can be applied to the three products, as seen in Table 1. Therefore, by aggregating the costs of all activities required in its production, the manufacturing cost of a product is determined. Also, as illustrated in Table 1, there is no consistent overcosting of high-volume products (product A) and undercosting of low-volume products (product C) with activity-based costing.

Application of activity-based costing in health care

Even though many of its applications deal with the costing of mass production of homogeneous units in the manufacturing sector, activity-based costing can also be applied in the health care sector in which patients are unique products themselves. This is because under activity-based costing, costs are accumulated for activities that consume resources and then applied to products (or patients) on the basis of the activities required in their production (or treatment). Therefore, regardless of whether we are manufacturing one million units of a product or treating one patient, the principle of cost application with activity-based costing remains unchanged.

As suggested by Cleverly,⁶ the Standard Treatment Protocol can be used to account for the treatments and services provided to a patient with a specific disease. This protocol, in sum, consists of the list of services, including the standard full-cost-per-service unit and the estimated quantity of service required, established for a specific DRG treatment. Therefore, by comparing the standard full cost data against the expected payment, the

hospital administrator can determine if the specific DRG treatment contributes positively toward the hospital's bottom line or whether some corrective actions have to be taken to bring its cost down in line with the revenue generated. Also, a variance analysis of the standard full cost against actual cost provides the hospital administrator with insight into the operating efficiency of the service units.

The accuracy of the standard full cost data, clearly, is the backbone of the use of the Standard Treatment Protocol in hospital planning and cost control, and this is where activity-based costing may contribute. For instance, activity-based costing can be used in determining the standard full-cost-per-service unit, such as the standard full costs of the various tests conducted in a hospital laboratory, as given in Table 2. (A simple application, the costing of laboratory tests, is chosen over other more complicated examples, such as the costing of a surgical operation, to make the illustration of activity-based costing more effective.)

In applying activity-based costing to this hospital setting, the first task is to identify all activities required in performing the tests. These activities are simplified for illustration purposes and can be described as follows: This hospital laboratory is responsible for performing four different kinds of tests: P, Q, R, and S. Each test requires a specific setup of tools and equipment, which are maintained by the maintenance department of the hospital. Once the tools and equipment are set up, the laboratory technicians use the materials and supplies delivered by the supply processing and distribution department to perform the tests. As the tests are conducted, the clerks must complete the required documents and distribute the test results to the appropriate party.

After identifying the activities, the amount of hospital resources required to carry out these activities is recorded, and a summary of the laboratory's cost and operating data is given in the upper panel of Table 2. That is, in addition to the costs of labor, materials, and supplies directly associated with each test, other expenses such as clerical support, setup, and tools and equipment are required in operating the laboratory. Also, because the laboratory requires services of both the maintenance department and the supply processing and distribution department, the costs of providing such support services are charged to the laboratory by using specific allocation bases. This allocated overhead, even though not directly incurred by the laboratory, is essential to the proper functioning of the laboratory. It must be included in determining the standard full costs for the four laboratory tests.

TABLE 1

DETERMINATION OF THE SETUP COST OF A PRODUCT WITH THE USE OF ACTIVITY-BASED COSTING

	Product		
	A	B	C
(Given: Wage rate per setup labor hour = \$30)			
Setup labor time (hours)	0.5	1.2	0.8
Machine setup costs (\$)	15	36	24
Units per run	100	50	20
Setup costs per unit (\$)	0.15	0.72	1.20

