# THE INFLUENCE OF FINAL COURSE PROJECTS ON THE EARLY ENGINEER'S PROFESSIONAL LIFE

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***Abstract*** *¾ Final course projects have proved to be effective both in complementing adequate academic and technical formation, and in preparing students for a competitive work marketplace. In order to better evaluate and improve the effects of these projects on junior engineers, a research was done with the students who graduated in the last 4 years and the outcome of the projects they had implemented for final course. Key questions were asked, in order to verify what kind of influence the projects had had so far on their early professional career, and so be able to re-evaluate the various pedagogical aspects. The answers to these questions show that most students are not working now in the same field they did at the time of the project, but the final course projects had a considerable importance in helping them to obtain their first job.*

*Index Terms ¾ Final course projects, university-industry joint programs, hands-on engineering education.*

## INTRODUCTION

Final course projects, or FCP for short, have proved to be effective both in complementing adequate academic and technical formation, and in preparing students for a competitive work marketplace. These projects have mostly been done, at FEI- Faculdade de Engenharia Industrial, in collaboration with local industries or with the support of large corporations [1] – [3]. This strategy allows better and cheaper formation of qualified engineers, ready to enter the labor market and also allows that both teachers and students keep up with the state of the art in technology and quickly respond to the needs of a fast changing society with technological solutions [4], [5].

In order to better evaluate and improve the effects of these projects on junior engineers, a research was done with the students who graduated in the last 4 years and the outcome of the projects they had implemented for final course.

## METHODOLOGY

Following the methodology used in [6] and [7], key questions were asked, in order to verify what kind of influence the projects had had so far on their early professional career, and so be able to re-evaluate the various pedagogical aspects of FCP's. Some of these questions took into consideration the kind of influence that the project had in helping them to obtain their first job, the adherence that their working activity had to their project technical field, and what was the perception that they had now, in the industry, of the project, and their willingness in making partnerships with the academia to solve problems and develop new products.

Specific inquiries were also put on the projects, in order to identify, for instance, which of them had been placed in the market as new products, or would become new products, which remained in academic research, or how did the companies involved in these projects evaluate these results. Table 1 presents the questions asked to the students.

TABLE I
QUESTIONNAIRE PRESENTED TO THE STUDENTS

| | Question |
|---|---|
| | *About the student current position:* |
| 1 | Was the student's first job (or is it) in the same area of his final course project? |
| 2 | Is the student's your current job (if different from the first) in the same area of his final course project? |
| 3 | Did the final course project help him to find the first employment? How? |
| 4 | What does the student think today, with his professional vision, on the project that he implemented? |
| 5 | As an active member of the industry, would he be willing to do a partnership with FEI to develop a new product for his company, based on a final course project? |
| | *About the project:* |
| 6 | Was the student's project of a new product or an academic study? |
| 7 | Was his project implemented? Did it become a product or does anybody continue using parts of him? Was it used as a prototype? |
| 8 | If it was accomplished in collaboration with a company, what did the company find of the result? |

## QUESTIONNAIRE RESULTS

The answers to the proposed questions, which are summarized in table 2, show that most students are not working now in the same field they did at the time of the project. An interesting fact is that some students who were already in the work market changed jobs to continue to work in the same area of their projects.

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TABLE II
ANSWERS GIVEN BY THE STUDENTS

| | Answers |
|---|---|
| | *About the student current position* |
| 1 | 41% of the students had the first job in the same area. |
| 2 | 32% of the students are working in the same area of the FCP. |
| 3 | 35% of the total number of students thinks the FCP helped help him to find the first employment. This number rises to 52% if the students that worked before the project are not taken into account. |
| 4 | 67% of the students think they developed an excellent project and 33% a good one. |
| 5 | 100% of the students are willing to do a partnership with FEI to develop a new product. |
| | *About the project:* |
| 6 | 91% of the projects were for products, 9% were strict academic projects. |
| 7 | 15% of the projects became a product, 59% of the projects did not became a product but served as a prototype or still are being used in some way and 26% have no more use. |
| 8 | 100% of the projects accomplished in collaboration with a company received good evaluations. |

Observing the answers to the 3rd question we could find that the FCP had a considerable importance, in many aspects, in helping students to obtain their first job. The numbers presented in table II are somewhat misleading because we only took in account as "helped the students" only those replies that really answered "yes" to that question. But most students, even the ones that answered that the FCP did not help find the first job also stated that the FCP didn't helped find the first job, but was an excellent showcase I used to present my abilities to the industry.

