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## DEVELOPING TECHNOLOGIES ON THE BASIS OF KNOWLEDGE TRANSFORMATION CHAINS

The **subject** matter of the article is the theoretical and applied aspects of technology development on the basis of knowledge transformation chains. The current scientific and technological progress of the leading countries of the world is marked by an increase in the level of intellectualization and a reduction in the life cycle of technologies. This encourages the study of the features of the generation and dissemination of knowledge as a driving force for the development of technology. Understanding the nature of the transformation of knowledge is the basis for managing the development of technology efficiently. Therefore, the **goal** of the article is to study the development of technologies on the basis of knowledge transformation chains. To achieve the stated goal, a number of **tasks** have been solved: the evolutionary development of approaches to understanding the concept of technology was studied as well as the concept of technology as a commodity; the nature of technology that determines the features of its current development in the chains of knowledge transformation was considered; the determinants of the concept of technology dictated by the chains of knowledge transformation were identified. In the course of the scientific work, the following **methods** were applied: grouping method, the method of structural and logical analysis, the methods of analysis and synthesis, graphical method. The conceptual approach to understanding the development of technologies on the basis of knowledge transformation chains was designed as the **result** of the study. Knowledge, as an intangible component of technology together with materialized technology, is transferred thus determining the formation of new knowledge. Consequently, the intangible component of technology enhances its material component and determines the creation of additional value. In this process, technology can be subject to market effects or generate such effects itself. On the basis of the suggested conceptual approach, significant determinants are identified, they reflect the concept of technology taking into account its development on the basis of knowledge transformation chains. **Conclusions:** the suggested conceptual approach to understanding the development of technologies on the basis of knowledge transformation chains enables increasing the level of justification of the technology management processes in the context of the modern paradigm of their transfer, take into account the technology-driven market phenomena (in particular: synergy, convergence, diffusion of technologies, multiplicative effect, spillover effect, “crowd” effect, and so on, and, consequently, to assess the business opportunities stimulated by these phenomena.

**Keywords:** technology, scientific and technical development, knowledge, knowledge transformation, innovation.

### Introduction

Raising the level of the technology intellectualization and reducing its life cycle are the decisive factors of the current technologic advance of the leading countries of the world. The beginning of the IV Industrial Revolution (Davos, 2016) gave rise to the world-wide revision of available approaches to generating and spreading technology. Global transformational processes in the technological sphere are characterized by the synergistic interaction of digital, physical and biological technologies that lead to the changes in both the character of technological progress and the approaches to human development in general. This is evident from the fact of the popularization of the concepts of creative economy, *Society 5.0*, and other current economic theories. Increasing the share of intellectual property as a part of technology, developing artificial intelligence, raising the importance of intangible assets, peculiarities of the development of the consumer value of technologies as well as other events and phenomena actualize technology in a new perspective. Knowledge and intelligence are of primary importance in the context of the conceptual framework of technology.

A new value is created on the basis of the transfer of knowledge embedded in the technology. *The Global Information Technology Report 2016* of the World Economic Forum [1] emphasized the exponential growth of the role of knowledge, materialized in high technologies, the leverage of their boosting, and so on. The technological progress is determined by the nature and speed of the transformation of knowledge embedded in them. That is why the task of the present scientific and

practical interest of the modern economy is studying the latest qualities and peculiarities of technology development on the basis of the evolution of knowledge.

### Analysis of literary sources and problem statement

The works [2 – 12] of foreign and Ukrainian scholars study the issues of technology in the context of technological development and economic growth of mankind. The concepts of “technology” and “technological development” and the approaches to technology management are described in the works [13-18]. Some aspects of predicting the technological progress are highlighted in the works [19-23]. Technologies as system knowledge are studied in the scientific works [24-26, 30], and so on.

Despite a significant number of scientific and practical studies, due attention was not paid to the development of technologies in the context of current features of the world technological progress caused by the intellectualization of technologies and the growth of the role of knowledge. Scientists and practitioners widely declare the approach according to which the transformation of knowledge that generates the chain of knowledge advance is the driving force of the technological progress. At the same time, the main task, that is to study the nature of such transformation and to determine the tools of its management, is not practically solved.

The factors mentioned above determined the subject of this work, which is to describe the theoretical and applied principles of technology development on the basis of knowledge transformation chains. The object of the

research is the technologies in knowledge transformation chains.

