Practical Issues in Cost Driver Selection for Managerial Costing Systems

The third in a series of articles exploring cost measurement issues.

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Introduction

The first article in this series focused on government organizations' increasing need for managerial costing systems in order to continue their missions in an environment of constrained fiscal resources. The second article emphasized the importance of management's role in choosing the cost object, the view of cost to be measured, and in selecting from alternative measurement methodologies. This article will begin the discussion of design issues of managerial costing systems by defining and resolving key issues in cost driver selection.

Cost measurement, by itself, does nothing to manage cost. Managerial costing systems must provide measurements in concert with a cost management process. Cost measurement and cost management are closely inter-related. As it is sometimes said, "Tell me how you will measure me and I will tell you how I will behave."

Remember that a cost driver is simply another measure that is used to proportionately distribute the cost of activities to cost objects. The choice of cost driver is an important design issue that can have considerable impact on the effectiveness of a managerial costing system. There are typically many possible choices of cost driver. Each choice may distribute cost differently, pose a different measurement challenge, and make different underlying assumptions about behavioral response. Furthermore, different drivers may themselves cost different amounts to measure.

This article focuses on cost driver choice and explores the fitness of alternative cost drivers in enhancing cost management: the purpose of a managerial costing system. Illustrative cases will demonstrate the practical implications of cost driver alternatives. These implications exist in three inter-related dimensions: behavioral stimuli, measurement credibility, and measurement cost.

Theory: Behavioral Issues in Cost Driver Fitness

The selection of a cost driver offers managers a surrogate target for reduction in source costs. Measurement motivates and the cost driver can generate powerful managerial responses to reduce drivers because they appear to be causing the cost that is allocated.

Consider for example, the allocation of setup costs in proportion to the cost driver: number of batches. Managers now have two cost targets. They can work on reducing the costs that go into making setups and they can work on reducing the number of batches. Reducing the number of batches will greatly facilitate reduction in the cost of making setups. Allocating setup cost through some other driver can make setup appear to be a "free good" that will generally be overconsumed by schedulers trying to please customers.

Tectronics and Hewlett Packard case studies (Cooper and Kaplan, 1991) illustrate the power of cost driver selection in cost management. In both cases the use of cost drivers such as cycle time and number of parts focused attention on key operating parameters: greatly reducing the underlying causes of many operating costs. In these cases the importance of cost reduction was so great that the cost drivers were selected primarily for their behavioral impact: not to accurately cost the cost object.

A danger exists in choosing cost drivers primarily for their behavior impact. It is possible to go too far in adding overhead to reduce cycle time and number of parts, for example. A safer, and more common, approach is to choose cost drivers that reflect the underlying economics of resource consumption by being correlated to resource usage. However, even the fitness of well-correlated drivers can change over time.

Relevance Lost (Johnson and Kaplan, 1987) describes how the common practice of allocating of overhead on the basis of direct labor evolved. This practice made great sense when direct labor was the predominant manufacturing cost and most overhead involved the supervision of direct labor. Unfortunately, the world changed and the allocation processes did not. It is easy to understand the bad motivations created when, for example, overhead costs for automation are allocated to labor intensive, un-automated processes. This subsidization makes labor intensive processes appear to be more expensive and automated processes or outsourcing less expensive. Motivation then exists to over-automate and outsource.

Managers must also consider instances where they do not seek reduction in the cost driver. Distribution of legal expenses on the basis of patents filed is an excellent way to allocate cost from the standpoint of measurement accuracy. However, such a cost driver can de-motivate the submittal of patents. Likewise, allocation of hazardous waste material on the basis of pounds disposed may motivate cost conscious managers to illegally dump such materials. Managerial cost systems cannot ignore the behavioral implications of cost driver selection, and indeed should anticipate them.

Theory: Measurement Issues in Cost Driver Fitness

The measurement viability of cost driver selection is also non-trivial. Danger exists that the cost driver may misstate a cost view that is specified. Several issues are involved: homogeneity, causality, and saliency.

Use of a cost driver implicitly assumes homogeneity: that the average cost per unit of cost driver is a credible measurement in the context of the management application. As in the case of labor-based allocation described above, it often is not.

Consider the average cost per diner in the dinner check allocation issue discussed in Article 2. The average did not reasonably reflect the dinner cost of any of the diners because the dinner costs being averaged were non-homogeneous. That is to say, there were wide variations in the costs being pooled and the average cost did not closely reflect any individual's consumption.

