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CONCEPTUAL MODEL FOR ECONOMIC EVALUATION OF INNOVATIVE TECHNOLOGIES

Abstract.The conceptual model for economic evaluation of innovative technologies that focuses on the consumer value thereof has been developed. Contemporary role and significance of the value that is laid in the technology and is a condition for their innovativeness have been substantiated, a set of tools for practical implementation of the proposed model established. The model enables evaluators to take into consideration the parameters of the impact of technology due to current market phenomena and trends, which helps to make better management decisions on the strategy for development of innovative technologies**.**

Key words: innovative technologies, concept for evaluation, value, cost.

Problem statement. Dynamic progress of the technologically leading countries of the world highlights the increase in the level of intellectualization of technologies with simultaneous technological singularity. Announcement about the beginning of the 4th Industrial Revolution (Davos, Switzerland, 2016), implementation of the concept of creative economy, significant increase in the share and importance of intellectual property in the structure of technologies and other factors related thereto have contributed to the need for the world countries to review existing approaches to understanding the conditions and peculiarities for generation and spreading of innovative technologies.

One of the key factors of the present sixth technological system and the 4th Industrial Revolution is artificial intellect which is convergent with all spheres of human life. The world analytics trends [49, 50] highlight the rapid development of artificial intellect and methods for processing databases in all technological areas. Intellectualization of technologies extensively began to determine their innovativeness, and, accordingly, consumer value. Therefore, the problem of intellectualization of technologies and objectivity in evaluating them as intellectual property objects (IPOs) are increasingly being the subject of special attention of the specialized organizations worldwide. In particular, within one of the three subindexes of the *Global Competitiveness Index* proposed by The World Economic Forum, which is covered in the Global Competitiveness Report 2016–2017 [49], is a *sub-index of factors of innovativeness and creativity* (Innovation and sophistication factors subindex). The key role of subindex's components is to represent diverse aspects of technology intellectualization. The

Global Information Technology Report 2016 [50] of the same organization focused on the exponential growth of the role of knowledge that has been materialized in high technology and tools for their stimulation, etc.

Intellectualization of technologies is objective and irreversible phenomenon which determines studying the specifics of new economic instruments to work therewith, among which the priority belongs to the sphere of evaluation of innovative technologies. The importance of intellectualization-dictated new approaches to evaluation of technologies is explained by current increase in their intrinsic value. In turn, this will determine the choice of methodological approaches in the cost estimation of innovative technologies.

World scientists and practitioners have already developed a considerable number of guidelines and models for evaluating innovative technologies that meet current market demands. Because these models are mostly local in nature, designed for specific technology enterprises or even for certain technologies. The value laid down in innovative technologies is based on the nature of the market in a particular country at certain time. However, in the Ukrainian realities, it is not always possible to apply the world experience in technology evaluation, which is explained by the peculiarities of the domestic R&D system and the transfer of their results. Therefore, integration of Ukraine into the community of technologically developed countries of the world and the innovative type of development declared requires for revision of existing approaches to evaluation of innovative technologies that would actualize the present role of the value laid down therein.

Analysis of recent researches and publications. Innovative technologies are now the main drivers of competitive development of the world. Numerous reports of scientists at the conferences of the World Intellectual Property Organization ([52]) on the issues of economic evaluation of innovative technologies and, in particular, evaluation of intellectual property within them, indicate the relevance and scientific and practical significance of this problem.

Significant works in the field of economic evaluation of innovative technologies are presented by foreign scientists. In particular, J. O. Lanjouw, A. Pakes, J. Putnam [40] evaluate innovative technologies in terms of patent evaluation, which, as intangible assets, determine the cost of innovative technologies. P. H. Sallivan in his work [46] considers evaluation of the technology value determined by intellectual contribution within the framework of intellectual capital management on the basis of the double complexity paradigm (*the two-paradigm complexity*): problems of creation and removal of the value. M. Dobija, J. Barburski and the authors [5] study this problem based on the human capital theory, understanding the capital as human ability to perform work and generate value added, on the basis of which scientists propose approaches to measuring human capital.

The research of methods of economic evaluation of innovative technologies is the subject of works of the scientists, namely: N. P. Archer, F. Ghasemzadeh, P. Board and other authors [26], D. Andriesson [25], A. Brooking [28], L. Edvinsson and M. S. Malone [31], R. S. Kaplan and D. P. Norton [39], S. Kamiyama and authors [38], B. Livson [41], D. H. Luthy [42], K. E. Sveiby [47], T. A. Stewart [45], K. Fink [32], B. H. Hall [33], H.-J. Shiu [36] and others. Groundwork of the scientists is valuable in terms of using certain provisions for evaluation of innovative technologies. However, to be used in domestic conditions, the proposed developments require significant adaptation.

