Improving the methods of training specialists in the sphere of construction and utilities (on the example of the Volgograd region)

E M Maznitsa*, M K Belyaev and O V Maksimchuk

Volgograd State Technical University Institute of Architecture and Construction, 400074, Academicheskaya st., 1, Volgograd, Russia
E-mail: Dilemaz@mail.ru

Abstract. The existing methods of training engineering personnel in the sphere of road, power, utility machines and other special equipment do not take into account the changed realities of the national economy. For maintenance engineers it is now not enough to know the basics of the operation of machines and mechanisms, it is necessary to have management skills. The operator should study not only the technical characteristics of the equipment, but also the principles of pricing for utility services, the basics of tariff regulation, the methodology for calculating tariffs and the cost of utility services. Therefore, the development of practical management skills in the housing and utilities sector, the study of the fundamentals of accounting and tax reporting, estimated rationing and legal training are becoming a modern addition to the classical training of specialists - operators of the construction and utilities sectors.

In recent years, there has been a significant decline in private investment in the communal infrastructure. This is especially noticeable in the water, heat and power supply sectors. There are a lot of reasons including the high level of risks and the low solvency of household consumers in a crisis economy. The solution of these problems is determined by the influence of various factors [1]. For example, one of the main limiting factors for the effective implementation of housing and communal services reform is the lack of experienced qualified personnel in the management and operation of utilities, which is associated with a sharp change in the functioning of the housing sector in modern Russia [2]. More recently, the state was responsible for the work of the housing sector, for heat in houses, water supply and sewage, electricity, cleaning, etc. and now - in one decade everything changed dramatically, the responsibility is blurred, it is completely incomprehensible for the population how the housing sector is working now [3].

Discussing today the reasons for the decline in GDP growth and changes in economic policy that are necessary for the revival of “constructive” production, it can be concluded that there are signs of recession in the Russian economy. The current movement towards recession is a consequence of the deep deindustrialization of the domestic economy [4]. Deindustrialization always leads to economic stagnation, and Russia's experience confirms this. The industrial sector survived at least two hard blows.
The first - in the 90s, when everything collapsed, including industrial communications. In the early 2000s, oil prices began to rise, and golden rain fell on the country. The industry was revived. But then there was a change of authority, and with it the economic model of development changed: in fact, instead of the economy of supply, the economy of demand for the export-raw material base was developed. Such ill-conceived economic policy dealt a second blow to the industrial sector [5].

In the context of the crisis and the possible post-crisis development of the Russian economy, entrepreneurship education should become the most important factor in the modernization of education and growth of economy. It is possible that the current crisis will lead to an even greater segmentation of the regional business education market. Of course, it is important to single out the positive moment of the crisis, as the most suitable time for improving the content of educational programs and improving the quality of the educational process, but the current situation has a downside. It seems that the need for a full-fledged, serious business education will always remain, as well as in managerial trainings, seminars and short programs. In our opinion for Russia and our region, one of the main areas of business education should be innovative management and the development of new areas of entrepreneurship [6].

The peculiarity of the current situation of the innovative development of the Volgograd region is the presence of a significant research and production base, combined with the lack of specific innovations related to the lack of enterprises' own, borrowed and attracted funds, low effective demand for scientific and technical products. Available examples of high-quality goods in general do not solve the problem of low competitiveness of the main products of enterprises [7]. Managers of enterprises in modern conditions are not ready to invest in especially risky scientific and technical projects at the stage of scientific research and experienced constructive works. Investor interest arises, as a rule, if a prototype or an experimental batch of a new material or product has been obtained as a result of research work. In the scientific and technical sphere, effective innovative entrepreneurship is impossible without managers in the commercialization of technologies and in the management of innovative projects. Now there is a situation where the rapidly developing Russian economy is facing a shortage of specialists in introducing new technologies, most specialists want to work in quiet places without much risk and responsibility. For example, we need specialists who will solve the engineering task of transferring the heating system of residential buildings from hydrocarbon fuel sources (fuel oil, diesel fuel, etc.) to alternative and renewable types of energy (solar, wind, wave, as well as hydroelectric and thermal energy ocean) [8].

