COLLABORATION BETWEEN COLLEGE AND INDUSTRY

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Abstract: While the industry is looking for fresh engineering graduates equipped with strong theoretical and application skills, the curriculum of engineering schools in Turkey mostly cover theoretical concepts. This yields the industry to practically train new employees to fulfill the job requirement. Thus, this is not only financially hurts the industry, but also resulted in less productivity.

In order to address this issue, Higher Education Council of Turkey established a new educational stream called School of Technology where their graduates have been trained by both theoretical and application oriented curriculum. While 40 percent of the degree work is based on practical courses, also the students are required to complete a full semester working in the industry.

There are 21 College of Technology in Turkey that train engineers in different areas of engineering, such as software engineering, energy system engineering, automotive engineering, mechatronics, digital forensics, etc. Since, the knowledge management between schools and industry is very important to train students as an initiative manner and offer them a qualified training in the industry; we created a new regulation and built a new flow chart management system that has been applied to our students at Firat University.

In this work, a survey has been applied to the industry personnel to evaluate our prior evaluation system for internships to discuss about its strengths and weaknesses. Then, we discuss about a flow chart management system created to follow the success of the students during their workplace training in the industry. Considering our new flow chart and findings from the survey, we will not only evaluate the student success, but also discuss the possible improvements on the Schools of Technology’s programs.

Keywords: Flow chart management system, Knowledge management, School of technology.

1. INTRODUCTION

Engineering profession expects strong theoretical and experimental foundations from its employees (Dehing et al, 2013). It also requires skills in human relations and critical thinking from the workforce (Bean & Weimer, 2011). Today’s engineers must also keep up with continual technological and organizational change in the workplace with an active participation in professional activities such as workshops, seminars, and discussion sessions (Machekhina, 2011). Despite all these necessity the engineering education still remains limited to teacher oriented sessions, with lots of one way interaction with black board usage of the instructor (Wang et al. 2010). With not introducing enough hands on experience opportunities to the students, industry is having difficulty to hire fully equipped personnel (Ergin et al 2012). To overcome this problem, developments in student-centered lab sessions were introduced for a number of engineering major classes, but those also had relatively little impact on the student readiness for the workforce (Mills & Treagust, 2003). In order to fill the lack of hands on experience of the students, the Higher Education Council in Turkey approved the universities to offer College of Technology which combines the theoretical knowledge with problem-based and project-based learning, and industry (workplace) training. Although the component of workplace training is enforced by the council, there is no information provided by them to manage this part of the education. However, there is a vital need to create a flow chart management for workplace training activity to evaluate the training success and to make sure students are assigned to work in a recognized company while improving their knowledge and practical skills.

Therefore, in this study, first the importance of this newly established Colleges of Technology is discussed. Second, the differences between those two colleges are shown. Third, a feedback type survey that is applied to the internship supervisors at companies related to the prior internship experiences is discussed. At the end, based
2. ENGINEERING EDUCATION TYPES IN TURKEY

There are two types of engineering education in the Turkey, one from given by the College of Engineering and another given by the College of Technology. The one given by the College of Engineering is established mostly on theoretical concepts. Specifically, only a few of the courses have supported by laboratory sessions. For example, considering the department of mechanical engineering at a College of Engineering, the courses like Strength of Materials, Material Sciences, Machine Tools, Fluid Mechanics, Thermodynamics, Heat Transfer, Heating and Cooling, Machine Elements, and Computer Aided Design, etc. are taught mostly theoretically. Including the theoretical foundations, some courses, such as Computer Aided Design and Machine Tools, are supported by laboratory work as well. These laboratory hours are either one or two hour sessions per week. In these labs, usually the students are separated into groups and each group conduct experiments on a workbench.

There are strong arguments claiming that it is not possible to do enough experiments of a whole curriculum of the technical courses with limited hours of lab sections (Litzinger et al. 2011; Cengel & Boles, 2006). The students graduating from the engineering colleges are not very practical oriented. Therefore, the industry is hesitant to hire these engineers who are not fully ready for the work environment (Sugayama, 2011). Also, the new employed engineers are not fully confident to do the job when they start working in the industry. That is why, usually, the authority is shifted to the masters who use and steer the tools. To overcome the lack of practice problem of new hirings, companies established their Research and Development centers to train these new employees (Farr & Brazil, 2010). Although this is beneficial for the companies in the long run, it will delay the expected outcome from the new employee and also add extra cost for running the business (Farr & Brazil, 2010).

