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JUSTIFICATION OF TYPES OF INNOVATIVE LABOR IN THE IT INDUSTRY

The peculiarities and contribution of the information technology industry (IT industry) to the development of the Ukrainian economy are studied. The classification of different types of innovations by basic features and by scope is considered. The degree of automation and regulation of labor operations in the development of IT-projects is described. The types of innovative labor in the IT industry are identified, depending on the degree of its regulation and the types of innovations to which it is aimed. The types of innovative labor in the IT industry depending on the types of innovations and the degree of regulation of labor elements are developed and graphically presented. The influence of regulation of innovative labor on the efficiency of its rationing is substantiated. The proposed classification of types of innovative labor with professional groups in accordance with the quadrants of the matrix of positioning of IT professionals in the specialty is compared and their relationship is presented. The labor of programmers and features of its rationing are considered. Placement of the labor of software product developers on the matrix in accordance with the classification of innovative labor and the matrix of positioning of IT professionals are graphically presented.

Keywords: *innovative labor, types of innovations, regulation of labor operations, IT industry, types of innovative labor.*

Перерва І. ОБГРУНТУВАННЯ ТИПІВ ІННОВАЦІЙНОЇ ПРАЦІ В ІТ-ГАЛУЗІ

Досліджено особливості і внесок галузі інформаційних технологій (ІТ-галузь) у розвиток української економіки. Розглядається класифікація різних видів інновацій за базовими ознаками та за сферою застосування. Охарактеризовано ступінь автоматизації та регламентації трудових операцій при розробці проектів в ІТ-галузі. Виокремлено типи інноваційної праці у ІТ-галузі, орієнтуючись на види інновацій, а також на ступінь автоматизації та регламентації трудових операцій при розробці ІТ-проектів та запропоновано класифікацію видів інноваційної праці фахівців ІТ-галузі залежно від ступеня регламентації та видів інновацій, на створення яких вона спрямована. Розроблено і графічно представлено типи інноваційної праці в ІТ-галузі в залежності від видів інновацій та ступеня регламентації елементів праці. Обґрунтовано вплив

регламентації інноваційної праці на ефективність її нормування. Проаналізовано особливості об'єктів нормування у різних галузях економіка та традиційні підходи щодо нормування праці IT-фахівців. Розглянуто матрицю позиціонування фахівців в IT-галузі. Співставлено запропоновану класифікацією видів інноваційної праці з фаховими групами відповідно до квадрантів матриці позиціонування IT-спеціалістів за фахом та представлено їх взаємозв'язок. Проведено теоретичне узагальнення підходів до нормування праці фахівців з вироблення програмних продуктів та щодо розроблення нормативів витрат інноваційної праці в IT-галузі. Розглянуто працю програмістів та особливості нормування їх праці і доведено, що праця програмістів є інноваційною і може бути віднесена до такого типу, як високорегламентована орієнтована на продукт, яка формує «стабільний» квадрант матриці позиціонування працівників IT-галузі за фахом. Графічно представлено розміщення праці розробників програмного продукту на матриці відповідно до класифікації інноваційної праці та матриці позиціонування працівників IT-галузі за фахом.

Ключові слова: *інноваційна праця, види інновацій, регламентація трудових операцій, IT-галузь, типи інноваційної праці.*

Problem statement. In conditions when the country seeks to gain competitive advantages, there is no alternative to innovative development: the innovative economy should become not only the core of the national economy, but also the key to increasing its competitiveness. Bringing Ukraine's economy out of the crisis and ensuring sustainable economic growth requires a reassessment of the role of the human factor, the effective realization of the labor potential of society, the use of competitive advantages in the global division of labor based on innovative development.

It is fair to say that the initial prerequisite for the formation of a new economy is the transformation of intelligence into a leading resource for economic development and growth.

Analysis of recent research. The scientific literature widely studies the development of the IT sector, in particular the impact of information technology on economic growth and development of the country in a whole. Among the authors who study this issue in depth, it is worth noting R. E. Yaremchuk, who believes that Ukraine is currently one of the most promising markets for high technology and innovation in Central and Eastern Europe, being in the process of integrating Ukrainian markets with EU markets, receives a powerful incentive for active integrated development of its own IT sector, the most developed and largest segment of the innovative economy in Ukraine [1].

