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Abstract

A significant issue has existed for engineering technology faculty members who aspire to faculty positions at universities who have research as a primary mission element. It is the requirement of a doctoral degree as the entry-level credential for the ET professorate. This concern pervades many professional discussions of faculty status both formal and informal. It has led to TAC/ABET guidelines on the subject in an effort to provide a community-wide solution to the perceived problem. Yet these concerns remain. The purpose of this paper is to provide context and quantifiable evidence from Carnegie Research 1 universities that defines the scope of the conditions that give rise to a major component the ET faculty concerns. The information generated, explains variations in patterns of institutional hiring, tenure criteria, and promotion standards and allays negative faculty feelings.

I. Introduction

Engineering technology programs exist in a wide variety of higher education institutions in the United States. There are two-year associate degree programs that are offered in community college; mono-technical institutions that have both two-year and four-year programs; and even in some universities that offer degrees through the doctorate. There is also great variation in the mission of four-year colleges and doctoral degree granting universities that offer degree programs in engineering technology. Therefore, institutions with great differences in mission, goals and accountability characteristics are involved in nurturing engineering technology education programs. These differences usually manifest themselves in the primary requirements and characteristics of the faculty. The faculty executes the institution's mission. Faculty members teach the students; generate research ideas and write proposals, to acquire funding that supports research activity and manage and execute research operations. Faculty members execute the service goals of the institution, both internal and external. Hence, the institution has a tremendous stake in the selection and retention of every faculty member, since it mission and reputation is raised or lowered by the performance of each individual member.

II. The Situation

Research universities have made a major commitment to the execution of fundamental research. The selection of persons to populate faculty positions in these institutions is critical to the execution of a major element of their institutional mission. Since the accepted minimum credential for research is the Ph.D. degree or equivalent generally, these institutions require it as

the credential that indicate minimum education attainment level in their hiring processes. Because this requirement is ubiquitous with rare exceptions, in such institutions the engineering technology units generally follow the accepted practice. Therefore, the engineering technology faculty in a research university is populated with persons holding doctoral degrees, which are compliant with the faculty profile in the university at large.

The dichotomy associated with this circumstance arises from the existence of large numbers of engineering technology programs in four-year colleges and universities that are not heavily focused on research and a major element of their mission. These institutions select their faculty persons to execute their primary mission focus, which is teaching undergraduates. Hence, this characteristic pervades the entire institution's faculty profile including that of the engineering technology unit.

Additionally, the Technology Accreditation Council of the Accreditation Board for Engineering and Technology (TAC of ABET), in its program criteria provide the specificity needed for interpretation of the general criteria as applicable to a given discipline as used in the accreditation process. Hence, the TAC of ABET Program criteria amplify or interpret the specific section of the general criteria for faculty in particular engineering technology disciplines as follows.

> **V.F. Faculty**
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> This section of the criteria relates to the technical faculty members' adequacy in credentials, numbers, and competence. The technical faculty, which may be the single most important factor in an educational program, will be evaluated individually and as a whole. … **Strong programs will have technical faculty members whose qualifications exceed what is described here as "basic credentials."**
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> V.F.1. Each program must have appropriately qualified technical faculty members. Basic credentials are prescribed to assure the program is appropriately quantitative in nature and includes proper engineering and industrial emphases. A technical faculty member who has the following qualifications is viewed as having basic credentials with regard to technical competence, degree level, and industrial experience. Basic credentials consist of three years of relevant industrial experience and one of the following:
>
> V.F.1.a. A master's degree in engineering or engineering technology, which is considered as the appropriate terminal degree.
>
> V.F.1.b. A master's degree in a closely related field if the degree is primarily analytical and the subject clearly appropriate, e.g., a degree in physics for certain areas of electronics.
>
> V.F.1.c. Professional registration and a master's degree.
>
> V.F.1.d. For associate degree programs only, professional registration.
>
> V.F.2. In exceptional cases there may be technical faculty members who satisfy the intent of the above minimums without literally satisfying the criteria. TAC of ABET may recognize these exceptions if the institution convincingly demonstrates the equivalence.
>
> V.F.3. Technical faculty members not satisfying paragraph 1 must have at least a bachelor's degree in an appropriate science or engineering related field. Faculty members teaching the technical skills courses are not required to have advanced degrees but are expected to be artisans or masters of their crafts. However, they should represent only a small fraction of the total engineering technology faculty.

The result of these confusion factors there exists a lack of clarity in the hiring of tenure track faculty in engineering technology. This lack of complete understanding leads to barriers to collaboration between programs across institution and even to negative feelings of superior/inferior status.

