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**CONCEPT OF FORMING THE MUNICIPAL MARKET
OF ENGINEERING KNOWLEDGE**

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**КОНЦЕПЦИЯ ФОРМИРОВАНИЯ МУНИЦИПАЛЬНОГО РЫНКА
ИНЖЕНЕРНЫХ ЗНАНИЙ**

The regional market of Knowledge is the economic system, the infrastructure of which implements a function to enhance continuously the competent level of enterprises' manufacturing-technological systems. It provides the increase in sales of products and /or services that have market cost, in other words, competitive advantage on the market. Products of the market of Knowledge are educational bachelor's programs by the major «Innovation» and master's programs by the major «Innovation management», which is university's intellectual property and intangible assets. The mechanical-engineering enterprises of the municipal district have been offered to purchase these intangible assets in the form of «Rights to manage the study process under the Bachelor's Educational Program» and «Rights to manage the study process under the Master's Educational Program» adapted to the competent level of manufacturing-technological systems of each enterprise. These Educational Programs have been accredited in the Russian Federation and submitted for the ASIIN accreditation. The estimation of capitalizing the balance cost of intangible assets shows that managing amortization techniques allows adjusting the base for the tax on operating income. Besides, if we have a group of at least 10 students who pay for the course of 4 years – the study period of bachelor students -, it will result in the capitalization of 3.47. The main advantage of the concept of the municipal infrastructure of the Knowledge market is the formation of a market structure based on the purchase of intangible assets, which provides funding for accreditation of Educational Programs at the European accreditation agencies. The proposed methodology to assess the level of competence in manufacturing-technological systems provides reasonable investments into their competent level and functional capabilities. The methodology allows controlling the stability of consumer properties of products having a competitive advantage on the market.

COMPETENCE; COMPETENT-TECHNOLOGICAL COMPLEX; COMPETENCE LEVEL OF MANUFACTURING SYSTEM; MUNICIPAL MARKET OF KNOWLEDGE; INFRASTRUCTURE OF MARKET OF KNOWLEDGE; EDUCATIONAL PROGRAM; STUDY PROCESS; ACCREDITATION; INTELLECTUAL PROPERTY.

Региональный рынок знаний является экономической системой, инфраструктура которой реализует функцию непрерывного повышения компетентностного уровня производственно-технологических систем предприятий, обеспечивающего увеличение объема реализации продукции (услуг), имеющих рыночную стоимость (конкурентные преимущества). Продукцией рынка знаний являются образовательные программы подготовки бакалавров направления «Инноватика» и магистров направления «Инновационный менеджмент», являющиеся интеллектуальной собственностью (нематериальными активами) университета. Машиностроительным предприятиям муниципального округа предложено приобрести нематериальный актив в виде права управления образовательным процессом по программам, адаптированным к компетентностному уровню каждого предприятия. Программы аккредитованы в России и представлены к аккредитации в ASIIN. Оценка капитализации балансовой стоимости нематериального актива показала, что управление амортизационными технологиями при формировании налогооблагаемой базы налога на операционную прибыль предприятия и совместную (в пропорции 2 к 8) реализацию одного платного набора группы (10 человек) студентов, позволит за четыре года (срок обучения бакалавров) получить капитализацию 3,47. Основным достоинством разработанной концепции муниципальной инфраструктуры рынка знаний является формирование рыночного уклада на основе трансфера нематериальных активов, обеспечивающих инструмент финансового обеспечения процедуры аккредитации образовательных программ в Европейских аккредитационных агентствах. Предложена методология оценки уровня компетенций производственных систем, обеспечивающая формирование обоснованных пропорций инвестирования в компетентностную и функциональную составляющие производственно-технологических систем. Методология позволяет управлять стабильностью получения потребительских свойств продукции, имеющей конкурентные преимущества на рынке.

