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INTELLECTUAL SERVICES SECTOR: FEATURES OF ESTABLISHMENT AND DEVELOPMENT OF ENGINEERING

СЕКТОР ІНТЕЛЕКТУАЛЬНИХ ПОСЛУГ: ОСОБЛИВОСТІ СТАНОВЛЕННЯ ТА РОЗВИТКУ ІНЖИНІРИНГУ

Nowadays, the development of the service sector is very relevant, therefore, this kind of enterprise is very important both for the whole world and for Ukraine as a whole. In international statistics, engineering is associated with the design and construction of facilities, however, engineering services are also provided in the implementation of other types of economic activity. The terms “engineering” and “engineering services” contain only an indicative list of types of high-tech and highly professional services that need to be improved. The article describes the different types of organizations operating in the research and development sectors and are engaged in design and technical-economic engineering. The article describes the “intermediary model” of engineering companies, vertically integrated engineering structures of the holding type, specializing in the implementation of turnkey projects, as well as engineering organizations specializing in design, engineering and technological and technological and software research and development. Various statistical indicators for measuring and assessing the quality of engineering services are analyzed, as well as indicators of the effectiveness of engineering organizations. A system of indicators for assessing the effectiveness of the activities of engineering organizations in the service sector has been developed and described.

Key words: engineering, information and communication technologies (ICT) sector, high-tech and highly professional engineering services, engineering companies, engineering services.

В наш час дуже актуальним є розвиток сфери послуг, у зв'язку з тим, що даного роду підприємства є дуже важливими як для всього світу, так і для України в цілому. У міжнародній статистиці інжиніринг асоціюється з проектуванням і будівництвом об'єктів, проте, інжинірингові послуги надаються і при здійсненні інших видів економічної діяльності. Терміни «інжиніринг» та «інжинірингові послуги» містять тільки приблизний перелік видів високотехнологічних та високопрофесійних послуг, який потребує вдосконалення. Тому, для того щоб зрозуміти, які саме базові функції мають інжинірингові організації, необхідно визначити їх роль в ланцюжку створення і перетворення знань в нову або вдосконалену продукцію чи послугу. Важливим для даної області також є виявлення типів інжинірингових організації, ідентифікацією українських інжинірингових організацій, підприємницьких структур сфери послуг, а також із розумінням їхньої ролі у національній інноваційній системі. В статті описані різні типи організацій, що діють в секторах досліджень і розробок, а також займаються проектним і техніко-економічним інжинірингом. Детально була описана «посередницька модель» інжинірингових компаній, а також вертикально інтегровані інжинірингові структури холдингового типу, що спеціалізуються на реалізації проектів «під ключ». Описано інжинірингові організації, що спеціалізуються на конструкторських, конструкторсько-технологічних та технолого-програмних дослідженнях, розробках. Проаналізовано різні статис-

тичні індикатори для виміру і оцінки якості інжинірингових послуг, а також індикатори ефективності інжинірингових організацій. Деякі із наведених в аналізі показників було використано для розробки системи індикаторів оцінки ефективності та динаміки розвитку українських інжинірингових організацій та підприємницьких структур в обраній області сфери послуг. Розроблено і описано систему показників для оцінки ефективності діяльності інжинірингових організацій сфери послуг, з об'єднанням та виділенням показників у групи, їх описанням, одиницями виміру і детальними коментарями.

Ключові слова: інжиніринг, сектор інформаційно-комунікаційних технологій (ІКТ), високотехнологічні і високопрофесійні інжинірингові послуги, інжинірингові компанії, інжинірингові послуги.

