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ABSTRACT

The role played by the institutional research office in the successful re-engineering of the University of Miami (Florida) college of engineering is described. The private research university's engineering school was at risk of closure due to declining enrollment and a changing job market. A committee of engineering faculty and other university administrators wrote a strategic plan using ideas from internal and external sources and site visits to other institutions. The plan outlined objectives for enrollment, external funding, overall college quality, faculty commitment and development, quality of overall student experience, fiscal solvency, and institutional image. The university's institutional research office provided five types of analyses: student and faculty demographic data; projection models; results of student surveys; focus group data; and credit hour and financial data breakdowns. In addition, the institutional research administrator assisted in interpretation of data and in preparation for a planning retreat. The services provided by the office were found useful. Recommendations included: provision of a listing of institutional research reports and customized analysis services to university deans; more use of focus groups; and identification of development of reports on key issues. (MSE)

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Reengineering a College of Engineering: The Role of an Institutional Research Office

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Jean Endo
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Abstract

The College of Engineering at a major southeast private research university was in dire straits: a $4.25 million full-cost deficit, declining enrollments, shifting job markets for its graduates, low faculty research productivity, and several members of the Board of Trustees and senior administrators who were calling for the closing of the College. What decision was made? Reengineer the College of Engineering! This paper will focus on the role that the university's institutional research office played in the successful reengineering effort made by the College of Engineering and will alert other institutional research offices to ways they can enhance their support services while simultaneously increasing visibility on their campuses.

Reengineering a College of Engineering:

The Role of an Institutional Research Office

Introduction

Institutional researchers by nature are very sensitive to *doing things the right way* (e.g., using correct statistics, comparable data definitions) but sometimes are not as sensitive about *doing the right thing* in a university-wide setting. The experiences of an institutional research office in helping to reengineer the College of Engineering at a major research university have led to changes in data supplied to all of that university's colleges and schools. Ideally, lessons learned will be useful to institutional research offices at other institutions.

Background

Major changes were necessary to ensure the viability of the College of Engineering at the University of Miami. Enrollment for degree undergraduates had declined from a peak of approximately 1,200 students in the mid-1980s to 703 students in fall 1993. These decreased enrollments and the changing job market for its graduates forced the faculty to acknowledge a simple truth--change and change quickly or look for employment elsewhere.

In fall 1993 the president appointed a committee of engineering faculty (half of whom were department chairs) plus three administrators from other areas of the University to assess the future of the College. The committee considered several options, including

closing the College. Instead they saw encouraging possibilities for the College's future and embarked on a path to reengineer the College for the twenty-first century.

The reengineering effort began with the writing of a strategic plan. The plan's recommendations were based on input from a committee of visiting deans; focus groups comprising students, alumni, faculty, and staff; information gathered during visits to Syracuse University, Boston University, Tulane University, and Southern Methodist University; and analyses of data about the College of Engineering. In spring 1994 the faculty of the College, involved throughout the process, voted almost unanimously in favor of the committee's recommendations and subsequently provided written suggestions. The president and provost reviewed the recommendations and met with the planning committee and faculty for input. In addition, copies of the plan were distributed to the administrative staff. Feedback from all of these groups was incorporated into a formal strategic plan that was presented to the Board of Trustees at its annual strategic planning retreat.

The strategic plan called for a restructuring of the College in a significant manner to achieve the following seven goals:

- increase the size and quality of the undergraduate and graduate programs in the College to a level consistent with resources and fixed costs
- increase the level of externally funded research in the College
- improve the overall quality of the College as measured by research funding and reputation of graduates in the marketplace
- develop and maintain a faculty committed to excellence in teaching and research

- enhance the overall student experience and consequently increase retention
- achieve fiscal solvency
- improve the image of the College within the university community and nationally

These goals were to be met over a five-year period. A key objective of the reengineering effort was to reduce the budget deficit from $4.25 million in FY 93 to $450,000 on a full-cost basis by the end of FY 99.

After the strategic plan was approved by the faculty, the chair of the planning committee (who was vice president for information resources) was appointed as the new dean of the College (while continuing in his role as vice president), with the responsibility of guiding the plan into reality.

Role of Institutional Research

Because the new dean was also the vice president for information resources, with the director of planning and institutional research reporting to him, he was familiar with the types of reports and analyses the office produced and the support services the office could provide. Consequently, the vice president, in his capacity as convener of the planning committee and subsequently as dean, was quite comfortable in asking the institutional research office for help. The office of planning and institutional research was able to aid the reengineering process by providing the following types of analyses: 1) demographic data for students and faculty, 2) projection models, 3) results of student surveys, 4) focus groups,

and 5) an analysis of credit hour and financial data. In addition, the director provided assistance with selecting, analyzing, and interpreting the data and offered advice for the strategic planning process.

