A Useful Intersection: The Balanced Scorecard and EC2000

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Abstract

The new requirements of ABET’s EC2000 have caused the authors’ academic department to undertake a significant restructuring of its internal functions. This restructuring was guided in part by the ideas of object-oriented software development and in part by the ideas of the Balanced Scorecard. The object-oriented ideas led to creation of Process Teams and the Balanced Scorecard has been adopted as the management structure that guides department operations. In the present paper, a brief introduction to the ideas of the Balanced Scorecard is followed by a detailed description of how the Process Teams were formed and how the Balanced Scorecard was adapted to meet the needs of an academic department.

Introduction

ABET’s introduction of Engineering Criteria 2000\textsuperscript{1} (EC2000) was, to use an overused phrase, a paradigm shift, in which many aspects of the accreditation criteria and the program evaluation process underwent significant change. In engineering terms, one aspect of the shift can be described as a shift of focus from “input” to “output.” Although examples of student work were, and are, an important component of an accreditation review, program faculty are now asked to do a much more extensive job of assessing and documenting the “abilities” that have been imparted to graduates by the program. Annual national meetings have come into existence with the express purpose of bringing together engineering educators to share best practices for outcomes assessment (i.e. Best Assessment Processes IV Symposium\textsuperscript{2}). Another example of change is that the new criteria require program faculty to define and publish Program Educational Objectives (PEOs) and Program Outcomes (POs), or their equivalents. ABET’s stated purpose in giving almost unlimited latitude to programs in defining their PEOs has been to encourage creativity and uniqueness within the engineering education community. Although there is room for originality in definition of the POs, it is the authors’ experience that programs either adopt the “a-k” abilities defined in the EC2000 document or view these as a minimal set to be supplemented with additional abilities appropriate to the particular program. In the new criteria, and in the instructions to program evaluators, there is a clear insistence that a program must develop and deploy processes to create an environment in which there is continuous
improvement in achievement of the program’s PEOs and POs. Although it had always been expected that program faculties continually strove toward program improvement, the old criteria did not require documentation of continuous improvement process for program accreditation.

The primary purpose of the present paper is to share with other engineering educators how the authors’ department has attempted to create and institutionalize a continuous improvement environment that is effective, efficient, and that produces a continuous program improvement system aligned with the accreditation requirements of EC2000. That effort was guided by the collection of ideas espoused by Norton and Kaplan in “The Balanced Scorecard.” With apologies to those authors, this paper presents a very abbreviated introduction to the fundamental ideas of the Balanced Scorecard (BSC). It is then shown how these ideas, which evolved in a for-profit business setting, have been adapted to serve an academic department for which success cannot be measured in earnings-per-share. Although any program choosing to build a continuous improvement environment upon the precepts of the BSC will produce a unique result, an in-depth presentation of the details of how the authors’ department implemented these principles is provided to illuminate the process. This process was neither quick nor easy. It is still a work-in-progress. In fact, by its very nature, it will always be a work in progress. As more experience is gained, it is expected that the level of effort required to implement the Balanced Scorecard will decrease, that the effectiveness and efficiency of the associated processes will improve each year, and that collectively the evolving structure will move the authors’ program toward continual improvement in achievement of its POs and PEOs.

The Balanced Scorecard

The first time that the ideas, processes, and structure of the Balanced Scorecard were collected, codified, and presented in a single document was the publication by Kaplan and Norton of a book of the same name: “The Balanced Scorecard: Translating Strategy into Action.” Recognition that “success” for any modern organization requires regular assessment and improvement of multiple perspectives of performance lies at the heart of the Balanced Scorecard (BSC). This is a significant departure from some past practices in which the financial bottom line was accorded overriding priority in strategic planning and performance measurement. Although the insights on which the system was built were the result of a study of for-profit organizations, the BSC is being adapted to serve the purposes of not-for-profit organizations and governmental agencies. “Today over half of Fortune 1,000 companies in North America are using the Balanced Scorecard. … many public sector organizations, including the US Army, the Australia Department of Defense, and many others such as the Texas Education Agency, have recognized its value and are using the scorecard.” The engineering society with which the authors’ program is most closely linked, the American Society of Mechanical Engineers, recently stated that it “… has adopted its first Strategy Map, and is developing the measures, targets, and initiatives to achieve the objectives contained within the Strategy Map.”

