

## Balanced Scorecard for Education Assessment

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### Abstract

In choosing a method to evaluate an academic unit, there are multiple choices to consider. This paper begins with a discussion of the decision process that one college of engineering took along the path of deciding how to assess their newly formed strategic initiative. The four sets of performance measures that compose Kaplan and Norton's Balanced Scorecard provide fundamental structure for institutional goals and seem promising in the context of assessment for education improvement. With assistance from administration and faculty, a comprehensive scorecard can be assembled accounting for several specific assessment objectives. An extensive, quantitative model as such would provide a clearer understanding of education system dynamics, support formal experiments, evidence value-added practices and factors for success, identify opportunities for intervention, and so better inform policy decisions. An example will be presented of a Balanced Scorecard applied to the University of Oklahoma College of Engineering's strategic initiatives.

### I. Introduction

In the summer of 1997, the University of Oklahoma College of Engineering obtained a new Dean of Engineering and, with the new Dean, began constructing a new strategic initiative. This initiative underwent many transformations and continues to evolve. The vision of the College of Engineering is "to produce engineering graduates sought first by industry and investors for excelling in a rapidly changing, technology-driven world both as problem-solving engineers and technology managers in existing companies and as leaders in starting new, technology-based companies." The plan to fulfill this vision includes three main areas: enhanced education, relevant research, and top students. Also, the plan must determine how it will assess when the vision has been met or how close/far away the vision remains. A discussion of the plan took the College of Engineering along three paths: the U.S. News & World Report's rankings of colleges and schools, the Baldrige Quality Award, and the Balanced Scorecard.

## II. U.S. News & World Report

U.S. News & World Report's rankings serve as barometers of the best colleges and graduate schools, but the engineering rankings are ostensibly helpful in choosing metrics of institutional success. America's Best Colleges are "based solely on the judgements [sic] of deans and senior faculty <sup>1</sup>," nothing internally measurable or which suits continuous improvement efforts. The Best Graduate Schools are based on a weighted average of indicators in four categories: Reputation, Student Selectivity, Faculty Resources, and Research Activity <sup>2</sup>. Though measuring some of the indicators will eventually contribute to continuous improvement in the College, it decided that sole reliance on U.S. News & World Report's rankings for assessment was not the best path. Table No. 1 presents and interprets the U.S. News & World Report indicators specifically with the goal of assessing the College of Engineering. Obviously, some of these will be useful to our assessment plan, i.e., research expenditures/faculty or quantitative, analytic GRE scores.

**However, it was decided that, though we may see an overall improvement in our rankings in this metric, it would not be our sole means of assessing our progress toward our new strategic plan.**

**Table No. 1 – U.S. News & World Report Summary**

Indicator	Weight	Control	Avg. Top 25	Avg. Top 50	Oklahoma
Academic Reputation	0.25	Little	4.1	3.8	N/A
Recruiter Reputation	0.15	Little	4.1	3.7	N/A
Research Expenditures	0.15	Size Dependent	91.5 million	64.5 million	10.5 million
Expenditures/Faculty	0.10	Controllable	497.8 k	410.4 k	104.0 k
PhD Students/Faculty	0.0625	Controllable	3.4	2.9	1.6
Faculty in NAE	0.0625	Controllable	7.9%	5.7%	1.0%
PhDs granted	0.05	Size Dependent	120	87	19
Quantitative GRE	0.045	Controllable	761	755	724
Analytic GRE	0.045	Controllable	701	691	618
Acceptance Rate	0.01	Controllable	28.6%	28.7%	38.0%
Full time masters/faculty	0.025	Controllable	N/A	N/A	2.6
Faculty with PhD	0.025	Controllable	N/A	N/A	100%
F/T enrollment	0	Size Dependent	1290	965	385

### III. Baldrige Education Criteria

The Baldrige National Quality Program has established Criteria to help the US Education Community address its educational challenges, and assess and measure performance. The criteria are based on four Core Values and Concepts (CVC) that may inform a strategy for assessment in the Engineering College of the University of Oklahoma. Also, performance measurement can be categorized, assessment strategy further transformed, into sets that compose a Balanced Scorecard.

One of four pertinent CVC is Learning-Centered Education of which key characteristics include an understanding that students' learning styles may differ, and a focus on school-to-work and school-to-school transitions. Two types of assessment also characterize learning-centered education: 1) *formative* assessment of learning styles and early learning used to fit teaching to student needs, and 2) *summative* assessment of student progress versus standards. The Organizational and Personal Learning characteristic highlights that education improvement requires a learning environment, curricula and program designs that include an assessment strategy and methods for measuring student progress. Valuing Faculty, Staff, and Partners means staff and faculty development involving knowledge of assessment methods and student learning styles.