Demographic data were supplied relating to both students and faculty. Student data included breakdowns by major, class, gender, ethnicity, geographic origin, and academic credentials; graduation and retention data (by demographic category) for undergraduates; and trends in academic credentials and yields by demographic categories for applicants. Faculty data included breakdowns by department, rank, hire date, age, gender, ethnicity, and national origin; faculty teaching loads; and NSF data on funded research by discipline for the University of Miami and other private universities.

The office of planning and institutional research, which provides five-year enrollment projections for tuition revenue figures included in the University's strategic plan, used its projection model to run "what if" scenarios for the dean. The College had determined that an undergraduate enrollment of 800 would be optimal, and the model was used to project the number of new students and the retention rates for continuing students that would be required to attain this enrollment by the end of the century (original estimates of the faculty committee, made without the benefit of detailed data or a computer model, were not accurate). Credit hour projections were also provided.

The office of planning and institutional research supplied student feedback in two forms: surveys and focus groups. The University had already developed a collection of surveys to track students throughout their undergraduate careers. Admitted students furnished information about factors affecting their decisions to enroll, ways the University

of Miami compared with their top "comparison college" (defined as their second choice institution for those who enrolled at the University of Miami and as the institution in which they matriculated for those who did not enroll at the University of Miami), and information about their five top choices for college. The College received admitted student data for engineering students and also for the entire University. A survey of enrolled students asked about the importance and quality of a number of academic and non-academic areas, performance of student-support offices, levels of participation in certain activities, and aspects of the University they liked and disliked. Again, the College of Engineering was provided with tables comparing the responses of engineering students with those of other students at the University. A final survey, of graduating seniors, asked about future plans, the degree to which abilities had been enhanced at the University, satisfaction with various aspects of college experience, factors affecting career choices, and questions related to financing education. In addition to engineering data and data for the University of Miami as a whole, the College received peer data from other private universities in the Higher Education Data Sharing Consortium that had participated in the survey.

To supplement the survey results, the office of planning and institutional research was commissioned to conduct a series of focus groups for students, alumni, faculty, and staff. Students were asked why they came to the University, how satisfied they were with the College of Engineering, if their program oriented them to what they wanted to do upon graduation, how they evaluated faculty teaching and research, what they liked best, and what changes they would make. Alumni were asked why they chose the University of Miami, whether they were satisfied with their experience, whether the College of Engineering

prepared them for what they were doing, what they thought of faculty teaching and research, what they liked best about being a student in the College, how well the College kept touch with its alumni, what the reaction of others was to the University's reputation, and what they would emphasize if they were dean. Faculty discussed reasons for coming to the University of Miami, strengths and weaknesses of the College of Engineering, threats and opportunities that might impact the College, the relative importance of teaching versus research, the level of support provided by the College for teaching and research, their definition of quality, and their top priorities for the College. Staff were asked why they came to the University, what they liked most and least, what they thought of faculty teaching and research, whether they considered faculty to be available to students, and what changes they would make.

Because the financial problems of the College had been the impetus for reevaluating its future, an understanding of financial data, particularly tuition, was important. As indicated earlier, enrollment and credit hour projections helped forecast the level of revenue that could be expected, but in addition information about "crossover" patterns in course enrollments proved valuable in understanding the interdependence of the College and other schools within the University, in particular the College of Arts and Sciences and the School of Architecture.

Besides providing data, the director of planning and institutional research also met with the new dean of the College on a number of occasions to help analyze the data and to serve as a "sounding board" for interpretations. In addition, the director shared suggestions for conducting a strategic planning retreat (Griffith and Stafford, 1991) and was actively involved in editing the College's strategic plan.

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Findings from Institutional Research and Responses of the College of Engineering

Many of the action plans developed to support the goals of the College were in response to--or at least informed by--analyses supplied by the office of planning and institutional research. The key decision that had to be made concerned the viability of the College. To this end, the first question that needed to be resolved was how serious the College of Engineering's financial situation really was. Although many in the University (including the authors) had an image of a school in financial and academic difficulty, a more detailed analysis of data revealed a different picture.

