A Cooperative Project-based Business Engineers' Model for Regional Universities Running ABEEK Program

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Abstract

This paper suggests a realistic, business engineers' model based on cooperative projects run by regional universities or colleges, in which students must meet the guidelines for engineering design that ABEEK requires. Many of the current activities such as cooperative programs and internships aimed for engineering undergraduates have not led them either to a satisfactory level of entrepreneural business skill, or to increased employment opportunities. Under these circumstances, we need a revised version of cooperative activities for example: launching a project that will be fully supported in trust by both sides, and thus improving students' business skill while they are working on that project. This study demonstrates how students have greatly improved their business skills through a model project that was planned by a working group, successfully carried out real job demands, and many of the students in the working group received job-offers, as this new model suggested.

I. Introduction

Due to the global regression, industry all over the country is reducing their capacity for new employment, automatically resulting in increased youth unemployment. In the meantime, many individual companies have a shortage in their work force and are requesting "well-trained" university graduates.

In this paper we attempt to suggest some efficient solutions which will satisfy both parties, the companies and recent university graduates, by identifying basic problems lingering around the current situation, and by diagnosing why the problems cannot be easily resolved.

It is unsure how the newly design-oriented courses will help improve students' business skills, even though those courses have been offered as ABEEK (Accreditation Board for Engineering Education of Korea) programs [1]. As known, ABEEK shall establish accreditation criteria and administer the accreditation process based on these criteria which address educational objectives of program, educational outcomes, assessment method, professional components, faculty members, facilities, funding and program criteria. These criteria are applied with discretion and proper judgment to reflect specialization and differentiation among educational programs. In reality, the contents of the design based courses are limited in instruction times and in weight-placement.

Few students would take project-courses, which were based on design and manufacturing, at the expense of hard work and time consuming efforts. Those courses proved to be not for everyone. Also, universities have made several attempts to increase the employment rate, including customized cooperative programs and internship programs. Efforts, like these, did not prove to be worthy. These programs could shake regular curricula and senior courses resulting in the insolvency of them.

Here upon, a project based cooperative program is presented, overcoming the disadvantages of the existing cooperative programs. A research team was organized for carrying out a project to produce recognizable results. This example was found to be sufficient in improving the employment rate and students' business skills, which were satisfactory for both parties.

This paper is composed of the following successive four chapters: current engineering education status and its accompanying problems in chapter 2; newly proposed co-op project-based business engineers' model in chapter 3; a research team for implementing the new model in chapter 4; the final chapter, suggestions for the future.

II. Existent Business Engineers' Models

1. Unbalanced supply and demand of engineers

According to the 2008 unemployment survey [2] which had been done by public media, the unemployment rate was 3.15% officially or 7.41% in sensory rate. The new employees decreased by 12,000 compared to that in the previous year. It has been proved that most universities experienced a large reduction in the employment rate at the 1st survey for the employment status done in February, 2008 [3].

Nonetheless, industry seemed to hesitate to hire new employees but were in want of capable engineers, since they had difficulties in carrying out R & D and other competitive business activities due to the unqualified, supply of new engineers. In other words, there was an odd imbalanced between engineers' supply and demand; this is not the case of an ordinary imbalance when supply surpasses demand or vice versa. In a sense, an easier solution could be found.

In that context, first take a look at the possible causes of the imbalance before rushing for a solution.

First, industry seeks only 'all-ready-made' engineers. At the same time, they indicate that universities ultimately fail to produce business engineers, especially in the quickly changing IT area.

This negative viewpoint involves the following:

- University graduates need to start over with their job training when employed in the industry
- Even high GPA (grade point average) holders work poorly
- Industry has no idea what has been learned in universities
- Professors fail to support businesses with skillful students

On the university side, they are not vocational *status quo* but are responsibile for finding an appropriate solution. As mentioned before, industry's accusation against universities can be summarized as follows:

- One way communicated curricula
- Too basic lab classes
- Insufficient extracurricular counseling or mentoring
- Lack of trustworthy networking between industry and academia

Also, some regional universities intrinsically have students who lack 'necessary' business skills due to their unfortunate circumstances comprising 'evasion for science-engineering.'