Anyone who has been a faculty member for any length of time has probably been involved in at least one strategic planning exercise. These exercises have frequently produced a document defining the organization’s strategy, but they have not resulted in significant progress toward improvement of the program, department, college, or university. “A study of 275 portfolio managers reported that the ability to execute strategy was more important than the strategy itself.” “In the early 1980s, a survey of management consultants reported that fewer than 10
percent of effectively formulated strategies were successfully implemented.\textsuperscript{7,8} The remarkable penetration of the BSC into the corporate and public sectors has given birth to associations, software vendors, and consulting companies offering to help adapt the BSC to a particular organization.\textsuperscript{9,10,11} It is well beyond the scope of this paper to present all of the ideas on which the BSC is founded. Rather, the following paragraphs provide a very brief introduction to those ideas and to the associated structure and processes of the BSC.

A study of a collection of companies from the banking, oil, insurance, and retail industries, led by Kaplan and Norton\textsuperscript{3} in the early 1990s, revealed that success in the modern marketplace required a focus on continuous improvement of four perspectives of corporate performance: “financial performance, customer knowledge, internal business processes, learning and growth.” To begin building a BSC structure, the organization should write a Mission Statement in which it defines its core beliefs, identifies target markets, and identifies core products. Once the essential “reason for being” has been elucidated, the appropriate perspectives of performance can be defined. A perspective is a category of performance in which the organization should excel to accomplish its mission. The organization’s mission statement will determine if it is appropriate to simply adopt the perspectives of Reference 3. If not, (as is the case in the adaptation of the BSC to an undergraduate engineering program), substantially different perspectives may be required to achieve organizational success.

Once the perspectives of performance have been defined, the BSC structure produces an environment of continuous improvement by repetitive execution of a cycle of processes through which the organization:

- defines accomplishments to be pursued;
- defines metrics by which to measure achievement of those accomplishments;
- defines and conducts actions designed to produce the desired accomplishments;
- evaluates the outcomes of the actions; and
- then repeats the entire cycle.

A somewhat standard lexicon has become associated with these processes.

- An objective defines what is to be accomplished. To be meaningful, it should be time-bounded, measurable, and reasonable.
- A measure quantifies performance with respect to an objective.
- An initiative is an action, or set of actions, designed to achieve an objective.
- An outcome is a consequence of executing an initiative.

Success, or lack of success in achieving an objective is evaluated by outcome-based measures. The outcomes of one cycle should be a very strong influence on the objectives defined for the next cycle. Although it may be useful to synchronize some process within the organization, it is not necessary to operate all processes with the same periodicity.

The size and mission of an organization will dictate the complexity of the BSC structure. A simple organization, such as an ad hoc committee tasked with a very specific mission, might only merit a few performance perspectives, all of the objectives and measures might be defined by the committee as a whole, and initiatives might be assigned directly to committee members for execution. However, for all but the smallest and most limited of organizations, some hierarchical BSC structure will be appropriate. In fact, one of the tasks in building an effective BSC is to identify the entities within the organization for which a BSC structure should be developed. Consider a corporation composed of several companies. Top-level corporate
executives would be expected to define perspectives that encompass the entire corporation. 
Initiatives associated with these perspectives would likely require execution by a large number of 
employees. To keep the scenario simple, it is assumed that one of the initiatives could be 
executed entirely by the employees of a single company within the corporation. The job of top-
management within the company would be to pursue corporate strategy. Therefore, they would 
be tasked with developing a company-level BSC. To accomplish the purpose for which the BSC 
was created, “translating strategy into action”, the corporate-level initiatives would be adopted as 
the company-level objectives. The company executives should then define appropriate initiatives 
to accomplish the objectives and these initiatives would be adopted as the objectives for the 
middle-management BSC. This cascade would continue down to the smallest scale of the 
organization at which actions are taken. Once outcomes are determined at the smallest scale, this 
knowledge can be used to define objectives for the next cycle. These outcomes should also be 
fed upward through the structure to determine cycle outcomes at ever higher levels of the BSC 
structure until the information has returned to the highest level of the corporate executives. 
Although the authors have not seen such an analogy in the literature, they have observed that this 
cascade of repetitive structure is reminiscent of the fractals of chaos theory. The strength of the 
BSC structure lies in its insistence that actions executed at all levels of the organization be 
aligned with the organization’s strategic vision.

