AC 2010-1789: A LONG-TERM LOOK AT THE SUCCESS OF ROCHESTER INSTITUTE OF TECHNOLOGY ENGINEERING TECHNOLOGY GRADUATES

Maureen Valentine, Rochester Institute of Technology

Maureen Valentine, Rochester Institute of Technology Professor Valentine, P.E., has been a faculty member at RIT for over 16 years and held the position of Department Chair for the Department of Civil Engineering Technology, Environmental Management, and Safety from 2000 to 2008. She is currently the Miller Professor and Associate Dean of the College of Applied Science and Technology. Her scholarly activities recently have focused on women in technology programs, and the female faculty who teach them.

Carol Richardson, Rochester Institute of Technology

Carol Richardson, Rochester Institute of Technology Professor Richardson is a professor of engineering technology in the Department of Electrical, Computer, and Telecommunications Engineering Technology. She is currently the program chair for the electrical engineering technology program and teaches freshman courses in the department. Her scholarly activities are academic programming and services to ensure student success, curriculum development, and assessment.

A Long-term Look at the Success of Rochester Institute of Technology Engineering Technology Graduates

Abstract

The Rochester Institute of Technology (RIT) has collected a significant amount of historical data on the alumni of its seven engineering technology (ET) programs through surveys conducted in 1997, 2002 and again in 2009. This paper provides an analysis of the most recent 2009 data, comparisons to RIT historical data and an alignment with survey data from several other universities in the past five years. It also provides a discussion on the usefulness of alumni surveys in assessing program educational outcomes. The RIT alumni salary data obtained from all three surveys corresponds closely to salary data for engineers with job experience published by the Engineering Workforce Commission and has been a strong recruiting tool for freshman and transfer ET students. The three RIT alumni surveys document the achievements of the RIT ET graduates for the past thirty seven years and provide an assessment tool for the next RIT ABET Technology Accreditation Commission accreditation visit.

Introduction

Engineering technology and engineering programs across the United States have been using alumni surveys for years as a way of measuring success. In the past, the results of these types of surveys were historically used for benchmarking as a means of demonstrating successful career growth for graduates and identifying potential improvements for the programs. “Benchmarks for graduate salaries, job titles, graduate education, and professional certifications have been established in ET alumni surveys during the last decade at RIT, the University of Dayton, Old Dominion, Northeastern University, and the University of Pittsburgh at Johnstown (UPJ).”¹ Work completed by Mott,² Stanley and Verma³ in the early 1990’s provided an effective means of gathering relevant information from an alumni pool and data by which other schools, like RIT, could benchmark to demonstrate success of those alumni.

In 2004, the Technology Accreditation Commission (TAC) of ABET required the use of outcomes assessment as the basis for accreditation assessment for engineering technology programs. The current TAC ABET Criteria for accrediting engineering technology programs require the following:

Criterion 2. Program Educational Objectives

Each program must have in place:

- a. published program educational objectives that are consistent with the mission of the institution and applicable ABET criteria,
- b. a documented process by which the program educational objectives are determined and periodically evaluated based on the needs of constituencies served by the program, and
- c. an educational program, including a curriculum, that enables graduates to achieve the program educational objectives.⁴

As the changes to the accreditation process were implemented, the alumni survey became more than a simple benchmarking tool. It became a means by which to provide that necessary periodic evaluation of the Program Education Objectives (PEOs). As Nasser Alaraje from Michigan Technology University so aptly describes the process; “A set of assessment tools with performance criteria has been identified for each PEO. Data has been regularly collected, assessed and evaluated against the performance criteria to ensure that each PEO has been assessed and the goals have been met. Results of assessment process are then utilized in continuous improvement actions.”⁵

In 2002, Puerzer and Rooney further support the use of alumni surveys as an “objective assessment tool” to gather data. “The presumption, of course, is that graduates of a program with a certain amount of post graduate experience will have gained a perspective that allows them to reflect on the strengths and weaknesses of that program.”⁶

Variations in Surveys Used

Barron, Pangborn, Lee, Litzinger and Wise, from Penn State University, describe the evaluation of survey data collected from almost 1,300 Penn State engineering alumni in the paper titled “Educational Objectives and Expectations for Post-Graduation Achievement.”⁷ They describe a survey that is administrated every two years, always to recent graduates two to three years after graduation. Although they have been doing this for over fifteen years, they modified their process because of ABET. “The new expectations regarding formative assessment for engineering program accreditation served as an additional driver for a change in approach.”⁷ The paper goes on to acknowledge that changes need to be made in the alumni survey process to meet these assessment requirements but they must be done in a way that maintains longevity of information. “The challenge was to design the new instruments so that the value of comparison with the results of previous surveys was not lost, while introducing the new content in a way that would not make for a time-consuming and ultimately off-putting format.”⁷

Penn State also approached their data reduction in an interesting way, partitioning data based on whether the alumni pursued full-time employment directly upon graduation or went on immediately to graduate school.