В наше время очень актуальным является развитие сферы услуг, поэтому данного рода предприятия очень важны как для всего мира, так и для Украины в целом. В международной статистике инжиниринг ассоциируется с проектированием и строительством объектов, однако, инжиниринговые услуги предоставляются и при осуществлении других видов экономической деятельности. Термины «инжиниринг» и «инжиниринговые услуги» содержат только примерный перечень видов высокотехнологичных и высокопрофессиональных услуг, который нуждается в совершенствовании. В статье описаны различные типы организаций, действующих в секторах исследований и разработок и занимаются проектным и технико-экономическим инжинирингом. Описана «посредническая модель» инжиниринговых компаний, вертикально интегрированные инжиниринговые структуры холдингового типа, специализирующиеся на реализации проектов «под ключ», а также инжиниринговые организации, специализирующиеся на конструкторских, конструкторско-технологических и технолого-программных исследованиях, разработках. Проанализированы различные статистические индикаторы для измерения и оценки качества инжиниринговых услуг, а также индикаторы эффективности инжиниринговых организаций. Разработана и описана система показателей для оценки эффективности деятельности инжиниринговых организаций сферы услуг.

Ключевые слова: инжиниринг, сектор информационно-коммуникационных технологий (ИКТ), высокотехнологичные и высокопрофессиональные инжиниринговые услуги, инжиниринговые компании, инжиниринговые услуги.

Formulation of the problem. An important aspect of the study of the market of high-tech services was the study of perspectives for the development of intellectual services in Ukraine. Understanding the main “driving forces” (drivers of the intellectual services sector) makes it possible to more accurately and reasonably predict the future state of the market. This is important because intellectual services are very likely to take a leading place in the world and domestic economy. Engineering services, as an important component of the intellectual services sector, have recently been often attributed the role of special agents of innovation, capable of implementing the results of research and development. It should be noted that in foreign practice, there is no uniformity in the definitions, functions of engineering services and no place is defined in the process of digital transformation of business and economy.

Analysis of scientific publications. The economy, depending on the share of employment in the sector, is divided into “agricultural”; “industrial” and “post-industrial”. But, already in the third quarter of the twentieth century, scientists began to put forward ideas “about knowledge-based” economies of the future – “intellectual economy”. This concept was introduced by Fritz Mahlup (1962). In subsequent years, conducted research I. Mills, Dan Hertog, R. Bilderberg, N. Tsounis.

Currently, scientists M. Gershman (on the sector of engineering services), M. Doroshenko (on the market of intellectual services and forecasting the development of segments of the market of intellectual services) and others are conducting serious research.

The purpose of the article is to consider and understand the essence and functions of engineering companies, as well as to identify the features of information and innovation components of intellectual services in the market of intellectual services.

Presentation of the main material of the study. The development of the organization of the service sector is a very important task for the Ukrainian innovation system and the economy as a whole. Due to the specifics of its activities, enterprises of this sector of the economy on the one hand is an important part of the technological chain of creating competitive products (services) in certain parts of the service sector and on the other – perform the function of direct agents of modernization, eliminating existing infrastructure gaps.

For example, the activities of high-tech and highly professional service organizations – engineering organizations that require a high degree of professionalism in design, design and project management in various sectors of the economy are a catalyst for demand and training of engi-

neers adapted to the requirements and use of digitalization. Thus, the definition of domestic engineering organizations in the field of high-tech and highly professional services that carry out innovative activities becomes especially important in terms of complete understanding of innovation and information processes in the country and its regions and in industries, services.

In the Ukrainian legal field there are no unambiguous definitions of the term engineering. On the one hand, this can be explained by the legislator's lack of attention to this specific type of service organization, and on the other – the complexity of standardization of activities, the heterogeneity of which is due to differences in business practices in this service sector.

Engineering services include engineering and economic and management consulting services for the preparation of the production and implementation process (robot, services), preparation for construction and operation of industrial infrastructure and other facilities, pre-design and design services (preparation of feasibility studies and other similar services).

Engineering – performance of various engineering and economic works, provision of consulting services on a commercial basis.

Among the relevant documents of organizational and administrative nature under “engineering organizations should be understood organizations (offices, offices, etc.) that provide a range of high-tech consulting services” [1].

