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Ways to Improve Engineering Students' Economic and Management Competencies

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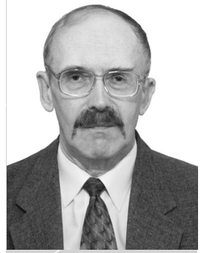

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The paper analyzes the requirements to present-day engineering graduates. The authors have proved that the profound knowledge in economics is necessary for engineering students. The ways to develop economic and management competencies of engineering students have been suggested.

Key words: engineering work, economic and management competencies, economic way of thinking, current labor demand, innovation in manufacturing, feasible engineering alternatives.

Today's post-industrial economy stipulates the character of engineering work and professional attributes of technical universities' graduates, who currently need well-developed economic and management competencies to meet the labor market requirements and high international standards.

However, economic and management competencies are not the priorities of engineering education at engineering higher education institutes.

The number of disciplines of economics and management is constantly decreasing, as well as the number of academic hours for these studies does. This hinders graduates' adaptation to changing market environment, restrains them from effective and timely decision making.

Therefore, modern engineering education should develop not only essential professional competencies, but also economic and management ones, which will allow the graduate to expand the sphere of professional activities.

There are many works today which consider the issue of improving technical students' economic competencies. For instance, there is a number of works which deal with the content of economics courses and their position within the curriculum of higher education institute (by V.V. Kraevskiy, N.V. Lezhneva, A.M. Novikov, S.A. Repin, V.V. Serikov, V.G. Kharcheva, V.N. Khudyakov, etc.). The importance of economic and management competencies development is described in the papers by Ye.A. Varakin, V.A. Polyakov, V.D. Simonenko, Ye.N. Khamatnurova, S.D. Churkin, etc.

The works mentioned above analyse and compare various aspects of the issue, nonetheless, there are still some interesting and relevant problems to be addressed. In recent years, the question of engineers' economic and management competencies improvement has been gaining importance as these competencies allow the person to adapt to social and economic changes, serves as a basis for personality development and human capital formation [1]. The necessity to improve economic and management competencies of engineers is also caused by the social need in technical specialists able to think in terms of economics and management.

As a result, the present-day engineer should be able to make economic calculations at any stage of a product lifecycle. Besides standard professional competencies, the graduates of technical institutes should develop management skills, be able to choose feasible engineering alternatives and assume responsibility for their implementation.

The knowledge in economics and management obtained at the higher education institute makes it possible for the engineer:

- to manage effectively the industrial process;
- to ensure economic feasibility of the important technical decisions;
- to make efficient management decisions and be responsible for their implementation.

A present-day engineer is responsible for manufacturing process and competitive products output and also should be able to manage people, work in a team and have potential to occupational mobility. The specialists need profound scientific and technical knowledge in engineering, be focused on professional development, use critical thinking to identify the optimal decision [2].

In foreign countries, engineer's economic and management competencies are of great importance as they connect manufacturing with the market. Knowledge in economics and management is among core competencies of elite engineers in Sweden, Japan, the USA, Germany, and China.

European technical education standards imply that economic and management competencies account for up to 30% of all competencies essential for a technical institute graduate.

In the innovative economy, the employer is interested in employees who can overcome economic and management challenges, and optimal decision making directly depends on how well the relevant competencies have been developed at the higher education institute.

The profound knowledge in economics is quite important for engineers as it helps to understand the laws of economic behavior and unveils the laws and modern trends in public production.

The well-developed economic and management competencies will allow a graduate [3]:

- to take timely the role of manager;
- to adapt to changing enterprise environment, both inner and outer one, as well as to the changes and shifts in manufacturing process;
- to influence staff in different situations;
- to generate ideas and to implement them in different spheres of work.

When at work, an engineer with improved economic thinking skills will be able:

- to form concepts and take a definite stance towards current economic challenges in Russia;
- to think over the process of national social and economic development;
- to lay foundation for stepping up creative efforts in professional activities;
- to adapt timely to the current market conditions.

The necessity to change the content and structure of engineering education is caused by moving into post-industrial society with a new type of economic system, diversification of business activities, innovations and high technologies in manufacturing. With the market conditions constantly changing, the national society is badly in need of engineering staff with well-developed economic competencies and the potential to occupational mobility [4].

As a result, the graduates' poor knowledge in economics might be considered a significant drawback of national higher education system. Therefore, the development of economic and management competencies should become one of the priorities in higher technical education improvement [5].

The Russian and foreign scientists suggest several ways to implement these improvements:

1) to determine the content and structure of academic disciplines of economics within the basic sciences and professional cycles to improve graduates' economic and management competencies (works by E.M. Korotkov, A.G. Porshnev, V.S. Semashko, Yu.G. Tatur, and others);

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2) to provide didactic support for economic courses taught for engineers in compliance with the requirements of the Federal State Educational Standards of Higher Professional Education (works by A.A. Belyaev, I.A. Blank, V.R. Vesnin, B.A. Rayzberg, K.A. Raitskiy, and others);

3) to improve professional education under new economic condition and develop personal qualities necessary to carry out professional activities efficiently (V.A. Belikov, A.N. Sergeev, E.F. Romanov, A.Ya. Nayn, O.V. Lesher, N.M. Yakovleva, and others)

4) to equip leaders with management skills (L.I. Evenko, A.P. Egorshin, A.V. Molodchik, and others);

5) to enhance specialists' education management (I.I. Lyakhova, V.M. Raspopov, Z.M. Umetbaev, and others).

The foundation of engineers' economic and management competencies improvement should rest on the scientific papers dealing with such methodological challenges as:

1) competency-based approach in higher education (M. Amstrong, S. Uiddet, Dzh. Raven, A.V. Khutorskiy, Yu.V. Koynov, and others);

2) development of economic competence and economic thinking (A.V. Dorofeev, F.M. Rusinov, S.A. Shenderova, E.A. Fadeeva, and others);

3) interaction of economic and manufacturing activities (G.Ya. Gorfinkel', N.N. Kostina, T.A. Petrova, A.V. Koren'kov, O.N. Sinitsyna, and others);

4) professional and personality development (E.M. Borisova, E.A. Klimova, S.L. Rubinshteyn, T.V. Kudryavtseva, V.A.Petrovskiy, L.L. Zelinskaya, and others).

A particular challenge is to create a model of engineers' economic and management competencies improvement and implement this model into the national higher education system. The model implementation will contribute to high quality engineers training, and the graduates will be equipped with the competencies necessary to fully realize one's professional potential.

To overcome this challenge, it is essential to do the following steps:

1) to analyze economic and management competencies with regard to their development in the course of engineers training at higher education institutes in compliance with the Federal State Educational Standards of Higher Professional Education and the Federal State Educational Standards of Higher Education;

2) to identify in the curricular of engineering students the disciplines of economics which allow developing economic and management competencies specified in Federal State Educational Standards of Higher Professional Education and Federal State Educational Standards of Higher Education;

3) to create a model of engineering students' economic and management competencies improvement with due regard to the current market conditions;

4) to equip engineering students with essential knowledge in economics, including:

- basic economic concepts (challenges of economic development, economic policy, manufacturing capabilities, agents of production, demand, supply, mathematical modeling in economics, etc.);

- fundamentals of economics for professional activities (the laws and rules of an enterprise's economic operation, process engineering methods, economic planning, work measurement, the principles of staff management, etc.);

5) to summarize and solidify the acquired knowledge in economics when preparing graduation thesis, which is an essential stage for the graduate to become an engineer with a wide range of competencies required for modern manufacturing production.

The result of this work is a package of developed methodological materials which can be used by the academic staff in the educational process.

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