The purpose of this paper is to provide context and quantifiable evidence from Carnegie Research 1 universities that defines the scope of the conditions that give rise to a major

component the ET faculty concerns. The information generated, explains variations in patterns of institutional hiring, tenure criteria, and promotion standards and allays negative faculty feelings.

III. Discussion

A close examination of institutions offering baccalaureate degree engineering technology programs shows that the great preponderance of such programs exist in four-year colleges and universities that are not heavily focused on a research mission. In fact, there are only seven Carnegie Research 1 universities that offer engineering technology programs with in the context of their main campus research mission. They are:

- Arizona State University
- New Mexico State University
- Purdue University Main Campus
- Temple University (data not available)
- Texas A&M University
- University of Cincinnati, Main Campus
- Wayne State University

These institutions were among the premiere research universities in the nation. By criteria, all of them must have awarded 50 or more doctoral degrees annually and received at least $40 million in federal research support. By the nature of their missions, the respective faculty profiles need to have included research activity.

Table 1, shows the number and percentage of engineering technology faculty by rank at six of the seven Carnegie Research 1 universities. The data for Temple University are not included due to inaccessibility. Institutional identify is coded to eliminate the tendency to focus on individual data sets. The presentation shows that the highest percentage of faculty at the rank of professor among these institutions was 28.6%, with 21.7% as total at the rank for all of these institutions. These data also show that 53.8% of the ET faculty members in research 1 institutions held the

TABLE 1. ENGINEERING TECHNOLOGY FACULTY RANK AT CARNEGIE RESEARCH 1 UNIVERSITIES

Institution Code	Professor	Associate Professor	Assistant Professor	Faculty Total
A	4 28.6%	7 50%	3 21.4%	14 100%
B	1 14.3%	3 42.8%	3 42.8%	7 100%
C	1 8.3%	8 66.7%	3 25%	12 100%
D	10 23.3%	25 58.1%	8 18.6%	43 100%
E	4 23.5%	8 47.1%	5 29.4%	17 100%
F	3 23%	6 46%	4 31%	13 100%
Total in Rank	23 21.7%	57 53.8%	26 24.5%	106 100%

rank of associate professor. The overall institutional percentage for assistant professor was 24.5%. The overall character of these data indicates that the ET programs in Carnegie Research 1 universities had an average faculty size of 18. The faculty distribution is skewed toward the assistant professor end of the academic ranks.

Table 2, shows the number and percentage of engineering technology faculty by rank at selected non-Carnegie Research 1 universities. These institutions were selected to include a wide range of institutional types with well-recognized engineering technology programs. However, the list was somewhat mitigated by the availability of the required data. Hence, the institutions used and shown in Table 2 and are:

- Bradley University
- California Polytechnic University, Pomona
- New Jersey Institute of Technology
- Oregon Institute of Technology
- Southern Polytechnic State University
- Texas Tech University
- University of Arkansas, Little Rock
- University of Maine
- University of North Carolina at Charlotte
- University of Northern Kentucky
- University of Southern Mississippi

The number and percentage of engineering technology faculty by rank at six of these selected

TABLE 2. ENGINEERING TECHNOLOGY FACULTY RANK AT NON-CARNEGIE RESEARCH 1 UNIVERSITIES

Institution Code	Professor	Associate Professor	Assistant Professor	Total Faculty
H	4 57.1%	3 42.9%	0 0%	7 100%
I	3 20%	11 73.3	1 6.7%	15 100%
J	5 41.7%	3 25%	4 33.3%	12 100%
K	1 11.2	4 44.4	4 44.4	9 100%
L	3 25%	8 66.7%	1 8.3%	12 100%
M	11 42.3%	12 46.2%	3 11.5%	26 100%
N	3 50%	2 33.3%	1 16.7%	6 100%
O	1 9%	5 45.5%	5 45.5%	11 100%
P	11 26.8%	16 39%	14 34.2%	41 100%
Q	7 38.9%	4 22.2%	7 38.9%	18 100%
R	21 36.8%	21 36.8%	15 26.4%	57 100%
Total in Rank	70 32.7%	89 41.6%	55 25.7%	214 100%

non-Carnegie Research 1 universities are presented. Alphabetical Institutional identify codes H through R were used to eliminate the tendency to focus on individual data sets.

The percentage of faculty at the rank of professor among these non-Carnegie institutions varies from 9% to 57.1 percent, with 32.7% as average for these institutions. These data also show that there is tremendous variability in the percentage of non-Carnegie ET faculty who hold the rank of associate professor. The span of these percentages is over 40 points. The total institutional percentage for assistant professor was 25.7%. The overall character of these data indicates that the average faculty size of the ET faculty in non-Carnegie institutions was approximately 20, with the distribution skewed toward the professor end of the academic ranks.