And some others are:

- Anxiety about not getting jobs closely related to their majors
- Defeated mind arising from incapable business skills
- Insufficient English proficiency

The psychological pressures like these are apt to make undergraduates passive, in developing business skills, resulting in failure in improvement and more specifically, failure to understand how majors are connected to real jobs, ignorance of how to train major-grounded business skill, and no self-motivated study.

A more serious problem is that graduates wander to jobs which are far different from their majors. That prevents them from enhancing their business skill. That consequently can result in a preference for big companies, hypersensitiveness to the current employment rate, attaching weight on learning foreign languages, and partiality to seek public service jobs. Under these circumstances industry and academic applicants become mutually alienated, and then industry might have the following difficulties:

- Difficultly verifying the ability of an applicant by just their resume
- Hard to judge personality and ability within a limited interview time
- Too much investment in job-training after hiring
- Hard to employ appropriate personnel at a reasonable price

Solutions to the above problems are hard to find by either the university or industry, and plausible suggestions are desperately asked by each side.

2. Problems and their solutions to the existent programs

For last few years a variety of ways to improve the employment rate for university graduates have been attempted.

Two of them are customized cooperative curriculum and internship programs.
The customized cooperative curriculum is focusing on establishing an official agreement with industry, reshaping the curriculum into a more industry-oriented one, and, therefore, elevating the employment rate with a reduction of cost for training new employees.
The customized cooperative education requires reshaping the current curriculum into what companies need most. In the process, some courses are very closely related to a company's products which are too popular and applicable. That raises a couple of questions like:
1) frequent revision of curricula where companies' demand on hot and popular products or technology prevails 2) too product-oriented curriculum, only providing with vocational contents of education 3) not enough instructors' pool to keep up with the short-life product cycle 4) too rigorous education frame for students to be self-motivated.
Considering all the risks for customized cooperative education, it aims to reform curriculum, not to develop business skills. That is, its goal is to raise specialized engineers in a narrowly specified area. Those good examples are found in areas of display control or display materials, where electronics or materials engineering cooperates with display manufacturers, so it is an informative security area.
An internship program is designated in order for students to have opportunities of working in industry before graduating, resulting in an understanding of real work place demands and better preparation for jobs on the students' side, and pre-occupying work force, leading to decreased training cost of new employees on the industry's side.
However, many of the internship programs recruit students who were not ready and then do not perform well at their job. As a result, companies are reluctant to hire new, unverified interns. According to a survey, only a few of internship trainees were found to get a job at the partner company.
If internship programs are linked to credited courses, the other courses for seniors are apt to be affected negatively and the participants are sometimes alienated from the advantage that they are supposed to take.
Another option for improving the employment rate will be a placement exhibition. It provides an information exchange between applicants and employers, and can also expand mutual sample space for timely encounters. A third party often plays a big role in the higher employment rate through an organized advertisement.
Placement exhibitions, however, create some issues to think about. Applicants cannot be pre-selected and therefore, efficiency in the process is low. In that case, companies just try to use the exhibition for self-advertisement to the multitude, not for new employment.
As stated in section 2, some suggestions for existent Business Model programs can be summarized as customized education: operation of flexible curricula, internships as ready-made work force, and placement exhibitions, need to be well-organized for competitive employment opportunities.
To develop and operate successful cooperative programs, both academia and industry need to make an effort to understand the basic problems and to resolve them through sincere cooperation. Academia should prepare a long-term curriculum including the practice of business skills, recruit specialists, and support them.
On the other hand, industry needs try to construct an academia-industry network to improve the existent cooperative programs which would require a small investment, which would be much larger otherwise.

III. Coop Project-based Business Engineers' Model

1. Required quality for business engineers

Industry sets values on two main categories of quality: general acquirements and professional ones.
The general acquirements include personality, morale, creativity, resource management, self management and expression, readability of technical documents, and English communication skills, etc. In particular, job morale is based on mutual trust between employer and employees, which is very crucial for continuity of employment as well as for management of human resources, that may be in short anytime in small businesses.
The professional quality that industry requires are a good understanding of a specific knowledge, programming, job and system analysis, self-motivation in doing projects, adaptability to new projects, ability for effective data selection and analysis, documentation ability from planning to results, and so on. Self-motivation is a vital quality but would not be easily learned through the conventional one-directional education.