Adapting the BSC to an Academic Department

As with all departments seeking ABET accreditation for their program(s), the faculty of the 
Department of Mechanical Engineering at The University of Memphis have invested 
considerable time and effort in responding to the new requirements of EC2000. Although a 
Mission Statement had been adopted long before ABET’s promulgation of EC2000, the informal 
continuous improvement of the undergraduate program leading to the B.S.M.E. did not provide 
the formal structure and documentation now required by EC2000. The entire faculty participated 
in a process, spanning several years, in which the Mission Statement was updated, Program 
Educational Objectives (PEOs) were identified, and Program Outcomes (POs) defined. As 
further understanding of EC2000 requirements and intent was gained, the PEOs and POs 
underwent a significant evolution before reaching their current state.

During the process through which the program PEOs and POs were being refined, one of the 
authors was introduced to the ideas put forth by Jacobson in “The Object Advantage: Business 
Process Reengineering with Object Technology.” Jacobson was a pioneer in object-oriented 
programming and the book suggests that the object-oriented ideas originally applied to software 
development should be used to reorganize a company’s internal functions so that they are 
focused on specific processes that must be executed well in order for the company to succeed. In 
addition to the intrinsic merits of Jacobson’s ideas, the focus on “process” inherent in the new 
organization seemed to be well aligned with the spirit and requirements of EC2000. After 
discussion, the faculty agreed to replace the traditional standing committee structure that had 
been used to organize department function, with a Process Team Structure. The only remnant of 
the old system was, and is, the Tenure and Promotion Committee required by university policy. 
The initial Process Team structure included ten teams; nine were focused on processes the 
faculty identified as important for successful operation of the department and the tenth was a 
team to ensure coordination of the actions of all teams focused directly on the undergraduate 
program. Experience with this mode of operation has resulted in some teams being subsumed by
others while entirely new teams were created to fill gaps in the original team structure. The current structure is composed of ten teams: Undergraduate Curriculum Improvement, Laboratory Improvement, Design in the Curriculum, Innovation in Teaching, Overall Curriculum Content, External Data Acquisition, Constituency Feedback, Recruiting and Retention, Scholarship and Awards, and Graduate Program. Perusal of just the team names reveals the strong influence of EC2000 on the team structure.

What is the difference between a Process Team and standing committee? The standing committee corresponds well with a traditional org-chart through which personnel are organized into a hierarchy that describes the components of the organization (i.e. purchasing, shipping, design, R&D). In contrast, “a business process is the set of internal activities performed to serve a customer.”¹² The customer can be either internal or external to the organization. “Whereas an organization’s hierarchical structure is typically a slice-in time view of responsibilities and reporting relationships, its process structure is a dynamic view of how organizations deliver value.”¹³ For example, in the setting of an academic department, a typical standing committee collected faculty into a group responsible for “the undergraduate curriculum.” The only regular deadlines or deliverables might be associated with submittal of proposed catalog revisions to add or delete courses. There was no requirement for an annual report from the committee and no insistence on continuous improvement of a program’s curriculum. Individual faculty members might well propose changes they perceive to be improvements, but this is typically ad hoc and sporadic. In contrast, the Laboratory Improvement Process Team is focused on continuous improvement of student learning in the laboratory component of the undergraduate Mechanical Engineering program. The first task of all teams was to produce a Process Definition. For all teams in the department, this definition clearly states: the process purpose; the process goals; the PEOs supported; the POs measured; a process description and flow chart; process milestones; process documentation requirements; and, the process definition history of revisions. In the heading on the first page of the definition a small table shows the version number of the definition, the process period, and when the process report is due. The process documentation requirements precisely define the minimum content to be included in every end-of-cycle report. Hopefully, this brief introduction of the department’s Process Teams shows: how their charge is different from that of a standing committee; how their focus is more clearly defined than the typical assignment of a standing committee; that their operation is defined in greater detail than that of a typical standing committee; and that the reporting requirements are more focused and demanding than those of a standing committee.