As part of its strategic plan the University prepares a full-cost study showing direct revenues, direct expenses, and indirect expenses (expenses for support areas that are allocated back to the schools and colleges of the University). Most people in the University knew that the College of Engineering had been showing a full-cost deficit for a number of years and that this deficit had been growing. An analysis of the data, however, showed the College was not in deficit on a direct-cost basis, but only after indirect costs were allocated. Furthermore, the $1 million increase in the deficit between FY 92 and FY 93 could be attributed almost completely to a dramatic increase in unfunded mainframe computing on the part of a *single* faculty member--although the former dean had never pointed out the source of the increased deficit to the Board or anyone else. At the University of Miami the central computing budget is allocated to schools and colleges based on their proportional use. Therefore, an increase in computer use for the College did not mean the total cost to the University had increased by $1 million, but just that Engineering had been allocated $1

million more of those costs in FY 93--and other schools and colleges had been allocated less. The new dean capped central computer usage for faculty members (unless paid by a research grant) and purchased servers for the College in order to prevent this type of huge indirect cost in the future.

A second consideration was the impact that closing the College would have on other schools and colleges in the University. The cost study analysis indicated that if the College were closed, the indirect costs for other schools and colleges would increase because they would have to absorb costs formerly allocated to Engineering, most of which would not decrease. Furthermore, an analysis of "crossover" credit hour tables supplied by the office of planning and institutional research (showing the number of credit hours that engineering students generated for other schools within the University) indicated that revenue to other schools--Arts and Sciences and Architecture in particular--would decrease as a result of losing engineering students who had been enrolled in their classes (just over half of the credit hours of engineering undergraduates were taken *outside* of the College).

Of course, the decision about the future of the College involved academic factors in addition to financial ones. An analysis of admissions credentials showed that engineering students had the highest SAT scores of any school in the University, and removing engineering students from the freshman class would lower student quality and the University's overall average SAT.

Another important consideration was whether the learning experience of the students was a good one. Several years earlier, a telephone survey of withdrawing engineering students had shown some dissatisfaction with teaching, particularly with that of graduate

students and foreign-born faculty. Recent student focus groups indicated that, although some of the concerns about graduate students remained, the overall satisfaction with the College was high, and, in the words of the focus group moderator, the evaluation of faculty teaching was "quite positive." This affirmative feedback (in all honesty a surprise to the authors) was an important factor in the decision about the future of the College, especially when coupled with the improved research on the part of the faculty (especially new faculty) and the sense of dedication and commitment of the members of the president's committee. There were political considerations--such as morale in the University and the reaction of alumni--that also influenced the decision. For all of these reasons, the vice president of information resources took the lead in recommending that the College be kept open, using some of the institutional research data to justify the decision.

In addition to helping inform the committee so that they could make a more intelligent decision about the future of the College, institutional research analyses helped suggest ways in which the College could achieve some of the goals identified through the strategic planning process. The following examples, organized according to the College's seven goals, show that many of the proposed actions in the College's strategic plan relate to results of the analyses.

Increase the size and quality of the undergraduate and graduate programs in the College to a level consistent with resources and fixed costs

The College knew it needed to reverse the decrease in enrollment that had occurred over the preceding years. The enrollment model was used to determine how to achieve

realistic enrollment targets. One of the keys to achieving the desired enrollment target was an increase in entering students, both new freshmen and new transfers. In order to attract more students, the College started working closely with the University's office of admission, involving faculty in the recruiting effort (including one-on-one faculty-guided campus tours for prospective students in audio engineering) and expanding recruiting outside of South Florida. The dean established a toll-free number at his home, handwrote notes to all accepted students, and has planned a recruiting trip to Asia in spring 1996. The College has initiated articulation agreements with five private colleges in Florida, allowing their students to earn two degrees in five years, one from their original school and the second from the University of Miami (after two years of courses in the College of Engineering). Furthermore, the College undertook programs (described below) that were intended to have a positive impact on retention (the retention analysis showed that for the three previous years, retention for new engineering freshmen had been below the corresponding overall university average). As of fall 1995 the College's undergraduate enrollment was on target.

To increase graduate enrollment the College planned to develop off-campus and weekend courses, recruit more full-tuition paying students, and engage in niche marketing.

Increase the level of externally funded research in the College

NSF data showed that levels of research funding in many departments were lower than at other private universities. In fact, the average funding per faculty member was only 60 percent of that at comparable institutions. The faculty focus groups suggested that refereed publications were strong but, as indicated by the NSF data, research revenue was

not. Assistance from the dean's office, in particular grant-writing support and the encouragement of interdisciplinary research, was requested by faculty in the focus groups. One of the first actions of the new dean was the appointment of an associate dean for research and graduate studies. Furthermore, the faculty approved a teaching load policy that would allow teaching load reductions only for funded research (at the level of 25 percent of salary for each course reduction) or for predetermined administrative responsibilities. The number of grant proposals and the level of funded research have increased in the last two years.