Because of the stated deficiency, The Higher Education Council of Turkey (YÖK) has established a new college, called Technology, in order to educate engineers whose theoretical knowledge is supported and improved by the practical work. These colleges have founded at the state universities where the College of Technical Education was existed. College of Technical Education was founded in 1983 and the main goal of these colleges’ was to train technical teachers for vocational high schools. The growth of these colleges was not planned according to the need of qualified technical teachers, which yields to oversupply of graduates. Especially within the last decade, this yielded to most of the fresh graduates’ not obtaining a position at high schools. Therefore, the Higher Education Council decided to replace these colleges with technology to overcome the struggle that the companies are having with engineers. In detail, the laboratories and buildings of the colleges of technical education were conveyed to the colleges of technology. A big part of the faculty of Technical Education who fulfilled the requirements has been transferred to Colleges of Technology. Therefore, although the college of technology has been founded in 2009, their physical infrastructures have been well equipped and these new colleges have started to perform with enough faculty members.

3. DIFFERENCES AT COLLEGES OF TECHNOLOGY

Colleges of Technology were founded at 21 different universities in Turkey. The curriculum of these colleges meets all major related requirements of the Colleges of Engineering. Same as College of Engineering, the program also includes the requirement of having two (summer), 5 weeks each, internships of the students at the end of their sophomore and junior level. Besides the internship requirement, a semester of workplace training is included into the curriculum so that the students are required to work in the industry before they graduate. The students take this training in the industry in their senior year. In the chosen semester, the students are required to
work full time in their job and share weekly work reports with their advisors. The students also have the option to combine internship activity with the workplace training after their junior year, which makes the student to work about 7 consecutive months for the company.

Specifically, the workplace training is offering the following phenomenon to the students:

- To introduce work environments related to their bachelor programs,
- To improve their knowledge and skills that the students gain during their studies,
- To combine theoretical and practical knowledge,
- To build a network between themselves and company personnel at the workplace,
- To recognize technical development occurs at the industry.

4. FLOW CHART FOR MANAGEMENT OF THE WORKPLACE TRAINING

4.1. SURVEY STUDY

College of Technology’s students have been conducting internships at variety of jobs in different cities. The only mechanism to check and assess their internship work is the report created by the student with a signature of the supervising employee (mentor). Due to the amount of time to be spent at workplace training and to have accurate and better evaluation of the student performance, the management of the workplace training needs to be conducted more systematically. Therefore, first we created a survey to supervising employees of the internships at the companies to fulfill the necessity we discussed above. The survey was distributed to the supervising employees of the interns within the last two years from College of Technology. 63 participants responded to the survey. According to the results, 84% of them strongly suggests to have an industry coordinator from the universities to make site visits to the company for not only evaluating students, but also create a common understanding about expectations from the company and internship. Additionally, 89% of the participants would like to see a board at the college level to be the contact point for student internship and workplace training issues, such as having common dossiers, common dates for announcements, student insurance issues, etc. In another question, as shown in Fig 1, 56% of the participants would like to see the students combining their internship with workplace training to spend more time on a particular job area to improve skills and to be more productive, while the rest of them argues that the students needs to be exposed to other work environments and job areas to grow strongly in their major.

![Fig1: Combining Internship with Workplace Training vs. Separation of Internship from Workplace Training](image-url)
As reflected in Fig 2, 91% of the participants feel more confident to hire an employee who conducted their workplace training at same place as long as the performance was satisfactory, compared to another unknown candidate coming from a top tier school.

![Graph showing rate comparison between hiring a previous trainee and hiring another person from top tier university.](attachment://graph.png)

**Fig 2: Decision on hiring of a previous trainee**

### 4.2. WORKFLOW CHART

As mentioned earlier, tracking the students is vital during the workplace training. Therefore, based on the survey results and expectations from the training we have created a flow chart to describe the responsibilities of each individual in both from the university and industry. The flow chart is shown in Fig 3.

Each individual listed in the flow chart has responsibilities and duties. These are stated below.

**Student Advisor for Workplace Training:** This is a faculty member of the department who serves as the advisor for the students. The responsibilities include, but not limited to, deciding the industry area that the student should focus on for training and scoping down the areas of interest.

**Industry Coordinator from the University:** This faculty member is designated by the Dean of College and the Department Chair and his/her duty is to coordinate the Workplace Training using the regulation. This is a person who will also go to the company to inspect the students and evaluate the Workplace Training at the company and also hand out the Workplace Training Inspector Form to the Workplace Training Commission of the Department. Additional responsibilities are:

- To decide the companies where the Workplace Training will be conducted,
- To determine the content of the Workplace Training dossiers and work flow chart what the students should prepare during the training,
- To prepare all documents and fill the forms at the beginning of the each semester and to evaluate the Workplace Training dossiers of the students at the end of each semester,
- To provide duties that the Board of Workplace Training of the College determines,
- To steer the Workplace Training using related regulation and rules,
- To solve problems occurred during the Workplace Training and to inform the Board of Workplace Training of College about the unsolved issues.
**Workplace Training Commission of the Department:** This commission is responsible for the steering of the procedures, administrating of the bureaucratic issues, and evaluating of the Workplace Training. This commission is composed of 3 faculty members from the department.