Initial experiences with the Process Teams were positive. An end-of-semester retreat was held at which each team presented their activities of the past year. The faculty concluded that although limited, there had already been some “return on investment” for the effort expended to define and participate in the teams. Further, the teams focused directly on EC2000-related issues seemed to be conducting activities that were in alignment with accreditation requirements. The pieces of the system were coming together but there was still something lacking in how they all tied together into a coherent superstructure.

The Process Team structure and its function were presented for review and comment at a meeting of the Advisory Board for the Department of Mechanical Engineering. This board is populated by representatives from the department’s industrial partners and its purpose is to serve as a resource that helps guide the department in directions that best serve the needs of companies.
and government agencies in the region. A review of EC2000 requirements and of related
department activities was presented at a meeting of the Board and the members were asked for
general comments and for specific feedback on their perception of how these activities
contributed to satisfaction of accreditation requirements. The Board seemed generally pleased
with the Process Teams but a question was raised as to the linkage between these teams and the
strategic planning. One of the Board Members, (T. Jamison), suggested that the department
consider adapting the Balanced Scorecard\(^3\) to manage department operations in general and,
specifically, to guide the continuous program improvement required for accreditation under
EC2000. He provided a thumbnail sketch of some of the basic components of the BSC and how
they might interact with the Program Outcomes (POs). Although all new ideas are met with
some resistance, the multiple perspectives of the BSC seemed to be a good match for both
EC2000 requirements and for the Mission Statement of the department. The faculty agreed that
the time was ripe to conduct a strategic planning exercise and to investigate developing a
Balanced Scorecard to translate that strategy into action.

For more than 3 months, the department chair and the undergraduate program coordinator
studied the ideas of the BSC and met repeatedly with a subcommittee of the Board, (Jamison,
Shrader, and Bilderbeck), to create and refine a Balanced Scorecard for the department and for
the undergraduate Mechanical Engineering program. Progress was regularly reported back to the
entire department faculty. Through this process it became clear that the department’s Mission
Statement, the undergraduate program’s PEOs, and the program’s POs should be tightly coupled
with each other and with the strategic plan. It was also recognized that for the strategic plan to
be meaningful, it should directly drive the department’s activities and it must contain measures
against which department and program performance can be evaluated. As this effort progressed,
the magnitude of constructing a comprehensive BSC for the department and all of its function
became apparent. It was decided to build a top-level shell to depict all of the department’s
performance perspectives, but to focus most of the effort on developing a BSC for the
undergraduate Mechanical Engineering program. Figure 1 presents the top-level shell that
evolved from an iterative process that involved the faculty and the Advisory Board. It shows
how the Mission Statement was interpreted to define four department-level perspectives:
Instruction, Research, Service, and Continuing Education. Each of these perspectives was in
turn broken into more detailed perspectives. For example, it was determined that the Service
perspective of the department should encompass service to the community, the university, the
college, and even the department itself. Although additional levels of detail will be required to
formulate a comprehensive BSC, the only perspective that has been developed in depth is that
leading to the undergraduate Mechanical Engineering program. Perspectives directly related to
the undergraduate Mechanical Engineering program are display in shaded boxes in Fig. 1. The
top-level Instruction perspective is seen as encompassing four performance perspectives of
which only one is the Curriculum. The Curriculum perspective is broken into two parts because
the department offers programs leading to graduate degrees as well as the undergraduate
program.

