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Does It Also Make Economic Sense: Economics of Assessment

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Introduction

The Department of Construction Technology of the Purdue School of Engineering and Technology (PSET) at Indiana University - Purdue University Indianapolis (IUPUI) has offered ABET (Accreditation Board for Engineering and Technology) accredited programs since 1984. The Department went through another accreditation visit in the Fall semester of 2000 and was accredited for another six years for all of its programs. Despite the comfort and reassurance this has provided, we have not lost sight of the fact that the next round of assessment-based accreditation, using ABET/TAC 2000 criteria (TC2K) for Technology, will be challenging. Consequently, the Department is continuing its assessment work at full speed with the understanding that we need to do assessment and implement continuous improvement for the next six years if we want to keep our accredited status.

The Department also went through an IUPUI review in 2000. All our courses state, cover, emphasize, and implement both the IUPUI Principles of Undergraduate Learning (PUL) and the ABET objectives. Our assessment efforts in all courses have tried to keep both the ABET and PUL based IUPUI accreditation/evaluation in sync.

Since most of the faculty members in our programs in the School are technical professionals (mostly engineers), it is kind of in our nature to try to optimize everything we do and try to see whether what we do makes economic sense. Inevitably, we are looking for economic feasibility, break-even points, and a benefit/cost ratio that is feasible and defendable also in the case of assessment activities that the School is involved in. I usually get the feeling that one reason why I see some resistance to assessment undertakings from some of my colleagues is probably due to the fact that they are not sure whether there is also an economic justification to all this even though we do not much of a choice.

So far assessment work has progressed with the premise that this is a good thing to do, and that we are required to do this whether we like it or not, and that there is a lot of qualitative justification for these undertakings in terms of the enhanced qualitative results we undeniably attain. Nevertheless, it is on my mind and probably on the mind of a lot of faculty in the PSET to see, even roughly, whether assessment can also be justified in the engineering economy

sense considering that assessment is really taking a toll on the scarcest resource of all academic departments, namely, faculty/administrator time and its inherent cost.

As Mikel Harry and Richard Schroeder state in their famous book, ***Six Sigma Breakthrough Management Strategy*** (1),

> "We do not know what we do not know
> We cannot act on what we do not know
> We won't know until we search
> We won't search for what we don't question
> We don't question what we do not measure."

So, notwithstanding the continuing assessment work we are involved with, we need to deal with the question of determining, establishing, and measuring the economic benchmark/rationale for assessment activities and maybe use this to answer the broader question of what exactly needs to be assessed, how much, and whether it is possible to do it too much. In terms of the resources and reputations at stake, the question is more than academic in nature.

The School Assessment Framework

Purdue School of Engineering and Technology at IUPUI houses a number of engineering and technology departments most of which are ABET accredited. Despite this common source of accreditation, there is no consensus or uniformity in terms of how to do assessment and how much. As a result the amount of faculty time spent on these undertakings and its "opportunity cost" varies widely.

The following table shows what each department in the School has chosen for its main assessment strategy. Examination of the table indicates that there is no consensus or uniformity in terms of how to do assessment and how much. As can be seen, some departments have opted to assess selected courses, some are assessing select courses plus a senior capstone course, some are assessing all courses, some are using comprehensive exams or portfolios, and some are using combinations of above in addition to the usual surveys, exit interviews, and such.

As a result, the question, are we doing enough or are we doing too much, still lingers. Establishment of an economic justification and benchmark for the economics of doing assessment may help in providing guidance for the proper direction to take.

Table 1. Characterization of Departmental Assessment Processes.