It seems that here the Higher School needs to move from training theorists to practitioners, for example, everywhere there is not enough competent specialists - real estate operators. How to prepare them? Why do not talented advanced young professionals come in such a promising in innovation and financial terms, the industry as housing and utilities? Should there be any specifics in training such specialists at the regional level? And is it necessary to take into account the peculiarities of regional economic development?

In our opinion, in the formation of educational programs in various areas of education, including in the housing and utilities sphere, regional specificity, the level of modernization of the economy of a particular region should be taken into account [9]. As for the Volgograd region, the degree of lag in its economic development, not even from the advanced, but from the ordinary and medium-sized regions of Russia, is increasing every year. The low dynamics of the economy puts pressure on social indicators, which, in turn, affect demographics. In order to reverse the negative trends, serious efforts are needed and, above all, to improve the quality of government in the region. It seems that separate, very successful and fairly large-scale projects will not be able to provide a breakthrough of the regional economy as a whole, it is too big and inertial. They cannot replace the daily hard work in creating a favorable environment for the development of the region. Entrepreneurs and the population are key economic players, and the state cannot and should not replace them in a market economy. But they respond to incentives. Consequently, the task of an effective economic policy of regional authorities is to create a strong motivation to develop business right here and now [10].
Since the beginning of the 90s of the twentieth century, the region has developed a steady shortage of capacity for heat, electricity, water supply and sanitation. Over the past few years, funds from budgets of all levels have been allocated in insufficient quantities. This led to serious losses:

Table 1. Indicators of utility system functioning of Volgograd [11, p. 215].

| Indicators                        | unit       | power supply | heat supply | water supply | water disposal |
|----------------------------------|------------|--------------|-------------|--------------|---------------|
| Total network length             | km         | 3 464        | 898         | 1 897        | 1 058         |
| The length of the networks       | km         | 866          | 415         | 498          | 485           |
| needing replacement              |            |              |             |              |               |
| line 2: line 1 x 100 %           | %          | 25.0         | 46.2        | 26.3         | 45.8          |
| The amount of leave in the network|            | 1 973 949, thou.s. kWh | 5 413, thou.s. Gcal | 185 581, thou.s. cub. m | 158 333, thou.s. cub. m |
| Total sales of goods and services|            | 1 372 251, thou.s. kWh | 4 417, thou.s. Gcal | 131 361, thou.s. cub. m | 104 149, thou.s. cub. m |
| The volume of losses             | %          | 601 698, thou.s. kWh | 996, thou.s. Gcal | 54 220, thou.s. cub. m |               |
| (line 3 – line 4): line 3 x 100 %| %          | 32.2         | 18.4        | 29.2         |               |
| Normative volume of losses       |            | 335 966, thou.s. kWh | 708, thou.s. Gcal | 33 405, thou.s. cub. m |               |
| The actual specific energy       |            |              |             |              |               |
| consumption per unit of resource |            |              | 106 614 kWh Gcal | 652 kWh thou.s. cub. m | 567 kWh thou.s. cub. m |
| Depreciation of utility          | %          | 82           | 74          | 72           | 77            |
| infrastructure systems           |            |              |             |              |               |
| (network)                        |            |              |             |              |               |
| Number of accidents, total *     |            | 66 *         | 136 *       | 4 614        | 7 121         |
| for a period of more than 8 hours|            |              |             |              |               |
| System failure (the ratio of     |            | 0.02 *       | 0.16 *      | 2.43         | 6.73          |
| the number of accidents to the   |            |              |             |              |               |
| length of networks)              |            |              |             |              |               |
| Loss ratio (the ratio of the     |            | 173.700, kWh km | 1.109, Gcal km | 28.582, cub. m | km           |
| number of loss to network ratio  |            |              |             |              |               |

Source: according to municipal unitary enterprise "Volgograd Interdistrict Electric Networks", municipal unitary enterprise "Volgograd Utilities" and municipal unitary enterprise "City Water Channel of Volgograd"

