

# MODEL OF ORGANIZING COOPERATION FOR INDUSTRY AND EDUCATION

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**Abstract** - The article reports on the experience of elaborating the cooperation model between industry and higher education in the case of Informational Technologies and Power Engineering Department of the East Kazakhstan State Technical University.

The issues of balancing between government standards and industry demands in engineering curricula are considered. Problems and their solutions are discussed in mutual relations between industry and the faculty.

*Key words: cooperation model, practical work, industry and education.*

## Introduction

As the Republic of Kazakhstan has joined to the Bologna Declaration [1] the reconstruction of higher education system is carried out according to the main principles of the Bologna Process.

It is stated in [2], “Kazakhstan entering the Bologna process must be forerun by the deep analysis and reconsidering of the existing State standards of higher vocational education specialties. At the threshold of the priority education we need to transfer from the knowledge model to the competence one. The competence approach is caused by the desire to correlate the content of higher vocational education and employees (labor market) demands”.

The topic of my presentation is one of the aspects of training process in technical higher institutions – cooperation between business and education.

At the soviet times (till the end of the 80-s) the system of interactions between industry and universities was controlled and regulated by the state. All the universities and enterprises belonged to the state that could order both sides what to do to develop interactions between each other, first of all with the aim to improve practical training of the students.

After the Soviet Union break up Kazakhstan found independence; and its economic system switched to the market principles. Kazakhstan economy has experienced great crisis, many enterprises has broken and thousands of people lost their jobs. As many enterprises tackled the problem of surviving they didn't pay much attention to the cooperation with education and manpower development. Higher education institutions were confronted by financial difficulties as well and they were trying to solve the problems of equipment renewal, training quality improvement in the conditions of the lack of budget financing.

Since the end of 90-s of the last century, when Kazakhstan started demonstrating high rates of economic growth, businesses began to pay much more

attention to collaboration with education. The problem of developing a new model of cooperation between industry and education has arisen at universities and businesses. New model should be based on mutual interests and give benefits to both sides.

Informational Technologies and Power Engineering Department is part of the East Kazakhstan State Technical University – the largest technical University of the eastern region of Kazakhstan. About 3000 students are enrolled at the Department where the following programs are taught:

**Undergraduate Programs:**

050702 Automation and Control Systems  
050703 Informational Systems  
050704 Computer Engineering and Software  
050705 Mathematical and Computer Modeling  
050716 Instrumentation  
050717 Heat-and-Power Engineering  
050718 Electrical Energy Industry

**Master Programs:**

6N0702 Automation and Control  
6N0703 Informational Systems  
6N0601 Mathematics  
6N0704 Computer Engineering and Software

**PhD Programs:**

05.13.06 Automation and Workflow Control Engineering (in specific fields)  
01.01.06 Algebra, Mathematical Logics and the Theory of Numbers  
05.25.05 Informational Systems and Processes, Legal Aspects of Computer Informatics  
05.13.10 Social and Economy Systems Control

**1. Model of cooperation for business and faculty.**

Since 2003 there has been introduced the model of “University - Technopark” Innovative University at the East Kazakhstan State Technical University [3]. As a part of it a model of interaction between business and higher education has been elaborated and introduced into the education process of the Information Technologies and Power Engineering Department.

First of all it should be mentioned that industrial and business enterprises are the main consumers of the Department output – qualified specialists. The heart of the model is that the cooperation between business and the Department is to be introduced at all the stages and levels of the “production process” of the department: teaching, science, certification, raising teachers’ skills, and so on.

So the cooperation has been divided into the following levels:

Teaching process:

- participation of industrial partners in syllabi development;
- participation of business representatives in education process;
- organization of all kinds of practice for students.

Science process:

- conducting joint scientific projects with businesses;
- conducting joint scientific practical conferences.

Certification process:

- participation in the work of State Certification Committees;
- assistance in determining subjects and supervising degree works of the students of the Department;
- reviewing degree works and projects by representatives of industrial companies;
- holding competitions of the degree works judged by IT companies.

Mutual raising the level of the skills:

- getting extra higher education by workers of a partner-industry;
- certification of the students and the teachers of the Department.

Organizational process:

- organising the regional round of the International Programming Competition;
- establishing the branches of the Sub-departments at the Companies.

## **2. Introduction of the model.**

In this presentation I would like to focus on the experience of the introduction of the model of collaboration between Information Technologies and Power Engineering Department and IT and power companies.

**Teaching process:**

- *participation of industrial partners in syllabi development;*

The collaboration with business in study programs forming implies that the business proposes to include some new disciplines in study curriculum. It helps to the graduates to get more desirable skills and knowledge for future employers. The Faculty conducts surveys and inquiries among the employers to collect their proposals on including some new disciplines to the study curriculum.

But some contradictions appear between State Educational Standards requirements and wishes of business as main consumer. The curriculum of each program is formed on the basis of State Educational Standards which prescribe the about 60-70% of number and content of disciplines. Also there are some restrictions on the maximum number of credits, forms of assessment, consequence of study process.

- *participation of business representatives in education process;*

In 2006-2007 academic year the following courses have been taught by people whose main field of work is industry and business: “Process Approach to the Informational Systems Design”, “Microprocessor-Based Complexes and Systems”, “Microcontrollers in Measurement and Control Systems”, “Automation of Technical Systems”, “Automation of Technological Processes”, “Relay protection” and so on.