Department	ABET or PUL?	Primary Strategy	Supplemental Strategies
Computer Technology (CPT)	ABET/TAC	Assessment in all selected courses	Assess how well students feel they have learned the course outcomes using surveys Develop rubrics for more courses Assess retention rates, graduation rates, and number of degrees conferred Assess how well students feel they have learned the course outcomes using surveys Assess continuing students satisfaction using in-hours survey Assess alumni satisfaction Assess employer satisfaction
Construction Technology (CNT)	ABET/TAC	Assessment in all courses + Assessment in a capstone course + exit exams + student and alumni surveys	Assess how well students feel they have learned the course outcomes using surveys Assess retention rates, graduation rates, and number of degrees conferred Assess retention rates, graduation rates, and number of degrees conferred Assess continuing students satisfaction Assess alumni satisfaction Assess employer satisfaction
Electrical and Computer Engineering (ECE)	ABET/EAC	Assessment takes place in selected courses with strong emphasis on the senior capstone course.	Assess how well students feel they have learned the course outcomes using surveys Assess retention rates, graduation rates, and number of degrees conferred Assess continuing students satisfaction using in-hours survey Assess alumni satisfaction Assess employer satisfaction
Electrical Engineering Technology (EET)	ABET/TAC	No information at this time	Assess how well students feel they have learned the course outcomes using surveys Assess retention rates, graduation rates, and number of degrees conferred Assess continuing students satisfaction Assess alumni satisfaction Assess employer satisfaction
Mechanical Engineering (ME)	ABET/EAC	Assessment takes place in a selection of courses, which includes the senior capstone design course.	Assess how well students feel they have learned the course outcomes using surveys Assess retention rates, graduation rates, and number of degrees conferred Assess continuing students satisfaction Assess alumni satisfaction Assess employer satisfaction Exit interview
Mechanical Engineering Technology (MET)	ABET/TAC	Comprehensive exam or portfolio, depending on the degree program	Assess how well students feel they have learned the course outcomes using surveys Assess retention rates, graduation rates, and number of degrees conferred Assess continuing students satisfaction Assess alumni satisfaction Assess employer satisfaction
Organizational Leadership and Supervision (OLS)	PUL	Assess selected courses, including the required senior research project course	Graduating senior survey Passing rate on certificate program Assess retention rates, graduation rates, and number of degrees conferred Assess continuing students satisfaction Assess alumni satisfaction Assess employer satisfaction

Methodology

The methodology that was to be employed, as originally envisioned, within the context of this study, would involve the following steps:

1. Determination of how much time faculty/administrators in PSET spend on assessment. This was done through surveys and other appropriate means.

2. Determination of the cost per unit faculty time in monetary terms. This was calculated based on direct pay/salary plus indirect faculty costs such as fringe benefits and such. This analysis yielded the "opportunity cost" of spending faculty time for assessment versus other academic purposes.

3. Determination of an economic/monetary "outcome metric" that can be associated with assessment activities. One outcome metric that I could think of was the increase in aggregate credit hour income for the School. This was based on the premise that programs whose quality decidedly increase as a result of assessment undertakings will be attracting more students, will keep them happy, and will retain more of them.

4. Based on the determination of the above two variables, i.e. shadow cost of faculty/administration time spent on assessment and additional income (return) as a result of assessment activities, a "sensitivity analysis" was done to depict what levels of investment of faculty/administrator time can be justified for what levels of expectations of increased additional income. From this analysis a range of break-even points were calculated to exhibit the economic feasibility framework for the assessment undertakings.

5. It is to be noted that this analysis was done using PSET data on salaries, time spent on assessment, etc., in particular. The findings, however, can be extrapolated to exhibit the IUPUI, i.e. the whole University situation, if needed, since the variation in the means will most probably will not be significant.

Implementation

Within the context of this study, a request was made that all administrators, faculty, and staff provide me with the data in terms of how many hours they spend on assessment and related activities. For reasons unknown to me, very few people responded to this request. I received a total of 8 responses out of about 75 people I could identify as being involved in one way or another with assessment. The time spent on assessment for this group of 8 people varied between a minimum of 30 hours/year to a maximum of 787 hours/year. In terms of this variation and in terms of this response population not constituting a representative sample, I decided to pursue a different route for this study. This approach comprised defining a numeric outcome metric that can be construed as a result of assessment activities and determining how much of a change in this metric will justify what kind of a time expenditure on the part of the administrators, faculty, and staff on average.

In order to be able to calculate the average cost of time per hour for the total sample of administrators, faculty, and staff, salaries of people in each of these categories who deal with assessment in some shape or form and the number of such people were obtained. The data in terms of types of positions, the number of people in each of these positions, and their salaries have been displayed below. Data reflect the Fall 2003 semester situation.