One of the areas of training of modern engineering personnel can be an educational program for managers of housing and communal services. The Institute of Architecture and Construction of the Volgograd State Technical University has long developed such a program. To improve the methods of training engineering personnel for operation, engineers need serious economic training, especially in terms of tax and tariff accounting. The simplest calculation of thermal energy consumption in
accordance with the method of Methodical documents in construction 41-4.2000 (approved by order of the State Construction Committee of Russia of 06/05/2000 No. 15), Set of Rules and Regulations No. 23-01-99 of 01/01/2000, requires the specialist to know these standards requirements:

Consumption is calculated by the formula:

\[ Q = q \times \frac{t_{vn} - t_{pa}}{t_{vn} - t_{cp}} \times 24 \times n, \text{ where} \]

- \( q \) – quantity of heat
- \( t_{vn} \) – internal temperature
- \( t_{cp} \) – average temperature
- \( t_{pa} \) – counting temperature
- \( n \) – the number of days of the month counted in the calculation.

1. **Summary**

In our opinion, the formation of such direction of education as “Training of Specialists for Management Companies in the Municipal Sphere” and “Management of Housing and Communal Services” should be an important step in developing a regional development strategy for the executive authorities and local governments. The training of specialists in introducing innovations, including the housing and utilities sector, can be carried out at the expense of regional or local budgets, or with the use of subsidies from these budgets. The support of the authorities may also include financial, credit, property, technical, consulting, informational direction. The necessary methodological support includes training of specialists in the technical sphere, who:

- can execute various agreements with all interested individuals and legal entities (owners, district administrations, land committees, etc.);
- know the basics of accounting and management accounting and reporting;
- can properly exploit the common property of the participants in the homeowners’ partnership;
- know the basics of team management.

The approximate list of blocks of the educational program is as follows:
**Table 2.** The approximate composition of the educational program “Management of housing and communal services”.

| The name of the topic, the name of the issues studied in lectures and seminars | Lectures, hour | Practical lesson, hour | Forms of control, hour |
|---|---|---|---|
| **Module “Technical and operational training”** | | | |
| Basic concepts and operating conditions for residential real estate | | | |
| Functional features of the operation of foundations, basements, attics, roofs, etc. | | | |
| Pipeline operation (heating, ventilation, water supply and drainage, sewage) | | | |
| Operation of power equipment in residential buildings | | | |
| Repair and reconstruction in residential buildings | | | |
| **Module "Financial and tariff preparation"** | | | |
| Regulatory base for calculating utility tariffs | | | |
| Calculations. Wages, charges, taxes, etc. | | | |
| **The module "Legal training"** | | | |
| Normative base of housing and utilities system | | | |
| Types and forms of contracts of various civil and legal orientation | | | |
| **Module "Management Training"** | | | |
| Analysis of specific business situations | | | |
References

[1] Maznitsa E 2011 Opredelenie investitsionnogo i finansovogo potentsiala pri sozdaniy malogo predpriyatiya [Definition of investment and financial potential when creating a small enterprise] «Narodnoe khozyaistvo» [National economy, Section "Proceedings of the IV International Scientific and Practical Conference" Modern Problems of the National Economic Complex: III Nauka Publishing House, Moscow, 1 211- 5 -

[2] Prilozenie k Strategii razvitiya zhilishchno-kommunal'nogo khozyaistva v Rossiiskoi Federatsii na period do 2020 goda [Appendix to the Strategy for the Development of Housing and Communal Services in the Russian Federation for the Period up to 2020] Raspoloyazhene Pravitel'stva RF ot 26 yanvara 2016 g N 80-r «Ob utverzhdenii Strategii razvitiya zhilishchno-kommunal'nogo khozyaistva v RF na period do 2020-g» [Order of the Government of the Russian Federation dated January 26, 80-p

[3] Maznitsa E and Brighten S 2013 Formirovanie sistem pokazatelei i primenenia metoda analiza ierarkhii dlya opredeleniya effektivnosti innovatsii [Formation of a system of indicators and application of the hierarchy analysis method for determining the effectiveness of innovations] Ekonomicheskiy analiz – teoriya i praktika 13(316) 24-33

