

Higher IT Education: Ways of Development

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ABSTRACT: *Development of modern software demands today joint work of special project team consisting of project manager, product manager, system analytic, one or several programmers, tester, logistic. The success of the whole project depends not only on qualification of each project member but on proper management of the project.*

Project management means proper delegation of responsibilities, development of time table of all project activities, control of fulfillment of tasks, coordination of necessary project changes and, at last, successful implementation of the project. Besides professional knowledge in software engineering project manager must have practical management skills which allow him to manage project team and successfully finish the project in time.

What knowledge must have graduates of IT-specialities? Besides of professional knowledge in software engineering they must have special knowledge in management. Most of IT curricula at Russian universities are oriented to give students theoretic IT courses only. One or two courses of management theory which are usually included into IT curricula can't positive influence the situation.

Who is called an engineer? At first, this is a manager who has good knowledge in professional technical field. Our graduate mostly looks like qualified "technical person" only, not manager at all. Could the process of transferring to international curricula "Bachelor – Master" improve the situation? Most probably – not because in new curricula main stress will be out on IT courses not on formation of management skills. We must look at standards of professional software companies containing principles of project management and include such courses into university IT curricula.

Traditional educational approach can't give to student real practical management skills during university. We can solve the problem by using innovative methods of students focused training based on problem oriented approach by means of students business incubator

The other problem of modern university IT-education is what to teach in the field of information technology. Russia is traditionally famous for its theoretical education in physics, mathematics. Most of IT curricula have deep courses in Mathematics and in theory of software engineering, less attention is given to professional courses in programming tools, concrete data bases and so on while very often IT labour market demands practical skills in definite software (like C#, VB, Oracle, MS SQL, Java). It takes time for a university graduate to get this skills. The problem could be solved by including into the curricula professional courses together with theoretical subjects.

HIGHER IT EDUCATION: WAYS OF DEVELOPMENT

IT-business today differs from what was 10-20 years ago. Information technologies play an important role in all fields of business. Most of companies include position of IT-director into Directors Board. Development of modern IT-projects demands today, at first, special analytic skills used during definition of information processes and formulation of task for software development, then joint work of special project team consisting of project manager, product manager, system analytic, one or several

programmers, tester, logistic. The success of the whole project depends not only on qualification of each project member but on proper management of the project.

What do we mean by project management? At first, proper delegation of responsibilities, development of time table of all project activities, evaluation of project's risks, control of fulfillment of tasks, coordination of necessary project changes and, at last, successful implementation of the project which includes also training of staff who will work with developed software and who will support it. One of the key aspects of the success of the IT-project is motivation of the project's team and the same time the company's staff who will implement developed software.

Obviously, besides professional knowledge in software engineering and in information technologies project manager must have practical management skills which allow him to manage project team and successfully finish the project in time. At the same time all team members must know how to work in team and have strong motivation for project development.

From this point of view, what knowledge must have graduates of IT-specialities? Besides of professional knowledge in software engineering they must have special knowledge in management. At the same time, most of IT curricula (like "Software Engineering", "Information Systems and Technologies", "Applied Informatics") at Russian universities are traditionally oriented to give students theoretic courses mainly that's why graduates of universities do not management skills at all. One or two courses of management theory which are usually included into IT curricula can't positive influence the situation. According to the results of interviews of top-managers of IT companies in the Volga Region, one of the most stable economic regions in Russia, the quality of programmers and software developers is very high but there is real lack of qualified IT-professionals who are able to manage software projects or IT departments or IT-resources. Mostly staff of IT-departments consists of technical specialists only. It prevents business from rapid growing.

Let's formulate main skills which are necessary for modern IT-managers:

- Development of informational models of business-processes;
- Monitoring of modern information technologies implementation of which could increase the effectiveness of business
- Development of company's policy in informational systems and IT;
- Management IT-projects;
- Management risks connected with IT-projects development and implementation;
- Coordination of interests of users oriented on short-time demands and interests of developers oriented on planning implementation of new technologies.