2. Current status of undergraduates' business skill

Curriculum and non-curricular activities for undergraduates are being implemented in most of the information security departments. The curriculum has been systemized as much of the related research has been done, but business skills development is far short of a satisfactory level which industry requires, with students having no more than a few hours of practical training or internship credits. Fortunately, one-third of the students are involved in improving their business skills through extra-curricular activities, specifically academic clubs. In the short-term this would be satisfactory just for them; however, in the long-run, we need a continuous, systematic supporting system to help them adapting to the future job environment which could change and evolve. Furthermore, a change is urgent because the rest, 70%, are considered to lack the abilities of self-motivation and personal growth.

3. Business skills to be developed in universities

Business skills, on the industry side, could be about commodity and its related knowledge. They are essentially peripheral but could be surely obtained through job adaptation, which universities need not to be concerned about. The core skill that industry asks universities to take part in will be the general and professional acquirements already mentioned in section 1, which are common in every industry; since every company has its own products and a different work environment.

Most small companies and businesses have a relatively larger percentage of labor expenses than larger companies, and investless in the training of new employees, thus are apt to put new employees into jobs without properly equipping them with the necessary business skill. Consequently, the new comers have less chance of being trained but have a heavy work load when starting their new job.

From this point of view, the development of business skills in universities is advantageous in many ways. Firstly, new training/education for business skills can be given as a support to the existing curriculum with a reasonable cost. Secondly, the results out of the training/education are not judged as success or failure. Also, the outcomes of training/education can be examined and utilized for future improvement. In addition, students are given numerous opportunities for developing their skills at different levels, as independent or related classes, even linked to the students' activities on campus, and eventually are ready to meet one of the goals of engineering education.

4. Cooperative Project-based Business Engineers' Model

As the procedure and managing method for resolving problems arises on projects, universities, first of all, need to provide students with skills to resolve the occurring problems and not just provide item-related knowledge of a specific area.

In order to increase problem-solving skills students need to be exposed to the environment where: various items are suggested, repetitive designing & implementation is made, and real, field issues are discussed for resolution. In other words, they are allowed to choose promising items appropriate to students' levels and current market. According to that, projects would be defined, data collected for selection and analysis, and results evaluated and assured to led to improvement.

Additionally they are asked to document all the procedures and results. While projects are in progress, meetings and consultation with the professor and graduate assistants should be on a regular basis. That would lead the students to self recognition through advice and suggestions. This process requires patience until a certain level is attained. Then the repetitive training process should increase the quality and ability of students, enhancing their macroscopic problem recognition.

Business skills training at universities not only values itself, but also provides industry with the following;

- Long-term collection of data for judging students' ability and personality
- Opportunity for periodic or impromptu discussions during student site visitation or independent study
- Selectivity for pre-contracted employees if necessary
- Mutual sharing of knowledge and results obtained from the training

To fulfill the purpose universities should set up a network with industry and based on mutual trust, form an undergraduate-centered task group comprising a professor, graduate students, and a supporting industry with specific technology for training future engineers for business skills and personal quality. On the other hand, industry should provide university with useful subjects and materials which it lacks so that the task group could take better items to

market or the real world.

Fig.1. A model case based on university-industry cooperation

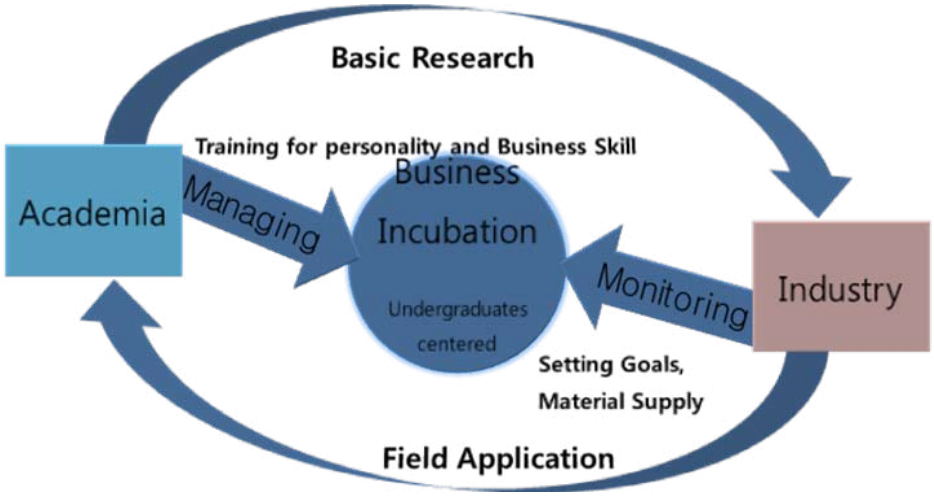

Fig.1. Shows how undergraduates can be centered in a cooperative program between industry and academia.

