ENGINEERING TECHNOLOGY AND ENGINEERING AT IUPUI:
A Harmonious and Profitable Co-Existence

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Abstract

Currently, there are less than twenty engineering and engineering technology schools in the US in which the administrations of engineering and engineering technology programs are merged and a dean or director maintains academic and fiscal responsibility for both programs. The Purdue School of Engineering and Technology at Indiana University Purdue University Indianapolis (IUPUI), has followed this administrative model since 1972. The school houses two engineering departments and five technology departments. The engineering departments offer undergraduate and graduate degrees and the technology departments offer both two-year and four-year degrees.

This paper focuses on how a fair and harmonious balance is maintained to create a cooperative and collaborative community between both fields within the Purdue School of Engineering and Technology at IUPUI. The school's overall management systems are also presented. Resource allocation under the Responsibility Center Management (RCM) system, the faculty tenure and promotion processes, faculty loads, sharing resources, and other pertinent topics reveal that the administrative structure is not only effective, but also versatile. Through open channels of communication between faculty governance and department and school administration, the framework of the school has become a successful archetype of collaborative engineering and engineering technology program administration.

In this paper the word "technology" will represent engineering technology and the word "PSET" will mean the Purdue School of Engineering and Technology at IUPUI.

Introductory Remarks

The Purdue School of Engineering and Technology at IUPUI, reserves a unique position within the ever changing technical and engineering environment of the US. As one of a small number of schools in which engineering and technology administrations are integrated and one dean maintains the fiscal responsibility for both programs, IUPUI's School of Engineering and Technology has remained a model of joint administration for over twenty-five years. Since its inception in 1972, PSET has become not only a vital presence within IUPUI, but also an active contributor to the development of the community and the expansion of the engineering and technology education opportunities open to its residents. PSET's success is a result of the administrative structure, the enthusiasm and collegiality

of the faculty and staff, and the involvement of the student body, as well as the product of IUPUI's own approach to cooperative education.

IUPUI was formed in 1969 when Indiana University and Purdue University merged their Indianapolis operations to form a united campus. Indiana University had established its first center in Indianapolis in 1916, and this center grew to become a regional campus in the 1960s. As a result, Indiana University at Indianapolis was later created in 1968. During World War II, Purdue University also centralized programs in Indianapolis and then established a regional campus in 1946. In 1969, the Board of Trustees of both universities specified that the fiscal and administrative responsibility for these programs be given to Indiana University, thus the IUPUI campus was established. Consequently, the combined resources of Indiana University and Purdue University have created the state's third largest and most comprehensive university, as well as opened up significant opportunities for the surrounding community. Today, IUPUI is an urban center of over 180 innovative academic programs and serves over 27,000 students. IUPUI employs over 1,500 full time faculty, 800 associate faculty per semester, 3,500 administrative and professional staff, and 3,500 full time support staff.   In addition, IUPUI maintains sixteen schools offering Indiana University degrees and two schools offering Purdue University degrees. The two Purdue schools on the IUPUI campus are the School of Engineering and Technology and the School of Science.

The Purdue School of Engineering and Technology at IUPUI maintains a very unique status within both universities. Purdue University, West Lafayette approves new program and degrees for PSET. And while degrees granted by PSET are official Purdue University degrees, the faculty and staff of PSET are employees of Indiana University. Indiana University also approves PSET's budget and is the granting institution for tenure and promotion. Though the system may appear complex from the outside, this uncommon position has afforded PSET many opportunities. The Purdue School of Engineering and Technology at IUPUI, for example, stands as the only engineering and technology school for Indiana University.   The largest drawback for PSET is the confusion by outsiders of who, what and where we are.   Many outsiders believe that we are at Purdue University in West Lafayette. Even some Indiana University faculty and staff believe we are a part of Purdue- West Lafayette. And it seems only a few people outside Indiana have heard of IUPUI. While proud to be offering excellent Purdue degree programs for the IUPUI community, we struggle with communicating our uniqueness.