Alternatively, consider an overhead function in a oversight office that allocates its cost to two customers on the basis of time and attendance reporting by staff members. If staff includes high cost lawyers and low cost paralegals, the mix of staff time per customer becomes important. If a customer/user requires the same proportion of each, the staff time hour basis is fit for use as a cost driver. However, it is not fit if use of staff is non-homogeneous and all the lawyers work on one customer and all the paralegals work on the other.

Pooling all staff time implicitly assumes that the average cost per hour is representative. The insidious nature of averages is that they may not accurately reflect any of the components of the average. To some level of theoretical precision it is inescapable that an average is always wrong. The practical issue is whether the average is close enough "for management work."

If management's goal is to understand the economic cost of the cost object, cost driver selection should exhibit correlation or causality to the consumption of costly resources by the cost object. As discussed above, it would not make sense, for example, to distribute automation overhead on the basis of direct labor.

A simple test for causation is "does more cost driver increase cost in the cost object and less cost driver decrease cost in the cost object." Increased direct labor has no relation to the consumption of automation resources. Indeed the cost object with the most automation resources might not have any labor!

A third measurement issue is saliency. Cost drivers are often determined through interviews or estimated through level of effort analyses. The danger exists that recent events will bias results. This is more of a problem when recent events are used to allocate future cost or when recent events are used to allocate historical costs incurred over a long period of time.

Theory: Measurement Cost Issues in Cost Driver Fitness

Cost drivers must themselves be measured and these measurements can be costly. Different cost drivers have different price tags. A highly complex, frequently updated driver may not be worth the expense to maintain. On the other hand using a readily available driver may be inexpensive, but non-homogeneous or improperly motivating.

There are many measurement techniques that are technically possible and many management information needs that are genuinely useful but are too expensive to measure. It has been said that any problem can be solved if it can be defined and there are ENOUGH RESOURCES. The problem in managerial costing is that there are never enough resources to satisfy the measurement technocrat or all possible management applications. Organizations usually initiate managerial costing because they are trying to better manage limited resources, not because they wish to set records for accounting complexity.

A related measurement issue is the frequency of driver update. Ideally every accounting period should have updated cost drivers. This may be prohibitively costly. When the cost driver is reasonably stable, cost drivers for future periods are often taken from history. Another issue here is the use of cost drivers to forecast or predict future cost distributions. To avoid forecasting driver measurement and to avoid cost object variances caused by cost driver forecast error, organizations often use a historical measurement of the cost driver.

Theory: Cost Driver Fitness for Use Summary

Cost driver selection must consider behavioral motivation, measurement credibility, and cost of measurement issues. A useful driver that is not credible or is extremely costly is not fit. A credible driver that is easy to measure, but not managerially useful, or is costly to measure, is not fit. A driver that is inexpensive, but not useful or credible, is not fit. Fit cost drivers create desired and useful motivation through a credible measurement that is not prohibitively expensive.

Cost Driver Fitness for Use Illustration

Let's consider some of the practical issues involved in a common allocation problem: the distribution of facilities cost to the occupants of a building. Let's assume that $100,000 of utilities and maintenance cost must be distributed to four occupants of the five rooms in one building.

Designers of the cost distribution must make some critical decisions against which to evaluate the cost driver's fitness for use, so let's make the following assumptions. Management's goal for behavior motivation is to encourage occupants to use space wisely. The goal for measurement credibility is to reflect the economic consumption of resources to within five or ten percent. The goal for measurement cost is that the measurement process be easily affordable.

Facilities Cost Distribution Using a Number of Rooms Driver

A simple allocation process would be to distribute facilities cost on the basis of number of rooms occupied. Allocation on this basis is easy. Each room is allocated cost at the rate of $20,000 per room. If Organization A occupies two rooms, and B, C and D occupy one each, the cost allocation would be $40,000 to A and $20,000 each to B, C and D.

This driver would score well on the dimension of measurement cost. We must, however, consider its viability in the behavior and credibility dimensions.

Consider the likely behavioral motivations. Organization A has tremendous incentive to tear down the wall between its two rooms and apparently save half its facilities cost. No one would ever subdivide a room as this would double cost. This is probably not what management had in mind.

The per-room driver could be considered fit for use in the measurement credibility dimension if all five rooms were identical. It is then plausible that utilities and maintenance consumption for identical rooms would be similar enough to warrant this simple allocation methodology.

