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By Dr. Athula Kulatunga, Dr. Randall Shaw, & Dr. Mark Nelson

Athula Kulatunga, Ph.D., CEM is an Assistant Professor in Energy and Electronics at Southeast Missouri State University. The Association of Energy Engineers (AEE) has certified him as an Energy Manager (CEM). CEM is the highest certification offered by AEE for energy professionals. Recently one of his projects has been selected as one of three best completed at Southeast Missouri State University. The project was funded State of Missouri's Funding for Results (FFR) program. He is the Coordinator of the Manufacturing Resource Center (MRC) at the newly formed Polytechnic Institute. MRC provides area manufacturers with information and assistance in the application of energy efficient modern manufacturing technologies. He presented two papers at international conferences in Honolulu, Hawaii and Beijing, in 1998. Dr. Kulatunga has received BSET from Pittsburg State University, an MS from Eastern Illinois University, and his Ph.D. from Purdue University.

Dr. Randall Shaw serves as Director of the newly formed Polytechnic Institute and as Assistant Provost at Southeast Missouri State University. He is on the NAIT Research and Standards and Accreditation Committees. He is also an approved NAIT Accreditation Team Member.

Mark Nelson, Ph.D. has been teaching Engineering Graphics and CAD for six years, and is currently an Assistant Professor at Northeastern State University in Talhlequah, OK.

Introduction

In the past, a variety of surveys have been done to collect National Association of Industrial Technology (NAIT) demographic data including salary ranges for industrial technology faculty (Henderson, 1985; Israel, 1985), faculty hiring practices (Shaw, 1991), competencies for industrial supervision (Shaw, 1996), competencies for interdisciplinary technology programs in developing nations (Yu & Garcia, 1992), and need and competencies for Ph.D. programs in Industrial Technology (Zargari, 1997). Most surveys were limited in scope to specific areas of NAIT accredited programs such as faculty or academic programs.

In 1996, NAIT Research Committee decided to fund a survey study to collect comprehensive demographic data from accredited industrial technology programs in the United States. As a result of this decision, the following study was conducted in 1997. Stakeholders of industrial technology programs may need comprehensive data for "benchmarking." For example, administrators of industrial technology programs may wonder if a recent decline of student enrollment is due to a national trend or to a localized problem. A faculty member, on the other hand, may be interested in knowing that he or she is paid according to national averages. The goal of the study was, therefore, to find national norms for the field of industrial technology. A summary of results was presented at the 1997 NAIT National Convention in Atlanta, Georgia. It should be noted that the authors do not intend to analyze or interpret the data in this article due to space limitations. The objective of this article is to summarize the data obtained for each major section.

Purpose and Procedures

The purpose of this survey was to collect data related to nine major areas: 1) institutions, 2) bachelor degree programs, 3) graduate programs, 4) faculty, 5) support staff, 6) placement, 7) capital investments, 8) innovative teaching and learning initiatives, and 9) advisory committees.

The questionnaire for this study was developed with input from NAIT national office personnel, NAIT Research Committee members, and selected NAIT program administrators. A pilot study was conducted to validate the questionnaire. The NAIT Research Committee suggested the following individuals for the pilot study: Dr. Mahyar Izadi, Dr. Alvin Rudisill, Dr. Dennis Depew, Dr. Everett Israel, Dr. Clois Kicklighter, Dr. John Sutton, and Dr. Ralph Pittman.

In January 1997, the instrument was mailed to department chairs of forty-three NAIT accredited bachelor programs that were listed in the *Industrial Technology Baccalaureate Program Directory, 1996 Edition*. In addition, the instrument was mailed to Morehead State University as it received accreditation in late 1996. The survey instrument contained ninety-two questions. As of June 1997, thirty institutions had returned completed instruments. A 70% (n = 43) return rate was achieved after two mailed reminders and several telephone follow-ups.

Findings

The findings of the nine major areas are given in this section under the title of each major area. As needed, descriptive statistics and a brief interpretation of the data are presented for each question. Since some responders skipped certain questions, the number of complete responses is represented by the letter "n" when necessary.

1. Institution

The priorities set forth by the individual institution's mission establish guidelines for departmental emphasis on teaching, research, and service components. Most NAIT accredited programs (n=30) are located in institutions which have 60-70 percent teaching, 10-30 percent research, and 10-20 percent service emphasis.

The majority (70%, n=30) of programs receive medium to high financial support from their institution. Two institutions felt that they received very little support.