The sharp focus on undergraduate instruction was indeed enlightening. As suggested at the
Board meeting that initiated the planning exercises, the BSC made an immediate contribution to
NOTE: Shaded boxes indicate Perspectives which have been the focus of Scorecard development to-date.

Figure 1  Department of Mechanical Engineering Balanced Scorecard Perspectives (May 2003)
aligning the program with EC2000 requirements. Specifically, Criterion 3 of Reference 1 demands that engineering programs must demonstrate that their graduates have a prescribed list of abilities; colloquially referred to as the “a-k criteria” because of how the list is labeled in that document. The departments with which the authors are familiar have either directly adopted the a-k abilities as POs or have considered them to be a minimal-set to which others can be added as best suits the individual program. When the strategic planning process started, the authors’ department had already supplemented the a-k abilities with four more abilities related to the “Program Criteria for Mechanical and Similarly Named Engineering Programs”¹. However, development of the BSC induced the process participants to question why these particular POs were so important to the constituents of the program. Returning to the Mission Statement that should drive the department’s strategic planning, the following phrase can be excerpted: “… to provide a quality program of instruction that will prepare our students for successful engineering careers, …”. It therefore seemed natural to ask what constitutes preparation for a successful engineering career and to conclude that the program should equip its graduates with the knowledge, skills, and foundation for future learning that will enable them to perform the tasks expected of them by future employers (or customers). Further discussion between faculty and Advisory Board members led to definition of four perspectives in which program graduates are expected to perform, and to organization of the existing list of POs into those perspectives: Analytical Outcomes, Application Outcomes, Interpersonal Outcomes, and Managerial Outcomes. Analytical outcomes are most closely aligned with idea of subject matter knowledge. Application Outcomes reflect the graduate’s ability to apply knowledge to accomplish goals. Interpersonal Outcomes include several of the a-k abilities that reflect the team-oriented nature of modern engineering practice. Managerial Outcomes were specifically recommended by several members of the Advisory Board as being crucial to successful practice of the engineering profession. These generally describe abilities related to leadership and planning in an engineering setting. As the existing POs were sorted into these four perspectives, it became clear that none of them were really Managerial Outcomes per the intent of our Advisory Board members. Development of the BSC had uncovered a real need of program constituents that had heretofore gone unrecognized. Therefore, the first objectives of the Managerial Outcomes perspective would be identification of appropriate POs to meet these needs.

Once the POs had been sorted into the four perspectives, the team focused on defining objectives, initiatives, measures, and desired outcomes for the first cycle of the BSC. Attempting to define the objectives revealed how little could be documented about achievement of the POs. Figure 2 presents the four perspectives of the undergraduate Mechanical Engineering program and the objectives defined for these perspectives for the first cycle. The objectives have been written in such a way that it should be easier to develop the BSC for these perspectives in future years than it was for this first cycle. After examining the scope of the entire collection of POs, it was concluded that improving achievement of every PO during every cycle would be an unreasonable burden on the faculty. Instead, during each cycle, a subset of POs in each perspective will be targeted for improvement and the others will be monitored to ensure that achievement of those POs does not decline. Partitioning the POs into these categories will take
### Analytical Outcomes

**Objectives:**

1. To ensure that achievement of the following Program Outcomes does not decline. (Note: Letters correlate with POs)
   - (a) Apply knowledge of mathematics, science, and engineering
   - (c) Design a system, component, or process to meet desired needs
   - (e) Identify, formulate, and solve engineering problems
   - (l) Be knowledgeable about chemistry and calculus-based physics …
   - (m) Apply advanced mathematics …
   - (n) Be familiar with statistics and linear algebra
2. To improve the level of achievement of the following Program Outcomes. (Note: Letters correlate with POs identified in ABET Self-Study)
   - None --- 1st year committed to defining current state of achievement of POs.
3. Consider addition/deletion of the following POs. None this year.

