A Simulation-Based Approach to the Development of Compensation Models for Distance Learning

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ABSTRACT

This paper continues the research of Moscato (3) on the development of compensation models used by universities engaged in the development and delivery of on-line courses. Current research is identified and evaluated. The emphasis is placed on existing quantitative models that have been presented in the literature.

The focus of this paper is the extension of previous analytical work to more elegant characterizations of the key variables. A series of simulation models are used to depict the following factors:

Revenue per credit hour to the university
Number of students served
Frequency of course delivery (Including initial & subsequent times)
Plausible revenue and cost function to the university
Various delivery options (regular load, teaching assistant, adjunct).

The results of the various models are presented and discussed along with their implications for all parties concerned (students, faculty & university administration.)

Keywords: compensation, distance learning, simulation, sensitivity analysis

INTRODUCTION

As more institutions of higher education move toward the utilization of online, distance learning courses the debate over compensation of faculty intensifies. In one of the more empirical research studies on faculty compensation in a distance-learning environment Schifter (5) concluded, "No clear patterns of faculty compensation and incentive models for participating in DE programs arose…" Her study involved 212 individuals from 160 identified institutions. The fact is that despite all the rhetoric on the subject precious little actual modeling has been conducted Moscato (3). A recent NEA (4) study concludes the following:

(1) 84% do not get a corresponding reduction in workload,
(2) 63% are compensated for their distance learning course as if it were part of their normal course load,
(3) faculty believe that they will be hurt financially by DL and
(4) more than half of distance learning faculty spend more hours on their distance-learning course than traditional courses.

The author decided to employ a simulation-based study that would capture the richness of the

decision-making environment for distance learning. A total of 2160 simulations were run. This number was necessary in order to obtain a sufficient level of sensitivity analysis of the key drivers. In the next section the model is developed.

MODEL DEVELOPMENT

The objective function studied is "Gain to the University". The Gain is as follows:

Revenue - Cost

= (Number of students in course * revenue per credit hour * number of credit hours for course)

- (Cost for faculty + Cost of Overhead to develop or maintain DL course).

The cost for the faculty variable follows the work of Turoff(7) in which he posits three approaches for staffing a course. They are as follows:

use of an adjunct faculty member
use of a teaching assistant and
use of a full-time member's salary prorated per course.

The overhead cost was determined to be either the initial cost to develop a distance learning course or the ongoing cost to maintain the currency of a course. See the work of Boettcher (1) in which she develops the idea of using a team approach that relies on the use of area specialists. Fink (2) demonstrates a similar approach followed at the University of Toledo

In order to perform sensitivity analysis, the variable number of students ranged from a low of five to a maximum of 100, however, increments of five were used in the range between five and forty students. The variable tuition per credit hour ranged from $100 to $500 in increments of $50 which reflects enough variability to include the gamut from public community colleges to private universities. The variable cost of faculty was assigned values according to the following logic. An adjunct was paid $2500 to teach the course. A teaching assistant's compensation was prorated to be $5000 per course. If a full-time faculty person is paid $88,000 , then 1/8 of his salary was assumed to be $11,000. Clearly, the aforementioned values would be different for each institution but those selected are consistent with the work of Turoff (7).

Model Assumptions:

Number of Students	Tuition Per Credit Hour	Faculty Compensation*	Fixed Cost To Develop	Fixed Cost To Maintain
5	$100	$2,500	$0	$0
10	$150	$5,000	$5,000	$500
15	$200	$11,000	$10,000	$1,000
20	$250		$15,000	$1,500
25	$300		$20,000	$2,000
30	$350			
35	$400			
40	$450			
100	$500			

***Adjunct=$2500**
TA=$5000
Faculty Load=$11000

Figure 1

The final variable included in the model reflected either the initial development cost that was allowed to vary from zero to $20,000 in increments of $5,000. Succeeding offerings of the course were assumed to require a maintenance cost that was allowed to vary from zero to $2,000 in increments of $500. This later cost was assumed to be 10 percent of the development cost. All courses were assumed to be for three credits.

When you combine all of the scenarios you have 2160 unique simulations captured by thirty EXCEL® spreadsheets with each spreadsheet capturing seventy-two scenarios. Figure 2 illustrates one of the thirty spreadsheets. This spreadsheet depicts the gain to the university for an initially offered course taught by a full-time faculty person. The development cost is set at $10,000.