In Ukraine, despite the existing number of conceptual documents on technological development of the country (Sustainable Development Strategy “Ukraine 2020”, Concept of development of the national innovation system, etc.), in fact, no conceptual vision for economic evaluation of innovative technologies has not yet been developed.

An analysis of domestic studies and publications has shown that, for the most part, attention is paid to the aspects of evaluation of innovative technologies from certain specialized points. In particular, evaluation of innovative technologies in the context of management thereof is the subject of the following works: K. Ya. Vodianko

[4], S. M. Illiashenko [8], P. H. Pererva and I. V. Hladenko [14], O. M. Yastremska [24] etc. Evaluation of technologies in terms of the objects of intellectual property right is considered by: S. F. Butnik-Siverskyi [2], P. M. Tsybuliov, V. P. Chebotariov and authors [19]. Approaches to evaluation of intellectual capital were investigated by: M I. Saikevych [18], Y. S. Sytnyk [17], N. O. Shpak [21]. A significant contribution to the study of economic evaluation of intellectual and innovative technologies was made by V. M. Vasylenko [3], V. I. Dovbenko [29], O. Yu. Yemelianov [6], O. P. Kosenko [12].

Despite a good deal of theoretical and practical groundwork in the field of evaluation of innovative technologies, the concept has not yet been developed, and the contemporary significance of their value not duly considered. The fragmentariness of developments does not make it possible to notice that the role and place of innovation technologies in the National innovation system of Ukraine in recent years has changed having acquired qualitatively new accents. The consumer value of technologies determined by the level of their intellectualization has qualitatively new features.

Statistics show that during 2016 scientific and scientific-technical works in Ukraine were carried out by 972 organizations. Of those, 15.7 % belonged to the higher education sector [7, p. 1]. This indicates a significant scientific technical and technological potential of the domestic R&D sector. At the same time, intangible assets have small share – 2–5 % in the assets of domestic companies [9]. For comparison: with the leading world corporations such share reaches 30–40 %, and in high-tech companies 70–80 % [9].

According to the World Economic Forum [49], Ukraine has all prerequisites to generate innovative technologies. In particular, this is traced in the component of the 11th parameter of "innovation" of the global competitiveness index. In the sample of 138 countries, Ukraine gained the following values for the index components (ranking of 138 points): "innovative capacity" – 49, "level of quality of research institutions" – 50, "availability of scientists and engineers" – 29, "patent applications" – 49. Totally aggregated, the "innovation" parameter equals to 52. At the same time, in the above index, within the parameter of "business creativity", the component of "nature of competitive advantage" (indicating the nature of emergence and impact of implementation of competitive advantages as a mover for innovation development) is 109, which means the low level of implementation of innovation and technological potential of Ukraine. That is, having a considerable amount of resources for generation of innovative technologies and R&D results there is no necessary and sufficient response from technological subjects to the demands of the market environment.

This situation slows down technological progress and taking the leading positions on the international scene by Ukraine. Lack of a conceptual model for economic evaluation of innovative technologies that would meet the challenges of time is violating effectiveness of both evaluation and commercialization of technologies and management thereof. Thus, it is time for development of the conceptual model for evaluating innovative technologies that would provide a systematic view of the given problem.

Goal and tasks. The purpose of the work is to substantiate the conceptual model for economic evaluation of innovative technologies.

The object of the study is a set of components of the system of economic evaluation of innovative technologies. To achieve this goal, the following tasks were solved:

1) the contemporary role and significance of the value that is laid in the technology and is a condition for their innovativeness have been determined. On this basis, there is a need for new approaches to evaluation of innovative technologies;

2) the concept of economic evaluation of innovative technologies has been substantiated which focuses attention on the value laid down therein;

3) a set of methodical instruments for implementation of the proposed conceptual model for evaluating innovative technologies has been established.

Description of the main results of the study. Technology, like any other commodity, acquires this when two parties are available, the consumer value and the cost. Such a duality of technology is inherent in labor which is also featured by dual nature. Value and cost are two categories of economic evaluation of technologies that are mediated by mutual influence.

The value laid down in technology by a developer determines the consumer value of this technology in the form of the finished product and dictates the choice of the method for its valuation. The consumer value is the basis for determining the value of technology which subsequently becomes the basis for pricing it. The distribution function of the price indicates that in case of price deviation of cost (for example under the influence of demand and supply), there is a redistribution of the product value between economic entities, sectors, etc. Based on such distribution, the existing technologies can acquire new values. The stimulating function of the price, due to the specifics of the economy of each country, affects manufacturers' aspiration to increase their revenues minimizing cost of their product or expanding output volumes at the existing (conditionally balanced) level of the product price in the industry. It stimulates the search for ways to improve the technology characteristics, and nowadays the main one is intellectualization. Popular point is that the consumer, first of all, buys the value that can be derived from the use of technology, and not the technology as such. Thus, in this way, the value has an impact on the value of technology which essentially determines the course of scientific and technological progress.

