# FOLLOWING THE CAREER PATH OF TELECOMMUNICATIONS TECHNOLOGY GRADUATES

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## ABSTRACT

Technical innovations, coupled with the divestiture of AT&T and deregulation of the telecommunication industry, as a whole, has significantly altered the exciting field of telecommunication. With these changes, a multitude of career opportunities has become available to aspiring telecommunication professionals. Trained telecommunication professionals are currently in short supply and the-long term career opportunities are very encouraging. Careers in this field include telecommunications engineering and management, public policy, consulting, research and development, vendor sales, marketing, and technical support.

In responding to this opportunity, the Engineering Technology Department at New Jersey Institute of Technology developed an undergraduate telecommunication concentration within the Electrical Engineering Technology program. To keep abreast with the market space and the demands of the industry, we developed an assessment plan used as an input to the program improvement process. Included in the assessment plan is a survey sent to the graduates of the telecommunication concentration to track their progress and to gain an insight to the strength and

weakness of our program. In this paper we present a summary of our program, followed by the design of the survey and the data analysis of the returned survey results. We also include the steps we have taken in response the graduates feedback.

## INTRODUCTION

The speed at which the telecommunications and computer technologies change presents educators in the technology field with a set of challenges. Most experts agree that institutions and universities can not afford to ignore the rate at which these fields are changing. Industries, government regulations, the dynamics of the globalization of the market space, and the technological innovations are all factors that need to be considered in developing engineering and technologies programs. At New Jersey Institute of Technology we developed a telecommunication program that takes these parameters into consideration, with a special focus on the industrial component. We believe our program meets today's market requirements at the undergraduate levels.

The telecommunication program, as all programs in the engineering technology department, encompasses a core and specialization curriculum. The core curriculum focuses on skills in mathematics, humanities and social science, oral and written communications, and basic science skills. The specialization curriculum consists of courses and hands-on work in telecommunications, geared at giving students a broad base of knowledge and skills needed to mount a career in this field. Courses in telecommunication fundamentals, networking, optical fiber communications, wireless, are offered in the program. The specialization courses are focused on industry practices, state of the art technologies, laboratory work, leadership as well as managerial skills.

To keep the program focused and current, we had to balance two competing dynamics. One is how fast we need to change the curricula, and the second is making the program stable for both faculty and students. Balancing these two forces is not always an easy task, but continuous re-evaluation seemed to give encouraging results. Re-evaluation is a continuous process of assessments and improvements. As part of this process, a three-track plan has been developed.

One track is the industrial input, the second is the student's skill assessment, and the third track is assessment of how well graduates of the program do in their careers after leaving the program.

This paper focuses on the career tracks of the graduated students, and acquisition of feedback from those graduates who mounted careers in the telecommunication field. We designed a survey that queries the graduates for information related to many aspects that are necessary to implement changes in the curricula. The survey includes twenty-two questions focusing on many areas relevant to the improvement process. Additional questions related to salaries and positions attained for comparative studies of career paths taken by our graduates and graduates of other programs.

**THE SURVEY**

The questionnaire contains twenty-two elements directly and indirectly related to information relevant to the process improvement we have in place. The first five questions are related to general information including date of graduation, the concentration of study while at the university, and the number of years the graduate spent to obtain his or her degree. One question is related to the position held by the graduate immediately following completion the study program as well as the starting salary. This question also including information related to the actual tasks performed by the graduate in his or her daily activity.

The following four questions are related to the technical and non-technical courses that were most helpful and least helpful to the graduate in his or her first position, and the number of companies the graduate worked for after leaving the university. The next part of the survey focused on a number of issues including whether the graduate is employed, the current positions, and the current salary, how satisfied the graduate is with his current position.

The final part dealt with suggestions related to improving the telecommunications program. There are questions regarding courses and skills that would help the graduate in his or her current position, what new courses would improve the program based on the industrial insight gained. Other questions directly related to the contents of the program including whether

a graduate degree will be pursued or completed. Two additional questions concerned with whether going for the undergraduate degree in telecommunications and Electrical Engineering Technology has helped in the career choices made and the number of companies worked for upon completion of the undergraduate degree.

Information obtained from the survey gave a very good insight onto what is needed in the telecommunications concentration. Some of the information were as expected and other were not anticipated. For example, the salary range of the graduate of this concentration was surprisingly similar to graduates of the electrical engineering and computer science programs. Expected responses emphasized the importance of communication skills and technical writing skills in the execution of the day to day tasks. In the following section we analyze in more details the data collected. We then follow by the steps taken to implement changes in respond to the survey results.

**RESPONSE DATA ANALYSIS**

Graduates of the past five years were the focus of the survey. Our rational was that because the fast pace of changes in the field of telecommunications, we felt that a five-year cutoff interval is reasonable. We sent the survey to 142 graduates, then we followed by telephone calls those who did not respond immediately. In some few cases we conducted the survey over the telephone. The survey returns were about 32% of the total number sent.