IT programs are housed in various colleges and schools. The majority reside in schools/colleges of Science and Technology, Technology, or Engineering-Technology. The administrative location of the Industrial Technology department may affect its governing policies such as acceptable research (basic or applied), tenure and promotion requirements, etc.

In addition to BS degrees, 20 percent (n=30) of the institutions offer A.A.S. degree programs under the Department of Industrial Technology and 40 percent of the institutions offer Master's degree programs. Only two reporting institutions grant Doctorate degrees related to Industrial Technology. Forty-three percent (n=30) reported that there is some form of engineering program at their institution.

Program Title	No. of Programs	Program Title	No. of Programs
Airway Science	1	Hazardous Materials	1
Applied Science	1	Industrial Technology Management	2
Architecture	1	Industrial Automotive Technology	1
Automated Manufacturing Technology	1	Industrial Control Systems Management	1
Automated Systems	1	Industrial Distribution	2
Building Construction Management	1	Industrial Management	3
Building Construction Technology	1	Industrial Science	1
CAD	2	Industrial Technology	10
CAM	1	Manufacturing	8
Computer Technology	1	Manufacturing Management	2
Computer-Aided Design Management	1	Manufacturing Systems	2
Computer-Aided Manufac. Management	1	Manufacturing/Robotics	1
Computer-Integrated Manufac. Technology	1	Mechanical Technology	2
Construction	4	Occupational Safety	1
Construction Management	4	Occupational Safety and Health	2
Construction/Mining	1	Packaging Technology	2
Design Drafting	1	Plastics	1
Design Technology	2	Printing Management	1
Document Design Management	1	Product Development	1
Electronics	7	Quality Assurance	1
Electro-mechanical Systems	2	Quality Systems Management	1
Electronics Technology	2	Quality Technology	3
Energy and Power	1	Safety Technology	1
Environmental Health and Safety	1	Supervision	1
Facilities Management	1	Technical Communication	1
General Industry and Technology	1	Telecommunications	1
Graphic Communication	4	Transportation Systems Management	1

Table 1. Titles and count of different program options offered by industrial technology departments at the baccalaureate level

2. Bachelor Degree Programs

The following list was compiled to illustrate the different programs offered under the industrial technology umbrella. This does not mean that any single department offers all the listed programs. Table 1 presents the titles and the number of departments that offer a particular program.

2.1 Enrollment

In the 25 reporting accredited institutions (n=25), the total number of students enrolled in bachelor programs in the past 3 years were: 6326 students in the academic year 1993-94, 6017 students in the academic year 1994-95, and 6067 students in the academic year 1995-96. The 25 institutions granted 1330 BS degrees in the academic year 1993-94, 1314 BS degrees in the academic year 1994-95, and 1197 BS degrees in the academic year 1995-96. The reported average age of beginning BS students is 23 years (mode=19, standard deviation = 4.6).

2.2 Student body

The student body included 16% of females, 14% of minority students, and 6% of foreign nationals. Other related data are presented in Table 2.

The percentage of beginning freshmen IT majors that drop out within the first year of school was 7% (n=18, mode=5%, min=0%, max.=25%, standard deviation = 6). During the remaining years, before graduation, 8% of the student population (n=15, mode=5%, min=0%, max.=3%, standard deviation = 11) withdrew from the IT programs. Consequently, the programs have an average graduation rate of 85%.

2.3 Articulations and transfer students

Eighty-three percent (n=30) of the programs have some form of articulation with community colleges or technical institutions. On the average, 22 majors per year have transferred to four-year programs from two year colleges through these articulations (n=17, mode=10, min.=0, max.=85, standard deviation=26).

2.4 Extended learning

Seventy percent (n=30) reported that they have some involvement with off-campus learning programs. Seventeen percent (n=30) of the accredited

programs offer customized training for local industries.

2.5 Entrance requirements

SAT and ACT are the most commonly used entrance exams for IT programs. Acceptable scores for those two tests are presented in Table 3.

2.6 Student organizations

Thirty-three percent (n=30) of the departments sponsor NAIT student chapters. About 20% (n=10, min.=5%, max=30%, standard deviation=9) of IT majors were members of these chapters from 1993 to 1996.

3. Graduate Programs

Fifty percent of the programs (n=30) have some form of a graduate program or programs. Sixty percent (60%) of the IT departments that do not offer graduate studies currently are planning to start a graduate program within the next five years. If these institutions were to achieve their expectations, about 80 percent (80%) of NAIT accredited departments would have a graduate program in five years.