The "showcase" aspect of the FCP is clearly visible during the ELEXPO - the "Electrical Engineering Final Course Project Exhibition" (Figure 1). This event is held at the end of each semester at the FEI Campus, in São Bernardo do Campo, where the best Final Course Projects are presented to the community. The main purpose of the exhibition is to improve contact and communication between School and Industry. At the ELEXPO, a committee composed of professionals from more than 20 companies is responsible for the judgment and awarding of the best works. This committee evaluates each work considering some aspects, such as presentation, user interface, assembly, maintenance easiness and market potentiality, and finally gives suggestions for future implementations. The awards consist of software packages, courses or educational travels, which are provided by the partner companies.

In several answers received, the students stated that during the ELEXPO they were approached by recruiters and offered jobs. As one student said, the company he works today contracted him first because he graduated at FEI, but they increased their interest in the recruiting him after the ELEXPO. In his opinion, it works as a kind of 'showcase' for the future professionals. Up to now the company is very interested in hiring other members of his FCP group. Other students stated that the project and the consequent exhibition at the ELEXPO were a great opportunity for everyone to find the first job.

FIGURE. 1
VIEW OF THE XII ELEXPO EXHIBITION.

The 4th question had the expected answer, in which most students were glad with the projects they developed and so answered they projects to be good or excellent. More interesting are some of the comments the student made. According to him, besides being a product of great worth for any corporation, more important is that he had proved for himself and for a lot of people that is possible to develop complex applications in Brazil. The confidence in himself that this project gave him was essential for his career. The importance of hands-on learning process of the FCP becomes evident in other statements, as here: "I learned a lot of thing when we were studying and implementing the system. I learned with the mistakes and with all the problems that appeared. Undoubtedly, it was a positive experience which complemented my preparation for the professional life".

The 5th question presented itself as a surprise for us, as all the students stated that they are willing to do a partnership with FEI to develop a new product. Some of the alumni that are already working with current students stated that he found that the FCP was a fantastic initiative and he believed that it is the best way for the integration between industry and university.

Most Projects were in Computer System and Information Technology area. The typical project involves developing some hardware and the necessary software to make it works. As it can be seen in table II, most projects intended to develop a new product or improve an existing one. "My project tried to reduce the cost of vehicles security systems. It was not an innovation but a cheaper and competitive alternative for the market", said a member of the Mobile Tracer project.

As for the projects results, the research pointed out that they were mostly used as prototypes for new products, and some of them eventually reached the market. The most usual answer is that some modules were good as base for future developments or parts of them are now being used in other projects".

Despite being only 15% of the total, some projects reached the market: "I developed an Internet management system through cable TV (the DSAudit, already patented), that was concluded as the first of the world". The next section describes some products that resulted from these projects.

## PROJECTS

In the recent years several products were developed by teams of students working in real industry problems. Some of them reached the market, as the ones described in this section.

The "Automated System for Consumer Flux Control" is a completely automated system for monitoring the entrance and exit of customers in a large group of department stores, supplying reports that facilitate decision making. It is based on 2 microcontrollers PIC 16C65A, a microcomputer and optical sensors. This work arose as a necessity of a large commercial group to control the client movimentation in its 14 stores, spread all over the country.

The "Arterial Oxygen Saturation Meter" is a device capable of measuring the rate of oxygen in the patient's blood and his heart frequency without invasive proceedings. It is based on the spectrometry analysis of the color of the blood.

"Cardiac Biotelemetry": the goal of this telemedicine project was the development of a equipment that facilitates the recording of electrocardiogram signs anywhere that the patient is and allows the transmission of the data through a telephone line. With this equipment doctors are able to check the patient conditions at all times, enabling cardiac patients to live a normal live.

A "Decision Support System" applied to the development of computer networks based on the ATM technology. The project goal was the creation of a system which enables the network designer to find the best solution for the specification and dimensioning of an ATM based network, and with this obtain a better composition, standardization and organization of the projects.

A security related project is the Security System Based on Signature Recognition. This software is responsible for access authorization on a Windows NT 4.0 network, relying on *on-line* signature recognition technology to check if the user, trying to log, on is registered. The software, called "Alcatraz", adds security to the netlogon procedure used by Microsoft NT, which is based on password check. As the system analyzes the user's signature, it can detect non-authorized login attempts of any person who has found a user's password, but cannot reproduce the user's signature.

## CONCLUSION

FCP's were extremely important in completing the student formation, with a professional orientation, and they had a considerable influence in helping the students to obtain good posts in demanding high-tech careers. Some private enterprises also invested in the projects and/or are making use of the FCP's outcome for new technological applications.

FCP have proved to important not only directly for the students but also for companies so that they know where to recruit the right professionals for their needs, and all this strengthens the image and reputation of our university and the students formation.

We conclude with a student statement that sums up the spirit of the projects: "Until today my Final Course Project enables me to work with several new and interesting techniques".

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