Abstract

Academic institutions are notorious for their resistance to change. The National Science Foundation (NSF) has been a leading proponent for the need to effectuate fundamental and systemic change in this country’s engineering education system. To that end, it has funded numerous “Engineering Education Coalitions” consisting of a number of engineering colleges at different institutions working together to remedy the perceived shortcomings in the engineering education system. The volume of change and innovations that have resulted from these coalitions is phenomenal as can be seen by accessing their home pages via NSF’s web site (www.nsf.gov).

Developing and proposing change is, however, a different matter from implementing it and managing the change process. At a recent Innovators’ Conference hosted by NSF, a workshop was held on factors of importance in institutionalizing change. Although a number of factors were discussed, there was no specific prescription on how to organize and create the changes in the first place.

This paper will describe how the principles of engineering management were employed to temporarily reorganize a large College of Engineering and Technology to accomplish a specific set of tasks. This reorganization, based upon the principles of matrix management, resulted in a complete re-engineering of the College’s programs and curricula. The results, achieved by faculty working in cross-functional teams are now institutionalized in the catalog and being executed. More importantly, the results were achieved in one academic year.

1. Introduction

I accepted the opportunity to become Dean of Old Dominion University’s College of Engineering and Technology in the Spring of 1997. During the interview process and as a result of numerous discussions with faculty and university level administrators, it became obvious that one of my main challenges would be to transform a divided, demoralized, and hostile faculty in conflict with the administration into a cooperative, goal oriented team. The other challenge would be to engage the team in effectuating a turnaround in a multi-year monotonic decline in enrollments and external research funding. In short, a dream job.

Effectuating change is difficult, particularly in academic environments where faculty are used to pursuing individual as opposed to organizational objectives. Changing this culture is risky in a period when the demand for high technology professionals is at an all time high. I have seen a number of faculty leave academia for private sector jobs, and several of my fellow deans at other
institutions have had similar experiences. Furthermore, the bottom line of the faculty reward system at many universities is research and teaching. Getting effective faculty participation in service activities, including committee work, requires more than assigning them to a committee and expecting results. To get effective faculty participation in service activities, they must be motivated very much like volunteers. They must know and believe in the organization’s mission and be challenged by the task to be accomplished. Thus, as Peter Drucker\(^2\) points out, the management of people, faculty in this case, is increasingly a marketing job. And, in marketing one does not begin with the question “what do we want?” One begins with the question “What does the other party want? What are its values? What are its goals? What does it consider results?” To ascertain this information, immediately after accepting the position, and before I arrived on campus, I distributed a questionnaire to all my prospective faculty and staff. The questionnaire had only one question: “Please list what major goals you would like for us to collectively achieve during the next 5 years.” Approximately 40% of the faculty and 25% of the staff responded. The result was a list of 126 goals that were placed in 11 categories as shown in Table 1.

**SUMMARY BY MAJOR CATEGORY**

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership Style</td>
<td>33</td>
</tr>
<tr>
<td>Faculty Reward Issues</td>
<td>24</td>
</tr>
<tr>
<td>Resource Issues</td>
<td>24</td>
</tr>
<tr>
<td>Undergraduate Curriculum Reform</td>
<td>16</td>
</tr>
<tr>
<td>Partnerships</td>
<td>13</td>
</tr>
<tr>
<td>Visibility</td>
<td>8</td>
</tr>
<tr>
<td>Undergraduate Student Recruitment</td>
<td>6</td>
</tr>
<tr>
<td>Faculty/Staff Development</td>
<td>3</td>
</tr>
<tr>
<td>Personnel Practices</td>
<td>3</td>
</tr>
<tr>
<td>Distance Learning</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
</tbody>
</table>

**Table I**

**Number of goals to be achieved by category**

The results of the survey made it apparent that most goals could be categorized into either dealing with leadership/managerial style or with programmatic issues. To fully understand them would require personal discussions with the faculty once I arrived on campus. However, it was clear to me that these goals, once fully understood, had to be aligned with the institutional goals of increasing enrollments and external research support.

2. Developing an Agenda for Action

Once I arrived on campus, a dialogue was initiated with faculty and department chairs. This resulted in resolving a number of issues relating to the categories of Leadership Style, Faculty Reward, and Resources. To move on the other goals, including the institutional goals, required a
mission statement be developed for the College. We wanted this mission statement to be such that it differentiated Old Dominion University’s College of Engineering and Technology from its primary in-state competitors: Virginia Tech and the University of Virginia. Both of those institutions have excellent programs and it made no sense to mirror our offering to theirs. Thus, we conducted a detailed program by program, course by course comparison of Old Dominion’s offerings and those of all other engineering and technology programs in the state. As a result, the College adopted the following mission statement:

“The College of Engineering and Technology is a continually improving, learner oriented organization celebrated for producing successful graduates who know, in the context of their preparation, what to do, as well why, how, and when to produce results in a multicultural and global environment.”