IV. An example model

This chapter shows how the research and development team worked on a real example and what it produced. The team was composed of two master's students and four undergraduates who were be supervised by a professor on Nov., 2005. Then, the team grew to 20 undergraduates, delegates from 5 companies, 2 master's students, 1 PhD student and a professor, maintaining 25% of their experienced crew.

1. Form an environment for business skill education/training

The team was permanently positioned in the university with support from the delegate companies. It also constructed a cyber space site, including a data server and some project management sites in order for all the related parties to share information and cooperate with each other.

Fig. 2. An internet site for project management and information sharing

A project management site in Fig. 2 was used as a window for daily reports, problem shooting, communication, or-

ders, and advice for the students' side and member management, suggestions and resolutions of occurring problems was used at professor's side as well. Some important issues from this site were discussed at the weekly meetings (see Fig. 3).

Fig. 3. On-going project site discussion cited in Fig. 2

Each member was encouraged to manage his/her experiences and achievement in their own area by writing in their portfolio (Fig. 4) on the site. In the data server one can manage various file folders such as project folder, and common and personal folders (Fig. 5). Self-tasking like this allowed each member not only to improve his/her abilities and business skills, but also to indepently evaluate him/herself.

Fig. 4. Managing the server portfolios

Fig. 5. A server manages the status and products of all projects.

Fig. 6. Some pictures taken at a workshop

The team held workshops on a regular basis where educational and/or training results were reported and discussed, where a strong bond and close cooperation among the attendees developed. The members had opportunities to improve their self expression abilities and to become community role models through the workshops which the delegate companies financially aided (see Fig. 6).

2. Results of business skill education/training

As mentioned before, various projects were initiated by the research team powered by undergraduates. The themes of the projects were granted by industry in a reasonable scale that students would be able to manage. By doing this, students could learn practical and market oriented skills while industry might use the results for its own sake, which would turn out to be a win-win cooperation for both sides. The students' achievements were listed as follows:

- Deployment of the Centralized Management System for Networked CCTV, Kyeonggi ITS: Developing Client ActiveX, Web Counterpart, and Connection Module to Networked CCTV
- Deployment of the Sensor Network in the Underground Chambers for Communication Cables, Pusan City: Porting the OS, Developing Device Drivers and CGI Interfaces
- Deployment of Environment Monitoring Network and Counting WebSite, Yeonje Gu: Message Parser, Message Compactor and Web Interface
- Development of an Alternate Apparatus Against Keyboard Hacking, Internal Project: User Interface, DB Module, Keyboard Protocol

In addition, the students were advised to publish the project results in conference papers. The list of papers published to date can be found in elsewhere [4-12]:
Most of the undergraduates who participated in the research team obtained jobs at Ahn Lab, Hauri, A3 Security Consulting, TaeKwang ENC, LinkLoad, ELUON, etc. or entered graduate school. The companies listed here are all in upper class among their areas in Korea.

Fig. 7. Companies which the team members are now working at

Graduate Year [No]		Company or Job
2005	1	Taekwang ENC
2005	1	Doctoral Candidate
2006	1	A3 Security
2006	1	Ahn Lab Inc.
2007	1	Linkload
2007	1	Master Student
2007	1	Army Officer
2007	1	A3 Security

Graduate Year [No]		Company or Job
2008	1	Ahn Lab Inc.
2008	1	Eluon Co.
2008	1	KARPH
2008		
2009	1	Hauri, Inc.
2009	1	Senior
2010	4	Junior
2011–	7	freshmen/sophomore

V. Conclusion and suggestions

This work is to suggest an example solution to the current lingering problem in the co-op programs, with the aim of improving students' business skills that the industry requests of its new employees. A research team was organized to carry out a few company-sponsored projects, through which we demonstrated this strategy might successfully work for the two parties.
However, an cooperative elaboration from industry, universities and government is needed since the projects usually bring a great deal of work to be done by students, managers, graduate and the professors assistants in charge.

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