However, this driver would fail the measurement credibility test if the rooms are not all identical, or if Organization A tears down that wall. Rooms are no longer homogeneous. Motivations change. The organization with the smallest room now views moving out as making good economic

sense if rental space can be found at a lower cost per square foot. Big rooms look cheap and very desirable while small rooms are overcosted and unwanted.

Facilities Cost Distribution on the Basis of Net Square Footage

The problems with the simple driver based on number of rooms have led many organizations to distribute facilities related cost on the basis of square footage occupied. Such a driver means that each occupant will be allocated cost in proportion to the number of square feet occupied

Now we must look at the actual size of the rooms. The table below shows the square footage occupied by each organization and the resulting allocation.

Organization A	**Organization B**	**Organization C**	**Organization D**
2000	100	900	2000
$40,000	$2000	$18,000	$40,000

This managerial costing process now charges Organization B much more fairly in relation to the small space that it occupies. Organization A with two rooms the same size as Organization D with one room, now pays the same cost. The motivation for A to tear down walls and for B to move out have been eliminated. We might even create incentives for organizations to return unoccupied or unneeded space.

Notice how different this is from the allocation using number of rooms. Since we are discussing behavioral implications, it is pertinent to mention that the manager of Organization D would probably be resistant to this allocation. In the per-room allocation, the organizations that occupied the smaller rooms were in-effect subsidizing the organizations in the larger rooms. The beneficiary of this subsidization is unlikely to favor its removal.

The measurement credibility test hinges on the validity of the implicit assumption that the allocation rate of $20 per square foot reasonably reflects the cost of every square foot. In reality this will never be true. Consider that we never heat or cool square feet: cubic feet would be better correlated to energy requirement. Spaces with higher ceilings consume resources differently. Furthermore, space in an interior closet will take significantly

less heating energy than the space under a window. Space with a north-facing window or wall costs more to heat and less to air condition.

Now, we could place thermocouples throughout floor, wall, and ceiling surfaces and develop a model of energy consumption that would produce better data on energy consumption. Or we could put a power meter on every room and require tenants to have room heaters and room air conditioners. The practical issue here is whether the average cost per square foot is "good enough" to use. In most cases we would not really want to distinguish between square feet. The difference is usually not significant and the cost of measurement would be disproportionately high.

Facilities Cost Distribution on a Two Pool, Two Driver Basis

However, the homogeneity assumption in the square footage driver description may fail in certain cases. What if our building is in a hot climate and some occupants use room air conditioners for cooling. Air conditioning becomes a "free good." Utility and perhaps maintenance costs of the air-conditioned spaces would be subsidized at the expense of the non-air-conditioned spaces motivating non-air-conditioned occupants to leave.

It might make more sense in this case to follow a two-pool, two-driver methodology. This method would require estimating or tracking the incremental costs of air conditioning and distributing them using air-conditioned square footage as a driver. Costs not related to air conditioning could still use the net square footage as a driver.

The distinction of air-conditioned versus non-air-conditioned space captures and corrects a non homogenous situation. However, as mentioned earlier there are many other ways that the cost for utility and maintenance may differ. We could consider separate pools for carpeted and non-carpeted space, for example. We could consider maintenance history. We could consider building traffic and number of occupants.

There are really many things that drive these costs. The more variables we consider, the more precise our measurement process becomes. Where do we stop in our managerial costing process? Fitness factors limit the number of variables to be considered. More variables may add significant cost, failing the cost test. Second, motivational incentives and behavioral responses get diluted. Furthermore, credibility may suffer if

managers have trouble understanding an extremely complex measurement process.

Contracts Office Implementation Issues Illustration

Let's consider a hypothetical case crafted to further illustrate behavioral problems and issues possible in cost driver selection. We will consider a "contracts branch" of a purchasing department. This branch review, bids, and administers contracts for three organizations: X, Y, and Z. The illustration considers the choice of drivers proposed as the basis of allocating the branch's annual $1 million overhead cost to its three "customers."