The problems of innovative development are always given considerable attention by scientists. The work of many scientists is devoted to the study of various aspects of innovation processes and issues of innovation — P. Druker, B. Santo, Kh. Barnet, Gh. Mensh, R. Solou, Gh. Slezyngher, B. Tviss, Je. Toffler, J. Shumpeter, D. Boghynja, B. Ghenkyn, O. Gherasymenko, O. Ghrishnova, A. Kolot, L. Lisoghor, I. Petrova, I. Teron and others.

A significant part of the issues of possible prospects for the development of Ukrainian IT companies and automation and regulation of labor operations remains relevant and requires further research. It should also be noted that most of the scientific achievements are not theoretical, but informational and applied. Thus, a large amount of material has been accumulated, which requires theoretical generalization and systematization through the prism of research in the IT industry and its importance for the economy of Ukraine.

The purpose of the paper is to identify the types of innovative labor in the IT industry, focusing on the types of innovation, as well as the degree of automation and regulation of labor operations in the development of IT projects.

Major research findings. Intellectualization processes apply to all levels - from global to human society – and permeate all processes of life without exception [2].

At different stages of the innovation process, the possibility of rationing of innovative labor varies significantly, and for rationing of innovative labor, different methods are used depending on the type of work.

The typology of innovations also makes it possible to distinguish between innovation rationalizing innovations (innovations with partially improved characteristics). In addition, the classification of innovations by basic characteristics and other characteristics is used when making management decisions about investing innovations.

The number of classification features depends on the criteria used for the typology of innovations. As a result, the same innovation can be classified into several types.

The article proposes to identify the types of innovative labor in the IT industry, focusing on the types of innovation, as well as the degree of automation and regulation of labor operations in the development of IT projects.

The IT sphere in Ukraine is one of the most dynamic and promising. It has long been called the locomotive of the Ukrainian economy development. The importance of innovation in the IT industry for economic development is indisputable. At the present stage of development of our country, IT has become the second largest industry for the export of services, occupying more than 20% of all services exported to Ukraine. According to current data, the IT industry in Ukraine is among the top three industries with the largest share in GDP [3].

As a result of widespread globalization, the scientific literature extensively studies the development of the IT sector, in particular the impact of information technology on economic growth and development of the country. Despite the rapid development of the IT sector, we can't ignore the contribution of the IT industry to the development of the Ukrainian economy, which is as follows:

- forming the country's image as investment attractive;
- attracting investment to Ukraine and strengthening the country's economy;
- rapid and stable growth of the IT industry;
- significant tax revenues of IT taxpayers to the budget.;
- job creation [4].

Thus, innovative work in the IT industry and its rationing have the leading role. If we consider the classification of different types of innovations by scope (technological, organizational and managerial, economic, marketing, social, environmental and information), it should be noted that in the IT industry can be found all of these types of innovations. The largest number of innovations in the IT industry is related to information and technology, as new IT products are usually aimed at improving information exchange processes and technologies for its creation and processing. At the same time, the introduction of some innovative IT products can significantly affect both organizational structures and management processes of companies, and thus act as a basis for organizational and managerial innovations (for example, technologies that

enable collaboration, promote the development of new types employment and innovative labor and at the same time destroy traditional organizational structures). The rapid development of Internet technologies and technologies for processing large amounts of customer data in modern marketing is due to the fact that new IT products create marketing innovations, mainly in the field of Internet marketing (for example, advertising on social networks, contextual and banner advertising, SEO -technologies, analysis of customer behavior using Google Analytics, Google Big Query, etc.). The effects of new IT products are often seen in the economic, social and environmental spheres.

Taking into account such a wide range of applications for the implementation of IT innovations, it is advisable to take as a basis for identifying types of innovative work in this area to adopt an international classification of innovations in accordance with the Oslo Guidelines, namely: product, process, organizational and marketing innovations [5]. As mentioned above, organizational and marketing innovations in the IT industry are the result of improving either the IT product or the process of its creation. Therefore, it is advisable to take as a basis for determining the characteristics of innovative labor of IT professionals such two types of innovation as product and process. Product innovations in the IT industry involve significant new changes in the properties of IT products, or new products, process innovations - changes in methods of creating IT products.

In addition to types of innovation, on the features of innovative labor in the IT industry is also influenced by the degree and possibility of its regulation and standardization. According to the existing classifications, there are objects of labor that are subject to strict regulation, and those that are poorly regulated or subject to self-regulation. The first include functional responsibilities and job descriptions, the level of qualification of employees, information links between departments, deadlines for providing information and documents, division of responsibilities, requirements for the organization of jobs, working conditions, etc. Creative elements of employees' activity are subject to self-regulation. Thus, the more creative the activity is, the more unpredictable situations it contains, the less it can be regulated.