### Application Outcomes

**Objectives:**

1. To ensure that achievement of the following Program Outcomes does not decline. (Note: Letters correlate with POs.)
   - (b) Design and conduct experiments …
   - (k) Use the techniques, skills, and modern engineering tools …
   - (o) Work professionally in fluid/thermal systems area …
   - (p) Work professionally in mechanical systems area …
2. To improve the level of achievement of the following Program Outcomes. (Note: Letters correlate with POs identified in ABET Self-Study Document.)
   - None --- 1st year committed to defining current state of achievement of POs.
3. Consider addition/deletion of the following POs. None this year.

### Interpersonal Outcomes

**Objectives:**

1. To ensure that achievement of the following Program Outcomes does not decline. (Note: Letters correlate with POs)
   - (d) function on multidisciplinary teams
   - (f) understand professional and ethical responsibility
   - (g) communicate effectively
   - (h) … the impact of engineering solutions in … context …
   - (i) recognize the need for, and engage in life-long learning
   - (j) be knowledgeable about contemporary issues
2. To improve the level of achievement of the following Program Outcomes. (Note: Letters correlate with POs in ABET Self-Study Document.)
   - None --- 1st year committed to defining current state of achievement of POs.
3. Consider addition/deletion of the following POs. None this year.

### Managerial Outcomes

**Objectives:**

1. To ensure that achievement of the following Program Outcomes does not decline.
   - At present, no POs have been identified for this perspective.
2. To improve the level of achievement of the following POs.
   - At present, no POs have been identified for this perspective.
3. Consider addition/deletion of the following POs. (Note: letters indicate potential designation as Program Outcomes.)
   - (q) quantify and justify the financial impact of product and process development and improvement
   - (r) organize and use a project implementation plan
   - (s) facilitate multidisciplinary group to accomplish q & r

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**Figure 2** Four Performance Perspectives of the Undergraduate Mechanical Engineering Program
careful thought, but little revision of the document; simply move the POs between objective 1 and objective 2. Objective 3 is included to provide an opportunity for addition to, or deletion from, the list of POs included in the perspective. It is believed that this set of objectives, as slightly modified from cycle to cycle, will drive the continuous improvement program required by EC2000 for accreditation.

After objectives were defined for the four perspectives, the next step in BSC development was specification of the associated measures, initiatives, and desired outcomes for each perspective. Figure 3 presents the measures, initiatives, and desired outcomes for the Analytical Outcomes perspective of the first cycle. These initiatives focus on acquiring information to help define the current state of the program and to begin building systems that relate PO achievement to trackable measures. The department had already defined minimum learning objectives for every “required” course taught by faculty in the department. The first initiative is to develop minimum learning objectives for mathematics and science course taught by faculty of those departments. The second initiative is to collect quantifiable data on the past performance of the program’s students and graduates (e.g., FE, ACT, GPA). The third initiative is to build a system that will organize the information collected through initiative 2 in an effort to reveal how these different measures can be used to predict a student’s level of success in the program and how they relate to achievement of the program’s POs. As indicated in the figure, each initiative is assigned to one or more Process Teams for execution. It is here, at specification of initiatives, measures, and desired outcomes that the BSC drives the individual Process Teams to translate the department’s strategy into action. In planning a team’s activities for the cycle, the BSC initiatives are added to the list of routine tasks to be performed by that team during the cycle. The measure of success for initiative 1 is documentation of learning objectives for the support courses. The measures of success for initiative 2 are the collection and documentation of the specified data. The measures of success as evaluated by these measures is expected by the end of the present cycle. The measure of success for initiative 3 is more ambitious; determination of correlation coefficients that attempt to relate each student’s success and achievement of POs to her/his ACT score, GPA, and FE score. It would not be surprising to see partial success produced by this initiative by the end of the current cycle. If this is indeed the case, and the faculty still believe the effort to have merit, this continuation of this effort is likely to be an initiative for the next BSC cycle. The desired outcomes put into words what “values” the measures must achieve at the end of a cycle to signify success. The measures defined for the current initiatives do not lend themselves to quantification, so the idea of “values” must be interpreted in the most general sense.
1. To ensure that achievement of the following Program Outcomes does not decline.