КОМПЕТЕНЦИЯ; КОМПЕТЕНТНОСТНО-ТЕХНОЛОГИЧЕСКИЙ КОМПЛЕКС; УРОВЕНЬ КОМПЕТЕНЦИИ ПРОИЗВОДСТВЕННОЙ СИСТЕМЫ; МУНИЦИПАЛЬНЫЙ РЫНОК ЗНАНИЙ; ИНФРАСТРУКТУРА РЫНКА ЗНАНИЙ; ОБРАЗОВАТЕЛЬНАЯ ПРОГРАММА; ОБРАЗОВАТЕЛЬНЫЙ ПРОЦЕСС; АККРЕДИТАЦИЯ; ИНТЕЛЛЕКТУАЛЬНАЯ СОБСТВЕННОСТЬ.



Topicality. The factor which determines a continuous increase in the gross municipal product (GMP) and the tax base of municipalities is the improvement of production at enterprises based on product, technology and allocation innovations.

In the innovative market economy enterprises continuously increase sales of products and services on the basis of constant changes of the product range. Therefore, their production systems are competent-technological complexes implementing consumer properties through the sequence of technological stages, the formation of consumer properties of products being their market cost.

The capitalization level of cash flow is the factor of efficiency for a competent-technological manufacturing organization in the engineering business. That is why the innovative market economy is sometimes called the economy of commercialization of intellect.

Net income from company's operating activities amounts to net operating profit, amortization and depreciation of intangible and tangible assets. The fact of the increase in sales with the simultaneous growth of net income indicates investments into the product and/or technological innovation. In accordance with the accounting standards, investments into modernization are funded from the depreciation fund. It results in the increase of fixed assets of entity. Amortization of intangible assets decreases the taxable base of operating profit in the developed countries. As a result, the increase in the net income due to the increase in the net operating profit needs additional analysis.

The efficiency of enterprise production systems is determined by the adequacy of competent and functional levels of technological machines. The ratio of sales V , rub/year to net income D_o , rub/year from operating activities is an information indicator of the competence level of the production system. This ratio is an indicator of the competence of k_q production system at the enterprise

$$V / D_o = k_q > 1.$$

The logic of assessing the competent component of a manufacturing-technological system in terms of competence shows that the lacking professionalism of the production staff leads to the decrease in sales due to the inconsistency of consumer properties of the output. The manufacturing-technological system has sufficient technological capabilities if it manufactures 90 or more percent of products with the required consumer properties.

In the market economy cash flows are realized on the basis of two natural processes — purchase and sale. These two interrelated tools of management implement the following business functions: monitoring of consumer properties, market assessment of cost and motivation of participants in the money exchange. Thus, the production structures and processes are based on the transfer of cash flows, forming the market cost of products and services.

In general, in the developed countries a competent technological manufacturing organization is realized on the basis of the management accounting (controlling) by the transfer of operating costs into consumer properties of products or services having the market cost. It takes place subsequently in zones of financial responsibility, which are stages of technology. If any single part of the technology has no market cost, a finished product cannot have a competitive advantage on the market.

The main criteria to evaluate the effectiveness of management accounting are:

1. The price of product or of technological conversion is greater than or equal to its market cost and higher than direct operating costs;
2. Production costs should approach direct operating costs;
3. Wages in the structure of direct operating costs is equal to the labour payment;
4. Labour productivity must be equal to the productivity of manufacturing- technological systems;
5. The indicator of competence k_q of the operational process must not change or can increase;
6. The cost of property complex, business and equity capital (tangible and intangible assets) of a company on the stock market continuously increases.

Moreover, management accounting certified by the international quality management system is instrumental to continuously increased tax payments at all budget levels and reduces the technogenic burden on the environment.

Conclusion. The manufacturing-technological system of an enterprise (MTS) is a competent-technological complex. Firstly, it is obvious that in order to enhance a manufacturing organization, it is necessary to invest separately into the competent and engineering components of MTS. Secondly, it is necessary to invest proportionally to the positive or negative balance of functionality of technological machines and to the competent level of the production staff.

Management of competent-technological processes and systems

One of the processes regulated by the international quality management standard ISO 9000:2000 is developing the competent level of the production staff.

In order to ensure the enterprise's effective performance and to raise the competent level of the production personnel, this ISO suggests the procedure of regular professional upgrading for employees.