Even a shallow study of the terms “engineering” and “engineering services” appearing in the Ukrainian legal field makes it possible to conclude that they all contain only an approximate (poorly defined) but not exhaustive list of types of high-tech and highly professional services, thus leaving, “Information and legal space” both for law enforcement and for improving legislation in this area.

To define the meaning of “engineering” and “engineering services” it is necessary to refer to the international classifiers of economic activities ISIK (International Standard Industrial Classification of all Economic Activities) of the United Nations and NACE (European Classification of all Economic Activities) of the European Union. In both documents, engineering services are part of the section “Architectural and engineering activities and related technical and economic consulting” (in ISIK – code 7421, in NACE – code 74.2). The UN Guidelines for Statistics of International Trade in Services provide a classification of services Services Sectoral Classification List – GNS/W/120 [2].

This section contains four sections:

- engineering services;

- integrated engineering-economic and management-design services;
- architectural services;
- services in the field of urban planning and architecture.

However, it should be noted that the same UN guide for statistics on international trade in services has a high degree of conventionality of such classifications.

In international statistics, engineering is currently associated with the design and construction of facilities. At the same time, engineering services are provided in other economic activities.

For example, according to the OECD Information Society Measurement Guide, engineering services for projects, information telecommunications and television (code 83325) are included in the list of products of the information and communication technology (ICT) sector, due to the lack of statistical accounting of similar services in other sectors [3].

International standardization of engineering services is carried out within the framework of the European Committee CEN // TC 395 at the European Commission. (October 2009) in two working groups:

- on standardization of terminology of engineering consulting services for industrial products and industrial services;
- on standardization of terminology of engineering services for buildings, infrastructure, industrial facilities and feasibility studies.

One of the committee's documents (dated August 2011) contains a number of key terms, including: “... engineering is the type of intellectual activity required to describe, design, justify, support the production and reproduction of a product or service.” [4] Engineering and economic consulting services represent (committee version from 2011) is “a type of intellectual activity carried out by engineers and economists-consultants during one or all stages of the life cycle of an object, product or service”.

It can be noted that, in contrast to international standards and classifications, the UK National Statistics Division provides a broader interpretation of economic activities in which engineering services may be required (without limiting them to the field of construction) [5].

Also, in turn, the uncertainty of the concept of “engineering services” and the breadth of this high-tech and highly professional term allows it to be used by organizations, near the business structures of the service sector, performing a wide range of works and services in various sectors of the economy, including services, ie domestic legislation allows “unreasonable positioning” of organizations as engineering.

Such discrepancies in fact complicate the procedures for the formation and assessment of the representativeness of the sample in the survey of organizations and business structures in the service sector – as engineering. It is obvious that this direction of classification of business high-tech and highly professional services in Ukraine needs updating and further development within the framework of digital transformation of economy and business [6].

We describe the features of the activities of engineering organizations, taking into account the transition period of digitalization of the domestic economy.

In a narrow sense, engineering is a set of highly professional services provided by engineers, economists, programmers, civil engineers at all stages of the technological chain of creating a new (often innovative) facility / equipment development (transformation of new scientific knowledge into technical and technological product (service)).

In a broad sense, engineering organizations or business structures of the service sector are a kind of highly professional intermediaries, combining basic and applied science, specialized research institutes and manufacturing enterprises, startups, integrating and coordinating in the implementation of new technological projects.

On the scale of the national innovation system of Ukraine, engineering organizations occupy between science and the real sector of the economy, allowing the implementation of the results of scientific (innovative) research in industry, social activities and services. As a rule, they play the role of a key mediator (integrator) between the theoretical knowledge gained by scientists and its practical application.

To understand the basic functions of engineering organizations as representatives of the sector of high-tech and highly professional services related to innovation and information processes, it is necessary to define their role in the chain of knowledge creation and transformation (as an example, use of innovation and information technologies) into new or improved products (service).