In order to accomplish the mission, a number of tasks associated with each key element of the mission statement were identified as listed below:

<table>
<thead>
<tr>
<th>Key Mission Element</th>
<th>Associated Tasks</th>
</tr>
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</table>
| Learner oriented                                     | • Develop and implement a year-long Freshman Engineering and Technology Foundations course.  
  • Create an Engineering Learning Center. |
| Successful graduates                                 | • Develop and implement integrated 5-year BS/MS programs.  
  • Establish a partnership with a medical school and a law school and implement a BS/MD and BS/JD program. |
| Knowing what to do, and why                          | • Review and update the curriculum.                                               |
| Knowing how and when to produce results              | • Introduce real life projects in the new freshman course  
  • Identify and encourage participation in internship and co-op programs.  
  • Develop and implement a multi-disciplinary, industry project, senior capstone design course option. |
| In a multi-cultural and global environment.          | • Develop a global engineering upper division general education cluster and certificate |

The execution of these tasks will differentiate our programs in that students will: 1) Receive a 4X4 engineering education: 4 years of traditional classroom and laboratory experience integrated with 4 years of engineering practice in real life projects; 2) Be prepared to practice engineering in any global or multicultural environment; 3) Have the opportunity to be admitted into a 5 year integrated BS/MS program; and, 4) Have the opportunity to apply for guaranteed admission into medical or law school. Executing these tasks became our college wide agenda for action for the 1997-1998 year. Implementing them is our action agenda for the 1999-2000 academic year.
3. Existing Organizational Options for Action

The key tasks identified had to be executed in addition to the normal operations of the academic departments. The traditional tasks of teaching and research revolve around well defined skills and areas of specialization and are well suited to the traditional functional organization of a university and college. The tasks associated with executing the newly defined college mission were:

- Unfamiliar to all parties involved;
- Definable in terms of a specific goal;
- Complex with respect to requiring participation of and acceptance by all departments of the college;
- Critical to the college as a whole

and thus best suited to a project management organization.

Drucker points out that the executives of the future will require a toolbox of organizational structures and must be able to select the right one for the right task. They will need to use each one properly and to think in terms of mixed organizational structures rather than a pure structure. For us, the future had arrived. It would be necessary to maintain our traditional functional structure to carry out the normal activities and superimpose a project management structure to lead and manage the execution of the tasks.

The traditional academic approach to organizing and executing the tasks would be to form a faculty committee consisting of members from appropriate departments. The chair of the committee would either be appointed by the dean or elected by members of the committee. This structure closely resembles the matrix organization, shown in Figure 1, used by many organizations to manage projects--except that in non-academic settings the project manager or team leader is almost always appointed. The key advantage of a matrix organization is that it allows for the management of each task directly and can facilitate response to rapidly emerging new tasks that may be required to support college strategic initiatives. The key disadvantage is that team (committee) members are assigned by their functional manager (Chair) who normally conducts the performance evaluation on both the individual as part of her/his functional unit (department) and as part of the project team. When the functional manager has no direct stake or responsibility for success of the project, it is incumbent on the project manager to influence the functional manager to reward the team member. Establishing the good interface between the project and functional manager for this work can take a great deal of time, especially during the early introduction of these ideas into the organization. An additional complication to matrix organization in academia is that faculty culture encourages individual work. Thus typical faculty do not aspire to become managers and have little or no management experience or skills.
Based on the above, it became apparent that adopting a traditional matrix management structure had little chance for success. A new approach was required. This approach would have to allow all tasks to be completed within one academic year. Thus, department and college consensus would have to be achieved and approval from all appropriate levels of committees obtained within this time span. This approach would have to engage all stakeholders in the process and combine authority, responsibility, and accountability for continued and enhanced departmental functional success and success of the project teams formed to accomplish the tasks.

4. A New Organizational Model for Action

The fundamental change that led to the creation of a new organizational model was to redefine the role of the Department Chair. In an environment where change is required, it is not the role of a Chair to be a super faculty member, but to be a change agent. Even if change is not required, the role of the Chair is to maximize what the faculty of the department accomplishes individually and collectively. This is not the same as trying to do more than every faculty member in the department. Presumable, when a Chair is appointed, her/his credentials as a faculty member were already outstanding. These credentials earn the respect of the other faculty so the Chair can be a credible and successful leader.
The projects, or tasks that faced us cut across the entire college. Although the department provides an administrative home for each faculty member, departmental boundaries were not allowed to define the limits of action. Faculty from many departments were joined together to form project teams, or taskforces to plan and implement the tasks identified in the prior sections. Most of these cut across departmental lines. Faculty who participated in these taskforces were given direct responsibility for completing the tasks and achieving the objectives set for them. In a way, these taskforces became miniature and temporary departments that require strong leadership. This leadership was provided by a department chair who was assigned one or more taskforces to lead. This also made department resources available to the taskforce. Once a particular taskforce accomplished its mission, it was dissolved. When significant new cross-disciplinary requirement are identified, new taskforces will be formed. The organizational structure of the taskforce is shown in Figure 2.