The Standard requires continuous education, training and re-training of the enterprise's production personnel and provides for drafting an array of company documents which are binding for management in all divisions of the enterprise.

The supervisors of divisions and other structural units at the enterprise realize situation analyses of excellence in production processes, namely: consistency of consumer properties of products at stages of the technological process and adequacy of operating costs to planning parameters. Based on the situation analysis, plans and programs are designed to foster competencies of the production personnel.

Theory and practice of an engineering organization consists of:

1. Competencies for designing and enhancement of scientific and methodological systems as well as technical principles of a manufacturing organization;
2. Creation and application of methods and tools for monitoring;
3. Research and analysis of various organizational, technological and technical solutions at all levels of the organization's production of goods and services with competitive advantages.

The solution to these issues is implemented with a wide use of information technologies, which qualitatively improve a manufacturing organization's processes in various industries and accelerate the scientific and technological progress.

The competencies of innovation processes determine the practical development of science, techniques and technologies of producing goods and services, development and implementation of technology innovations, investments and processes of innovative transformations.

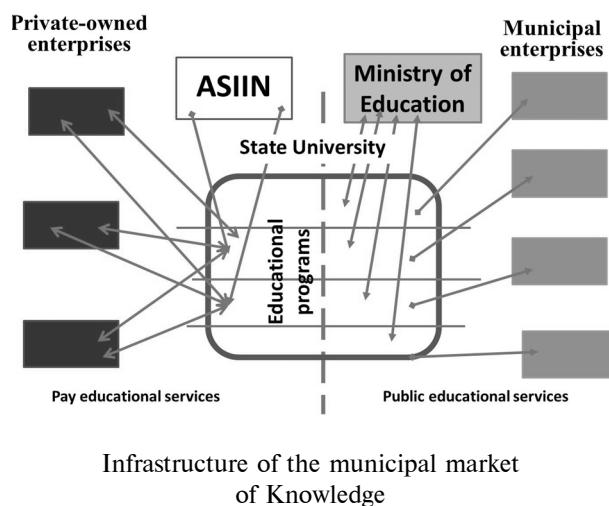
The innovators realize projects and predict processes of innovation development in the engineering business and adaptation of production systems to the innovation implementation.

The tasks of an innovative approach concerning the formation and development of the market structure are successfully solved by professional engineers. They master management functions in the state and municipal governments, implement the status of top managers at innovative production, create tangible and intangible assets that have the market cost. Any business created by a professional engineer generates income.

In relation to this, the Council of the Russian Federation (RF) has drafted a bill on the status of Professional Engineers and Engineering Interns. The underlying basis of the Law is the experience of the developed countries in this area which certifies professional engineers and engineering interns at self-regulatory organizations in the respective industry (e.g., the Union for mechanical engineers, the Union for building engineers, etc.). These are people who hold and apply for engineering positions in design, production and technological organizations.

Conclusion. Engineering competence is the base of innovative market economy.

The Federal Law on Education in the Russian Federation states organizational and financial aspects of high professional education in the market structure (Figure).





An employer is interested to hire graduates who are able to perform a number of professional tasks. Consequently, learning outcomes should assess competencies including the following:

- a) a necessary amount of background professional and theoretical knowledge;
- b) a set of methodologies and techniques to apply the knowledge in practical activities;
- c) professional experience during laboratory works, in job training, manufacturing, etc.

The competencies are divided into professional, i. e. specialization in certain production areas and universal, i. e. which require an educated person regardless of training. To do this, the modular design of educational programs is used.

The municipal market of Knowledge means a self-managing economic system, the infrastructure of which implements the balance of supply and demand on the competencies, having the market cost and adequate functionality at manufacturing-technological systems of enterprises.

A state university is a provider of competencies to the regional market of Knowledge. Under the Federal law on Education in the Russian Federation a higher educational institution may be either private and state, or municipal. The training of bachelors, masters and post-graduate students is based on the state licensing and accreditation of Educational Programs in compliance with the requirements of the State Educational Standards of the Russian Federation.

In the process of licensing and accreditation the Ministry of Education and Science of the Russian Federation applies the same standards to the regional and state universities regardless of their forms of ownership. These requirements are fair due to the fact that graduates are conferred the uniform state diploma on the entire territory of the Russian Federation.