Engineering services can be attributed to scientific and technical activities, as they are aimed at “the application of new knowledge (mostly innovative) to solve technological, engineering, technical, economic and other problems.” It is known that research and development includes basic and applied research, as well as developments, which include design, design, technological, feasibility studies and justifications. The implementation of these works / services is the defining direction of the activities of engineering organizations as agencies of the national innovation system.

However, the analysis of the definitions of engineering services that exist in the Ukrainian legal field shows that they may (and quite reasonably) include not only services related to development but also a number of scientific and technical, technological (eg, ICT and digital technologies) and marketing and logistics services, which at first glance are not directly related to the nature of scientific and technical activities, including in the field of services. Accordingly, there is a problem of identifying a range of scientific, technical and technological areas in the high-tech and highly professional engineering services, which, in the opinion of the authors, is seriously hampered by the lack of both statistical and socio-economic data.

Since the activities of engineering organizations and a number of business structures are associated with the production of products and services for the purpose of their sale, they can be attributed mainly to the business sector of high-tech and highly professional services. However, it is possible that a number of organizations (eg, specialized institutes, bureaus) performing engineering functions may belong to the vocational education sector (eg, the Academy of Civil Engineering and Architecture) and the public sector (sectoral design organizations).

An important issue is to identify the types of engineering organizations. The difficulty here is that engineering services in Ukraine are provided by many organizations and business structures of the service sector (including as a non-core activity), consisting of staff – engineers, programmers. Therefore, the typology should take into account the nature of engineering services and the possibility of their attribution to scientific and technical activities.

Also, in our opinion, it is necessary to understand that in terms of the volume of technological innovation projects for enterprises of the real sector of the economy, engineering organizations should stand out against other scientific and scientific-technical organizations.

The different types of organizations operating in the research and development sectors and engaged in design and technical and economic engineering include:

- effort, design and engineering technological organizations;
- design and design and survey organizations;
- experienced experimental enterprises;
- industrial enterprises, concerns, corporations (including engineering divisions, such as DTEK);
- engineering companies (firms, bureaus).

Engineering companies, mainly related to the business sector of the service sector, are the most

interesting object of study in the context of digitalization, given the lack of empirical data and practices of systems research in this area. A more detailed study of the activities of engineering organizations of business structures in the service sector would provide information about their features (including information and innovation) and business models.

For example, based on data from open Internet sources, it can be argued that in Ukraine and its regions, the so-called "intermediary model" of engineering companies in the business sector working in the field of construction. Such companies carry out complex management of works on construction (reconstruction, reengineering, modernization) of civil and industrial objects, offering also the corresponding set of services (legal, financial and others). However, they may not have their own scientific, engineering or reporting base, having extensive links with suppliers and contractors and playing the role of distributors.

You can specify a standard set of services provided by engineering companies of this type:

- initial diagnostics of the object;
- analysis of the contract with the contractor;
- budget analysis;
- technical Supervision;
- search for a construction or engineering firm and conducting a tender;
- legal support in conflict situations;
- budgeting;
- consultations on the design of buildings and engineering and operational facilities, etc.

Obviously, only some services from the approximate list can be indirectly attributed to scientific, technical or innovative activities. This model of the engineering company is not of particular interest in terms of innovation.

On the other hand, the "mediation model" can be combined with the presence of its own research base. In this case, the design and research activities will be the main for the engineering company, other types of work can be carried out with the involvement of contractors. Own developed research and design competencies, or the presence of close ties with scientific, scientific and technical organizations (for example, in the framework of technology park projects), which allow to bring novelty (including the expansion of ICT and digital technologies) in production processes, are important properties of engineering organizations.

It should be noted that the leading positions in the Ukrainian rankings of engineering organizations and companies are occupied by vertically integrated engineering structures of the holding type, specializing in the implementation of turnkey projects.

Quite a different model are engineering organizations specializing in design, engineering and technological research, development. Engineering organizations and companies can also act here as developers of non-standardized equipment and software.