Improve the overall quality of the College as measured by research funding and reputation of graduates in the marketplace

The planning committee was concerned that the productivity of some faculty members was low, thereby contributing to lower quality and to inequity in workload. Unequal teaching loads also produced complaints in the faculty focus groups--the moderator wrote, "The issue of teaching loads appears to be divisive." The teaching load report provided by the institutional research office showed these variations in teaching loads did in fact exist and identified those faculty who had low teaching loads and who had reductions in load as a result of outside funding and/or administrative responsibilities.

As part of the College's strategic plan, the faculty approved a teaching load policy that is quite different from that at most research universities. The standard load for regular faculty was set at 9 credits (three courses) per semester, but if a faculty member did not participate in scholarly activities or service to the University, the load would be 12 credits

per semester. Sponsored research covering 25 percent of salary could bring about a reduction of 3 credits per semester, and reductions could also be approved for certain administrative responsibilities (e.g., department chairs would have a reduction of 6 credits per semester). New faculty would also have reductions during their first four years to allow them to devote time to course preparation and research. The average teaching load in academic year 1995 increased by 1 credit hour over the previous year, when the new policy was approved; implementation continues.

Faculty focus groups indicated that expectations about the relative importance of teaching and research were unclear and that an unambiguous written policy on expectations for promotion was needed. The strategic plan included guidelines for tenure: a minimum of six refereed publications in high-quality journals, in addition to other publications; at least $175,000 in funded research as a principal investigator, with a significant amount of this in peer-reviewed funding; favorable course evaluations from students and faculty peer-review committees; direction of at least four graduate thesis/dissertation committees; and service on at least two committees within the University.

One of the main concerns identified through student and alumni focus groups was the need for more co-op programs and for other work opportunities. One of the College's action plans was to promote internships and co-op programs. Recently, such programs were implemented at Pratt-Whitney and Allstate Insurance Company. In addition, in response to concerns expressed in the alumni focus groups about career placement, the College has started working more closely with the University's office of career planning and placement and has assigned responsibility for placement to the dean's office. Alumni focus groups

indicated that students were not always well prepared for their jobs. To ensure that students are being prepared for the job market, an advisory council made up of members from outside the University has been established.

Develop and maintain a faculty committed to excellence in teaching and research

Student and alumni focus groups were actually quite positive about the instruction they received in the College, and even though participants in faculty focus groups expressed concern that the level of outside funding for research was too low, they believed that the quality of unfunded research was good. The development of clear guidelines relating to tenure and to teaching load was seen by the focus groups as a mechanism for improving both teaching and research. Under the new dean, faculty were encouraged to take advantage of the University's instructional support program. In response to complaints voiced in the faculty focus groups about technology, all college facilities were networked, providing full access to the Internet as a way of facilitating research. The College established its own World Wide Web page. To encourage quality teaching, a state-of-the-art multimedia laboratory, the best in the University, is being built. Furthermore, "teaching mentors" were assigned to new faculty.

Focus groups for both students and faculty identified a need for more flexibility in the curriculum. To that end the College established an "innovative curriculum" committee to review programs and to develop curricula. In fall 1995 a new curriculum for entering engineering students that linked mathematics, physics, English, and engineering courses and faculty was piloted. Preliminary results are encouraging.

To assure quality research, the College has identified two "centers of excellence" that it plans to develop. By encouraging faculty to focus their research in these areas wherever possible, the College hopes to alleviate a concern expressed in the faculty focus groups about a lack of peer support for research. The appointment of the associate dean for research and graduate studies was also seen as a way of improving research quality, again a suggestion from the focus groups.

Enhance the overall student experience and consequently increase retention

One of the major problem areas identified in student, alumni, and staff focus groups was the lack of up-to-date equipment, computers, and software. The new dean responded by immediately replacing out-of-date computers in student laboratories and planning a multimedia laboratory.

A second source of complaints from all three groups was the lack of a co-op program that could provide students with on-the-job training. A placement office was established to help identify jobs during the undergraduate years as well as upon graduation. Every graduate in May 1995 was offered an engineering job within two months of graduation.

The third major area of concern mentioned in the student and staff focus groups was academic advising. According to the students (and also the staff), some faculty did not keep their office hours and did not show up for appointments. In response, a central academic advising office was established, advisors are now expected to meet three times each semester with their students, and department chairs are asked to meet with their majors at least once each semester. In addition, the dean hired students from other disciplines to check on

whether faculty were keeping their posted office hours (two reports from the dean to department chairs about faculty who were not available during posted office hours led to an improvement in this area).