3.1 Enrollments

Total graduate student enrollment from the reporting eleven institutions was 485 students in academic year 1993-94. The number had increased to 497 in 1994-95. During 1995-96, the number went up to 527 students. From 1993 to 1996, the number of graduate students enrolled was increased by 8.7 percent (n = 11). On the average, about 4% (n=10, mode=0%, min=0%, max.=20%, standard deviation=7) of enrolled graduate students dropped out within the first year of their study.

3.2 Requirements

A typical graduate program (master level) requires 28 to 36 credit hours for completion (n=14, mode=30, min.=28, max.=36, standard deviation=1.99). A Ph.D. program requires 64 to 68 credit hours (n=2, mean=66, min.=64, max.=68, standard deviation=2.82). Seven departments (n=7) reported that 85% of the enrolled students did complete graduate studies. Only three out of 15 institutes that have graduate programs requires the Graduate Record Exam (GRE) as an entrance requirement. The acceptable total score range varies from 800 to 1000.

	Average	Mode	Min.	Max.	Standard Deviation
Average number years for baccalaureate degree completion.	4.7	5	2	8	1
Number of majors per year who transfer to a different institution before graduation.	0.8	0	0	5.1	1.52
Number of students per year who transfer in from a different baccalaureate institution.	3.18	0	0	12.8	4.26
Number of majors per year who change from IT major to another major (same institution).	1.92	0	0	10.6	3
Number of students per year who change from another major to IT major (same institution).	7.92	0	0	10.6	3
Number of majors per year that come into program from community college programs and technical institutes.	9.41	0	0	33.3	10.7
(n=25)					

Table 2. Average number of years for degree completion and transfer student data.

Exam	Number of respondents (n)	Median	Average	Min.	Max.	Standard Deviation
SAT	7	920	927.14	650	1200	175.66
ACT	13	20	19.66	16	24	2.34

Table 3. Acceptable ACT and SAT scores.

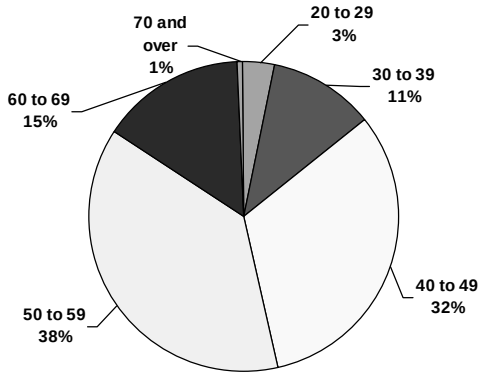

Figure 1. The composition of faculty according to age.

3.3 Student body

Average age of beginning IT graduate students is around 28 (n=11, mode=30, min.=24, max.=37, standard deviation=3.7). Thirteen departments (n=13) reported that 12% of their graduate student population consisted of female students while 19% (n=13)) of enrolled graduate students were minorities. Of the twelve departments (n=12) reporting, seventeen percent (17%) of graduate students were foreign nationals.

4. Faculty

A Doctoral degree in a respective field is considered as the minimum qualification for tenure-track positions by 19 out of 30 respondents (63.3%, n=30). A Master's degree meets the minimum requirement in eight institutions (26.6%, n=30). Three institutions require a Master's degree and work experience (10%, n=30).

Most institutions require (73.3%, n=30) a master's degree for non-tenure track positions. A BS degree in a respective field is accepted by 16% (n=30) of institutions. Three institutions (10%) did not specify their requirements.

Figure 1 illustrates the composition of faculty according to age. The

	n	Average	Mode	Min.	Max.	Standard Deviation
Current faculty credentials						
Percentage of faculty with a Doctorate degree.	28	72%	80%	25%	100%	20
Percentage of faculty with Master's degree	28	48%	100%	0%	100%	39
Trends in availability of faculty positions						
Number of full-time faculty hired within last 3 years	29	2.21	1	0	20	3.63
Number of full-time faculty expected to retire within 3 years	29	1.83	2	0	15	2.77
Number of expected openings per major area for next 3 years	26	1.88	1	0	15	2.89
Percentage of recruited faculty members in the last five years who left the institution within their first three years.	27	3%	0%	0%	25%	7
Faculty work load						
Average semester credit hour teaching load	29	11.17	12	6	12	1.53
Average contact-hour teaching load per week	28	15.46	12	9	24	3.63
Minimum class size (number of students) to meet institutional work-load requirements.	26	14	10	5	26	4.99
Other related data						
Percentage of minority faculty.	27	15%	0%	0%	70%	20
Funds expended per year per faculty member for professional development.	27	$588	$1,000	$0	$3,000	590.4
Salary						
Instructor	18	$30,556	$30,000	$20,000	$42,000	6089
Assistant Professor	27	$39,593	$43,000	$25,000	$70,000	7967
Associate Professor	26	$45,731	$46,000	$33,000	$75,000	7686
Professor	23	$54,348	$50,000	$39,000	$80,000	7749
Percentage of salary increase in past years	n	Average	Mode	Min.	Max.	Standard Deviation
1993-1994	24	4%	3%	0%	9%	1.73
1994-1995	24	3%	3%	0%	6%	1.41
1995-1996	24	3%	3%	0%	12%	2.76