TABLE 1

POSITION/GROUP	NUMBER	AVERAGE SALARY ($)
Deans	3	125, 516
Chairs	7	95, 720
Assistant Professors	25	56,940
Associate Professors	12	64,915
Full Professors	15	76,740
Lecturers	3	48,900
Staff-clerical	3	30,056
Staff-PA	7	39,788
TOTAL	75	

The average salary for each group was multiplied with the number of people in each group. The results were added for all the people and then divided by 75, which is the total number of people as shown above in the table, to find the average salary for the total sample. The salaries were increased by a factor of 27 % to account for retirement, social security, and other fringe benefits. When finding the average hourly cost for the group as a total, the fact that some of the people in the group work for 10 months (most faculty) and others for 12 months (most administrators) was taken into account in terms of a weighted time calculation for each group and number of people in that group. The actual time worked was used in these calculations not the yearly contract durations (ex. "10-month faculty" really work about 9 months etc). The overall determination was that this group of 75 people work, on average, 38 weeks a year, considering differences in their contracts and real time spent on the job.

The result from above described calculations was that the hourly cost for this group of people who deal with assessment was approximately $ 55.64 per hour.

The "numerical metric" used for measuring the result of assessment was ***increase in student credit hours taught***. It was implicitly assumed that assessment would lead to our doing better work, resulting in quality programs, which naturally would increase our reputation and increase our credit hours due to increased enrollment and better retention. For the basis of break-even calculations the present credit hours and tuition income for the whole School was considered as 44 000 credit hours and about $ 16.622 million in tuition income including the State contributions. As a result, on average, a credit hour generated is creating a "tuition+fees" income of about $ 16, 622, 000/ 44 000 cr.hrs = 378 $/cr.hr. including State appropriations.

Based on this average, a 1 % increase in student credit hours (in-state) is equivalent to about 1 x 44 000 cr.hrs per year x 378 $/cr hr = $ 166, 320 in "tuition+fees" income per year.

Consequently, the amount of time, on average, justified to be used for assessment per year on the part of each of the above 75 people to break even is :

($ 166, 320)/($ 55.64 per hr ave. cost for faculty/staff x 75 faculty/staff)= 39.86 hrs /year

or (39.86 hours per year) / (38 weeks per weighted average academic year) = 1.05 hrs/week.

What this means is that unless the total student credit hours for the School is increasing at least by 1 % for an average of 1.05 hours/week spent by each of the people in the above group on average on assessment, the undertaking does not make monetary economical sense if we were to have a choice.

As I noted above, I had very limited data as to how many hours people spend on assessment. Using a weighted average of the data submitted to me from the 8 people who responded, the average time spent for assessment per week was about 6.32 hours per week per each of these people. To be able to justify this amount of time being spent for assessment, the total student credit hours generated need to increase by:

(6.32 hrs/week x 38 weeks/year x 55.64 $/hr for fac/staff x 75 fac/staff)/(166, 320 $/yr)=6 % per year

The table below shows the % increase required in credit hours to justify the hours/week of time being put into assessment by all of us.

TABLE 2

Average hrs/week per faculty/staff spent on assessment in any one year	**% increase in total credit hours needed for the year to justify the time spent**
1	0.95
2	1.90
3	2.86
4	3.81
5	4.77
6	5.72
7	6.65
8	7.60
9	8.55
10	9.50

Another way of looking at this data is in terms of the relevance of how much it costs us to spend a certain amount of time on assessment. This is given below:

TABLE 3

Average hrs/week spent on Assessment per week per faculty/staff	**Monetary cost of the time to School ($)**
1	158,574
2	317,148
3	475,722
4	634,296
5	792,879
6	951,444
7	1,110,018
8	1,268,592
9	1,427,166
10	1,585,740

Discussion and Conclusions

The overall summary result for the 75 people involved in assessment was that for them to justify spending one hour per week on assessment, the School credit hours needed to increase by about one percent per year.

It is important to note that irrespective of what the results exhibited from the above described economic assessment of the assessment process at the School are, the economics of the situation will definitely get better over time. One reason is that we are still on a learning curve in terms of time spent on assessment, and, most assuredly, it will occupy less of our time as we get better at it. The other is that, there are numerous other worthwhile and positive outcomes of doing assessment that we are not easily able to quantify in monetary terms.

Bibliography

(1) Mikel Harry & Richard Schroeder., *Six Sigma – The Breakthrough Management Strategy*, Random House, New York, 2000.

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