Performance measurement based on student learning requires a *fact-based* system (Management by Fact), supported by the other, more subjective CVC, that might include students' backgrounds, learning styles, *aspirations*, academic strengths and weaknesses, educational progress, classroom and program learning, satisfaction with instruction and services, extracurricular activities, dropout/matriculation rates, and post-graduation success.

### IV. Balanced Scorecard

The balanced scorecard measurement approach allows a quick and comprehensive view of an organization<sup>3</sup>. The approach measures key areas of performance and links them to strategies and actions. The balanced scorecard differs from most measurement systems in that it focuses on a few critical areas that are essential to the success of the organization<sup>4</sup>. These areas traditionally have included the financial perspective, the customer perspective, the internal process perspective, and the innovation and learning perspective. The measures in each perspective must be consistent with each other and linked to the objectives of the organization<sup>5</sup>.

Defining the balanced scorecard is a continuous activity that is initiated as the goals and objectives of an organization evolve. The process necessary to achieve these goals must be decided as well as the key performance indicators for those processes. Once they have been chosen, the whole process must be moved throughout the organization, making sure that the measures of the units coincide with the overall objectives<sup>6</sup>. For the College of Engineering, the process must begin with the Deans. The process is then repeated with the Directors, the Faculty and Staff, and finally,

with the Board of Visitors.

Once performance measures have been determined, a method for evaluating the efficiency of those measures must be developed. The balanced scorecard approach provides a comprehensive approach to performance measurement, but it does not provide a numerical method for determining the efficiency of an organization. The balanced scorecard also does not provide preferences of the objectives. Each one is weighted equally. Many methods for decision-making, including the Analytic Hierarchy Process, can aid in this process. These methods can combine the qualitative and quantitative information given in performance measures to yield an overall effectiveness rating that is easily interpreted.

AHP is a multiple criteria decision-making tool developed by Dr. Thomas L. Saaty that has been specifically designed for decisions that require both quantitative data and qualitative information<sup>7</sup>. It takes complex comparisons and transforms them into simple pair-wise comparisons. A hierarchy of criteria is created using pair-wise comparisons. The top element of the hierarchy is the goal of the decision-making process. With each comparison, the question of how strongly each criterion affects the next is asked. Since each influence will not be equivalent, their individual priorities are developed. AHP allows the decision-maker to break a complex problem into simpler, less overwhelming, problems and to see how each element relates with the other elements<sup>6</sup>.

AHP facilitates comparisons by using pair-wise comparisons instead of multiple comparisons. Pair-wise comparisons are generally easier for people to make and provide a more comprehensive view of importance.

AHP can be used to ascertain the efficiencies of each level of the College. Pair-wise comparisons of each level as it pertains to the previous level are executed. These comparisons are used to weight the different elements. Each level of the College is asked, "With respect to the objective, Criteria A is equally, moderately more, strongly more, or extremely more important than Criteria B." These statements are then translated into numerical values using the following scale:

<b>Preferences</b>	<b>Rating</b>
Equally Preferred	1
Equally to Moderately Preferred	2
Moderately Preferred	3
Moderately to Strongly Preferred	4
Strongly Preferred	5
Strongly to Very Strongly Preferred	6
Very Strongly Preferred	7
Very Strongly to Extremely Preferred	8
Extremely Preferred	9

Once the preferences have been quantified, a matrix of the criteria is created. Priorities are determined by dividing the elements of each column by the sum of that column. The elements in each resulting row are then added, and the sums divided by the number of elements in each row. The resulting priorities are used to calculate the efficiency of different activities and levels of the College. The AHP process is illustrated in Figure 1.