### The goal and objectives of the research

The goal of this scientific work is to study the development of technologies on the basis of knowledge transformation chains. To achieve this goal, a number of tasks have been set and solved, particularly: 1) to study the evolutionary development of approaches to understanding the concept of technology; 2) to study the concept of technology as a commodity; 3) to consider the nature of technology which determines the peculiarities of its present progress in the chains of knowledge transformation; 4) to establish the determinants of the concept of technology dictated by the chains of knowledge transformation.

### The materials and methods of the research

Achieving the goal of the work determined the use of the method of grouping, the method of structural and logical analysis, the methods of analysis and synthesis, graphic method.

### The results of the research

The concept of technology is a form of thinking that reflects the essential features of the technology. The term “technology” (from Greek *τεχνολογια* derived from Greek *τεχνολογος*: *τεχνη* – art, skill; *λογος* – (here) to transfer) is first mentioned in the English Logical Encyclopedia in 1670, where it is interpreted as “scientific knowledge concerning skill”. At present, the concept of technology is characterized by a wide range of application: technology describes the manufacture of products, processes, organizations, and so on; technologies are used to perform various tasks of a human life. Technologies are used in all spheres of economic activity.

Despite the fact that in his work “Capital” K. Marx revealed the principles of the development of scientific and technological progress and its interconnection with the economy (in particular, the industrial revolution of the late XVII and early XIX centuries was analyzed), the classical economic analysis was based on the theory of factors of production. The progress of science and technology was mainly explained by the function of capital. Little attention was paid to the study of the nature

of technology in the context of scientific and technological development.

The fruitful relationship between scientific and technological progress and the increase of the social and economic level of the mankind was proved by many neoclassical scholars. In particular, J. Condorcet [27] noted that the progress of the sciences ensures the progress of industry, which subsequently accelerates scientific advances, and this mutual influence, whose action is restored, must be recognized as the most powerful factor in the perfection of the human race. R. Solow [2] proved that the decisive factor of the economic growth is not capital, as it was thought, but technological progress.

At this time, scientists testified that the development of technology and humanity takes place in exponential interconnection. Many scientists associate the technological development of the mankind with the growth of population according to hyperbolic dependence, the essence of which lies in the general intellectual progress of people.

In his work “*Population Growth and Technological Change: One Million B.C. to 1990*” M. Kremer [3] combines two concepts that explain technological progress, and shows the significantly deeper content of the process of technology development, in contrast to available approaches. The first concept lies in the fact that more people contribute to generating more ideas that ensure technological progress. According to the second concept in the terms of Malthusianism, the population is limited by incomes, and the income is a function of technology. Any increase in the income obtained thanks to the technological progress provokes an increase of population, which results in an increase in the level of technological development proportional to the increase in population.

Proceeding from the mentioned above, J. Collins and his co-authors [5] represented M. Kremer approach to understanding the nature of technology development as the feedback loop. The scientists developed a model of the relationship between the growth of population and technological progress, where an additional element – the “innovation potential” – is added, that is, the characteristic that leads to generating ideas that dissolve the existing boundaries of technology. J. Collins and other scientists in [5] indicate that innovation potential can include IQ, the willingness to invest in innovative technologies, the participation in events where innovative technologies can be introduced, risk and time advantages, and so on (fig. 1).

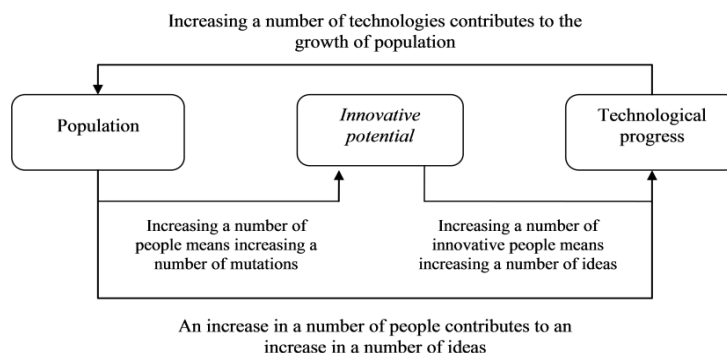


Fig. 1. The model of interconnection of technological progress with the increase in population (J. Collins, B Baer, E. J Weber) [5]