According to Biney and Bryant from Prairie View A&M University, they utilize an alumni survey to assess PEOs as well. They assess every two to three years and the questions are directly connected to the objectives of the program in the survey format. They also strive to create a “facts finding questionnaire (not an opinion survey)”⁸ in order to consider their data a form of direct measure, rather than indirect measure.

Unlike Penn State and Prairie View, RIT chose to administer an alumni survey every six years, approximately, in correlation to each TAC ABET review cycle. The graduates of all RIT ET programs in the RIT alumni database were surveyed in 1997, 2002 and again 2009. In 1997 RIT mailed over 3,000 surveys, and 550 alumni responded to this survey. The results of the 1997 RIT survey were published in the 1998 ASEE Proceedings⁹. In 2002 RIT mailed 5,632 surveys and received 743 responses. The results of the 2002 survey were published in the 2004 Proceedings.¹ In 2009 RIT mailed and e-mailed 7,715 alumni. Response rates on the most

recent survey were not as successful for the overall group (approximately 5%) but response from the most crucial group, graduates between 2003 and 2008 was approximately 10%. For assessment of PEOs and reporting information for this paper, results from this group have been used.

All of the RIT surveys collected basic success measurements such as salary information, job titles and descriptions, graduate education, licenses or certifications, and professional society memberships. The 2002 RIT survey asked additional questions on technical skills and knowledge preparation, communication skills, and ethics education in the RIT ET programs for assessment of PEOs, along with questions on the three most useful and least useful courses while earning their degree at RIT, areas where more or less emphasis should be placed within the program, and whether they would be interested in graduate studies at RIT, and in what discipline. These additional questions were continued in the 2009 survey.

In order to provide some background, RIT baccalaureate programs in Electrical Engineering Technology (EET), Mechanical Engineering Technology (MET), Civil Engineering Technology (CET), Manufacturing Engineering Technology (MfET), Computer Engineering Technology (CpET), Telecommunications Engineering Technology (TET) and Electrical/Mechanical Engineering Technology (EMET) were included in this survey. All of these seven current RIT ET baccalaureate programs are five-year programs that require 50 weeks of co-operative educational experience. Students began graduating from the ET programs in 1973 with a Bachelor of Technology (BT) degree. The BT degree was changed to a Bachelor of Science degree in all ET programs by 1990.

Results

Figure1 shows a comparison of RIT ET Graduates from the 2009 survey and 2009 salaries reported in the annual salary survey of the Engineering Workforce Commission (EWC).¹⁰ Salaries of all ET RIT graduates tracked very well with those of the Engineering Workforce Commission summary of all engineering graduates. The earlier RIT surveys showed similar results over a longer range of years. This reinforces the conclusion made in 2002 that RIT ET graduates are monetarily rewarded as professionals on the engineering team.

Figure 1: Comparison of recent RIT ET Graduates to 2009 EWC National Engineering Salaries

As in the past, the survey asked the RIT ET alumni to list their current job title. This question provides a means of assessing PEOs that seek graduates to be gainfully or successfully employed. Although not provided here, a longitudinal analysis of these titles can provide an assessment measure for PEOs seeking growth or development of leadership roles for the graduates. The results of this question are provided in Table 1.

Table 1: Job Titles

RIT Alumni Job Titles	Percentage of Responses for all Disciplines		
	2009	2002	1997
Engineer	81% (87 responses)	41 %	50%
General Management	0%	20 %	10%
Technical Services	1% (1 response)	12 %	Not a category
Engineering Management	10% (11 responses)	10%	17%
Senior Management	2% (2 responses)	5%	7%
Sales & Marketing	0%	4%	Not a category
Other	3% (3 responses)	6%	11%
Technician	3% (3 responses)	1%	4%