Selective study of engineering services of a number of Ukrainian organizations, as well as the experience of the results of engineering companies in the US, Japan, Germany, Sweden, Austria allows to form a preliminary list of types of high-tech and highly professional engineering services containing scientific, technical and technological components (including, and on the basis of innovative solutions), as well as important in terms of assessing the effectiveness of their innovation and information activities:

- performance of works on design of technological equipment and apparatus (including technical systems, equipment of non-standardized machines and equipment, technical safety systems);
- execution of logistic, commissioning works, carrying out of tests of cars, units, technical and technological systems;
- software development, technical consulting in the implementation and operation of information and communication technologies;
- technical audit, diagnostics, energy audit of industrial and agricultural facilities, infrastructure facilities;
- turnkey construction of industrial, agricultural facilities, infrastructure facilities (including development, design, supply, commissioning and commissioning);
- performance of works on automation of technological processes (including, within the limits of technology Industry 4.0);
- development of technical, engineering, ecological documentation;
- consulting and translation of management, financial and economic documentation into digitalization standards;
- other engineering, consulting services (including engineering and project management support).

Of course, this list should be further clarified and supplemented. Taking into account the previous research of the available information, it should be stated that the possibilities of identification of Ukrainian engineering organizations of business structures in the service sector are quite limited today. However, according to the authors, we consider it appropriate to outline a preliminary range of types of engineering organizations, which would be useful to include in the sample when conducting a "pilot" economic and sociological survey to test and validate the findings and hypotheses.

These include:

- scientific organizations (design and survey organizations);
- construction and engineering-technological holdings, company groups and other integrated structures of the business sector of the services sector, which include structures that provide engineering services;
- higher educational institutions of technical and technological profile;
- other independent organizations and business structures of the service sector, which performs certain types of engineering services.

Analysis of foreign experience shows that the set of statistical indicators used to measure and assess the quality of engineering services varies significantly depending on the subject of the survey. Most of the indicators for assessing the effectiveness of engineering organizations is usually reduced to financial. There is a lack of indicators that characterize their “scientific and technical component” and a significant shortage of indicators for assessing the effectiveness of engineering services as an element of the national innovation system.

Thus, the joint report of the OECD and the World Bank on trade in engineering services in South Africa [7], contains such indicators as total income by type of engineering services and sectors of the economy; volume of exports and imports of engineering services; revenue indicators of the largest engineering companies in this sector.

The North American report [8] characterizes the engineering services sector as a whole and by individual countries and includes indicators:

- the average level of wages of workers in this sector of services;
- level of employment of engineers, consultants, designers in this type of comprehensive services;
- annual number of engineering graduates and specialists in the field of digital technologies;
- volumes of exports and imports of engineering services in some countries;
- investments in the largest infrastructure projects;
- revenues of individual companies in the sector.

Among the foreign studies examining the effectiveness of engineering companies in the national innovation system, the report of the Statistical Office of Canada [9] deserves special attention, which provides the following indicators of the effectiveness of engineering organizations:

- innovation potential (level of staff education; research and development costs; level of

scientific and technical cooperation with universities, research laboratories, potential clients; participation in scientific and technical cooperation; acquisition of intellectual property rights, acquisition of digital technologies; acquisition high-tech machinery and equipment);

- implementation of innovations (innovative products, processes, services; the degree of novelty of innovation, the use of intellectual property; the number of innovative ICT);

Some of these indicators can be used to develop a system of indicators to assess the effectiveness and dynamics of development of Ukrainian engineering organizations and business structures in this area of services. It is possible to form preliminary directions of such estimation:

- the scale and effectiveness of the engineering organization in terms of (by type of engineering services);
- involvement of the engineering organization in the national innovation system (including corporation and interaction with universities; research organizations; companies of the real sector of the economy, as well as with foreign organizations);
- use of the results of intellectual activity of technology transfer;
- personnel and material and technical potential of the engineering organization;
- financial stability of the engineering organization.

The proposed specific statistics, as well as explains the comments to them, are presented in Table 1.