The degrees held by faculty members provide another indicator of the difference in the nature of hiring promotion and tenure caused by the extent to which emphasis is focused on the research part of the academic agenda. Table 3, presents data on the ET faculty distribution by degree and academic rank for five of the seven Carnegie Research 1 institutions. Carnegie institution C was not used and data from only one or two ET academic units was used for institution D due to lack of availability of the required data.

TABLE 3. ENGINEERING TECHNOLOGY FACULTY DEGREE DISTRIBUTION AT CARNEGIE RESEARCH 1 UNIVERSITIES

	Professor		Associate Professor		Assistant Professor		Faculty Total	
Institution Code	Doctorate	Masters	Doctorate	Masters	Doctorate	Masters	Doctorate	Masters
A	4	0	5	2	1	2	10	4
B	1	0	3	0	3	0	7	0
D*	2	4	3	10	1	4	6	18
E	4	0	6	2	4	1	14	3
F	2	1	1	5	3	1	6	7
Total in Rank	13	5	18	19	12	8	43	32
% Deg in Rank	72.2%	27.8	48.6%	51.4%	60%	40%	57.3%	42.7%
% Tot in Rank	17.3%	6.7%	24%	25.3%	16%	10.7%		

These data show that of the ET faculty members who had reach the rank of professor at Carnegie Research 1 institutions 75% held a doctoral degree. The data also show that there was an approximate fifty-fifty split between those who held doctorates and masters at the rank of associate professor. There were 60% of the assistant professors that held doctorates. Only 10.7% of the Carnegie Research 1 ET faculty members were assistant professors with only a masters degree.

Table 4, provides data on the ET faculty distribution by degree and academic rank for the selected non-Carnegie Research 1 institutions. These data show that of doctoral holding ET faculty members constitute approximately 54% of those at the rank of professor at non-Carnegie Research 1 institutions. The data also show that there were almost 30% more associate professors holding masters degrees than those with doctorates. There were approximately 53% of the assistant professors that held doctorates. Only 12.2% of the Carnegie Research 1 ET faculty members were assistant professors with only a masters degree.

TABLE 4. ENGINEERING TECHNOLOGY FACULTY DEGREE DISTRIBUTION AT NON-CARNEGIE RESEARCH 1 UNIVERSITIES

Institution Code	Professor		Associate Professor		Assistant Professor		Total Faculty	
	Doctorate	Masters	Doctorate	Masters	Doctorate	Masters	Doctorate	Masters
H	1	3	0	3	0	0	1	6
I	1	2	5	6	1	0	7	8
J	3	2	2	1	1	3	6	6
K	1	0	0	4	3	1	4	5
L	0	3	2	6	0	1	2	10
M	11	0	11	1	2	1	24	2
N	1	0	2	2	0	1	3	3
O	0	1	2	3	4	1	6	5
P	4	7	3	13	9	5	16	25
Q	6	1	1	3	4	3	11	7
R	9	12	5	16	5	10	19	38
Total in Rank	37	31	33	58	29	26	99	115
% Deg in Rank	54.4%	45.6%	36.3%	63.7%	52.7%	47.3%	46.3%	53.7%
% Tot in Rank	17.3%	14.5%	15.4%	27.1%	13.6%	12.2%		

IV. Summary and Conclusions

A significant issue has existed for engineering technology faculty members who aspire to faculty positions at universities who have research as a primary mission element. The requirement of a doctoral degree as the entry-level credential for the ET professorate is a concern that pervades many professional discussions of faculty status both formal and informal. It has led to TAC/ABET guidelines on the subject in an effort to provide a community-wide solution to the perceived problem. Yet these concerns remain. The purpose of this paper is to provide context and quantifiable evidence from Carnegie Research 1 universities that defines the scope of the conditions that give rise to a major component the ET faculty concerns.

Analysis of the data provided above it can be augured that higher educations institutions that have research as a major component of their mission have chosen to make the doctoral degree a stronger element of their hiring of ET faculty that non-research institutions. Additionally, research institutions have promotion and tenure processes that have skewed their ET faculties toward the doctoral degree holding rank of professor end of the spectrum. One may conclude that because of the influence of such institutions, their standards and practices do tend to have impact on the entire sector. This may partially explain the number of doctoral degree persons being hired at the assistant professor rank in non-research institutions.

Based on the findings of this preliminary study the ET faculty has a substantial number of masters degree holding faculty at all academic ranks in both research and non-research institutions. The of doctoral faculty members at the assistant professor rank does not indicate that there exists any effort to eliminate masters degree holding faculty from ET programs around the country.

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