Job titles were provided by 96% of the respondents who graduated between 2003 and 2008 on the most recent RIT survey. The percentage of response for 2002 and 1997 in all of the

following tables is for all alumni who responded to the survey. As is evident in Table 1, the most common response was engineer, with specific modifiers such as electrical, power, civil, network, software, project, manufacturing and design. Senior management titles included president/owner and vice president. Job titles in the Technician category were engineering technician (civil), nuclear reactor operator (mechanical) and voice repair technician (telecommunications). Technical Services was not a category for the 1997 survey but included the job title of consultant for the 2009 survey. In 2002, the other category was split evenly between ET-related and non-technical job titles, and some jobs were in education and the military. For the 2009 data, this held true with the category including job titles in environmental science and instructional faculty. No RIT ET alumni have reported a job title of technologist in any of the three surveys. It is assumed that the reduction in percentage of job titles in the engineering management and senior management categories may be due to the more recent cohort of alumni surveyed for this project.

Table 2 summarizes the amount of graduate education reported by the respondents in each RIT ET program in the most recent survey and compares those values to those from earlier RIT surveys. It is assumed that the general decrease in graduate work indicated by the 2009 survey is due the smaller sample size, using data of graduates of the past six years only, however the significant decrease in graduate work by the MfET graduates is unexplained. Further information will be sought by the program coordinator in that department to confirm this result. Two PhD degrees were reported in the 1997 survey; none were reported in the 2002 or 2009 surveys. In all three samplings, most of the Master of Science (MS) were in engineering, engineering management, or a specialized technology. As in the past, there were a few MS degrees in fields not directly related to ET or management.

Table 2: RIT Graduate Education by Program

ET Program	MBA 2003- 2008	MS Any Field 2003- 2008	MS + MBA 2003-2008	Alumni with some grad. work			Alumni with graduate degrees		
				2009	2002	1997	2009	2002	1997
	Number of Respondents			Percentage of Respondents					
Civil		4		8%	16%		24%	14%	
Computer		2		5%	24%		10%	22%	
Electrical	1	2	1	27%	33%		25%	30%	
Manufacturing				0%	32%		0%	32%	
Mechanical		3		25%	20%		37%	15%	
Telecom		3		0%	25%		23%	17%	
Unidentified		1		12%	15%		12%	15%	
All ET	1	15	1	8%	23%	36%	19%	21%	24%

According to Barron, Pangborn, Lee, Litzinger and Wise: “Over 30% of graduates eventually pursue advanced studies within two or three years of graduation; 70-80% of these in engineering and 20-30% in business or MBA programs.”⁷

Although the results summarized above for RIT ET alumni are slightly below that of Penn State, the results from the earlier surveys that included all graduates are reasonable in comparison to Penn State (21% to 36% vs. 30%).

Success in completing certificates and the professional licensure process represent a measure of accomplishment and life-long learning. As in the past, we asked the RIT alumni to identify the various licenses and certifications that they have acquired since graduation from RIT. Table 3 provides the results of this question, by discipline and by year of survey. The Fundamentals of Engineering (FE) and Professional Engineer (PE) examinations represent a multi-disciplinary certification, but our results demonstrate - as they have in the past- that these certifications are the most important to CET graduates. It is assumed that the reduction in percentage of CET graduates attaining the PE license is attributed to the fact that most of the alumni sampled in this round had not yet achieved an adequate amount of experience to sit for the exam. Certifications by the EET alumni were predominantly Cisco certifications. The MfET and MET RIT alumni from this most recent survey did not include any certifications, although certified manufacturing engineer (CmfgE), plant engineer, NRC, PMP, and CQE were reported in the past in small numbers.

Table 3: RIT Professional Engineering Licenses and other Certifications

ET Program	% Passed the FE Exam			% Attained the PE License			% Received other Certifications		
	2009	2002	1997	2009	2002	1997	2009	2002	1997
Civil	23%	27%	30 %	5%	34%	24%	0%	13%	24%
Computer	0%	0%	0%	0%	0%	0%	6%	16%	39%
Electrical	9%	4%	0%	0%	4%	2%	0%	10%	35%
Manufacturing	0%	8%	0%	17%	6%	0%	0%	16%	56%
Mechanical	0%	0%	0%	0%	0%	0%	0%	10%	49%
Telecom	0%	0%	NS	0%	0%	NS	23%	46%	NS

Many engineering technology programs including RIT's have written PEOs seeking graduates to be able to demonstrate work ethic, life-long learning and participation in the discipline. The involvement of the alumni in professional organizations can be considered a measurement of these types of PEOs. Table 4 shows the number of alumni in each RIT BS ET program that belong to a professional society as reported in each of the three surveys.