Conclusions. It should be noted that today there are a number of variables relevant to Ukrainian scientific, technical and innovation and information policy tasks in the digital transformation of the domestic economy and business, related to the definition of engineering services and their scientific, technical and innovation and information component, and with the identification of Ukrainian engineering organizations, business structures in the field of services, as well as with an understanding of their role in the national innovation system.

In order to test the developed indicators and refine them for the environment of enterprises and organizations of the real sector of the economy, as well as to construct new indicators, it is advisable to conduct a sample “pilot” socio-economic survey, which will also identify additional characteristics of engineering organizations and departments. main activity and form recommendations for the development of adequate state policy measures in the field of services of Ukraine and its regions.

Table 1

Indicators for assessing the effectiveness of engineering organizations in the service sector

№	Indicators	Unit	Comment
	Name		
1	2	3	4
1.	Group: The scale and effectiveness of the engineering organization and the business structure of the services sector (by type of engineering services)		
	1.1. The share of engineering services in the total amount of work performed, services, including: – performance of works on design of technological equipment, incl. non-standardized machines, equipment, technical systems; – technical audit, energy audit, diagnostics, examination of equipment of industrial and agricultural facilities, infrastructure facilities (highways and railways, pipelines, etc.); – turnkey construction of industrial, agricultural and social facilities (including development, design, supply, commissioning and commissioning); – performance of works on automation of technological processes (including at use of digital technologies); – development of technical, engineering and economic documentation; – other engineering services (including engineering and economic support of projects.	percent	The indicator is calculated in terms of types of engineering services: – for integrated structures (holdings, corporations, groups of companies, etc.) the volume of work, services performed by subsidiaries and affiliates that are part of them, provide engineering services (including research and scientific and technical centers, science and technology parks) is taken into account, branch research institutes, design bureaus, etc.); – for industrial organizations that have in their structure engineering units, the amount of work and services performed by these units is taken into account.
	1.2. The share of costs for research and development in the total amount of work performed, services	percent	Characterizes the share of funds of engineering organizations aimed at development, in the total cost of work, services. Used to assess the significance of design, engineering, technological works and services in comparison with other types of works, services.
	1.4. Expenditures on research and development	thousand UAH	Includes design engineering, technological works and services.
	1.3. Expenses for performance of works, services, for the reporting year (without VAT, excises, etc. similar payments)	thousand UAH	By types of engineering services.
	1.5. Net profitability of sales	percent	(Net profit / revenue (net) from sales of goods, products, works, services) * 100%.
2.	Group: Use of results of intellectual activity and realization of technology transfer		
	2.1. The total level of replicated technologies, including: – developed independently; – purchased within Ukraine; – purchased outside Ukraine.	percent	Characterizes the transfer of technology to the real sector of the economy. Used to assess the level of scalability of technologies at industrial facilities and infrastructure facilities. Calculated for organizations that keep records of the use of technology in the creation (modernization of reconstruction, technical re-equipment) of industrial machinery and equipment, technical products. When calculating the indicator, technologies are taken into account, the rights to which are confirmed by patents (certificates), licenses for the use of inventions, industrial designs,

Table 1 (Continued)