The following sections provide a more detailed look at the structural make-up of the departments and the administration of the Purdue School of Engineering and Technology at IUPUI, as well as an outline of activities and issues that have contributed to PSET's success. From ABET accredited programs to a strong interdisciplinary electric race car project, engineering and technology departments are equipped with the resources necessary to continue the pursuit of excellence in education on the IUPUI campus. Relationships with a not-for-profit corporation, AdvanceTek, and an international corporate institution in Malaysia have also proven invaluable, as have efforts to redefine the budgeting process by Indiana University through the Responsibility Center Management (RCM) system. At the heart of these new developments stand the PSET faculty and their students, two essential groups that are pursuing efforts to expand the collaborative community of PSET through teaching, research, and service.

Purdue School of Engineering and Technology at IUPUI Overview

The Purdue School of Engineering and Technology at IUPUI is the largest undergraduate degree-granting unit at IUPUI, serving a total of 1,881 students, with 58 full-time faculty, 75 full time equivalent associate (part-time) faculty, and 25 full-time staff members. Within PSET, five technology and two engineering departments provide students with a variety of choices, opportunities, and outlets for concentrated study. Specific fall 1997 student and faculty counts for each department are given in the following table.

Department	Students HC	FTE	Faculty Full	Part-time FTE *
Computer Technology	483	279	10	17.84
Construction Technology	207	133	5	8.20
Electrical Engineering	251	156	13	13.28
Electrical Engineering Technology	257	140	6	7.48
Manufacturing Technology	245	136	9	10.80
Mechanical Engineering	307	113	12	13.00
Organizational Leadership and Supervision	131	69	3	5.07
TOTAL	1,881	1,026	58	75.17

* Faculty FTE includes associate faculty FTE and full time faculty headcount.

The technology departments offer certificate, AS, and BS programs and the two engineering departments offer BS and MS programs. Currently, biomedical engineering is the only Ph.D.-granting program within PSET and is jointly administered by Purdue University, West Lafayette, and the Indiana University Medical School. All AS and BS technology programs in the Departments of Construction Technology, Electrical Engineering Technology, and Manufacturing Technology, excepting the Biomedical Electronics Technology AS program, are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC of ABET). The BS Electrical Engineering and Mechanical Engineering programs within the engineering departments are accredited by the Engineering Accreditation Commission of ABET (EAC of ABET).

Structurally, each department designates a chair who carries a twelve-month appointment with a half-time teaching responsibility. In addition to the dean, PSET administration currently consists of three full-time associate deans and one assistant dean, a full-time development director, a half-time recruitment director, a full-time placement and internship director, a half-time minority programs director, and several supporting staff. Since its inception in 1972, PSET has had three deans, all of which had a doctorate in an engineering field. The associate and assistant deans in PSET have come from both technology and engineering. Currently PSET's administration consists of a dean, an associate dean for academic programs, an associate dean for research, an associate dean for industrial relations, an assistant dean for administration and finance, and seven departmental chairmen. Working individually and as a team, these administrators strive to create

a unified and collaborative school that is conducive to the unique educational needs of IUPUI students.

PSET also benefits from the support of its own Computer Network Center, a computing facility that provides much needed aid to students, faculty, and staff. Under the supervision of a full-time director, three full-time and several part-time technical staff members prepare and maintain PSET-wide information technology services. PSET has seven instructional computer laboratories that are shared by all engineering and technology departments.

The largest collaborative effort by faculty and students in PSET is our electric race car project. Faculty and students from almost all disciplines within PSET combine their expertise, research, and development experience to create and maintain an electric race car. Students from the Departments of Mechanical Engineering, Electrical Engineering, Manufacturing Technology, and Electrical Engineering Technology have used the race car to develop their senior projects. In addition to the collaborative efforts among faculty and students in PSET, industry cooperation and collaboration on this project is an essential component to its success. Due to the success of this project, plans for future collaborative projects and learning activities are being considered.