Financing educational services for bachelors, masters and post-graduate students is carried out on the basis of the State Order for state authorities, self-government municipalities and enterprises which provide the support of population's life activities. The State Order for training is financed by the Ministry of Education and Science of the Russian Federation in accordance with the estimated direct costs.

Today, the estimated direct costs, depending on training, varies for universities from 80 to 120,000 rubles a year per student. This funding amounts to about 50% of the university budget. Under the current legislation a state university

has the right to render paid educational services to train bachelors, masters and post-graduates students and conclude contracts with individuals and legal entities (private-owned enterprises). The students who pay for their education must get the same educational services as their counterparts taught at the expense of the state budget. Therefore, student tuition fees shall be in no way lower than the price approved by the Ministry of Education and Science.

Higher school of the Russian Federation is moving towards the integration with the European concept of education.

In the developed countries Educational bachelor's and master's programs are drawn up by accumulating competencies (credits) that allow a postgraduate student to adapt to the specific business.

The fundamental difference between the educational system of the Russian Federation from the European systems results in the development of higher education in different economic systems. Therefore, there is some difference between bachelors and masters trained by those Educational programs accredited in the Russian Federation and the EU pertaining to different economical systems.

The leading engineering universities of the Russian Federation approach the challenge to integrate the educational systems from different points of view. For instance, the N.E. Bauman Moscow State Technical University set up the Department of Engineering Business & Management. The Department generates engineering solutions based on their cost. This Department and other engineering departments of this University award diplomas that are in great demand on the international market of Knowledge. The St. Petersburg State Polytechnic University accomplishes a double degree program with Lappeenranta University of Technology (Finland). Students of the first year study in Russia and they go to Finland for their second year. As a result, students gain a Master's degree in Innovation Management by the Educational program accredited in the Russian Federation and a diploma of the Educational Program on Global Innovation Management accredited by ASIIN.

Vologda State University has developed a similar methodology. The implementation of the double diploma program is very complicated and is not managed. Students should be financially supported for the course of one year in Finland

or Germany. Costs of accommodation and meals are more than 500 euros per month. Teaching is done in English. To be enrolled in Lappeenranta University of Technology (Finland), one must have the certificate to confirm a certain level of the English language with at least six points.

The price of the English examination for the certificate is 10,000 rubles in Moscow or St. Petersburg. Only three or five students agree to study in foreign universities to obtain a double diploma. The students usually do not return to Russia. As a matter of fact, regional industrial enterprises do not need those students who received a bachelor's degree or master's degree in engineering. It is explained by the difference in the content of engineering education.

In other regions there is no infrastructure for the market of Knowledge, which contributes to adaptation of bachelors and masters to engineering business upon graduation from university. Today large manufacturing companies are not ready to organize production and to form staff using the market of Knowledge at the level of bachelors. Bachelors are not ready psychologically to begin their production careers from the position of machine operator. There are also other reasons which prevent from training bachelors and masters for engineering business in accordance with the European requirements.

To solve this problem, Vologda State University has designed two Educational Programs for engineering and technological profiles of training bachelors and masters, having skills to cooperate with enterprises of the European Union. Their competencies, knowledge and practical skills allow them to work at an engineering enterprise and to develop products and technologies that have competitive advantages in foreign markets. These Educational Programs are the intellectual property of the University and are reflected in the balance sheet as intangible assets.

The University started the accreditation of Educational Programs in the European accreditation agency ASIIN. As a result of the accreditation, the University will receive a print of this Agency. The University graduates trained by these programs will be eligible to take engineering positions in Russia and the EU.

The price of the accreditation according to the agreement with the «Accreditation Agency for Study Programs in Engineering, Informatics, Natural Sciences and Mathematics» (ASIIN, Robert-Stolz-Str. 5, 40470 Düsseldorf) is 15,000 euros.

In order to implement the concept of continuous engineering education, the University has offered to its partners – enterprises to jointly tackle the task of training professional engineers and managers who will ensure the development of innovative production and will also implement product, technology and allocation innovations.