1	2	3	4
	2.1. The total level of replicated technologies, including: – developed independently; – purchased within Ukraine; – purchased outside Ukraine.	percent	utility models, or taken into account in the intangible assets of the organization carrying out engineering activities. Implemented is the technology used in the creation (modernization, reconstruction, technical re-equipment) of industrial facilities, machinery and equipment, industrial products. The fact of using the technology must be documented (in business or other agreements, implementing acts and other documents). The indicator is calculated in terms of sources of technology: – developed independently; – purchased within Ukraine; – purchased outside Ukraine.
	2.2. The level of technology implementation	percent	$(\text{Number of purchased and self-developed implemented technologies} / \text{Number of purchased and self-developed technologies}) * 100\%$.
	2.3. Technology borrowing ratio	percent	$(\text{Number of purchased technologies} / \text{Number of purchased and self-developed technologies}) * 100\%$.
	2.4. Number of valid (supported) patents (certificates) obtained in Ukraine and abroad	units	
	2.5. Number of technologies in the form of patents and licenses for the use of inventions, industrial designs, utility models purchased: – within Ukraine, including from the university – organizations of the research and development sector; – organizations of the business sector; – outside Ukraine	units	
	2.6. The number of transferred technologies in the form of commercial contracts (agreements), including: – research and development; – patent for the invention; – non-patent invention; – utility model; – patent license for the invention; – know-how; – industrial design; – sale of finished equipment; – purposeful delegation of qualified specialists to work; – other forms of technology transfer	units	The indicator allows to estimate the forms of technology transfer that are best for engineering organizations.
	2.7. Number of transferred technologies, including: – under agreements on alienation, exclusive right; – under license agreements	units	The indicator allows to assess the advantages of engineering companies in relation to the disposal of exclusive rights to the results of intellectual activity (alienation or granting the right to use within certain limits).

Table 1 (Continued)

1	2	3	4
3.	Group: Involvement of the engineering organization in the national innovation system (including cooperation and interaction with universities, research organizations, real sector companies, foreign organizations)		
	3.1. Coefficient of cooperation of engineering organizations with participants of the national innovation system, including: – University; – scientific organizations; – companies of the real sector of the economy; – foreign organizations	percent	(number of projects implemented in partnership with participants of the national innovation system / total number of implemented projects) * 100%.
	3.2. Number of created (modernized, reconstructed, technically re-equipped) industrial facilities, infrastructure facilities (by types of economic activity), including: – designed, built and commissioned ("turnkey"); – completely modernized, technically re-equipped; – fully automated using advanced production technologies and digital technologies of integrated management and control.	units	The indicator reflects the "contribution" of engineering organizations to the modernization of Ukrainian industry and national / regional infrastructure.
	3.3. Number of projects implemented in cooperation with participants of the national innovation system, including: – Ukrainian universities; – organizations of the research and development sector of Ukraine (scientific institutions of the National Academy of Sciences of Ukraine, branch research institutes, design bureaus, SKGB); – organizations of the real sector of the economy; – foreign organizations	units	Показник характеризує кооперацію і взаємодію з учасниками національної інноваційної системи.
4.	Group: Personnel and material and technical potential of the engineering organization		
	4.1. The share of young qualified engineers, programmers, economists in the total number of hired, including: – at the age of 18-25 years, having secondary-special engineering education; – at the age of 21-27 years, who have higher engineering education	percent	
	4.2. The share of engineering and technical workers (ITP) who have: – secondary special education; – higher professional education; – academic degree of candidate of sciences; – the degree of Doctor of Sciences in total	percent	
	4.3. The share of ITP in the total number of employees	percent	
	4.4. Number of employees, including engineering and technical staff	persons	
	4.5. The number of qualified engineers, programmers in the total number of employees, including: – at the age of 18-25 years, having secondary-special engineering education; – at the age of 21-27 years, who have higher engineering education	persons	

Table 1 (Continued)

1	2	3	4
	4.6. The share of specialized technological equipment in the total amount of fixed assets	percent	For integrated structures (holdings, corporations, groups of companies, etc.), information on their subsidiaries and affiliated engineering companies is indicated; for industrial organizations that have engineering units in their structure, the information on these units is indicated.
	4.7. The share of intangible assets (including computer programs, databases, topologies of integrated circuits) in total fixed assets	percent	
5.	Group: Financial stability of the engineering organization		
	5.1. The share of work performed and services not paid by customers in the total cost of work performed and services (negative parameter)	percent	
	5.2. Relative accounts payable	percent	Accounts payable (for the reporting period – year) / Revenue (net) from sales of goods, products, works, services (for the reporting period – year) * 100%.
	5.3. Wage arrears per employee (negative parameter)	thousand UAH / person	Wage arrears (for the reporting period – year) / total number of employees (for the reporting period – year).

Source: compiled from [9, c. 60-62]

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