In addition to many cooperative efforts with local industry, PSET also maintains an agency relationship with AdvanceTek, an outside, non-profit corporation. AdvanceTek's mission is to act as a catalyst for the advancement of engineering and technology applications and provide an entrepreneurial environment for engaging faculty and students in industry-led projects. The president of AdvanceTek is also the associate dean for industrial relations for PSET, a position which enables PSET to benefit from external projects organized through centers like Electricore, the Advance Vehicle Technology Institute, the Manufacturing Technology Center of Indianapolis, the Institute for Forensic Imaging, the Biomedical Engineering Resource Institute, and the Applied Digital Electronics Research Facility. These centers are a part of the university, located on campus, and have been developed through special grants and contracts from government, industry, and Indiana University. Especially attractive to IUPUI's industry partners is the fact that PSET contains such a wide range of engineering and technology programs and faculty expertise with both engineering and technology in the same location.

PSET is also involved in international cooperative engineering education and maintains a close relationship with a one of Malaysia's newest private university, Universiti Tenaga Nasional, formed by the national electric power company. Our current contract offers first- and second-year electrical and mechanical engineering curricula on site in Malaysia, completing this part of the program students travel to the US to complete their degrees. There are 125 students now completing a bachelor degree at IUPUI. PSET was also awarded a contract by the national power company, Tenaga Nasional Berhad, to train electric power technicians. Overall, having both engineering and technology curriculum has allowed PSET to offer a wider range of services to Tenaga Nasional Berhad. IUPUI and PSET, is thus in an exceptional position to be part of the ambitious educational initiatives planned by Tenaga Nasional Berhad, the training institute of Malaysia's national power company. In fact, course work bearing IUPUI credit has been offered in Malaysia since 1985 through a cooperative effort of Malaysia's Institute of Technology Mara, Indiana University, and the Midwest Universities Consortium for International Activities. With Indiana University as the lead institution within the consortium, more than 3,000 students of

Institute of Technology Mara have earned credit from academic departments at IUPUI and Indiana University, Bloomington. The excellent record of these students justifies the optimism that accompanied the launch of IUPUI's involvement with programs in Malaysia. Once again, faculty from both engineering and technology, working together, have played a major role in our overseas programs.

Responsibility Center Management

In 1990, Indiana University initiated a new fiscal and financial management system at IUPUI titled Responsibility Center Management (RCM). This new academic management style allows for long-range planning and provides schools with an opportunity to save residual funds for future projects. The old "spend it or loose it" management philosophy is gone. This new system uses the concept of responsibility centers as a basis of managing budgets. Support centers are units defined by their assistance in the academic mission of the university (e.g., central administration, physical facilities, library, computing services). Centers control and maintain their own budgets. Each center is made up of smaller units, such as departments. Each responsibility center either provides instruction called an academic center or is considered a support unit called a support center. Under this management style, the PSET is an academic center. The IUPUI campus consists of twenty-seven responsibility centers. Of these, eighteen are academic centers and nine are support centers.

In RCM, each center receives virtually all of the income it generates. An academic unit, like the PSET, receives all of its income from student fees, laboratory fees, indirect cost recovery (ICR) income from contract and grants, and a share of state appropriation determined by the central administration. PSET state appropriation income share changes annually depending on a number of factors. Centers are taxed or assessed for their proportional share of support centers based on a variety of methods such as the number of faculty, staff, students, or amount of allocated space.

Incentives are naturally built into the RCM system that allows for a variety of income-increasing strategies and optimization methods, as well as expenditure decreasing strategies. Increasing activities in student recruitment and retention, seeking new external funds, and optimizing class sizes can all lead to efficiencies in expenditures and increased income to the center.

For the fiscal year 1996-97, PSET had income of $12M from state appropriation and tuition, $6M from grants and contracts, and $2M from individual and corporate donors. Thus the size of the PSET Responsibility Center is about $20M. With a fairly accurate projection of the future income level, PSET is able to adjust expenses to annually balance the PSET budget. Residual year-end cash (actual income minus actual expenditures), or a deficit remaining with the responsibility center, carries forward to the next fiscal year.