The Commercial Offer from the University to its partners-enterprises

Below is the commercial offer to purchase the following intangible assets:

«The Right of managing the educational process of Bachelor's and Master's Educational programs, the competencies of which should meet the accreditation requirements of ASIIN to professional engineers».

These Bachelor's and Master's Educational Programs are intangible assets.

1. «Innovation» is the comprehensive educational program in engineering licensed and accredited by the Ministry of Education and Science of the Russian Federation. The content of the program is designed for the period of study of four years. Two degrees are awarded to each graduate: a bachelor's degree in «Innovation» (state-approved diploma of the first level of higher education) and that of a technician in «Technology of Mechanical Engineering» (state-approved diploma of secondary education) alongside with the machine operator certificate.

A bachelor having two state diplomas of the Russian Federation and a profession of a worker begins his production career with a position of manufacturing-technological system operator. His competences allow consistently adapting to the levels of technology and production management.

2. «Innovative Management» is the Educational Program of the second level of higher professional education licensed and accredited by the Ministry of Education and Science of the Russian Federation. The content of the Educational Program is designed for the period of study of two years combined with the industrial training. A master's degree in innovation management is awarded regardless of a bachelor's training profile.

Master's competencies in innovative management allow consistently adapting to the levels of production top management, aimed at organizing production based on innovative management tools, and launching innovative products with competitive advantages into foreign markets.



Capitalization of investments will be implemented with the following tools:

The previous logical research apparently shows that the post-industrial innovative economy is the economy of Knowledge. Namely, intellectual activity in the production sphere is converted into an intangible asset acquiring quantitative parameters, defining, and characterizing the cost of business on the stock market.

The market cost of the intangible assets purchased from the University is 5,000 euros.

1. The intangible assets purchased at a market cost by an enterprise will enter the balance sheet, and the management of amortization allows adjusting the base for the tax on operating profit.

2. The Rights of management over the educational process will be implemented through the selection of candidates for training. The use of planned educational programs for practical training to develop innovative technologies in production. As to Master's training, it is implemented in combination with the industrial activity.

3. Mastering proficient English will allow junior students to cooperate with foreign partners.

4. The framework of the contract for purchasing an intangible asset contains the following items:

4.1. The University will train five bachelors and two masters;

4.2. The University will advise on organizational and technological issues prior to the completion of training by bachelors and masters.

Estimation of intangible asset capitalization

V – balance cost of intangible asset – 380 000 rub; τ – time of useful life of intangible asset – 4 years; ΔD_{am} – part of income from amortization of intangible asset:

$$0.25 \cdot 380000 = 95\ 000 \text{ rub./year};$$

$N_{op} = 20\%$ – tax rate on operating profit; ΔD_p – part of income from the decrease in the taxable base on operating profit:

$$0.2 \cdot 95\ 000 = 19\ 000 \text{ rub./year}.$$

D_{tot} – total income over 4 years:

$$95 \cdot 4 + 19 \cdot 4 = 456\ 000 \text{ rub.}$$

$n = 10$ fee-paying students.

ΔD_s – income of enterprise from students:

$$(72\ 870 + 34\ 890) \cdot 4 \cdot 10 \cdot 0.2 = 862\ 000 \text{ rub.}$$

Commercial capitalization from intangible assets:

$$K = D/V = (862\ 000 + 456\ 000)/380\ 000 = 3.47.$$

Conclusion. The concept of economic tools and market infrastructure of educational services (market of Knowledge) requires that entities of infrastructure completely abandon the tools of the state system in training specialists for specific jobs. The market system of training bachelors and masters is fundamentally different from the state system of engineering training. However, there is a tendency to apply state organizational and educational tools to market conditions. For example, Educational programs are not recognized as intellectual property. Therefore, the motivation to update them from the point of view of scientific and applied significance is lost. In fact, credit-cumulative forms of competencies evaluation are not used. This fact causes serious problems in accreditation of educational programs at European agencies.

In the regions there are no documents to regulate the relationships between the market and consumers of universities' educational services. The Ministry of Education and Science should shape the market structure of engineering educational services.

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