Faculty and Chair performance in task forces was evaluated and rewarded. This evaluation and reward were made in accordance with the faculty handbook. Faculty performance on a taskforce was evaluated and rewarded by the Department Chair assigned to lead it. The Chair’s performance in leading the taskforce and achieving its mission was evaluated by the Dean, in consultation with the faculty comprising the taskforce.

Faculty members elected or appointed to these taskforces were assigned an appropriate portion of their load to the task. An equivalent proportion of the merit increment pool allocated to the taskforce faculty was distributed based upon performance on the taskforce as evaluated by the task force leader in concert with the members. Since publication of taskforce results and pursuing sources of external support for taskforce or related is expected, taskforce performance will automatically be considered during the promotion and tenure process.

An essential aspect of Chair performance and reward is based upon his or her success as a leader. Leadership of the department and leadership of a taskforce are essential to achieving the College’s mission and objectives. Hence, no specific weighting is assigned to each. They are both key requirements of the job.

Leading a taskforce and administering a department require different skills. Both skill set are now required of the department chair. The new requirement for taskforce leadership versus administration may require a redefinition of how the administrative activities of the department are conducted. Since many of the administrative activities of departments are the same, a collaborative exploration will be conducted to assess the feasibility of centralizing many of the common administrative duties. In our case, these common responsibilities were assigned to a newly hired Director of External Programs and Administration, who is responsible to the Chairs through the Executive Council, for their proper execution.
5. Results

The initial development of the College mission statement began during the summer of 1997 by the College Executive Council. Faculty involvement began via a general faculty meeting held on August 28, 1997, and subsequent open sessions with the Dean. The mission statement and associated tasks, including the new organizational concept for the taskforces, were presented to and approved by the faculty on October 21, 1997. Taskforce charters, faculty assignment to taskforces, and assignment of taskforce leadership to Chairs was complete by October 31, 1998.

During the remainder of the academic year, the taskforces executed their charter in a remarkable fashion. The new organizational structure, by merging department administration responsibility with taskforce leadership responsibility, successfully eliminated the traditional difficulties expected to occur between the project manager and functional management. Furthermore, it eliminated the problem of unpredictable leadership capability by assigning experienced leaders, the Department Chairs, to the taskforces. The faculty members of the taskforces enjoyed the opportunity to work with colleagues from other departments, many of whom they had not previously met. This mutual collaboration on projects of overall college importance resulted in a
much improved climate and spirit of cooperation within the college. It has also encouraged and facilitated a number of interdisciplinary course and research efforts.

To the extent possible, all administrative offices and faculty committees were kept informed of the direction and progress of the taskforce deliberations. This allowed for rapid response to formal approval actions required within the university. Through excellent collaboration with those entities, the following new programs/changes developed by our various taskforces are in this year’s catalog:

- A two course Freshman sequence “Engineering and Technology Foundations.”
- An Engineering Learning Center: a new physical and programmatic environment dedicated to students achieving success.
- Integrated BS/MS programs leading to both degrees in 5 years.
- BS/MD program in partnership with Eastern Virginia Medical School.
- BS/JD program in partnership with Regent University.
- An Engineering Foundations Division into which all freshmen will be admitted and that is responsible for their success.
- An Industry Sponsored Multi-Disciplinary Senior Design Project Option.
- A program in Technological Leadership.

The existence of these new programs has already been noted. The Spring 1998 enrollments indicated an increase over comparable enrollments the prior spring.

One key result of these taskforces has been the benefits to the faculty and Chairs. Faculty members have for the first time had an opportunity to interact with other faculty from every department in the College. Department Chairs, for the first time, had to lead faculty from other departments. This interaction fostered their personal growth within the college. It also led to the development of contacts that will persist and continue to be of benefit over time. Most of all, there is a better understanding of the needs of the College overall, and how they related to individual and departmental needs. This is already leading to far more collaboration among faculty, departments, and the Dean’s office than present ever before.

6. Conclusions

The end result of our efforts was to develop programs which would address individual faculty objectives as expressed in my initial survey while simultaneously increasing enrollments and research. Although the initial indications are optimistic, it takes more than attractive offerings in a catalog to achieve success. We have already begun an extensive marketing campaign to let students, faculty, employers, and funding agencies know about our new programs. But, ultimately, the most important change must be our ability to deliver on these programs in a manner that will delight our customers.

Bibliography


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