Gain for University									
Time Offering	**Once**								
Staffing Option	**Full Time**								
Development Cost	**10000**								
				Tuition	**Per**	**Credit**	**Hour**		
		150	**200**	**250**	**300**	**350**	**400**	**450**	**500**
	5	(18750)	(18000)	(17250)	(16500)	(15750)	(15000)	(14250)	(13500)
Number									
Of	**10**	(16500)	(15000)	(13500)	(12000)	(10500)	(9000)	(7500)	(6000)
Students									
Enrolled	**15**	(14250)	(12000)	(9750)	(7500)	(5250)	(3000)	(750)	1500
	20	(12000)	(9000)	(6000)	(3000)	0	3000	6000	9000
	25	(9750)	(6000)	(2250)	1500	5250	9000	12750	16500
	30	(7500)	(3000)	1500	6000	10500	15000	19500	24000
	35	(5250)	0	5250	10500	15750	21000	26250	31500
	40	(3000)	3000	9000	15000	21000	27000	33000	39000
	100	24000	39000	54000	69000	84000	99000	114000	129000

Figure 2

SENSITIVITY ANALYSIS OF MODEL

Breakeven Values For Assumption of First Time Offering:

Development Cost : Adjunct- 10 students at any tuition, 5 students a tuition > $200
$0 **T.A**.- 15 at $150, 10 at $200 and 5 at $300
F.T.- 25 at $150,20 at $200,15 at $250,10 at $400 ,never at 5

Development Cost: Adjunct- 20 students at $150,15 at $200, 10 at $250
$5,000 **T.A**.- 25 at $150,20 at $200,15 at $250,10 at $350,never at 5
F.T. – 40 at $150,30 at $200,25 at $250,20 at $300,15 at 400, never at 5 or 10 students

Development Cost: Adjunct-30 students at $150,25 at $200,20 at $250,15 at $300, 10 at $450
$10,000 **T.A**. – 35 students at $150,30 at $200,20 at $250,15 at $350, 10 at $500, never at 5 students
F.T. - >40 students at $150,35 at $200,30 at $250,25 at $300, 20 at $350, 15 at $500, never at 5 or 10 students

Development Cost: Adjunct-40 students at $150,30 at $200,25 at $250,20 at $300, 15 at $400
$15,000 **T.A**. - >40 students at $150,35 at $200,25 at $300,20 at $350, 15 at $450, never at 5 or 10 students
F.T. - >40 students at $150,>40 at $200,35 at $250,30 at $300, 25 at $350, 20 at $450, never at 5,10 or 15 students

Development Cost: Adjunct->40 students at $150,40 at $200,30 at $250,25 at $300,
$20,000 20 at $400, 15 at $500
T.A. - >40 students at $150 & $200,35 at $250, 30 at $300, 25 at $350, 20 at $450,>15 at $500, never at 5,10 or 15
F.T. - >40 students at $150,$200 & $250, 35 at $300,30 at $350, 25 at $450, never at 5,10,15,& 20 students.

Breakeven Values For Assumption of Maintaining Offering:

Maintenance Cost: $0
Adjunct- 10 students at $150, 5 at $200
T.A. – 15 students at $150,10 at $200,$250 & $300, 5 at $350
F.T. – 25 students at $150,20 at $200,15 at $250,10 at $400, never at 5 students

Maintenance Cost: $500
Adjunct- 10 students at $150
T.A.- 15 students at $150, 10 at $200,$250,$300,&$350, 5 at $400
F.T. – 30 students at $150,20 at $200,15 at $300,10 at $400, never at 5

Maintenance Cost: $1,000
Adjunct- 10 students at $150 and $200
T.A. – 15 students at $150,10 at $200,$250,$300,& $350,5 at $400
F.T. – 30 students at $150,20 at $200,15 at $300,10 at $450, never at 5 students

Maintenance Cost: $1,500
Adjunct- 10 students at $150, $200,& $250, 5 at $300
T.A. – 15 students at $150 & $200, 10 at $250,$300,$350 & $400, 5 students at $450
F.T. – 30 students at $150,25 at $200,20 at $250,15 at $300, 10 at $450, never at 5 students

Maintenance Cost: **$2,000**
Adjunct- 10 students at $150, $200, & $250, 5 students at $300
T.A. – 20 students at $150,15 at $200,10 at $250,$300,$350,$400 and $450, 5 students at $500
F.T. – 30 students at $150,25 at $200, 20 at $250, 15 at $300, 10 at $450, never at 5 students.

CONCLUSION

The results of this research demonstrate quite clearly the impact of two major factors that impact the economic gain to the university. This first is the accounting allocation for the development of the distance-learning course. When coupled with the second factor, the faculty staffing option, the economics of distances learning courses changes dramatically. Clearly, the gain is also affected by the number of times the course is given and the number of students in the course. The sad fact is that as the staffing cost increases the more students are required to breakeven regardless of the development or maintenance option. The contribution of this research is that the specific sensitivity of these factors is quantified for the first time.

Future research will explore different cost factors relating to the compensation of faculty in distance-learning courses.

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