- *organization of all kinds of practice for students.*

According to the syllabi of all the specialities which are based on the State Educational Standards, bachelor level students should pass three types of practical work: study, production and pre-graduate. Each type of practice plays its own part in the education process and is to provide mastering of practical skills in the real production environment. Partner companies in various branches of economy play decisive role in organizing practical work for students. When a student is assigned practical work there is an agreement signed between the company and the University. It prescribes rights and responsibilities of all the three contractors: the University, the Company and the Student.

A few years ago we experienced serious difficulties in providing our students with places for practical work, especially at large enterprises. The reason was their owners didn't want to spend their time and resources on training young people. The University authorities have had to negotiate with the company management and to convince them to take part in the training process of the students.

Now the problem is partly solved and our students get practical jobs according to their speciality. For example, IT students get practical work as programmers, network administrators, technicians; Automation and Control, and Instrumentation students as trainees at automation departments of large enterprises. The places of practical work for Power Engineering students are large power supply and heating companies.

### **Science process:**

- *conducting joint scientific projects with businesses.*

The Scientists of the Department conduct joint scientific projects with business companies in the fields of software design, developing automation systems, power supply and heating engineering.

For example, in 2006-2007 we have developed the following certified software along with “1C- Rating” company: “1C- Rating: Guidance Hot Line”, “1C- Rating: Training Unit”. We have also completed some work on programming and debugging of control systems for heating units together with “Iron Technics” company.

- *conducting joint scientific practical conferences.*

Since 2006 the Department and “1C-Rating” IT Company conduct annual joint scientific practical conference “The application of “1C” company software at the educational institutions of the Republic of Kazakhstan”. All the financial expenses are covered by “1C-Rating” company. Besides the workers of partner companies take part in various scientific conferences which are conducted at the University as speakers or participants. They also have possibilities to publish their papers in the University scientific journals.

### **Certification process:**

- *participation in the work of State Certification Committees.*

Every year high rank business representatives take part in the work of State Certification Committees of the Department for final examination and assessing

degree works of graduate students. Taking part in the Committee work gives them a possibility to assess the level and the quality of education process at the Department and to select potential employees for their companies. As a result the chairpersons of the State Certification Committees, who also are the top managers of large companies in the field, work out the Report for the Ministry of Education and Science. In that report they give their assessment of the quality of graduating students, point out the shortcomings and make their proposals to improve education process.

- *assistance in determining subjects and supervising degree works of the students of the Department.*

The following subjects for degree works have been proposed by the industrial partners: Software Design at the request of enterprises; Development and Enhancement of the Systems of Control and Monitoring Technological Processes of a Modern Enterprise; Development of Real Projects of the Systems of Heating and Power Supply for Small and Middle Industry.

- *reviewing degree works and projects by representatives of industrial companies.*

According to the Regulations on Final Certification each degree work should be reviewed by an external examiner. So, the best external examiners are business representatives, people who work in the field and therefore can identify practical value of the degree work and discover mistakes. About 80% of the Department degree works are reviewed by representatives of industrial companies.

- *holding competitions of the degree works judged by IT companies.*

Since 2005 the Department holds two competitions evaluated and sponsored by two IT companies. The aim of these competitions is to discover talented graduating students and to offer them a job.

### **Mutual raising the level of the skills:**

- *getting extra higher education by workers of a partner-industry.*

Some workers of partner companies are enrolled at the department as part-time students getting second education or raising the level of their skills. They are distinguished by a very high level of motivation and knowledge of the practical part of their speciality. They come to the Department to get a reliable theoretical foundation for their skills and to obtain new career possibilities. But sometimes they experience some difficulties combining work and study. In that case the Department helps them in working out individual schedule for exams and courses.

- *certification of the students and the teachers of the Department.*

Taking into account that the rating of the university graduates at the labour market could be much higher if they are certified by various software products, the “1C” company conducts training and certification of the students and teachers of the Department at a reduced price. Every year the number of students certified by such special courses on configuring the “1C-Enterprise” software as “Main Objects”, “Solution of Accounting Tasks”, “Solution of Operational Tasks”, “Solution of Calculating Tasks” is rising. Besides four teachers of the Department

have taken free training courses and certification by various software products in the last 2 years.

### **Organizational process:**

- *organising the regional round of the International Programming Competition*

Since 2004 “1C-Rating” IT Company annually conducts regional round of the International Programming Competition for higher education institution students. The winner of the regional round is to be sent to the final round in Moscow. The results of participation of the students of the Informational Technologies and Power Engineering Department at this Competition show their high level of competitive ability. In 2007 Dmitriy Bychenko, a 3<sup>rd</sup> year student of the Department, became the absolute winner of the Final Round in Moscow.

- *establishing the branches of the Sub-departments at the Companies.*

One of the most important forms of interaction between industry and education is the establishment of the sub-department branches at the companies.

The main form of work at these branches is organising practical work for students of the Department, such as: study practice, industrial practice and pre-graduating practice. Besides the staff of the sub-department branches work as teachers and degree work supervisors. Some laboratory classes could be organised at the modern high technology enterprises.

During the last 3 years 14 branches of the Department sub-faculties have been created at the various companies of IT, Heating, Power Supply and Automation fields.

### **Conclusion**

The experience of elaborating the cooperation model between industry and higher education in the case of Informational Technologies and Power Engineering Department of the East Kazakhstan State Technical University shows that in the heart of such a model should be placed mutual interests of both sides. Industry should be considered as “consumers” of the qualified workers, and the Universities should be considered as “producers”. The collaboration will be fruitful if both sides apply enough efforts to it.

### **References**

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