It is proposed to use the classification of types of innovative labor of IT professionals depending on:

- 1) the predominance in it of elements that are subject to strict regulation or self-regulation;
- 2) types of innovations to which it is aimed.

Visual representation of types of innovative labor in the IT industry is shown in Fig. 1.

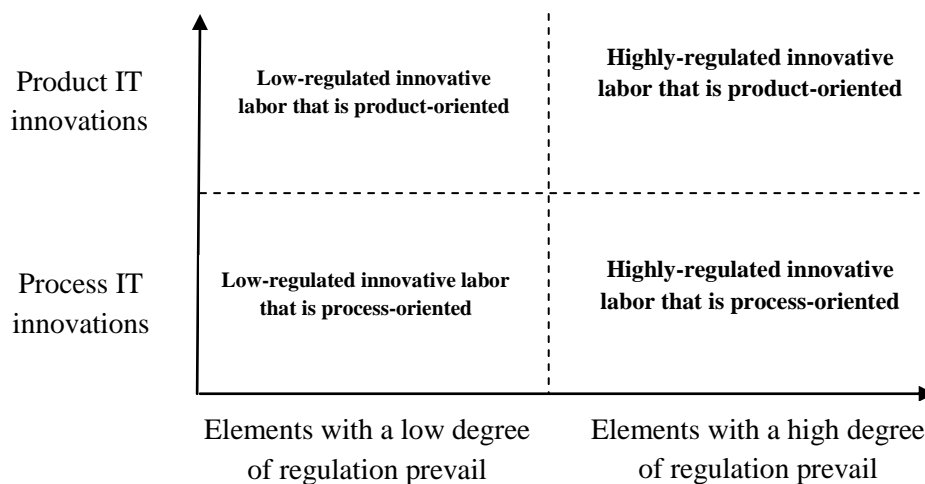


Fig. 1. Types of innovative labor in the IT industry depending on the types of innovation and the degree of regulation of labor elements

Source: author's development

The possibility of labor regulation determines the effectiveness of its rationing.

The objects of rationing in various industries are working hours, number of staff, workload, service area, physical and nervous energy expenditure of employees, technological operation, technological structure of the operation, labor trace element and others. The choice of objects and norms depends on the specifics of the industry. Thus, according to O. Nosikov, traditional approaches to labor rationing of IT specialists do not work, and it is necessary to use only an automated system of labor rationing processes [6]. Therefore, it is advisable to first determine which components in the work of IT specialists should be regulated.

Elements with a high degree of regulation are easily normalized using existing methods. Such elements in the work of IT specialists include: working hours, number of staff, service areas.

It is much more difficult to regulate such elements of labor as the amount of work, the cost of physical and mental energy of employees.

According to L. F. Yezhova, “information processing technologies, programming technologies are so diverse, so advanced that it is impossible to compare the work of programmers in different environments, you can make comparisons only in similar environments and set deadlines for software development based on statistical data and practical experience. This applies to mid-level programmers, ie performers. Higher qualification in programming is determined by those fundamentally new ideas that give rise to new directions in this industry. This was and remains a creative component of the programmer's activity, the payment of which cannot be rationing” [7, pp. 367-368].

Innovative labor is inherent in all stages of the life cycle of innovation, its results are of interest to both enterprises of all forms of ownership and market participants. However, one of the industries that today determine Ukraine's transition to a new economy, determine the further development of the knowledge economy, is the IT industry.

A mega-trend in the development of modern society is the unfolding of the Fifth Digital Industrial Revolution, driven by innovation. This is the kind of labor that distinguishes the progressive areas of the new economy associated with the fifth and sixth technological modes, which primarily include the IT industry. The multiplicative distribution of innovative products in all spheres of the economy depends on its final products.

According to the positioning matrix [8], in the IT industry can be highlighted the following professional groups:

senior executives and top managers (a “prestigious” quadrant characterized by a high level of competition and a high level of wages);

leading specialists and highly qualified specialists (leading programmers) (“attractive” quadrant, characterized by a low level of competition and a high level of wages);

highly qualified specialists (programmers and developers) (“stable” quadrant, characterized by a low level of competition and relatively low and average wages);

other specialists (“conservative” quadrant, characterized by a high level of competition with relatively low wages) [8].