Measures that gauge a program success can vary depending on the criteria set fourth. In our technology program, we emphasis the skill sets, required for gainful employment and career development. These sets are essential component that we continually examine and modify when possible. One simple measure of the success or failures in this regard can be gauged by the initial position immediately after graduation, and hence, the career path and ladders climbed. Two indicators from the data collected were the average salary from the current position and the initial salary immediately earned upon completion of the program. After 5 years of continuous employment, the average salary of the telecommunication program graduate is $50,525. The average initial salary upon completion of the program is $36,740. An interesting observation

regarding the initial salaries brought our attention to the improvement of the market place within the past five years. For example, significant number of recent graduates started with salaries ranging in the low forties. In contrast, the initial salary of earlier graduates within the same time period ranged between $32,150 and $38,500. This jump in the initial salary indicates an improvement in the job market in the past two years that is encouraging. Table 1 summarizes the salary information both for the initial salaries and the current income earned.

Table 1: Relationship of salary and position

| ***Average Initial Salary*** | | ***Average Current Salary*** | ***Average # of Years in Current Position*** | ***Average # of Companies worked for in the past 5 years*** | ***Average Wait for Employment*** | |
|---|---|---|---|---|---|---|
| 1994 -- 1996 | 1991 -- 1994 | $50,525 | 1 ½ years | 2 ¼ companies | 1994 -- 1996 | 1991 -- 1994 |
| $38,500 | $32,150 | | | | 2 months | 7 ½ months |

Another important measure related to the improvement of the job market that tabulated from the survey data is how long a graduate has to wait for gainful employment in the field. A high percentage of recent graduates of the telecommunication concentration secured positions while they were still in their last semester of study. On the other hand, the waiting period for a high percentage of earlier graduated ranged from 3 month to one year to obtain employment in the field.

Positions held by program graduates consisted of a wide range. These positions included design engineers, managers, technical sales, telecommunications engineers, system engineers, test engineers, and other positions in non-telecommunication areas. This range of position is similar to those held by graduates of other program including the electrical engineering and computer science programs. One slight deviation however, is the number of technical customer

support positions seemed to be slightly higher. We believe this is expected because technology education focuses on understanding of systems operations and troubleshooting more than the traditional engineering programs. The overall result suggests that once employed, the telecommunications technology graduates will do as well as graduates from other disciplines.

In addition to salaries, we were extremely interested in the graduates insightful input related to improvement of the program. A number of telecommunications courses were listed as most helpful. Seventy eight percent of responses listed the applied telecommunication course, seventy two percent listed the fundamentals of communication systems, and fifty three percent listed the fiber optical course, and sixty five percent of the responses indicated that senior-project-I and senior-project-II were most helpful. The front runners among the non-telecommunications courses were the microprocessors and the C/C++ programming language courses (62% listed microprocessors, and 58% listed C/C++).

A very high percentage of the responses indicated that the technical writing (ENG 352) was most helpful to their careers. Almost 88% listed this course as most helpful. This is an indicator of how important communication skills in the market place are today.

When we asked about new courses that may be helpful to the telecommunications technology students, we gave a list of courses to select from. The list of suggested courses included Networking, Visual C++, Technical Sales, Multimedia Applications, and Multimedia Networks. Surprisingly, almost all of these courses were checked. Additional courses not on the list that were suggested by students were Windows NT, UNIX SHELL programming, and server/client applications, with more lab exercise. Table 2 summarizes the result for most helpful course, least helpful courses and the suggested new courses. In the next section we will discuss a preliminary action plan to deal with the result of the survey.

Table2: Curriculum Information

| Most helpful courses received more than 60% | Least helpful received more than 60% | Suggested new courses received more than 60% |
|---|---|---|
| ENG 352 (Tech. Writing)<br>EET 415 (Applied Telecom)<br>EET 417 (Fiber Optics)<br>EET 401 (Senior Project I)<br>EET 402 (Senior Project II)<br>EET 414 (Fundamentals of Communications | CHEM 301<br>EET 303<br>MET 303<br>EET 300 (Signals and Circuits) | Networking<br>Unix Shell<br>Windows NT |

**ACTION PLAN**

The result of survey indicated areas of strength and areas of weakness. Our goal is to build on the strengths of the program while improving the areas that are regarded as weak. Because it is important that changes be within the overall context of the Electrical Engineering Technology Program, we devised a committee headed by Professor Bill Barnes, the coordinator of the EET program. The committee's goal is to devise a plan of action that includes revisions to existing courses, adding new courses to respond to the demands of the dynamics of the market place. The committee works is still in progress, but initial results indicate that there will be at least two courses that will be added to the telecommunications curriculum. These are the Networking and the Unix Operating system. Additional work is being done to develop a multimedia application course that will cut across concentrations including the general, computer and telecommunications.

**CLSONG REMARKS**

In this paper we presented the result of a survey sent to the Telecommunications Technology concentration graduates. The results indicate the vitality of the concentration to the

overall Electrical Engineering Technology (EET) program. The encouraging indication from the data is that in recent years, the market is producing more positions in the telecommunications technology field than it did in the near past. The results also indicate opportunities for improvement that is being addressed. We understand that the improvement process is continuous and needs not to stop at one survey or a single assessment study. We intend to offer new courses in response to the results outlined in this paper this coming academic year. We will also continue to perform assessment studies and perform research in nontraditional methods of delivery that will attract a wider population of students.

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