The issue of cost evaluation of technologies is more studied, while the value assessment has been researched relatively less than is required by the contemporary market. The reason for this is low rate of sharing and perception by scientists and practitioners of contemporary views about the role of value in the processes of generation of innovative technologies at the macro level, and significant level of subjectivity of value assessments and complexity in researching at the micro level. In general, the value as an economic category has not been sufficiently studied at this time (in particular, the mechanisms of acquiring value by both intangible and tangible assets still remain undeveloped).

The contemporary role and significance of the value in the system of evaluation of innovative technologies

Mainly, the innovativeness of technology is determined by the intellectual contribution of developers during R&D processes. The main subject of technology intellectualization is a *"knowledge-worker"* whose intellectual development and competencies are the basis for development of technologies with the consumer value of high level. Productive implementation of technologies with a significant level of value ensures stable competitive positions of companies, industries and regions in the future. At the same time, due to the value, the cost of innovative technologies provides for an increase in the capitalization level for companies (namely, *Alphabet Inc., Amazon.com, Apple Inc., Foxconn, Hitachi, Huawei, IBM, Microsoft, Lufthansa Samsung Electronics, Sony, Panasonic,* etc).

Value, as an economic category, determines feasibility of implementation of a particular choice among the set of possible ones, being one of the main criteria for substantiation of the product value. Value is the basis for further solving economic issues of ownership, distribution and reproduction. The contemporary view of the evaluation of innovative technologies requires for understanding of the principles of value origin laid down therein.

The criterion of value in various times was one for understanding economic processes. Basis of the theory of value is philosophy of I. Kant, due to which G. Lotze in the 60's of 19th century described the notion of value in the categorical sense for the first time.

Economic theories that describe the value and its role during the valuation of goods, from the 18th century to today include the following: the labor theory of value (W. Petty, A. Smith, D. Ricardo, K. Marx et al.), the theory of cost (F. Quesnay, R. Torrens, J. Mill) and the theory of factors of production (J.-B. Sey and

F. Bastia), the theory of marginal utility (K. Menger, F. Wieser, E. Ben-Bawerk, W. Jswans, A. Marshall, L. Waldras, V. Pareto et al.), the theory of supply and demand (J.-B. Sey, G.-D. McLeod, K. Menger, F. Wyzer, E. Bem-Bawerk). Nowadays, the informative theory of value (D. Bell et al.) according to which the main source of value is mostly intellectual, living work equipped with scientific knowledge becomes relevant.

According to J. Howkins [35], the current leading factor for emergence of technology value is creativity, intelligence, talent, etc. (the concept of creative economics), rather than traditional resources (land, labor, capital). In fact, use by technology developers of their creative imagination leads to the increased value in the technologies they create. Originality and creativity are those factors that a knowledge-worker shall generate during development of technologies. The higher the level of knowledge that a knowledge-worker employs in the technology, the more rapid the new knowledge will emerge, which will become the basis for producing the more effective technologies and will contribute to strengthening the competitive positions of the country, regions, companies, etc. In this context, the value becomes the hallmark of economic progress.

D. Bell, as one of the founders of the informative theory of value, notes that if knowledge in its systemic form is used in practical processing of existing industrial resources, then it is it, and not the labor, that is the source of value [27].

One of the sources of the value origin is the nature of technology synthesis as an intellectual property object (IPO), that is, its composition of simpler IPOs. The synthesis promotes technology to generate new values, enables to achieve the result that cannot be possible by using certain IPO as its components.

The Concept of Society 5.0 [44] updates the role of value in a fundamentally new format. Society 5.0 is a concept adopted by the government of Japan for superintellectual society designated to form “smart” society. This is a new social paradigm aimed at replacing the information society paradigm (Concept of Society 4.0). One of the foundations of Society 5.0 concept is that virtually all of the important processes in physical space are mediated by collecting data that are then digitized and sent to virtual space, where being analyzed by artificial intellect the decisions are made which, in turn, appear in the world of physical things. Based on the fact that this concept involves spreading of the Internet of things and advancement of work with huge amounts of data and artificial intellect, the role of value, as an economic category has increased significantly.