**Board of Workplace Training of the College:** This is a board steered by the Dean or Vice Dean of the college. Chairs of the departments and College-Industry Relations Coordinator are also the member of this board. The main responsibilities of this board are:

- To determine the workplaces where the trainings will be conducted,
- To prepare the Protocol of the Workplace Training,
- To plan, coordinate and implement the Workplace Training,
- To collaborate with the related industry and to establish information systems about supplying the Workplace Training for the students,
- To supply and follow health insurances of the students,
- To notify the students about regulations, deadlines, etc.,
- To prepare the forms and documents that will be used in the Workplace Training,
To inform the students about their training places,
To determine and announce the content of the Workplace Training dossiers that the students should prepare during the training,
To provide steady maintainability of the regulation and the rules of the Workplace Training,
To solve problems and missing components related to the Workplace Training,
To conclude the Workplace Training evaluation results prepared by The Workplace Training Commission of the Department.

**College of Technology:** The dean of the College of Technology is the top responsible and authority person. Dean's duties are following:
- Establishing the Board of Workplace Training of the College and designating the College-Industry Relations Coordinator.
- Approving the Protocol of Workplace Training that will be signed with Workplaces.
- Notifying of Student Registrar Office about the evaluation results of Board of Workplace Training of the College.

**College Industry Relations Coordinator:** The main responsibilities of this position are to provide coordination and communication between the college and industry in terms of Workplace Training. Another duty would be solving the problems occurred during the Workplace Training and to inform the Board of Workplace Training of the College about the unsolved issues.

**Mentor:** The followings are the responsibilities of the student’s mentors.
- Help to improve the students' knowledge and skills that the students gained during their theoretical and experimental studies at the colleges,
- To provide weekly plan and responsibilities to the students,
- To take responsibilities of the students during their Workplace Training,
- To expose students with professional competence and discipline,
- To evaluate the weekly prepared Workplace Training dossiers and activities of the students,
- To hand out the Evaluation Form of Workplace Training of the students to the Workplace Training Commission of the Department in an enclosed envelope at the end of the training,
- To discuss about student progress with the Industry Coordinator from the University

**Education Coordinator from the Industry:** This is the person who is assigned by the Director of the Company and s/he owns at least Bachelor of Science degree to designate students to a department according to the companies needs. Besides allocation of the students to a mentor, this person is responsible for:
- To provide accommodation, nutrition, and social facilities for the students what the Work Place supply for their personnel,
- To do necessary orientations for the students,

**Director of the Company:** This is the person who signs the Protocol of Workplace Training in terms of governmental or private institutions in the country or in abroad.

**The Duties and Responsibilities of the Students:**
- The students must conduct their Workplace Training at a company where they are assigned,
- The students must apply weekly work plan during their Workplace Training,
- The students must obey all rules of the regulation and Students Discipline Regulation of Higher Education Council,
- The students must hand out Weekly Study Report to the Officer of Workplace Training at the first work day of following week,
- Each student must prepare a Workplace Training Dossier,
The Workplace Training Dossier can be supplied by the related Department Secretary.

A Workplace Training Dossier consists of a cover page with the identity information of the student, Agreement of Workplace Training, Weekly Work Plan of Workplace Training, Weekly approved reports prepared and signed by the student, Inspector Reports of Workplace Training and Final Evaluation Form prepared by Officer of Workplace Training.

Workplace Training Dossier is kept by Officer of Workplace Training during the training and at the end of the training this dossier is handed out the Workplace Training Commission of the Department.

The students must hand out the Workplace Training Dossier at latest in a week to the Workplace Training Commission of the Department at the end of the training or the dossier can be sent via registered post.

If a student does not hand out the dossier in the determined time period, the Workplace Training will be counted as invalid.

5. CONCLUSIONS

In this work we have compared the newly created Colleges of Technology with the Colleges of Engineering. This new college’s curriculum contains workplace training to have hands on type experience for the students. According to our survey study, all of the participants looked positively for the workplace training requirement of this new college. However, we observed that their main concern was the administration of this process and contact points in the university. Therefore, since there was no framework which reflects the management of this activity, based on the feedback that we received from the industry, we offered a flow chart management system. The model is created in a way so that the responsibilities of each party are laid out clearly and there will be designated contact points both from the university and industry. With this model, we expect to see a strong collaboration and interaction between the university and industry. With active collaboration among personnel we expect to assess the quality and observe the outcomes of the training in a more direct way and objectively. Since the first stream of the students will start conducting their workplace training during 2013 and 2014 academic year, in the near future, with receiving data from the students and industry, we would be able to pinpoint missing portions in the flow chart and modify it based on the feedback.

REFERENCES