   (Note: Letters correlate with POs identified in ABET Self-Study Document.)
   (a) Apply knowledge of mathematics, science, and engineering
   (c) Design a system, component, or process to meet desired needs
   (e) Identify, formulate, and solve engineering problems
   (l) Be knowledgeable about chemistry and calculus-based physics with depth in at least one
   (m) Apply advanced mathematics through multivariate calculus and differential equations
   (n) Be familiar with statistics and linear algebra

2. To improve the level of achievement of the following Program Outcomes.

   (Note: Letters correlate with POs identified in ABET Self-Study Document.)
   None --- This 1st year is committed to defining current state of achievement of POs.

3. Consider addition/deletion of the following POs.

   None this year.

Initiatives

1. Establish minimum learning objectives for “support” courses, (i.e. Math, Physics) by enhancing liaison with those departments to exchange information.
   (obj-1a, obj-1l, obj-1m, obj-1n), [Assigned to Overall Curriculum Content Team, Laboratory Team]

2. Collect and organize FE scores, ACT scores, and GPA for graduates who have earned their degree within the past 5 years.
   (obj-1a, obj-1e, obj-1l, obj-1m, obj-1n), [ Assigned to External Feedback Team]

3. Establish a system to correlate achievement of POs, as measured by FE scores, to incoming ACT scores, to course grades earned in related subjects and to overall GPA.
   (obj-1a, obj-1e, obj-1l, obj-1m, obj-1n), [ Assigned to External Feedback Team, Laboratory Team]

Measurements

1. The minimum learning objectives for “support” courses, (i.e. Math, Physics).
2. Database of recent FE performance.
3. Correlation Coefficients, by student, relating FE scores, GPA and ACT scores.

Desired Outcomes

1. Definition of course competencies for support courses as has been done for all required MECH courses.
2. Creation of a database of recent FE performance to serve as a baseline against which improvement is to be measured.
3. A system to correlate achievement of POs, as measured by FE scores, to incoming ACT scores, to course grades earned in related subjects and to overall GPA

Figure 3  BSC related to Analytical Outcomes for the 1st Cycle.
After the BSC structure for the undergraduate program was completed, an additional table was assembled that mapped the initiatives onto the Process Team organization. This table was then used by the Process Teams to define the team’s activities and milestone chart for the current cycle. At present, all BSC cycles and all Process Team cycles are fully synchronized with the calendar year. Every January, the each Process Team submits its end-of-cycle report to the custodian of documents. During February, a leadership team reviews the end-of-cycle reports and draws conclusions related to the efficacy of the past cycle’s initiatives in accomplishing that cycle’s objectives. This information is compared to the department’s strategic plan. Draft objectives, initiatives, measures, and desired outcomes are defined for the next cycle. After appropriate review and modification by the faculty and the Advisory Board, execution of the new initiatives becomes the responsibility of Process Teams to which they are assigned, and the next BSC cycle is underway.

Summary and Conclusions

The insistence of ABET’s EC2000 on creation and documentation of formal continuous program improvement processes has caused the authors’ academic department to undertake a significant restructuring of its internal functions. Standing committees have been almost entirely replaced by Process Teams. The Balanced Scorecard has been adapted to produce a management structure that will drive continuous improvement processes toward achievement of the Program Educational Objectives and the Program Outcomes of the Mechanical Engineering program. The ideas, components, and structure of the BSC seem to be particularly well suited to requirements of EC2000 when they are adapted to serve the needs of an undergraduate engineering program. Although this experiment in organization and management of an academic department and an undergraduate engineering program is still in its early stages, the results to date are encouraging. The department and its Advisory Board are more committed than ever to the continued use and development of the new system to pursue the department’s strategy and to institutionalize a system that will help ensure continued accreditation of the undergraduate Mechanical Engineering program.

Bibliography


**BIOGRAPHICAL INFORMATION**

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