Digital economy (term introduced in 1995 by D. Tapscott in [48]) is one of the answers to demographic changes in the world. Based on the fact that population of the Earth is growing and, correspondingly, its needs are increasing, but natural resources are exhausted, humans in order to live and develop require for a new technological step to solve this problem. The foundation for the digital economy is presented by intellectualized technologies that ensure its main components: supporting infrastructure, e-business and e-commerce.

The theory of innovations (first described by J. Schumpeter [22], 1911) which is the basis for understanding the processes for generating and spreading innovative technologies, identifies such areas of knowledge as: heuristics (describes the processes of creative thinking), inventics (describes the processes of implementation of an idea) and innovatics (describes the processes of implementation of innovations). The main driving force of generation of innovative technologies within each of these areas of knowledge is the value added by human intellect.

From the view of evaluating spread of the innovative technology value, it is important to consider the diffusion of innovations. For the first time, the diffusion of innovative technologies was described by T. Hägerstrand [34] within the theory of spatial diffusion of innovations. According to systematization by E. Rogers [16], diffusion of innovations includes the following five stages: 1) knowledge, 2) conviction, 3) decision, 4) implementation, 5) confirmation. Given these steps, you can evaluate the value chains and manage such data when evaluating technologies.

Modern approaches to evaluation of innovative technologies involve considering a number of effects generated by technologies. In particular, the convergence effect (first described by J. Tinbergen [51] and co-authors within the convergence theory), the spillover effect (described by J. Monnet [43] in the concept of "spillover" within the neofunctional theory), the multiplicative effect (the theory of multiplicative effects of J. Keynes [10]), the effect of synergy (the synergistic theory described by R. Eggertson in [23]), etc. These effects arise during the transfer of value from the technology to the consumer.

Generalization of the factors actualizing the role of the category of value of innovative technologies and the resulting phenomena are given in Table 1.

The value intellectualizes the technologies it is inherent in. The higher level of intellectualization of technologies, the broader opportunities they open for business. Expanding business opportunities, in turn, leads to the expansion of needs and horizons for creating a new value. If this phenomenon is correlated with technological singularity, then the intervals between the rounds of value generation will reduce with time, but the amplitude of the values and business opportunities will increase. This is visually represented in Fig. 1.

Table 1

Modern economic theories, concepts and phenomena that actualize the role of value laid in innovative technologies

Economic theories, concepts	**Key features that update the category of value**	**Phenomena caused by growth of the role of value**
Theory of innovations	Branches of knowledge (heuristics, inventics, innovatics) determine the processes of generating the value, its development and conditionality by the course of scientific and technological progress.	Globalization Virtualization of the economy Massification of education E-education New forms of business Ecological and economic movement Social turbulence
Theory of spatial diffusion of innovations	Diffusion of innovations	
Informative theory of value	Labor supported by knowledge, intellectual work	
The 4th Industrial Revolution. The 6th technological order	Intellectualization of technologies	
Concept of creative economy (J. Hawkins)	Intellect, creativity, talent	
Concept of Society 5.0	Superintellectual society	
Digital economy	The growth of value is based on intellectualization of components of digital economy (supporting infrastructure, e-business and e-commerce)	
A group of theories that describe the effects from the degree of value laid into innovative technologies	Convergence effect, spillover effect, multiplicative effect, synergy effect, etc.	