Taking into consideration the acceleration of human adaptive evolution, as well as the fact that more people will mean more mutations, natural selection has more material that can be affected on. The increase in the number of people (and mutations) indicates that mutations that increase the innovative potential of the population will happen more often and with a greater number. As the population grows, the speed of the innovative potential evolution increases. J. Collins and his co-authors give notice that with the development of the population, the relative contribution of the constant growth of the innovative potential to the acceleration of the population growth will decrease. The constant increase of population becomes the main driver of technological progress and its further enhancement. However, this does not mean that the innovative potential is not important, as the level of the innovation potential continues exerting a significant impact. The population with a higher index of the innovative potential is characterized by a much faster demographic development.

The model, presented by scientists, explains the nature and spread of technology, but also raises new questions. In particular, what impact is required for developing technologies and what are the areas this impact can be made in order to manage technological development under the present conditions of globalization? The answers to these questions can differ for various branches of technology, but it is obvious that researching in this sphere can suggest entirely new tools to affect the processes of inventing innovative technologies.

Understanding the nature of technology requires attention to their evolutionary progress during the second part of the XVIII – the first part of the XXI centuries, which was marked by changes in technological systems and industrial revolutions. At the early stages of human development, technology was not directly related to science: on the one hand, the technology used scientific achievements (knowledge, methods, etc.), on the other hand, most technologies did not require a scientific basis for their application. The increase in the importance of the interaction between technology and science dates back to the XVII century when science acquired considerable development, which encouraged translating its results into action in the field of technology where these results made a great progress.

The consolidation of the position of science, which establishes its primary role in the interaction between “science” and “technology”, takes place in the XVIII century when the first Industrial Revolution is gaining momentum. By the end of XX century. economists came to the conclusion that the level and dynamics of scientific and technological progress are the main determinants of the boundaries between highly developed countries of the world and developing countries. Technology as the basis of scientific and technological progress become the basis for the sustainable economic growth of countries. The transition from the industrial age to the present information age enhances the value of technology that stimulates its development at the same time.

According to the Law of Ukraine “On State Regulation of Activities in the Sphere of Technology Transfer”, technology is the result of intellectual activity,

a set of ordered scientific knowledge, technical, organizational and other decisions on the list, the term, the order and sequence of operations, production process, and / or marketing and storing products, providing services [28]. However, these features are not sufficient to understand technology as a lever of the present technological development.

Taking into consideration the fact that technology is a driving force for capital formation, it involves creating a new value that leads to various results. In particular, reducing production costs in labour-intensive branches and/or saving capital in capital-intensive industries can cause a neutral effect during the simultaneous increase of both mentioned factors of production. In the context of scientific and technological progress, technology is considered both as an independent factor of production and as a booster of production factors.

According to the UN methodology, technologies exist in “pure form”, which are expressed in the methods and techniques of production of goods and services (*dissembled technology*) or as embodied technologies that are embodied in machines, equipment, structures, products with high technical and economic parameters, and so on (*embodied technology*).

In the regulations of the World Intellectual Property Organization (WIPO), technology is understood as “the ordered knowledge about the way of manufacturing products or providing services not only in industry but also in agriculture or trade, regardless the form this knowledge is fixed in. This can be an invention, a utility model, an industrial design, species of plant or technical information in the form of a certain set of documents, or some experience and skills of specialists” [29]. The interpretation given by WIPO suggests a clear outline of the forms that technology can acquire.

The analysis the concept of technology shows that this term is often identified with the concept of innovation. At first glance, an innovation can be likened to a technology since the term “innovations” is defined as newly created / applied and / or improved competitive technologies, products or services, as well as organizational, technical, industrial, commercial, or other significant improvements in the structure and quality of production and ( or) social sphere [30]. But, the study of the concept of “innovation” suggests that it is based on the concept of changes, which is a key function of any innovation activity. In turn, technology is the body of knowledge about the sequence of individual production operations. Technology is an applied science of the methods of transforming raw materials or semi-finished products into a finished product [31]. Consequently, the concept of changes also lies at the bottom of the technology. However, the technology is based on innovation and is already a ready-made “data set” for its implementation. An innovation is often just an idea or project that should be shaped up so that it can become a technology and is ready for further transfer.