For the Purdue School of Engineering and Technology at IUPUI, income earned over the base budget is distributed back to departments in accordance with a specific PSET formula. For example, indirect cost recovery (ICR) income from grants and contracts is split five equal ways. The university keeps 20% of the ICR income to fund a research investment fund. All IUPUI faculty may submit proposals to a university committee, which makes awards to seed new research initiatives. Of the remaining 80% reserved for PSET use, twenty percent is put into the

principal investigator's research and development account. Another twenty percent goes to the principal investigator's department, and the remaining 40% is split into two PSET accounts; one that funds faculty and staff development and one that supports school wide initiatives.

Because of this fiscal model (RCM), PSET has provided another incentive to departments. Salary savings (including retirement and fringe benefits) derived from contracts and grants are returned to the department generating the external project. Depending on the department's policy, the funds can be put into the principal investigator's (PI) research and development account, shared with the department and PI, or can remain entirely with the department. This particular financial incentive enables PIs and departments to further their research and educational endeavors by providing funds directly to support travel, student assistants, and equipment.

In PSET, resources are allocated to various programs and departments based on the viability and potential of each program, the success of its graduates, and the relevant demands of industry and business. While some programs do not participate in extensive research contracts or industry projects, they do create additional income for PSET by providing service courses. Additional tuition income is distributed back to those departments in terms of visiting faculty positions, additional equipment funds, or other needs.

Importantly, research grants and contracts successfully compensate for a loss in tuition income that accompanies low enrollment periods. A balance therefore exists that relies on each program's obligations and contributions to PSETs financial position. The combination of engineering and technology programs in PSET provides a dependable balance with regard to both kinds of income. While ICR income from grants and contracts on the engineering side may, for example, be on a decrease, an increase may be experienced in income from credit hours provided by technology service courses. With this pattern, a steady income stream is created for PSET that insures future stability.

In addition, equipment and instrumentation needs also dictate the supply and expense budgets for each department. Rather than allotting funds based on an artificial, two-class system of "technology" versus "engineering," the more personalized approach allows PSET to address the individual concerns of the departments and programs. All needs and requests for funds are discussed with the dean by the department or director. Consulting with the assistant dean for finance and administration, decisions are based on real need and for the benefit of the whole PSET. For larger budgeting issues, such as the development of new programs, the dean consults with a faculty budget and finance committee as well as department heads to maintain a fair and justified balance among programs.

Faculty-Related Issues

Just as budget items are directed exclusively to those departments and programs that will benefit most, so too are faculty positions assigned according to the needs of each individual department, institutional priorities, and the perceived needs of the community. The search and screen committee members for faculty positions consist primarily of faculty from the department that is searching to fill a vacancy. Recent efforts have been made to include engineering faculty in

technology searches and technology faculty members are also now members of engineering search and screen committees. This serves both areas well in that faculty from engineering and technology become more familiar with each other and their programs. This familiarity with each other has led the way for more collaborative projects across disciplines.

While engineering departments seek candidates with Ph.D. degrees, technology departments require a master's degree and at least three years of industrial experience. Several current technology faculty members, however, have obtained either the Ph.D. or the Ed.D. degree.

Newly hired tenure-track faculty members receive one course per semester release time for a period of two years. During this period, the faculty member is expected to develop excellence in teaching or research. Currently, the teaching load for technology faculty averages ten to twelve semester credit hours each semester, while engineering faculty teach seven to nine semester credit hours teaching load per semester. This load is an intensive teaching experience, which in both the short-term and long-term, will prove an invaluable addition to the faculty member's intellectual, professional, and personal approach to engineering and technology education. The release time for tenure-track faculty, as well as time for funded research, is calculated based on the percentage of those expected average teaching responsibilities.