Table 4: Professional organization membership, by discipline

Program	Professional organization membership		
	2009	2002	1997
Civil	68%	57%	46%
Computer	11%	24%	36%
Electrical	27%	31%	36%
Elect./Mech.	50%	100%	56%
Manufacturing	17%	52%	56%
Mechanical	84%	41%	48 %
Telecom	15%	29%	0%
ET Overall	44%	43%	44%

The results show that the overall involvement of RIT ET alumni in professional organizations has not changed significantly over the years. However, these results indicate that there are variations among the ET disciplines and indicate a marked increase in the level of involvement by the CET alumni. Although there is no way to prove direct correlation, both the CET and MET programs at RIT have very active student chapters of national organizations, American Society of Civil Engineers (ASCE) and American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE). It is concluded that participation in these successful organizations at a student may lead to more interest in being involved in a similar organization as a professional.

As has been done in the past, RIT ET alumni in the 2009 survey were asked the questions shown below in Table 5 and asked to rank them on a scale from 1(unsatisfied), 2 (somewhat satisfied), 3(satisfied) 4 (quite satisfied) to 5(very satisfied).

Table 5: RIT Graduate Satisfaction

Question How well did the ET/RIT program that you graduated from ...	2009	2002	1997
1. ...prepare you with the technical skills and knowledge necessary to be successful in your chosen field?	4.32	4.14	
2. ...prepare you with the communication skills necessary to be successful in your chosen field?	4.27	3.86	
3. ...prepare you to continue your formal education and receive subsequent degrees or certifications?	4.30	3.79	
4. ...prepare you to continue to gain skills and knowledge in informal ways such as self-teaching, company training and learning by doing?	4.40	4.15	
5. ...prepare you to succeed in a business environment?	4.16	3.76	
6. ...encourage you to maintain a high standard of integrity and ethical conduct?	4.39	4.06	
7. ...prepare you for overall success in your chosen field?	4.38	4.09	3.96
8. How satisfied were you with your education from RIT immediately after graduation?	4.18	3.97	
9. How satisfied are you with your education from RIT today?	4.26	4.02	4.01

From RIT's perspective, the values provided in Table 5 above indicate a very satisfied group of alumni. The values are all between "quite satisfied" and "very satisfied" and in several cases indicate an increase in satisfaction from past surveys.

Results from the questions about most useful and least useful courses varied widely. In 2002, Engineering Economics, Ethics, and Technical Writing and Presentation were listed as the most important courses that should be included in the curriculum. In 2009, only a few respondents mentioned an engineering economics or ethics course. Most responses focused on technical courses such as embedded systems design, product design, structural analysis and design and thermodynamics. Project Management and core courses such as statics and strength of materials were also mentioned often. In answer to the question about least useful courses, respondents seemed to focus on liberal arts and math courses although several answered "none" or "I learned from every class."

Conclusions

The data obtained from engineering technology alumni from RIT between 2003 and 2008 demonstrates that alumni surveys remain an effective means of measuring the success of these graduates and therefore, an effective means of measuring the success of PEOs. The survey shows that the salaries of these alumni track well with salaries reported by the Engineering Workforce Commission for engineers who have been working between one and five years. The

starting salaries of the RIT ET alumni are enhanced by their co-operative work experience as all RIT graduates of engineering technology and engineering programs are required to have 50 weeks of work experience before graduation from RIT. The job titles have continued to show that ET graduates are working in the more applied end of the engineering job spectrum and the number of graduates with the title of engineer has increased from the last 2002 survey. RIT ET Alumni from 2003 to 2008 had more graduate degrees as compared to the 2002 Alumni survey data for graduates from 1990 to 1996. The 2009 survey shows that RIT ET graduates are more satisfied with their RIT education as compared to the 2002 survey. The response rate of 5% to the 2009 survey for all RIT ET alumni (7,715) was lower than the 2002 rate of 15% for 5,632 surveys although the response rate for graduates from 2003 to 2008 was approximately 10%. The 2009 survey was an electronic survey and the 2004 survey was a paper survey.

The next step for any university employing an alumni survey as a means of measuring success is to look for indicators that can lead to continuous improvements in those programs. Continuous improvement, however, should apply to the alumni survey process itself, as well. The authors of this paper will look to others that have been successful, such as Penn State and Prairie View A&M University, to seek methods of increasing response rate, better direct correlation to PEOs and possibly an overall “effectiveness” measure beyond comparisons to benchmarks to established acceptable levels.⁸

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