Systematized by authors

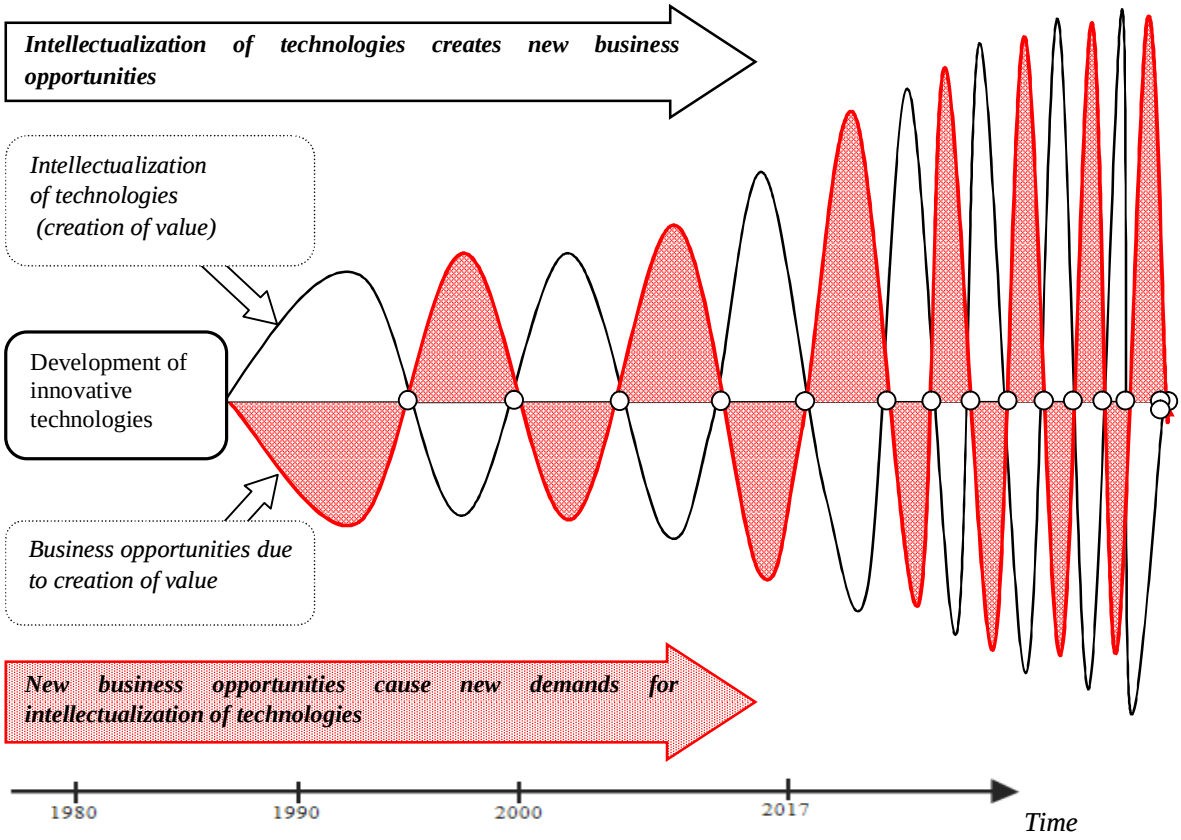


Fig. 1. Relationship between development of the value embodied in innovative technologies and the business opportunities created by it. Developed by authors.

In the framework of economic evaluation of innovative technologies, the proposed approach to the value, as an economic category, will be able to focus on the parameters dictated by contemporary market phenomena. In contrast to the existing approaches to evaluation of innovative technologies, where the key role is assigned to the analysis of cost indicators, this approach also considers the evaluation of parameters of the consumer value of intangible assets in the technologies from the view of determination of their future efficiency.

The concept of economic evaluation of innovative technologies

The principles of evaluation of innovative technologies are set out in the Civil Code of Ukraine, the Law of Ukraine "On evaluation of property, property rights and professional appraisal activity in Ukraine" Accounting Standards, International Accounting Standards, International Standards on Evaluation and National Standards No. 1 ("General Principles of Evaluation of Property and Property Rights") and No. 4 ("Evaluation of Intellectual Property Rights"). An independent appraiser certified by the State Property Fund of Ukraine is entitled to carry out the evaluation.

The nature of intellectual work is features by nonadditivity, synergy, which complicates the objectivity of evaluation of innovative technologies. Determination of the moment when an intangible asset in the technology (patent, copyright certificate, etc.) acquires consumer value often becomes a high-cost task. A separate problem is the fact that in Ukraine currently there is scarce of highly professional appraisers of innovative technologies.

Prerequisites for evaluating innovative technologies are a set of economic laws, theories and concepts (namely, listed in Table 1), which form the paradigm of contemporary innovation development and determine the role of value in the technology.

Before evaluating the innovation technology, it is necessary to clearly establish the need for evaluation, which may be, for example, a decision to be made on the appropriateness of investment in one or another technology, an IPO to be included in the balance sheet of an entity, agreements of any nature (licensing, purchase and sale, franchising, etc.) to be entered into, when the company's value and other operations with IPO is determined.

Evaluation of innovative technologies should take place based on the relevant principles – theoretical provisions for evaluation of innovative technologies established on the basis of the general principles of evaluation. The need for evaluation of innovative technologies determines the aim, tasks and strategy of evaluation.

Organizationally, evaluation of innovative technologies is recommended to be made by the following main stages: 1) preliminary evaluation of the technology readiness level (before commercialization); 2) evaluation of value and cost parameters of the technology; 3) evaluation of the processes caused by introduction of the technology to the market. The scheme for the proposed conceptual model of evaluation innovative technologies is shown in Fig. 2.

According to "Appraisal Methods for Intellectual Property Rights" [15], "in the case of determining the value of intellectual property rights as assets of a business entity of governmental or municipal sector of the economy, such an evaluation is preceded by the preparatory stage at which the inventory is carried out, with detection of proprietary intellectual property rights not registered in the accounting." Subsequently, according to the results of detection of IPOs and in accordance with Article 421 of the Civil Code of Ukraine [20], the subject of intellectual property right and, in accordance with Article 424, its proprietary intellectual property rights shall be determined. Such actions are the basis for making further decisions regarding this technology.