The listed professional groups in accordance with the quadrants of the matrix of positioning of IT specialists in the specialty should be compared with those proposed in Fig. 1 classification of types of innovative labor. As a result, we obtain an supplemented matrix taking into account the specified classification (Fig. 2).

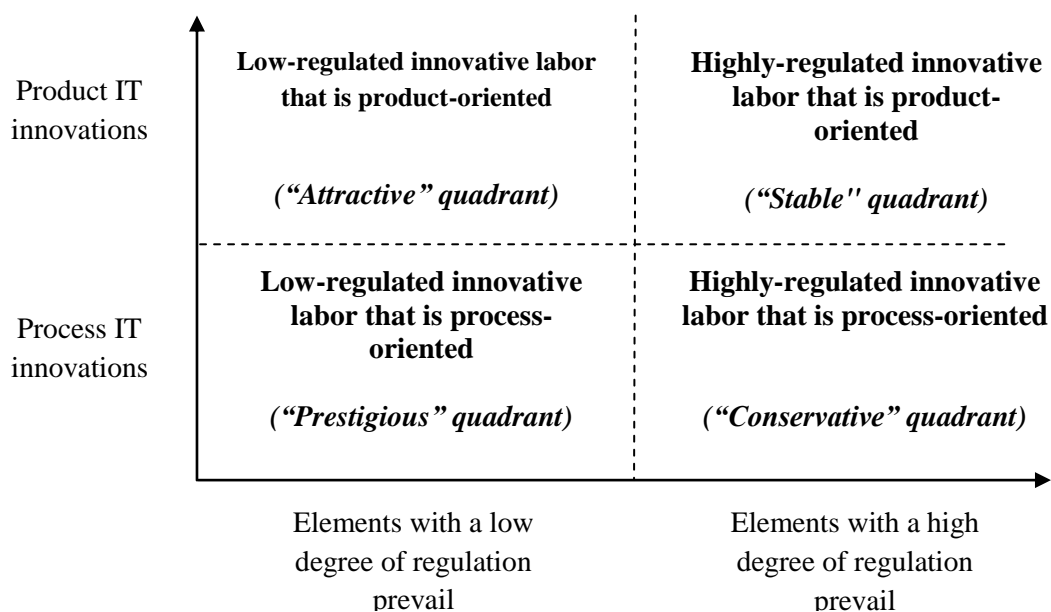


Fig. 2. Comparison of the positioning matrix of IT industry employees by profession with the classification of types of innovative labor

Source: author's development

Each of the considered professional groups in the IT industry can be assigned to one of the four quadrants of the proposed matrix and, at the same time, classified according to the types of innovative labor in this industry. The stable state and demand of IT professionals in the labor market require further research and require regulation of the labor of IT professionals.

The development of standards for the cost of innovative labor in the IT industry is quite a complex process, due primarily to the fact that the creation of software – is an intelligent process. Today it is not subject to accurate cost and time evaluation [9],

because the programming of one task may involve specialists of different professions and categories. In addition, productivity in the process of software development depends on many factors: the qualifications of the specialist, the algorithmic complexity of the programmed problem, mathematical software and others, which are quite difficult to take into account.

According to the results of theoretical generalization, it can be shown that the “formal approach” to the rationing of the labor of specialists in software development is currently absent: the terms of the code, functions, classes, etc. have not been calculated [9]. The creative elements of the labor of specialists and technicians in the IT industry are almost impossible rationing and can be determined only through the use of expert assessments of experienced professionals or clearly regulated by the timing of software development. That why, in preparing a project implementation plan, the responsible project executor with the head of the department and other specialists provide expert assessment (in other words, determine at random) the duration of development of project subtasks by those programmers who are included in the project group. The rationing of programmers' labor in practice is usually carried out on the basis of expert assessments. Often, experts are directly developers with some experience, company management, competitors [9]. Based on the assessments of individual experts in accordance with existing methods, an integrated consensus assessment is formed.

Technical elements of innovative labor in IT companies are subject for rationing, but the accuracy and adequacy of such standards has a wide range of values caused by certain dependencies of the complexity of the software product from its basic parameters, primarily the number of required input commands.

Based on the above, it can be argued that the cost of innovative labor in the IT industry depends on the type of software product and the duration of its development and implementation, that is, labor rationing should be based on labor intensity.

Researchers, based on the design process, divide the existing models for estimating the complexity of the software product into two groups [10]: algorithmic, based on the calculation of quantitative characteristics of the program in the form of the

number of operators or functional points, and non-algorithmic, using certain schemes or principles.