Present approaches to the definitions of “technology” and “innovation” differ from one another, which often causes scientific discussion. In a broad sense, the transfer of innovation means the transfer of innovative ideas. In particular, the authors of the work [32] consider

the transfer of innovations as the transfer of formal knowledge in a concrete form that is ready for use or as a continuous flow of all types of innovations that involves all participants in the innovative process and penetrates the entire system of relations between them. This is the process through which communication channels and tools spread innovations to the social system members. Its objects are new or improved products and services aimed at solving social, economic and other problems.

The study of the content of “technology” makes it possible to state that despite a sufficiently wide range of interpretations, “technology” is mostly understood as the ordered knowledge (technical and managerial) about how to get the added value (upgraded or innovative products, services, etc.) to meet human needs using a particular method (a set and sequence of operations, their modes) or certain resources. The concept of technology is inherent in the human activity. At the same time, technology is considered a branch of knowledge devoted to the development and implementation of technology in the life of the society on the basis of applied and fundamental science.

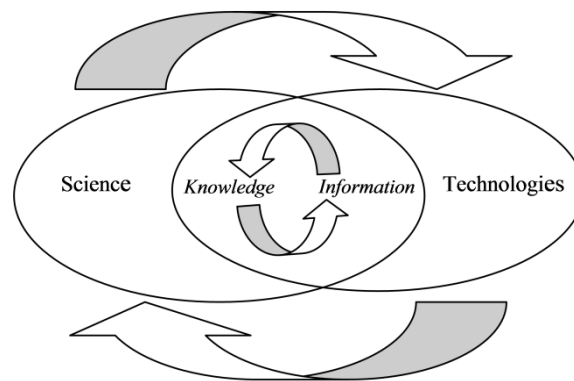
From the point of view of the system methodology, technology includes invention, development and management. Technology is not a science (knowledge), but it is closely interconnected with science. One of the founders of the history of science, J. Bernal notes that it is practically impossible to formulate the definition of the concept of “science” and outlines some directions that to some extent can bring the essence of science nearer to understanding.

According to J. Bernal, science appears as 1) the institute; 2) the method; 3) the accumulation of traditions, knowledge; 4) the factor of development of production; 5) the most efficient factor in developing beliefs and attitudes of a human being to the world. [33, p. 18].

Speaking of knowledge, the category of “information” should be mentioned. Knowledge and information are the concepts that are in the relationship of the unity and struggle of opposites. The basis of such opposition is the scientific knowledge, which a person implements in science producing technology.

A technological function resides in science because of human cognitive processes. Scientists use information gathered with the help of technology to explain one or another phenomenon, this contributes to generating scientific knowledge which subsequently becomes the basis for a particular technology. Consequently, any technology is based on the scientific foundation. From this position, science is a factor in regulating scientific and technological progress, as well as managing it.

Science is the knowledge of the natural world, and technology is the knowledge of the world of production. Both concepts are implemented in their close relationship, however, they are fundamentally different. Scientists cannot succeed in scientific work without relying on the gains of other scholars, on the collective memory of the mankind. Consequently, science is an intersubjective category which requires the cooperation of many people. Proceeding from the above, the relationship of science and technology can be represented in the following way (fig.2):

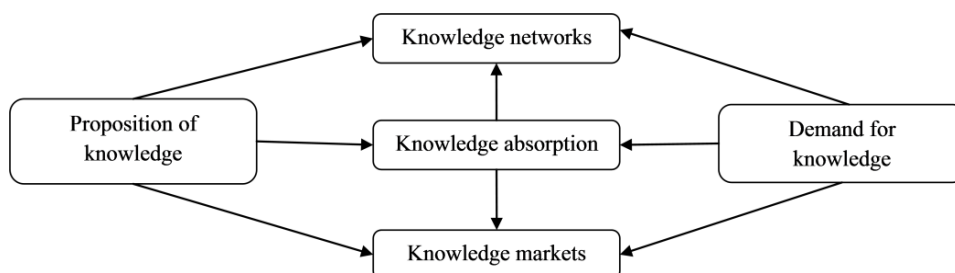


**Fig. 2.** The interrelation of science and technology and the place of knowledge and information in them

On the basis of scientific research, the knowledge is obtained that becomes the basis for the development of technology. The developed technologies, in their turn, stimulate generating new knowledge or methods for its acquiring, which determines a new scientific research,

and, consequently, can become the basis for developing future technologies (this cycle is outlined in fig. 2).