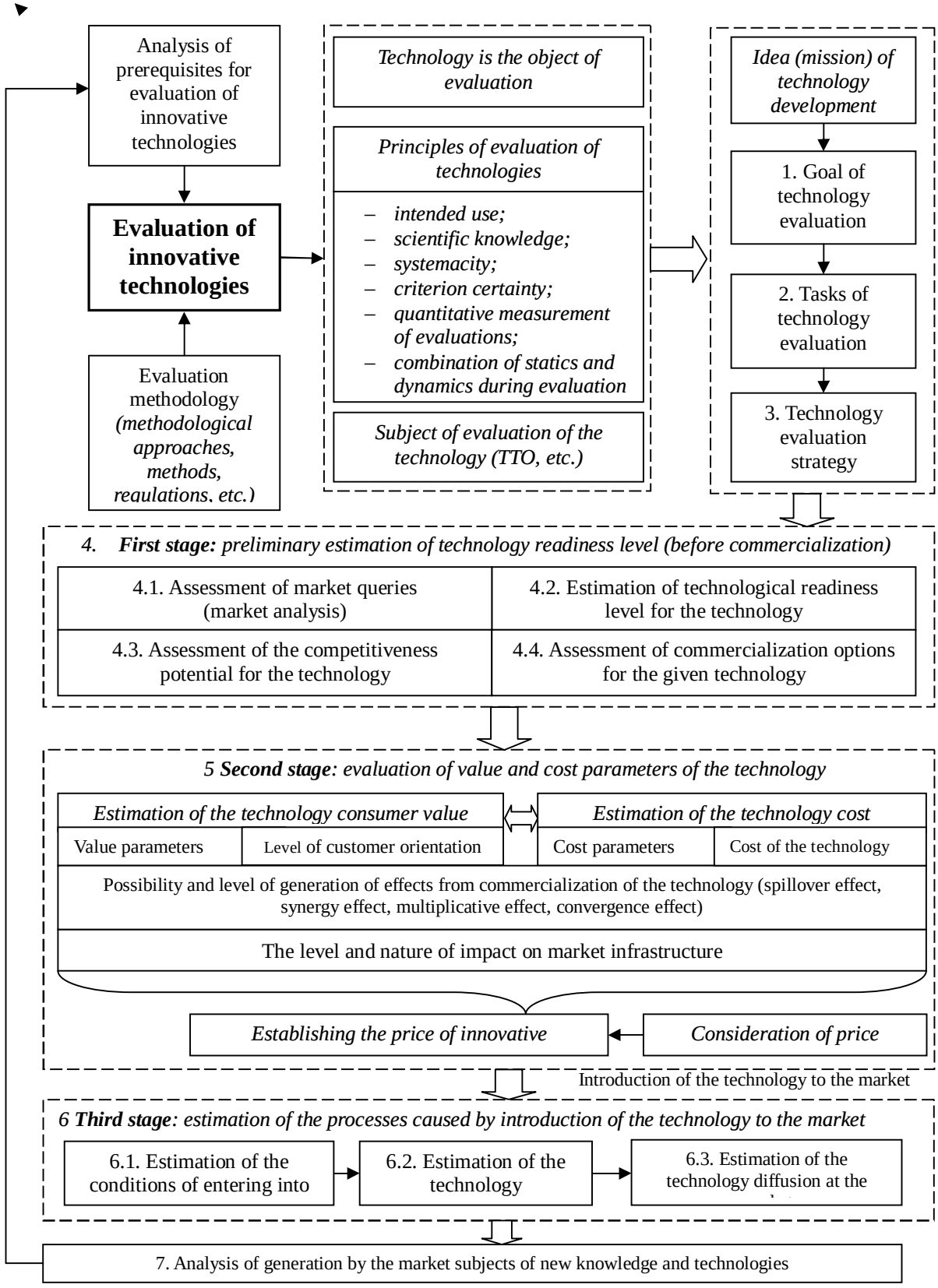
Thus, guided by the principles of the current normative legal field, at the stage of preliminary evaluation, we specified the aspects referred to in [15]. Note that as it comes to the economic evaluation of technologies, then no matter what further action on this technology was planned, commercialization is the key aim for such evaluation. Estimating the level of readiness for the technology at this stage is determined by its readiness for commercialization.