[4] Maznitsa E, Arcov S and Fyedorovyh E 2016 Public-private partnership as basis of modernization of the housing sphere of russia /Globalization and its socio-economic consequences, 15th International Scientific Conference, Proceedings, (Part III) - Rajecke Teplice, Slovak Republic, 1338-47 (Web of Science) Access mode: http://ke unisa sk/sites/default/files/conten_files/proceedings_part_iii pdf

[5] Maznitsa E 2011 Perspektivy innovatsi-onnogo razvitiya regional'nogo ZhKKh na osnove tochechnogo (lokal'nogo) reformirovaniya: monografiya [Prospects for the innovative development of regional utilities based on point (local) reform: monograph] Volgograd: VolgGASU, 107

[6] Maznitsa E 2014 Razvitie svyazi vyshey shkoly i biznesa kak sposob sokhraneniya invetsionskoj aktivnosti v regionakh Rossii v usloviyakh finansovogo krizisa Aktual'nye problemy razvitiya vertikal'noy integratsiy sistemy obrazovaniya, nauki i biznesa: ekonomicheskii epravovy i sotsialnye aspekty [Development of relations between higher education and business as a way to preserve investment activity in the regions of Russia in the context of the financial crisis Actual problems of the development of vertical integration in the education, science and business systems: economic, legal and social aspects]: materials of the II International Scientific Practical Conference October 23-24, 2014 - T 2 / ed S L Igolkina – Voronezh Voronezh scientific and technical information center 243 35-43

[7] Pridachuk M P, Cyzho L N and Boldyreva M S 2019 The development of the system of organizational and environmental indicators for the development of the housing sector in Russia // International Scientific Conference "Competitive, Sustainable and Safe Development of the Regional Economy" The materials will be posted on the website of the publishing house Atlantis Press and indexed in Conference Proceedings

[8] Alkemade F, Heimeriks G, Schoen A, Villard L and Lauren P 2015 Tracking the internationalization of multinational corporate inventive activity: national and sectoral characteristics RESEARCH POLICY, 44(9) 1763-72 doi: 10 1016/j respol 2015 01 007

[9] Bannò M., Piscitello L and Varum, C 2013 Determinants of the Internationalization of Regions: The Role and Effectiveness of Public Policy Measures Regional Studies, 49(7) 1208-22 doi:10 1080/00343404 2013 821570

[10] Barzi, Federica; Cortelezzi, Flavia; Marseguerra, Giovanni; Zoia and Maria Grazia 2015 Determinants of the Internationalization of Regions: The Role and Effectiveness of Public Policy Measures INNOVATION-MANAGEMENT POLICY & PRACTICE, Cortelezzi, Flavia/0000-0001-7481-1541, 10 1080/14479338 1036541, 281-307 Begg, I (1999) Cities and Competitiveness CURS Urban Stud Urban Studies, 36(5), 795-809 doi:10 1080/0042098993222
[11] Maznitsa E, O V Maksimchuk N I and Borisova L N 2017 Chizho Modernizatsiya zhilishchno-kommunalnogo khozyaistva goroda na osnove realizatsii innovatsionnykh reshenii [Modernization of the Housing and Public Utilities of the City through the Implementation of Innovative Solutions] Volgograd State Technical University – Volgograd: VolgGTU
[12] Belyaeva L 2009 The level and quality of life Challenges in measuring and interpreting Sociological Studies, 1 33-42
[13] Cardenas Davila, Cesar F, Vargas Hernandez and Jose G 2015 Strategic-spatial analysis of the implementation of business opening politics of Mexico FAEDPYME INTERNATIONAL REVIEW-FIR JUL-DEC 8-25
[14] de Dominicis, Laura; Florax, Raymond J G M ; de Groot and Henri L F 2013 Regional clusters of innovative activity in Europe: are social capital and geographical proximity key determinants? APPLIED ECONOMICS 10 1080/0036846 663474 2325-35
[15] Kennedy A (2016) Smart Specialization, Regional Growth and Applications to European Union Cohesion Policy REVIEW OF INTERNATIONAL POLITICAL ECONOMY, 23:1 65-92, 10 1080/09692290 2015 1105845, JAN 2 2016