Although students had been positive about overall teaching, there were complaints about graduate students, in particular their ability to be understood. Another concern of the student focus groups was that some foreign-born faculty did not always treat all students equally (e.g., they would not address female students directly), and faculty demographics indicated that fewer than half of the faculty were U.S. citizens by birth. In response to student concerns, graduate teaching assistants are tested for clarity of speech and a cultural diversity education program for administration and faculty has been implemented.

Achieve fiscal solvency

Many of the actions outlined above relate to increasing tuition and research revenue in order to reduce the College's deficit. The elimination of 12 faculty positions and additional reductions in staff have also been planned. The dean's office has been restructured in a way that emphasizes priorities identified in the focus groups.

Improve the image of the College within the university community and nationally

Improved quality in research, teaching, curriculum, and job placement was seen as the best way of improving the College's reputation. The new dean has been very involved in speaking with the media, attending conferences, and drawing on contacts made as vice president of information resources to improve the visibility of the College. The alumni

indicated that they are willing to help but had not been asked; they are being asked now. In response to staff focus group discussion of friction and factions within the College, the College also held its first annual faculty "advance" (retreat) as a way of improving self-esteem and cooperation within the College. Communications have improved and morale is now much higher.

Lessons for Other Institutional Research Offices

One of the major lessons learned from working with the College of Engineering is that many of the academic units within a university are unaware of the useful services that an office of institutional research provides. One solution is to develop an inventory of institutional research reports that are relevant to schools and colleges (or departments) and then share this list with deans. Meeting with new deans to discuss available institutional research services can be especially effective. Often, a new dean knows very little about the school/college and would appreciate having information about his/her new area of responsibility. Although group meetings may be worthwhile, one-on-one meetings work best because priorities and interests may vary from school to school. These meetings not only can provide the institutional researcher with the opportunity to describe analyses already included in the office's repertoire but also can allow for an exchange of ideas with the dean about what kinds of analyses would help support decision making. It is important to remember that if one dean asks for a given analysis, other deans may find it useful--even if they hadn't thought to ask for it themselves.

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A second lesson is that deans find customized data much more useful than aggregate data. They are interested in *their* students, *their* faculty, and *their* school, not the entire university. Deans often prefer to see a customized report that highlights their school (perhaps in comparison with the entire university average) rather than a report in which their school is simply one of many. At the University of Miami, in addition to distributing a traditional Fact Book (which includes a number of analyses by school/college), the office of planning and institutional research has also developed a series of Fact Files for each school and college, a project prompted by the engineering experience.

A third lesson is that dean's offices often do not have the expertise, software, or data to do projections and modeling even though they may be asked to provide such projections to the central administration. Institutional research offices that are already providing projections at the institutional level may wish to consider customizing the model for units within the university, especially if each school and college is required to provide the same projections to the central administration. Offering to provide projections for all schools and colleges will not only ensure uniformity of projections but will also relieve the deans of that responsibility (of course each school's projections should be approved by the relevant dean before being finalized). The budget office at the University of Miami had been asking each dean to project credit hours over a five-year horizon. However, not only was it difficult for the deans to project without a computer model, they also lacked knowledge about changes in curricula and enrollments for other schools and colleges (both of which affect their own credit hours). After the engineering dean asked the institutional research office for

assistance, the office developed a credit-hour projection model that was linked to its previously existing enrollment model. These projections were sent to each of the schools.

A fourth lesson is that focus groups probably have more impact than do more traditional analyses. One reason is that focus groups address a wider range of issues than do analyses of institutional databases or even surveys. In addition, participants in focus groups automatically produce recommendations (usually questions are consciously worded in such a way as to identify areas needing improvement and to elicit recommendations, and participants are not shy about sharing their ideas). Finally, it is easier to understand focus group recommendations than it is to formulate policy implications based on a table of data.

A fifth lesson is that institutional research offices should identify key issues--based on information both from within the institution and from the external environment--and proactively develop reports that deal with these issues. Based on issues identified at conferences, the office of planning and institutional research at the University of Miami decided to develop teaching load reports before they were requested by the University's Board of Trustees, thereby obviating the need to produce these reports under pressure.

One final lesson is that many deans are not trained in designing or interpreting analytic reports. Spending a small amount of extra effort interpreting the data for a dean is an important way to enhance institutional research support. All of these suggestions will improve the value of the institutional research office to the university community and increase the office's visibility.

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