By mediating by means of technology the idea of commercialization, one can determine its value in terms of market demand (level of competitiveness). Thus, at this stage, it is necessary to carry out market analysis and assess technological readiness of the technology. At the same time, it is necessary to assess the competitiveness potential of the technology, and, based on the evaluation carried out, analyze options and alternatives for the effective commercialization of the technology in question.

When evaluating innovative technologies at the preliminary stage, it is advisable to use the methodological approach of NABC, developed by the specialists of the Stanford Research Institute (*N – need*, the need dictated by the market; *A – approach*, the approach proposed to meet this need; *B – benefit*, the revenues planned to be received in result of commercialization of this technology; *C – competition*, the competitors to this technology). By applying this approach to the evaluation of innovative technologies at this stage, it is possible to obtain a preliminary conclusion on the demand for the technology in the market and to preliminarily outline evidences of the value generated by this technology.

The more precisely defined components of this stage have been tested and covered in the works [11, 13]. For each of the components, a number of author's evaluation methods have been developed that enable to set an integral indicator of the level of the technology readiness.

At the second stage it is reasonable to assess the value and cost parameters of the technology by quantities. An important aspect of evaluation of the value parameters is forecasting and consideration of various types of effects from introduction of innovative technologies to the market and their diffusion. This allows to substantiate with the higher level of accuracy the cost parameters of the technology and to form the price. Having assessed the prospects for the particular effect, for example, that resulting in manifestation of the consumer value of this technology in related industries, the appraiser may add value to the price of the technology being evaluated.



Note. Key to symbols:
⇨ *main sequence of evaluation;*
→ *interrelationships between aspects of evaluation;*
⇔ *mutual influence of the aspects of evaluation. The dotted line shows the evaluation blocks.*

Fig. 2. Conceptual model for economic evaluation of innovation technologies. Developed by authors.

At this stage, it is necessary to pay attention to the impact of the technology on market infrastructure – business entities that servicing markets of various types and will determine conditions for effective functioning of this technology. In this context, the prospects of business opportunities that will be brought by the value laid in the technology are evaluated. It should be noted that most markets are imperfect, market supply and demand are not balanced. These and other reasons can affect both the cost and value indicators during evaluation of innovative technologies.

Note that economic evaluation of the value and cost parameters of the innovative technology is not just a total of these estimates. In practice, these parameters are closely interwoven and have reciprocal effect. Understanding and taking into account their convergences makes it possible to estimate more objectively the cost of innovative technology and, accordingly, choose more precisely the method of pricing and form the price at which this technology will be commercialized.

At this stage, when evaluating the IPOs, those methods are used that can be divided into two main groups [1, 3, 45]: 1) measurement methods that propose indicators that could give managers a more complete picture of intellectual assets of their companies; 2) methods of evaluation aimed at assessment of intellectual assets of the company in monetary terms.

For the quantitative measurement of IPOs in the "Methodology of evaluation of proprietary rights of intellectual property" [15], it is recommended to use the methods in terms of income, cost and comparative approaches, as well as their combination, according to the needs of the assessment situation.

The most popular methodological developments worldwide that can be used to evaluate innovative technologies (namely, IPOs in their composition), have been systematized in Table 2.

Table 2

Methodological basis for evaluation of innovative technologies

Methodological developments	Description
1	2
Market approach (includes the comparative sales method)	Compare the IPOs with analogues, by relevant features, comparably in time and by the markets, etc.
Cost approach (includes the following methods of: cost replacement, recoverable cost, determination of initial costs)	Determines the current cost of reproduction or substitution of the IPO
Income approach (includes the methods of: exemption of royalties, discounting cash flows, direct capitalization, express evaluation, surplus profit, "rule of 25 %')	The economic value of the IPO at this time point is determined by expectations of revenue from its use in the future. The cost of the IPO is equal to the discounted revenue flow expected to be received during its use.
Methods of direct estimation of intellectual capital	
Technology Broker [28]	The method is based on the perception of intellectual capital as a set of four key elements: market assets, intellectual property, human assets and infrastructure assets and includes 20 auditor's questions. It is a method of identification, evaluation, verification and management of the company's intellectual capital.
Method of evaluation of patents been citation weighted (*Citation-weighted patents*) [33]	The efficiency of intellectual capital is measured by the level of R&D impact on the set of specific coefficients (in particular, by the ratio between the number and value of patents and sales volume) that characterize the patents of the business entity.
The Value Explorer [25]	The method is based on the valuation of five types of intangible assets: 1) own assets and assets being at the business entity's disposal; 2) skills and implicit knowledge; 3) culture and values; 4) technologies and explicit knowledge; 5) process management.

