A MATHEMATICAL MODEL OF THE COST ALLOCATION IMPLICATIONS FOR REASSIGNED TIME

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ABSTRACT

The authors' university is a state institution that has recently introduced graduate level programs that have to be self-funding. This requirement has given rise to a number of cost allocation issues for the graduate programs. The present paper focuses on the cost of reassigned time, in the form of a course release, for a tenured/tenure-track faculty member who teaches in the graduate program. A mathematical model is developed to show that the cost that should be allocated to the graduate program for this release time is a function of the cost of the affiliate faculty that teaches the course originally assigned to the tenured/tenure-track faculty member.

INTRODUCTION

The authors' university was chartered as an undergraduate-only, four-year university by the state's legislature. Today, the university has grown to a student population of about 23,000, and it boosts the state's largest undergraduate accounting program. In 2008, the university's president proposed adding a select group of graduate-level degrees at the master's level to further enhance the range programs available to the student body. The department of accounting was one of the first to propose a formal master's program within the university. However, due to serious fiscal limitations attributed to budget constraints imposed by the state's legislature, the administration mandated that all the master's programs had to be self-funding. Consequently this has resulted in ongoing discussions about various cost allocation procedures for these self-funded master's programs. The specific areas where there are issues with the cost allocation methodology include an overhead allocation for administration support, the cost of faculty fringe benefits, the allocation of bad debts, and the cost of reassigned time for faculty teaching in the graduate programs. The purpose of this paper is to develop a mathematical model for the allocation of reassigned time.

In the next section a brief literature review of cost allocation methods and issues is presented. Next the reassigned time model is developed and this is followed by the conclusion.

LITERATURE REVIEW

An equitable cost allocation process is difficult to determine (see, for example, Young, 1994 [7]) and has been the subject of discussion from Aristotle's proclamation of "equal treatment of equals and unequal treatment of unequals in proportion to their inequality" (Aristotle, trans. 2000 [1]) to modern times.

The idea of academic units being managed as responsibility centers has been around since tuition was first charged to students (see, for example, Strauss & Curry, 2002 [6]). However public institutions have been slower in adopting this approach preferring to rely on the "general-fund" approach (Hearn, Lewis, Kallsen, Holdsworth, & Jones, 2006 [5]). In the case of the authors' university, the implementation of

responsibility centers in respect of the graduate programs has been necessitated by the fact that these programs have to be self-funded.

Dugdale and Jones (2003) [4] highlight the centuries old debate between the supporters of the direct costing approach and those of the absorption costing method. Although the absorption costing approach is probably favored there is no clear winner. It is argued that direct costing is appropriate when overheads are not significant and that absorption costing is likely to be more useful when overheads are high (Baxter, 2005 [3]).

These traditional methods have been criticized as being unable to deliver relevant information in an inter-organizational context (Bastl, Grubic, Templar, Harrison, & Fan, 2010 [2]). This is certainly true in respect of the authors' university where the debate has raged for nearly three years as to the appropriate cost to be assigned for reassigned time. In the next section a mathematical model is developed that identifies the appropriate amount to be allocated for this cost.

THE MODEL

The model is developed on the basis of the premise that the university's undergraduate programs will be not be financially worse off as a result of the reassigned time. The variables will then be identified, the assumptions will be given, and finally the model will be developed.

Premise

The department's undergraduate program will remain financially neutral when a faculty member is granted reassigned time for a master's project. Financial neutrality means that the undergraduate program will not incur any unintended costs nor will it receive any unintended benefits.

Variables

Let

f_a be the faculty member's academic year salary including fringe benefits,
$\frac{1}{8} f_a$ be the faculty member's salary, including fringe benefits, for teaching a 3 credit hour course as the university's normal teaching load is 4 + 4,
a_3 be the affiliate faculty's salary, including fringe benefits, for teaching a 3 credit hour course,
$E(b_{rt})$ be the expected benefits from the reassigned time,
UC_{nrt} be the salary cost to the undergraduate program of teaching a 3 credit hour course with no reassigned time,
UC_{rt} be the salary cost to the undergraduate program of teaching a 3 credit hour course when a faculty member is given reassigned time, and
M_{rt} be the cost plus the benefits to the master's program of the reassigned time.