Table 4. Data related to faculty positions, work load requirements, and salaries as of Spring 1997

percentages were obtained from twenty-nine (n=29) responses. Table 4 summarizes the other data related to current faculty in IT programs.

The faculty population of 22 IT departments consisted of 92.2% males and 7.8% females.

4.1 Tenure process

These were open-ended questions designed to identify the nature of the tenure process as a whole. Based on the answers provided by 18 department heads (n=18), the researchers derived the following:

Excellent teaching performances, evidence of research and publications, and some evidence of service to the university community are expected from faculty seeking tenure. Only one of the respondents did not consider conducting research as a part of the tenure process.

Evidence of effective teaching is assessed by student, peer, and department-head/chair evaluations. Words such as "Superior," "Excellent," and "Good" were mentioned by respondents to specify the accepted level of achievement.

Evidence of research can be verified by submitting grant proposals, conducting classroom-based studies, or performing applied research. The word "pure-research" was not included in any responses.

Evidence that must be submitted to verify publication requirements varies from institution to institution. One institution expects two refereed papers per year. Another expects six to eight publications, including at least one of them refereed, from the candidates during the period prior to tenure. A third institution expects one to two publications and/or a national presentation per year prior to tenure decision.

Evidence of service can be verified by serving on departmental, college, and university committees. Membership on committees outside the university community was not mentioned as acceptable evidence. In average, the tenure process takes about six years (n=27, mean=6.04, min.=4, max.=7, standard deviation=0.9).

5. Support Staff

On the average, there is one secretary for seven faculty members (1:7). In some institutions, there is one secretary for three faculty members (1:3) while in one institution there is one secretary for twenty (1:20) faculty members (n=28). Data from twenty-eight (n=28) institutions indicated that there is about one technician for seventeen (1:17) faculty members. Some departments did not have any technicians. The highest ratio reported was one to three (1:3).

6. Placement

The average rate of job placement for IT graduates over the last three years (1994 to 1996) was 96% (n=26, mode=100%, min.=89%, max.100%, standard deviation=4). The reported minimum entry level salary was

$14,000 per year while the maximum was $90,000 per year. The national average obtained from the data of twenty-seven (n=27) institutions was $34,000 with a standard deviation of 3,843. The following is a list of reported job titles for IT graduates:

Application Engineer
AutoCAD Technician
Automated System Manager
CAD Manager
Construction Foreman
Construction Manger
Cost Estimator
Design Engineer
Electrical Engineer
Engineering Assistant
Engineering Technician
Environmental Engineer
Estimator
Fabrication Maintenance Specialist
Field Engineer
First Line Supervisor
Industrial Engineer
Inventory Analysts
Logistics Engineer
Loss Control Associate
Maintenance Supervisor
Manufacturing Engineer
Physician Assistant
Process Engineer
Product Engineer
Production Engineer
Production Manager
Production Scheduler
Production Supervisor
Production Technician
Project Engineer
Project Manager
Prototype Engineer
Quality Assurance Statistician
Quality Assurance Specialist
Quality Control Supervisor
Quality Engineer
Radiological Project Specialist
Risk Control Supervisor
Safety Inspector
Safety Director
Safety Engineer
Sales Engineer
Technical Sales Representative
Training Specialist
Vehicle Program Manager

7. Equipment

To keep up with advancing technologies, IT programs are often required to upgrade software and equipment. Table 5 illustrates the dollar figures that have been spent during the last three years.