Continuation of the table 2

1	2
Methods of market capitalization	
Tobin's Q Ratio [37]	It connects the market value of the company, as measured by the market rate of its shares, with the recoverable value of its assets. This ratio superficially reflects the aspects of the IPO.
Methods for determination of return on assets (ROA)	
Economic value added (*EVA*) [36, 45]	The profit earned by the company should exceed the fee for using capital (own, borrowed), through which this profit was received. EVA points to the company's intellectual capital efficiency.
Income from Intellectual Capital (*Knowledge Capital Earnings*) [32]	It is determined as the ratio of the value of normalized profit (minus returns on tangible and financial assets) to the discount rate of knowledge capital
Intellectual Capital Value Added Coefficient [38]	The coefficient is intended to measure efficiency of the intellectual capital and the capital which is involved from the view of the value created thereby. It is determined based on the ratio of components: capital employed, human capital and structural capital.
Scoring methods	
Skandia Navigator [30]	Intellectual capital is evaluated by analyzing 164 parameters which include the following components: finances, consumers, processes, updating and development, human resources.
Intangible Asset Monitor [47]	Based on the company's strategic goals, it defines indicators to assess four aspects that can be derived from the value generated by intangible resources, including: 1) growth; 2) updating; 3) use / efficiency; 4) risk / stability reduction.
Value Chain Scoreboard [41]	Matrix method that involves grouping of non-financial parameters into three categories according to development cycles: 1) opening / training; 2) implementation; 3) commercialization.
Balanced Scorecard, BSC [39]	According to BSC, effectiveness of the company's activities is measured using parameters by such main directions: 1) finance, 2) consumers, 3) internal business processes; 4) training and development.

Systematized by authors on the basis of [1, 45]

Considerable number of existing methodological approaches to evaluation of innovative technologies like IPOs is the result of the complexity of technologies that contain IPO data, on the one hand, and the limited applicability of existing methods on the other hand. The diversity of approaches highlights the difference in the author's perception by scientists of the IPOs nature and the goals of their assessment.

From the point of view of accounting, evaluation is a specific method by which accounting elements are transferred from the physical form in cash to be reflected in the accounts, and, accordingly, for taking management decisions. Choice of a methodological approach depends on the specifics of the object evaluated and the situation when the evaluation is carried out. The evaluation of IPOs in innovative technologies is carried out solely with a specific purpose, the results of which cannot be used for other purposes.

The third stage of the conceptual model involves evaluating the processes that mediate introduction of the technology to the market (commercialization) and its distribution on the market (this is, in particular: assessment of the conditions of entering into agreements with

counteragents, assessment of commercialization itself (or other economic transactions with the technology) and assessment of market diffusion for the technology).

Under diffusion of innovations, the effects of various nature may often occur in the market, which may result in new knowledge that been subsequently transferred into new technologies. The analysis of generation of new knowledge and technologies by the market players is important, since it provides a set of data that can be considered when developing and evaluating future technologies (when determining the consumer values of new technologies).

The research of the problems of evaluation of innovative technologies from the given points allows to focus on the moment of generation of the consumer value by technologies. In turn, this enables to increase the accuracy of cost evaluation of innovative technologies. The conceptual model proposed will enable technology appraisers to increase the objectivity of the evaluation results and substantiate the processes of implementation of innovative technologies, and the managers of the companies – to increase flexibility of management decisions.

Conclusions and prospects for further research. The tendencies of the world and national economy dictate the need for changes in approaches to economic evaluation of innovative technologies. Current foreign approaches and methods can be applied in domestic conditions fragmentarily, and the domestic ones require for significant revision.

The proposed conceptual approach to evaluation of innovative technologies, unlike the known ones, is based on the contemporary role of value, which allows to focus on the parameters caused by the current market phenomena and trends. This approach to evaluation of innovative technologies, besides the cost parameters, focuses on those of the consumer value of intangible assets within the technologies. This allows them to determine more accurately their future performance.

Application of the proposed conceptual model for evaluation of innovative technologies makes it possible to eliminate the one-sided evaluation results, in contrast to well-known approaches that focus mainly on cost indicators. This will contribute to improvement of pricing the technologies, impartial evaluation of the structure of tangible and intangible assets as part of the technology, reduction of errors under forecasting the market diffusion by technologies, etc. Altogether, this will contribute to better management decision-making on technology development. An additional advantage of this approach is an opportunity to take into account not only the results of technology transfer, but also to calculate the effects obtained (spillover effect, effects of synergy, convergence, technology multiplication, etc.) and, accordingly, to evaluate business opportunities that they create.

The problem of impartial evaluation of innovative technologies is not so easy either from the theoretical standpoint, or in practical sense. The subjectivism of such evaluation is often evident which requires for improvement of the existing methodological toolkit and is the subject of development in our further scientific works.

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