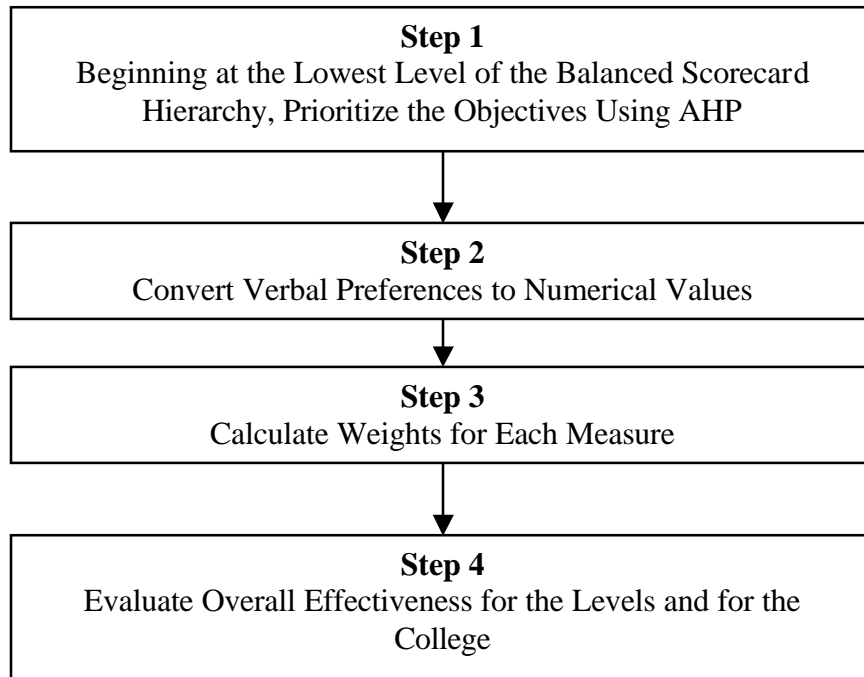


Figure 1: The AHP Process.

## V. A Combination for Assessment

The fact-based management of the Baldrige Education Criteria relate well to the Balanced Scorecard's four sets of performance measures: Customer Satisfaction; Financial Measures; Innovation, Learning, Improvement and Growth; and Internal Business and Management Processes. They provide a framework for goals and their respective measures, and seem promising in the context of assessment for education improvement.

Considering performance with respect to customer satisfaction, one may ask: *How do customers see us?* Customers defined as students, two components of the proposed fact-based system can be named as goals: classroom and program learning, and satisfaction with instruction and services. School-level classroom and program learning is presently measured as confidence in outcomes.

As outcomes assessment is in aid of accreditation, college-level learning might be measured as college-wide success with respect to accreditation. The Assessment Specialist in University College measures satisfaction with instruction and services with the Student Opinion Survey. Other surveys including evaluations of teaching exist and are evaluated at college, school and teacher levels.

Financial measures should arise from the question: *How do we look to shareholders?* Defining shareholders as graduates highlights post-graduation success as a possible financial measures goal. Objective surrogates for this could include job placement both in and out of state, and alumni survey responses. Another financial goal of funding might be measured with respect to government and private funds and funds arising from intellectual property rights.

Innovation, learning, improvement and growth may be simplified with the question: *Can we continue to improve and create value?* Continuous improvement well suits goals regarding Dropout/Matriculation Rates. Related measures are retention/graduation rates with special attention paid to transfers out of schools and the college in good/bad standing.

Internal business and management processes are identified with a final question: *What must we excel at?* The general component of the fact-based system, academic strengths and weaknesses, reflects performance in the other sets of measures presented here. Supposed functions of these are the recognition and reputation accorded by college and school rankings of U.S. News & World Report and the Gourman Report. A more consequential measure of academic strength for example is appearance on premier recruiting lists for major companies.

Since there is importance in not just measuring these performance factors but understanding the variation in them, performance measures may be statistically modeled as functions of variables including (among others) most of the remaining components of the fact-based system: students' backgrounds (demographics), learning styles, extracurricular activities and educational progress (credits until graduation). Furthermore, the Balanced Scorecard provides a format for understanding the interaction between performance measures.

## **VI. Conclusion**

With assistance from administration and faculty, a comprehensive scorecard can be assembled in the spirit of the Baldrige Education Criteria, accounting for additional, specific assessment objectives of the College of Engineering. Goals maintained by a fact-based system of performance measures will provide a framework for college-level assessment. Performance with respect to the four scorecard dimensions will be monitored independently and simultaneously to appreciate interaction between them. Performance measures will also be modeled for better understanding of what factors explain variance. An extensive, quantitative model as such would provide a clearer understanding of the College of Engineering's education system dynamics,

support formal experiments, evidence value-added practices and factors for success, identify opportunities for intervention, and so better inform policy decisions. In addition, the very nature of the technique will lend itself as an aid in our accreditation process. The accreditation process now requires that each program set goals, measurements that tell us whether these goals are being achieved, and a process of feedback to allow for continuous improvement. The techniques described herein help to achieve these criteria.

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