However, it is necessary to take into account the type of innovative labor in the IT industry according to the developed classification (with a high or low degree of regulation, focused on process or product innovations in the IT industry).

Thus, the first step in determining the actual standards of innovation labor costs in the IT industry should be to determine the type of this labor. Considering the innovativeness and creativity of most components of the software, such assessments have become widespread in the practice of software development, which became the dominant argument in choosing to use this method of scientific knowledge to assess the complexity of the IT industry on the example of software products [11].

The development of software products is taken as an example of innovative labor in the IT industry, because software development requires the use of knowledge, skills, abilities to give birth to a new idea and its implementation – creating a fundamentally new or improving an existing product characterized by innovation.

According to the proposed classification, the labor of programmers can be attributed to such a type as highly regulated product-oriented, which forms a “stable” quadrant of the matrix of positioning of employees in the IT industry by profession (Fig. 3).

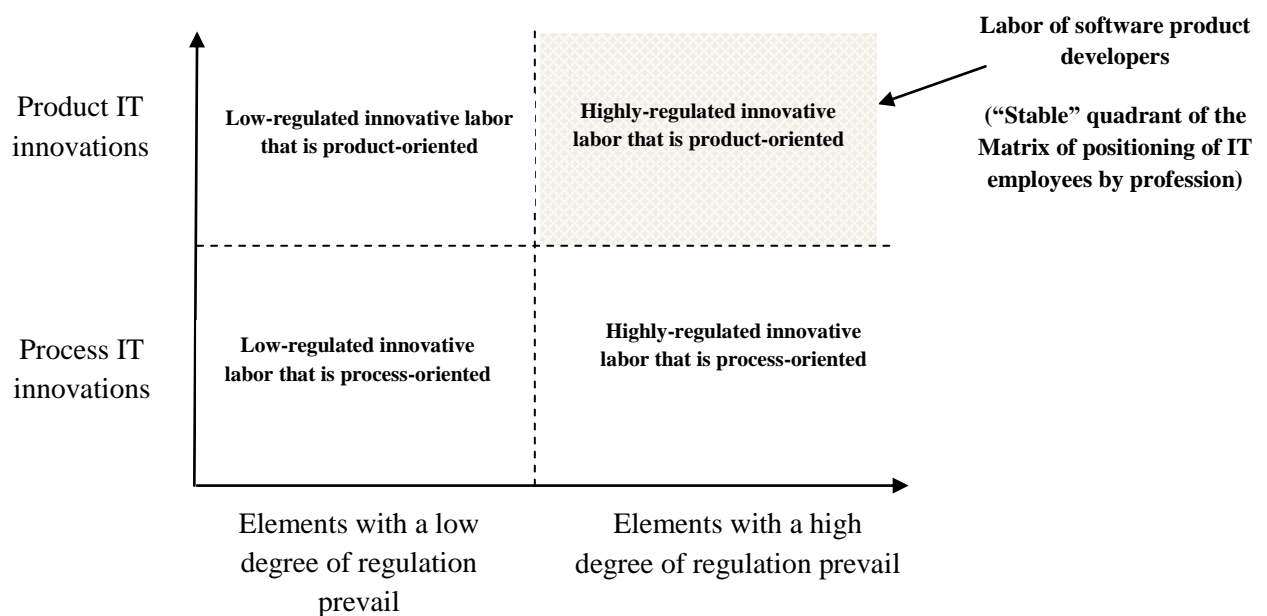


Fig. 3. Placing the labor of software product developers on the matrix in accordance with the classification of innovative labor and the matrix of positioning of employees in the IT industry by profession

Source: author's development

The development of the IT industry and the successful operation of IT companies depend on the qualifications of IT specialists, their ability and desire to work productively, so the issue of labor regulation in the IT industry should occupy one of the main positions in the strategy of IT development of Ukraine (reducing imbalances in supply and demand of highly skilled professionals, stopping their possible outflow abroad, etc.).

Conclusions. Focusing on the types of innovations, as well as the degree of automation and regulation of labor operations in the development of IT projects, four of its types are identified as low-regulated, product-oriented; low-regulated, process-oriented; highly regulated, product-oriented; highly regulated, process-oriented, which will take into account the type of IT innovation and the degree of regulation of the elements of labor in determining the level of its complexity.

The development of IT industry and IT-employment helps to increase productivity in all sectors of the economy, the efficiency of human and material resources. The demand for IT professionals in the labor market, determines the importance and need to improve the processes of labor regulation in the IT industry.

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