TABLE 2

STANDARD FULL COST PER LABORATORY TEST WITH THE USE OF ACTIVITY-BASED COSTING AND CONVENTIONAL COSTING

Laboratory tests	Number of tests per year	Materials and supplies per test	Direct labor hour (DLH) per test	Machine (m/c) hour per test	Number of setups	Direct labor hour per setup
P	100,000	\$ 5.00	0.05	0.220	5,000	0.05
Q	60,000	3.20	0.10	0.050	6,000	0.08
R	80,000	12.50	0.04	0.600	16,000	0.12
S	5,000	2.00	0.10	0.828	2,500	0.15
Wage rate			\$30.00			\$30.00
Department overhead*:						
Clerical support						\$147,000
Setup						90,750
Tools and equipment						30,856
						<u>\$268,606</u>
Allocated overhead†:						
Maintenance						\$ 46,284
Supply processing and distribution						8,510
						<u>\$ 54,794</u>
						<u>\$323,400</u>
Total overhead						
(a) Activity-based costing						
Overhead rates:						
Clerical support	= \$147,000/245,000 tests	= \$0.600 per test				
Setup	= \$90,750/3,025 setup DLH	= \$30.000 per setup DLH				
Tools and equipment	= \$30,856/77,140 m/c hour	= \$0.400 per m/c hour				
Maintenance	= \$46,284/77,140 m/c hour	= \$0.600 per m/c hour				
Supply processing and distribution	= \$8,510/\$1,702,000	= \$0.005 per material\$				
Laboratory tests	P	Q	R	S		
Materials and supplies	\$5.0000	\$3.2000	\$12.5000	\$2.0000		
Direct labor	1.5000	3.0000	1.2000	3.0000		
Department overhead:						
Clerical support	0.6000	0.6000	0.6000	0.6000		
Setup	0.0750	0.2400	0.7200	2.2500		
Tools and equipment	0.0880	0.0200	0.2400	0.3312		
Allocated overhead:						
Maintenance	0.1320	0.0300	0.3600	0.4968		
Supply processing and distribution	0.0250	0.0160	0.0625	0.0100		
Standard full cost per test	<u>\$7.4200</u>	<u>\$7.1060</u>	<u>\$15.6825</u>	<u>\$8.6880</u>		
(b) Conventional costing						
Overhead rate = \$323,400/14,700 = \$22.00 per DLH						
Laboratory tests	P	Q	R	S		
Materials and supplies	\$5.0000	\$3.2000	\$12.5000	\$2.0000		
Direct labor	1.5000	3.0000	1.2000	3.0000		
Overhead	1.1000	2.2000	0.8800	2.2000		
Standard full cost per test	<u>\$7.6000</u>	<u>\$8.4000</u>	<u>\$14.5800</u>	<u>\$7.2000</u>		

*The categories of department overhead have been greatly simplified for illustration.

† Allocated overhead refers to costs incurred by support departments that are charged to the laboratory for services provided. The categories of allocated overhead have also been greatly simplified for illustration.

As the indirect costs of operating the laboratory are identified, they are applied to the four tests on the basis of the activities undertaken in performing each specific test. For instance, for each test performed there is a certain amount of documentation and paper work that has to be completed by the clerks. If the amount of time required for these functions is more or less the same for each test, it is appropriate to apply costs of clerical support to the tests on a per-test basis. Setup direct labor hours and machine hours, on the other hand, are more appropriate for applying costs of setup as well as tools and equipment to the laboratory tests respectively, because the cause-effect relationships are more transparent here. For the allocated overhead, two other cost drivers are used: machine hour for the maintenance department costs and material dollar for the supply processing and distribution department costs. This is because the longer the tools and equipment are used in laboratory tests, the more maintenance is required. Also, the larger the amount of materials handled, the more service is required of the supply processing and distribution department. Therefore, with the use of activity-based costing the standard full costs for the four laboratory tests P, Q, R, and S are \$7.4200, \$7.1060, \$15.6825, and \$8.6880, respectively.

As illustrated in the previous example, various cost drivers can be chosen for applying indirect costs to cost objects under activity-based costing as long as a cause-effect relationship is evident. Conventional costing, on the other hand, usually uses one volume-related allocation base in cost application. For instance, if direct labor hour is chosen as the allocation base, the standard full costs for the four laboratory tests P, Q, R, and S are \$7.60, \$8.40, \$14.58, and \$7.20, respectively [Table 2(b)], which are quite different from the costs computed by using activity-based costing [Table 2(a)]. The difference is most significant with test Q (an increase of 18.21 percent) and test S (a decrease of 17.13 percent).

In fact, conventional costing has again overcosted the high-volume tests (P and Q) and undercosted the low-volume tests (R and S), as evidenced in the manufacturing sector. Activity-based costing, on the other hand, reports a more accurate computation of standard full costs by focusing on the activities of the laboratory and the resources those activities consume, as well as choosing cost drivers that exhibit a cause-effect relationship with the overhead charged to the laboratory.

Contributions of activity-based costing

Activity-based costing is more accurate than conventional costing in determining product cost, not only

when the products differ in their demand on various resources due to high diversity in volume, complexity, materials, and setup,¹¹ but also when there is a high proportion of volume-unrelated overhead costs.¹¹ Also, with the more informative product cost information generated from activity-based costing, managers can better identify the relevant costs and are likely to make better decisions in product or service pricing and abandonment, as well as in new product or service introduction.¹² As well, activity-based costing systems have assisted managers in implementing new strategic directions, such as identifying profitable orders for low-volume customer orders and setting competitive bid prices.¹³

In addition to reporting more accurate product cost and improving managerial decisions, activity-based costing can guide managers to effective cost reduction by focusing on non-value-added activities.¹⁴ Costs can be reduced by decreasing the time or effort required to perform the activity or by eliminating the activity entirely if it does not add value to the company. For example, one way to reduce material handling overhead costs for the hospital is to decrease the distance between the supply processing and distribution department and its major user departments. In this way, materials can be delivered in the shortest time possible, thereby reducing handling costs. Another alternative is to have the suppliers deliver the materials directly to the user departments; in which case, material handling overhead costs are totally eliminated. Costs can also be reduced by selecting the low-cost activity from a set of design alternatives and sharing the activity with other products (or service units) to yield economies of scale.