NESTA suggested reflecting the process of acquiring knowledge as the circulation of two routes – networks and markets (fig. 3).



**Fig. 3.** Knowledge acquisition via networks and markets [34]



The factor of transforming information into knowledge is a person. Some people are constantly generating needs for new technologies, others are solving this by creating new knowledge. The complexity of the circulation presented in fig. 5 lies in the fact of the continuous asymmetry of information, which becomes the basis of knowledge.

Both science (knowledge) and technology are multi-aspect social phenomena. According to its essence, the technology is an operation on the knowledge acquired on the basis of the implementation of other technologies, which also arose as a result of the development of knowledge. Consequently, technologies have an extractive nature, that is, collecting material (knowledge) is mandatory for implementing new knowledge.

The results of the study indicate a wide range of features, properties and functions of the technology. The scope of this study is narrowed down by the context of technology transfer, in particular from universities in the business environment. When studying the concept of

technology from the position of its further transfer, it is important to consider technology as a commodity.

Technology is a product of labour or value capable of meeting certain human needs and intended for exchange (purchase, sale). This is confirmed by the Law of Ukraine "On scientific and scientific and technical activity", where the scientific (scientific and technical) products are specified as scientific and (or) scientific and applied results, intended for implementation [35, Section I, Art. 1]. Consequently, according to the ideological essence of the law, the scientific and technological products (technology) obtained at the university and resulting from research and/or design and development activities (R & D) must be suitable for implementing and generating commercial (social, ecological, etc.) effect. That is, technology is a product that is implemented in accordance with the laws of marketing.

From the point of view of classical marketing, the product is characterized by three levels: core product, actual product (tangible product), augmented product (intangible product) (fig. 4).