There are many possible drivers that could be used to distribute this cost. We will contrive a scenario that walks us through sequential consideration of four different drivers and then consider the pros and cons of each. Many organizations allocate overhead on the basis of labor so let's start with that driver. Based on "headcount" in X, Y, and Z we can allocate the contract overhead function as follows:

	X	Y	Z
# of employees	250	300	450
% of total	25%	30%	45%
Allocation	$250,000	$300,000	$450,000

Now the manager of Z looks at this and labels it "wrong." He can't understand why he should be allocated $450K for contracting overhead when he doesn't have any contracts.[1] He demands choosing a driver that corrects this obvious distortion and cross subsidization. He suggests using that the "number of contracts" prepared for X, Y, and Z would be a better cost driver. The number of contracts and the resulting allocation are:

[1] This example may seem so wrong that it defies credibility that any allocation could be done so poorly. Yet, many organizations seem to use labor based allocations when they don't really make sense. (See again Relevance Lost, Johnson and Kaplan, 1987) The phenomenon applies to government organizations also. I once saw a labor based allocation of millions of dollars annually to a detachment in Philadelphia for Navy buildings in San Diego. Perhaps it shouldn't have been a surprise when the detachment was closed in a "base realignment and closure" action.

	X	Y	Z
# of contracts	50	50	0
% of Total	50%	50%	0%
Allocation	$500,000	$500,000	$0

Note that X's cost has now doubled and Y's has gone up significantly. Sometimes this phenomenon is referred to as "balloon squeezing." The total volume of air in a balloon does not change when it is squeezed. Squeezing the "air" out of Department Z simply redistributes it to the others. The effect, however, is that managers of X and Y are likely to be unhappy with the change in cost driver.

Manager Y is the next to react in our scenario. He is upset that he is getting charged the same amount as Department X because he "knows" that X's contracts are more time consuming to support and X never complies with lead time requests and other procedures designed to increase the efficiency of the contracts office.

He demands that a driver be chosen that corrects this obvious distortion and cross subsidization. He suggests that using an estimate of effort spent by the contracts office to support X, Y, and Z would be a better cost driver. "Level of effort" is a customized driver developed by interviewing the people likely to know where the efforts of the organization are being spent. The evaluation of effort and the resulting allocation are:

	X	Y	Z
Level of effort	60%	40%	0%
% of Total	60%	40%	0%
Allocation	$600,000	$400,000	$0

The manager of Department X is now livid. He states that his organization cannot afford this level of cost without compromising its mission and that this cost distribution is "unacceptable." This manager, who happens to be the most senior and forceful of the department managers, demands that a driver be chosen that corrects this obvious (to him) distortion and cross subsidization. He suggests using "something fair, like the number of people wearing glasses" would be a better cost driver. We can count the

"glasses" in Departments X, Y, and Z and calculate the allocation as follows:

	X	Y	Z
# wearing glasses	10	10	10
% of Total	33.33%	33.33%	33.33%
Allocation	$333,333.33	$333,333.33	$333,333.33

Discussion of Cost Driver Selection Process

Note that allocation mechanics work quite well for all proposed cost drivers. (Lesson: a proposed driver need not make sense in order to be used.) Software allocation engines can easily calculate the cost distribution to the nearest penny. Furthermore, when printed on computer paper, this appears to be an extremely accurate bookkeeping process that some will find extremely credible. Now, no one other than the manager of X is likely to recommend a driver so ridiculous as "glasses," but it should be noted that this driver may be closer to truth in this case than the commonly used labor driver.

As shown in Figure 1, each of the drivers being considered offers a different cost distribution to X, Y, and Z. All appear fairly inexpensive to generate and all have measurement credibility to at least one of the managers. Let's consider some of the behavioral issues involved in choosing a reasonable cost driver in this case.

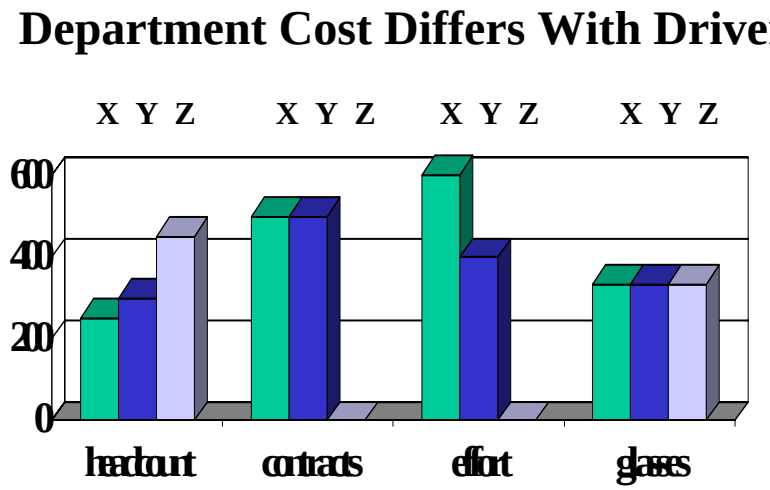

Figure 1: Organizations X, Y, and Z receive quite different cost allocations under each of the four proposed methods. Which should be used?