Implementation concerns of activity-based costing

Despite the contributions of activity-based costing, the economic as well as technical feasibilities of implementing such a cost accounting system in an organization must be evaluated (that is, whether the benefits derived from activity-based costing more than offset its costs of implementation and whether it is feasible to identify the activities that consume resources, to accumulate costs per activity, and to select the appropriate cost drivers for cost application).

There are, in general, two kinds of costs associated with any cost system: (1) the costs of measurement and (2) the costs of errors.¹⁵ The costs of measurement, which include the costs of routing the information to the cost system and the costs of computation, are less with conventional costing than with activity-based costing. This is simply because more cost drivers are required with activity-based costing systems, thereby requiring greater

The activity-based costing system should be implemented only when the decrease in cost of errors far exceeds the increase in cost of measurement.

efforts in data collection and measurement. The costs of errors, which include the costs of making a poor product, capital investment, and budgeting decisions, however, are greater with the conventional costing systems than with the activity-based costing systems, because less accurate product cost information is generated by the former. Thus the activity-based costing system should be implemented only when the decrease in cost of errors far exceeds the increase in cost of measurement. In fact, activity-based costing provides the most benefits to organizations facing severe competition, because the cost of errors attributed to conventional costing is very high.

In the development of activity-based costing systems, an activity analysis has to be conducted to identify activities that consume resources. This involves a detailed study of the organization's logistics and accounting information systems, and it is an expensive project in itself. Besides, it can be quite difficult and time consuming to identify and trace resource consumption to a specific activity because of the complexities involved. Thus it may be technically infeasible for some organizations to implement activity-based costing.

If the economic and technical feasibilities of an activity-based costing system are confirmed, the system designer must (1) decide on the number of cost drivers required by the system and (2) select the drivers from the alternatives available.¹⁶ In general, the higher the desired accuracy of product costing, the larger the number of cost drivers required. Also, the greater the degree of product diversity, especially volume diversity, the more cost drivers are required. In addition, when a significant proportion of the total costs of the products is represented by a large number of activities, more cost drivers are required. Finally, when there is a low correlation between the cost drivers and the activities' consumption of resources, more cost drivers are needed. The designer, therefore, must trade off the desirability of having a large number of cost drivers with the costs of measurement and the increased complexity of the activity-based costing system.

In summary, the designer should focus on activities that represent a significant proportion of the total costs of products and select cost drivers that have a high correla-

tion with the activities' consumption of resources, as long as the costs of measurement are within acceptable limits. On the other hand, for activities that have insignificant costs, it is appropriate to aggregate these activities and cost pools into one, and select a cost driver that is reasonable according to the designer's professional judgment.

As in any new system development, activity-based costing should only be implemented if its benefits far outweigh its costs. Also, management support and communication of the development plan to employees are essential to a successful implementation of activity-based costing in an organization.

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As described in this article, activity-based costing provides more accurate product cost information than do conventional costing systems. The former approach is especially important in the health care industry in which planning and controlling the costs of services provided are the key to maintaining a healthy financial status for the organization. Combining activity-based costing with the development of Standard Cost Profile per service unit⁶ and Standard Treatment Protocol per DRG allows health care administrators to identify unprofitable treatments, the costs of which are greater than the fixed payment received from Medicare. Once the costly treatments are identified, actions can be taken to either reduce or eliminate the nonessential activities of the treatments. Another alternative is to change the mix of health services provided to the public; that is, to reduce the costly services as much as possible. Thus activity-based costing provides more accurate product costing and more informative product cost information, both of which can assist health care administrators in making improved decisions.

Activity-based costing, however, is not a panacea to all problems within a hospital or any organization. If the organization is operating inefficiently, activity-based costing can assist managers in identifying activities that are costly or non-value-added. Nevertheless, it is still up to management to decide on the remedial actions that need to be taken to reduce the costs of such expensive activities and, eventually, to eliminate all non-value-added activities. Also, as indicated earlier, both the economic and the technical feasibilities of an activity-based costing system must be assessed before management approves its development and implementation in an organization.

An activity-based costing system is an invention of the Western world and has been implemented quite success-

fully in a number of manufacturing and service organizations. There are management consultants whose expertise is in developing activity-based costing systems for their clients. Also, a number of software packages are available, ranging from the more expensive package ACTIVA of Price Waterhouse to the cheapest package EasyABC designed by ABC Technologies Inc. (about U.S. \$1,000), providing good support for the implementation of activity-based costing systems in various organizations. For health care organizations that are facing shrinking revenue sources and spiraling expenses, activity-based costing can be a valuable tool to administrators in controlling costs and making strategic decisions.

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