Now we could finalize main knowledge and skills necessary for IT-manager:

Information technologies, management, analytic skills.

Let's try to remember – who is called an engineer? At first, this is a manager who has good knowledge in professional technical field. Our university graduate mostly looks like qualified "technical person" only, not manager at all. The 5 year-curricula leading to Engineer Diploma are planned so that typically 2 first years are devoted to theoretic courses in Mathematics, Physics, Humanities, Informatics, Theory and Methods of Programming while the last 3 years - to development of practical skills in programming. Typically diploma project represents development of software. As a result – good knowledge in software development mainly in programming.

Could the process of transferring to international curricula "Bachelor – Master" improve the situation and give university graduates necessary skills? Most probably – not because in new curricula main stress will be out on IT courses not on formation of management skills as well.

How could the problem of preparation IT-managers in frames of university education be solved today? At first, we must create specializations "IT-Manager" and "IT Service Manager" within standard engineer curriculum, for example, within "Information Systems and Technology" speciality. The specialization covers the last 2 years of university education and its curriculum includes such subjects as Management, Marketing, Staff Management, Project Management, Modelling of Business Processes, Theory of Decisions, Development of Information Systems, System Integration and others. Process of teaching must be oriented on active methods (development of real projects in teams, case studies, business games). Secondly, we analyzed standards of software companies like Microsoft, Oracle which are very popular between software developers and IT-managers, for example, Microsoft 70-100

certification exam (“Analysing Requirements and Defining Solution Architectures”), containing principles of project management, and included such courses into university IT curricula.

Now let’s look at the problem from the other side and ask reasonable question: is it really possible to give to 21-22 years old university graduate real practical management skills during university education already? If we use only traditional educational approach then the answer will be “No”. But we can solve the problem by using innovative methods of training based on students focused problem oriented approach. Effective way of realization of such method is students business incubator which allows to teach students by real practice. Students business incubator (BI) set up at Saratov State Technical University (SSTU, Russia) evidently showed the success in getting practical business skills in a short period (1 year). Last year students or graduates who wish to start their own IT company or to get management skills begin to develop real software projects, communicate with customers. They fulfill all stages of business cycle including first stage: analysis and the last one: implementing the project. University provides facilities, consultancy, book-keeping, business training based on active methods. Initial funding which students get from the university is not sufficient for starting of business but enough to get business experience. Main idea is to learn by practice. Students learn how to work in project’s teams, how to solve problems appearing during the project development and interaction with the customer. 65% students passed through BI consider motivation of project’s team to be the most difficult problem in IT-project development, 30% - interaction with customers.

Each students team has its own consultant (tutor) who helps to understand current problem and to solve it. The main idea of tutors activities is to help the project’s team in but not to manage it. The role of tutor is fulfilled by experienced IT-manager. After 1 year students could continue staying at business incubator or leave it for their own business. 4 years of successful business incubator activities at SSTU shows very high effectiveness of this way of training – 99% of all BI graduates have found good job at managers position in IT companies or started their own business. BI curriculum could be used as curriculum for specialization “IT-Manager” or as curriculum for professional continuous education or as curriculum for Master Degree for those university graduates who would like to get management skills and make career of IT managers.

The other important problem of modern higher IT-education is what to teach in the field of information technology. Russia is traditionally famous for its theoretical education in Physics, Mathematics that’s why most of IT curricula have deep courses in Mathematics and in Theory of Information Technologies, less attention is given to professional courses in programming tools, computer networks, concrete data bases and so on while very often IT labour market demands practical skills in definite software (like C#, VB, Oracle, MS SQL, Java). It takes additional time for a university graduate to get this skills. Today this problem is usually solved by computer training centers providing short-term courses in software. University departments responsible for IT-education must monitor professional software and demands of labour market and include dynamically into the curricula corresponding professional IT courses together with theoretical subjects.