Assumptions

The following assumptions are made:

1. $\frac{1}{8} f_a$ is strictly greater than a_3. This captures the economic reality that affiliate faculty are paid less than full-time faculty.

2. The reassigned time is strictly used for a master's project. This assumption is relaxed in a later section.
3. $E(b_{rt})$ is greater than the salary cost, however it is measured. This is a basic tenet of the allocation of scarce economic resources.

Evaluating the allocation to the master's program of the faculty member's salary ($\frac{1}{8} f_a$)

Without any reassigned time the salary cost to the undergraduate program of a 3 credit hour course taught by a faculty member is given by

$$UC_{nrt} = -\tfrac{1}{8} f_a, \text{ ceteris paribus} \tag{1}$$

If reassigned time is given to a faculty member for a master's project and the cost allocation is based on the faculty member's salary, then for the Master's program we have

$$M_{rt} = E(b_{rt}) - \tfrac{1}{8} f_a, \text{ ceteris paribus} \tag{2}$$

If the reassigned time is granted then the cost to the undergraduate program becomes

$$UC_{rt} = -a_3, \text{ ceteris paribus} \tag{3}$$

When equation (1) is compared to equation (3) it is clear that

$$UC_{nrt} \neq UC_{rt} \text{ since } -\tfrac{1}{8} f_a \neq -a_3 \tag{4}$$

This violates our premise which states that the undergraduate program must remain financially neutral as a result of the granting of the reassigned time, that is

$$UC_{nrt} = UC_{rt} \tag{5}$$

The unintended consequence to the undergraduate program of allocating the faculty member's salary to the Master's program is $\frac{1}{8} f_a - a_3$ which is the difference between equations (3) and (1). Since, from assumption 1, we know that $\frac{1}{8} f_a$ is greater than a_3, this means that the undergraduate program is benefitting from the reassigned time by the difference between the faculty member's and the affiliate's salary cost for teaching the course.

Evaluating the allocation to the master's program of the affiliate's salary (a_3)

For the premise to hold we know that for the undergraduate program

$$UC_{nrt} = UC_{rt} = -\tfrac{1}{8} f_a, \text{ ceteris paribus} \tag{6}$$

This means that the affiliate's salary must be allocated to the master's program such that

$$M_{rt} = E(b_{rt}) - a_3, \text{ ceteris paribus} \tag{7}$$

A second unintended consequence of allocating the master's program with the faculty member's salary, rather than that of the affiliate's salary, can be inferred from comparing equations (7) and (2). There could well be situations where

$$\tfrac{1}{8} f_a > E(b_{rt}) > a_3 \tag{8}$$

This means that by incorrectly allocating the faculty member's salary to the master's program there may be situations where reassigned time is not granted for a master's project because the costs exceed the expected benefits, $\tfrac{1}{8} f_a > E(b_{rt})$. If, however, the affiliate's salary was correctly allocated then the project would be approved since the expected benefits exceed the costs, $E(b_{rt}) > a_3$.

Relaxing the assumption that the reassigned time is strictly for the benefit of the master's program

Let

x be the percentage of $E(b_{rt})$ that is applicable to the master's program,
$(1 – x)$ be the percentage of $E(b_{rt})$ that is applicable to the undergraduate program,
y be the percentage of a_3 that is applicable to the master's program,
$(1 – y)$ be the percentage of a_3 that is applicable to the undergraduate program,
$x = y$, to ensure that the costs are aligned with the benefits, and
U_{rt} be the benefit and the cost of the reassigned time that is applicable to the undergraduate program.

For the undergraduate program we have

$$U_{rt} = (1 – x)E(b_{rt}) – (1 – y)a_3, \text{ ceteris paribus} \tag{9}$$

and for the master's program we have

$$M_{rt} = xE(b_{rt}) - ya_3, \text{ ceteris paribus} \tag{10}$$

Since $E(b_{rt}) > a_3$, from assumption 3, and $x = y$ then both programs are benefitting from the reassigned time and each program is allocated a portion of the affiliate's salary based on the expected benefits that each program receives.

CONCLUSION

This model shows that the master's program should be allocated no more than the cost of affiliate's salary if all of the benefit of the reassigned time accrues to the master's program. To the extent that a portion of the reassigned time benefits the undergraduate program, then that program should bear a concomitant share of the affiliate's salary.

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