First, it should be recognized that the individual Department managers are biased in their views of measurement credibility. Their conflict of interest arises from the fact that they will be charged on the basis of cost driver selection. Just as "beauty is in the eye of the beholder," "cost driver credibility is in the pocketbook of the payer."

Therefore, we cannot simply take a vote or rely on a political process for cost driver selection. We must take the view of higher management or of the total organization to weigh the advantages and disadvantages of each proposed cost driver.

Students are quick to reject the "number of people wearing glasses" driver. It is easy to recognize the lack of correlation in such a measurement with the consumption of contract support services. Furthermore, consider the possible impact on operations. As stated earlier, one of the more powerful implications of cost driver selection is that the driver becomes a target, or surrogate, for reduction. Managers seeking to reduce their cost allocation recognize that reducing the driver quantity reduces their share of cost allocated.

This driver would motivate a reduction in the wearing of glasses. There might be a rule against it. Someone would calculate the apparent cost savings achieved by buying employees contacts or laser surgery to reduce "glasses." No manager would want to hire a wearer of glasses. In fact, a really aggressive manager like Manager X would transfer employees who wear glasses to the other departments, since such a tactic lowers X's base while increasing somebody else's. These outcomes are unlikely to be in the organization's best interest.

Now consider the behavioral motivation generated by the "headcount" driver. Is this common driver really any better correlated with resource consumption than "glasses" in this case? "Headcount" in X, Y, and Z is not related to use of the contracts office and reducing or increasing "headcount" does not effect the consumption of services from the contract support overhead office.

The only way to lower contract's allocation is to decrease the number of employees in one's organization. Ironically, reducing "headcount" by contracting-out will actually *increase* the workload and cost of the contract administration branch. This outcome is not in the best interests of the organization.

Next, consider the effect of the "number of contracts" driver. There is undoubtedly some causal link, or positive correlation, between the number of contracts and the cost in the contracts office. However, this driver makes a homogeneity assumption that may not reflect inherent complexity differences and may also create some perverse incentives.

Managers may be motivated to reduce the number of contracts rather than reduce the underlying workload required in the contracts office. For example, a creative and apparently cost conscious managers might seek to lower his allocation by rewriting his fifty contracts into a single master contract with forty nine subcontracts. Again, such behavior may actually *increase* the cost of the contract administration department. These outcomes are also not in the best interests of the organization.

Now consider the behavioral motivation generated by the "level of effort" cost driver. This driver is likely correlated with resource consumption. Actions by Managers X, Y, and Z that reduce effort in the contracts branch can reduce the branch's workload and cost. This drivers creates a virtual "fee for service" environment that motivates efficient consumption.

Such motivation creates a situation of goal congruency. That is to say, anything that X does to reduce effort in the contracts office can ultimately return to X as a cost reduction. Moreover, actions of X that increase overhead effort get appropriately charged to X. The "level of effort" cost driver appears to work in the best interests of the organization in this example.

Conclusions

Careful selection of cost driver fitness is important if a managerial costing system is to achieve its goal of enabling cost management. The impact of driver choice on the organization must be considered since the

driver chosen will stimulate management behavior for better or worse. Achieving the best interests of the organization also demands a driver that is credible and relatively inexpensive to obtain and update.

The "level of effort driver" developed in the Contract Office Case was clearly superior in terms of the behavioral motivations generated for the overall good of the organization. Its cost of generation was not significant and the measurement would probably be credible to the satisfaction of an unbiased observer. The motivation, measurement credibility, and measurement cost are all reasonably aligned with the best interests of the organization.

Yet, measurement of "level of effort" through an interview process is unlikely to be extremely precise. We could certainly account for the "number of people wearing glasses" with much greater precision. Issues of measurement precision are an extremely important, but misunderstood, arena in emerging governmental managerial costing systems. These issues will be specifically addressed by the next article in this series, but suffice it for now to note that in cost driver selection it is much better to be "reasonably right" rather than "precisely wrong."

Cooper, Robin and Kaplan, Robert; The Design of Cost Management Systems: Text, Cases, and Readings, 1991, Prentice Hall, Englewood-Cliffs, New Jersey.

Johnson, Thomas and Kaplan, Robert; Relevance Lost, 1987, Harvard Business School Press, Boston, Massachusetts.