Year	n	Average	Mode	Min.	Max.	Standard Deviation
Equipment 1993-94	29	$75,274	$50,000	$0	$1,000,000	184,422
Equipment 1994-95	29	$146,772	$50,000	$0	$3,000,000	549,869
Equipment 1995-96	29	$112,386	$50,000	$0	$2,000,000	365,236
Software 1993-94	25	$43,310	$0	$0	$1,000,000	199,337
Software 1994-95	25	$44,967	$2,000	$0	$1,000,000	199,118
Software 1995-96	25	$112,386	$2,000	$0	$1,000,000	199,088

Table 5. Spending for equipment and software upgrades

	n	Average	Mode	Min.	Max.	Standard Deviation
Number of members on Advisory committee(s).	25	14	15	2	32	6.6
Length of appointment for committee members (years).	21	3.7	3	1	15	2.79
Percent of committee members who serve more than one term.	19	62%	80%	0%	100%	30.75
Number of times the advisory committee meets per year.	26	2	2	1	6	1.04

Table 6. Data related to advisory committees

8. Innovative Teaching/Learning

Twenty-eight institutions (n=28) reported that 100% of their faculty members have access to the internet. Twenty-six out of twenty-seven institutions (n=27) indicated that their students have internet access. Twenty-four out of 25 institutions reported that they provide internet resources to their support staff.

As distance learning is becoming popular, 42% of industrial technology programs (n=29) offer some sort of distance learning courses. In addition to distance learning programs, other initiatives have been undertaken to improve or expand the industrial technology program and services. The following list summarizes the nature of some initiatives:

Multimedia education - self-paced learning
Computer integrated manufacturing using LAN process
Creating interactive laser discs
Imagine science and CD-ROMs
Establishing a metal casting center
Offering MA on site at local industry
Offering Doctor of Industrial Technology (DIT) in Taiwan
Establishing manufacturing resource center with an area utility company
All students required to use e-mail and World Wide Web for classes
Establishing virtual electrical lab
Establishing quality control lab
Technology transfer partnerships with other institutions
Courses taught in-plant for regular students
Compressed video presentations of courses for distance learning
Establishing a Ph.D. program for Technology
Establishing a new BS program for packaging

9. Advisory Committee(s)

Advisory committees that contain members from industries can be very beneficial to the development and upgrading of industrial technology programs. It seems that some IT programs do not have advisory committees. Only 26 out of reporting 43

institutes provided data related to the committees as shown in Table 6.

Conclusions and Questions

With a 70% return rate, the data presents important baseline demographic information about the Industrial Technology programs in the United States. NAIT educators, administrators, and students may derive different conclusions from this data and use them for different purposes when making decisions about their programs. From the information collected during this study, the authors ask the following questions:

1. IT departments offer a wide range of programs under different names. This may be confusing to students and employers. The question then becomes, should NAIT standardize the titles of programs?
2. Undergraduate student enrollment in IT programs dropped a 5% from the 1994 to 1996. The number of BS degrees granted also dropped by 10%. Are we losing popularity as a discipline?
3. Graduate student enrollments, on the other hand, increased by 8.7% from 1993 to 1996. Sixty percent of departments not offering graduate programs expressed a desire to offer their own graduate-level IT programs within five years. Should we start offering more graduate programs?
4. The ratio of male to female faculty was about twelve to one (12:1) while the ratio of male to female students was about six to one (6:1). Do we need to hire more qualified female faculty members to help encourage even greater female student enrollment.
5. Fifty-three percent of the faculty members are in the 50-69 year-old age group. Will we be able to hire qualified faculty to replace these faculty when they retire?
6. Traditionally, as Wright (1998) points out, faculty members were hired to teach, not research. Since the pressure to conduct research has increased significantly in recent years, do faculty have adequate time with traditional teaching loads and significant lab contact hours?

References

Henderson, Roy D. (1985). NAIT Salary Survey. Journal of Industrial Technology, 1(2), 8-14.

Israel, Everett. (1985). NAIT Salary Survey. Journal of Industrial Technology, 1(2), 6-7.

Shaw, Randall W. (1991). Salary and hiring related information from NAIT accredited programs. Journal of Industrial Technology. 7(3), 25-27.

Shaw, Randall W. (1996). Industrial supervision competencies for industrial technology programs. Journal of Industrial Technology. 12(1), 16-20.

Wright, J. R. (1998). Overcomming resistance to change through participative staff development. Journal of Industrial Technology 14(1), 2-5.

Zargari, Ahmad. (1997). Survey results guide the establishment of doctor of philosophy degree (Ph.D.) programs in industrial technology. Journal of Industrial Technology. 13(4), 15-19.