In order to progress towards promotion and tenure, technology faculty are usually expected to excel in the chosen teaching area, demonstrate satisfactory research and/or creative ability, and contribute service in any applicable areas. In contrast, engineering faculty tends to choose research as the area of concentration and designate teaching and service as significant secondary professional activities. Each group of faculty are evaluated based on different promotion and tenure criteria, but both are expected to provide superior teaching, research, or service for the university and PSET. Further, both departmental and school level promotion and tenure committees contain both technology and engineering faculty as members. For the unit tenure and promotion committee, the preponderance of committee members comes from the technology departments and from the engineering departments for engineering. Primary tenure and promotion committees generally consist of an equal number of members from engineering and technology. Faculty from both engineering and technology have served as PSET's representative on the university's tenure and promotion committee.

Research and service opportunities are available for both technology and engineering faculty. PSET's associate dean for research and associate dean for industrial relations assists technology and engineering faculty with locating funding for research, program, and service projects. Importantly, PSET encourages interdisciplinary collaboration, specifically in research and projects.

Resource Sharing

Despite successful cooperative research and development projects, more efforts are needed to insure that resources are shared effectively by both degree programs. As a result of more constrained budgeting, space and personnel have become limited, yet increasingly valuable, commodities. The Departments of Mechanical Engineering and Manufacturing Technology have already agreed to share the materials laboratory, a facility that can cater to the needs of both

fields of study. In addition, the Departments of Electrical Engineering and Electrical Engineering Technology have initiated cooperative discussions that focus on possible sharing arrangements of circuits and electronics laboratories. Incentives such as additional equipment dollars for departments who share laboratories, have spurred these initiatives forward. Many technology and engineering departments are now submitting joint equipment proposals to agencies like the Society of Manufacturing Engineers (SME) and the National Science Foundation (NSF) with co-principal investigators from engineering and technology. PSET has been awarded several of these jointly sponsored equipment grants. All technology and engineering departments utilize academic program, internships and cooperative education programs, placement, recruitment and retention, financial, and human resource services offered through the PSET dean's office.

Conclusion

For over twenty-five years, the singular administration of the Purdue School of Engineering and Technology at IUPUI has proven an integral factor in the cooperative success of the departments, PSET, and the university. Students are offered a wide range of programs to suit their various interests, preparation levels, and commitments, and this variety has become the emphasis of PSET's recruitment efforts. The benefits of a cooperative relationship between engineering and technology faculty are many--educators and students are exposed to the practical and applied sides of both fields, gain vital experience working with other future professionals, and increase their knowledge of their fields. In addition, PSET's focus on teaching and collaborative research has created an environment that both stimulates and compliments the existing curriculum. Interdisciplinary cooperation, then, has become a permanent, exciting part of today's university curriculum and an area that Purdue School of Engineering and Technology at IUPUI will continue to support, encourage, and celebrate.

We are not suggesting that this organizational model would work for all other institutions. However, for campuses with both engineering and technology programs or schools, we believe there is a lot to gain from joint cooperative efforts in sharing laboratories, research, service, and teaching. Especially for an urban university where the backgrounds, talents, and needs of students are diverse, having engineering and technology program under the same administration encourages collaboration rather than competition among the programs and departments so that a large spectrum of the technical education market is served.

Biographical Information

H. ONER YURTSEVEN, Dean and Professor of Electrical Engineering, Purdue School of Engineering and Technology, IUPUI. He received his BS in Electrical Engineering from Middle East Technical University, Turkey in 1967 and Ph.D. in Electrical Engineering from John Hopkins University in 1974. Prior to becoming Dean of PSET in 1996, he served as Provost of PSET's Malaysia Program and Associate Dean for Academic Programs.

PATRICA L. FOX, Assistant Dean for Administration and Finance and Assistant Professor of Organizational Leadership and Supervision, Purdue School of Engineering and Technology, IUPUI. She received her BS in Accounting from Indiana University in 1980 and her MBA from Butler University in 1985. She has served as an administrator in the PSET for 18 years.