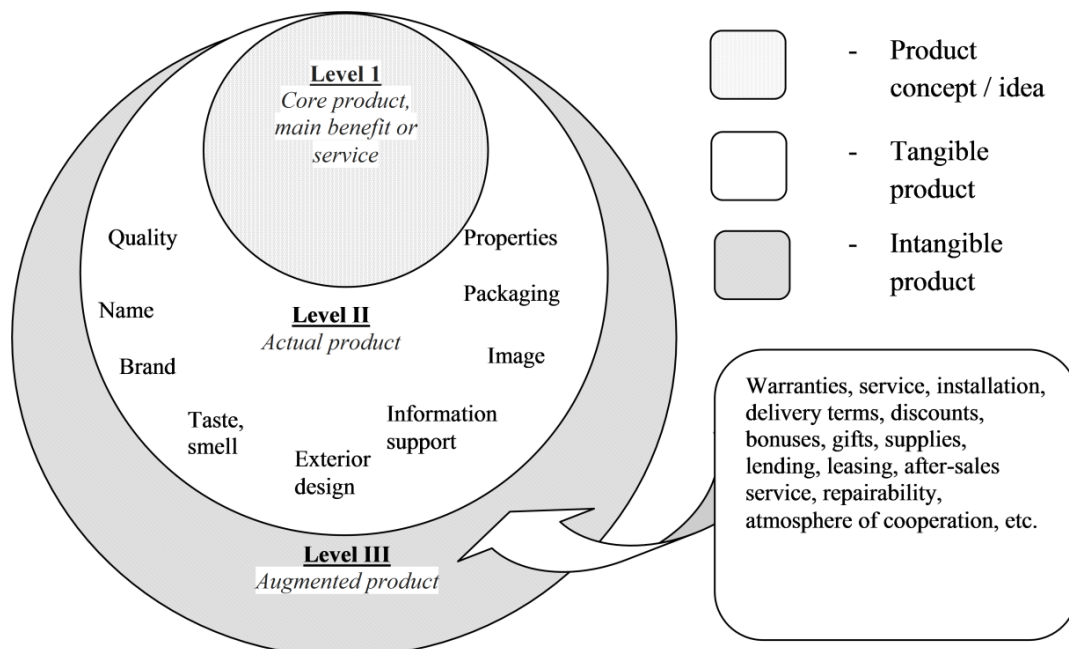


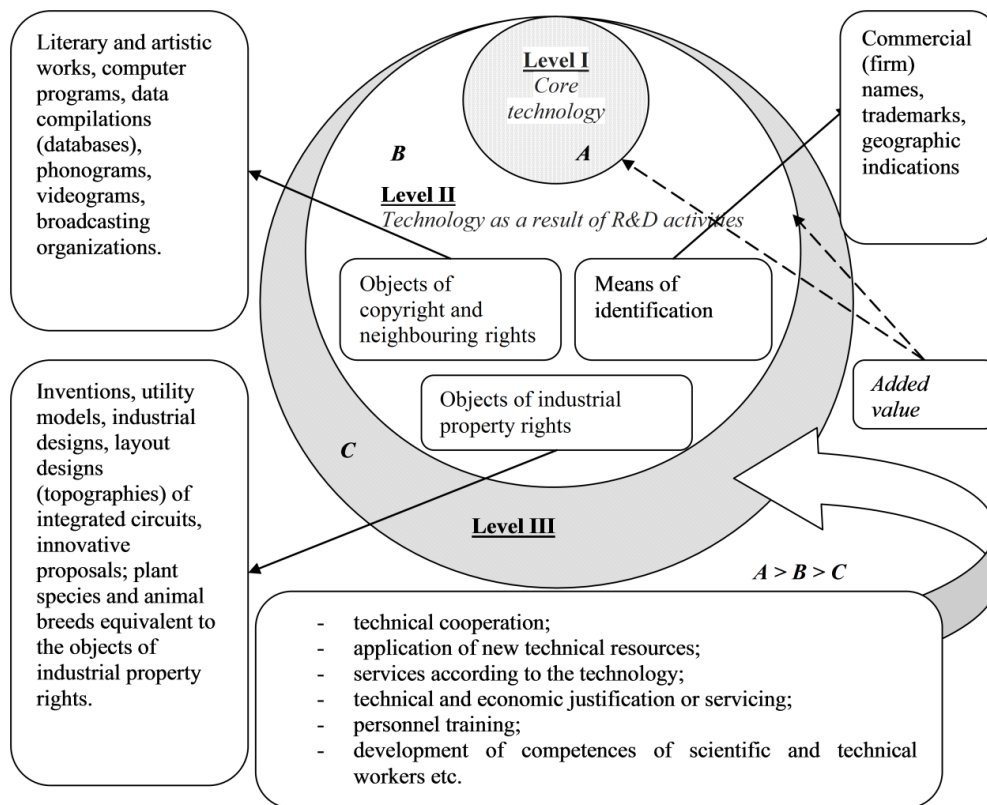
Fig. 4. The concept of goods according to the marketing theory [36]

Considering technology as a commodity, it can be noted that each of the three levels of presenting a product exactly corresponds to the available presentation of technology. The product-technology often combines all three levels of the product, for example, know-how, tangible object (actually, technology as a set of documentation for its development), pre-sale or after-sales services, and so on.

Relying on the notion of technology as a product, it can be presented in a three-level form. The first level of technology is its design, an idea that a developer has created, and designed. The second level occurs when the idea that arose at the first level was realized in the course of R & D activities, which resulted in the acquisition of intellectual property rights (IPRs). According to the Civil Code of Ukraine (Art. 420), they can be the objects of copyright and neighbouring rights, the objects of

industrial property rights, means of identification. The second level of technology gives opportunities for the third level considering not only services (as for the product) but also converges into other areas. For example, the advancement in the information and technology field, embodied in innovative types of software products (the second level of technology presentation), led to the development of flexible methodology of project management, which is necessary for the implementation of the products indicated at the second level (the third level of technology presentation). The example above deals with teaching people, which is another kind of economic activity. However, the product cannot be further promoted and this technological trend cannot be developed in general without study.

The described approach is detailed in fig. 5.



**Fig. 5.** The concept of technology as a commodity

Fig. 5 shows all three levels of technology presentation as circles where the area of every next circle is greater than the area of a previous one:  $A > B > C$ . This indicates the effect of synergy due to the addition of value at the transitions between the levels of technology, which takes place on the basis of the interaction of the technological process members, the interaction of knowledge, and so on.

Technology at all levels of its presentation should be protected (not a form of the presentation of technology as a result of intellectual activity (a chip, a piece of work, species of plant, etc.), but its essence (the content, the basic idea, etc.).

Knowledge as an immaterial component of technology that is transmitted along with the tangible product-technology from the second level to the third stimulates the new knowledge. Thus, the intangible component of technology enhances its tangible component.

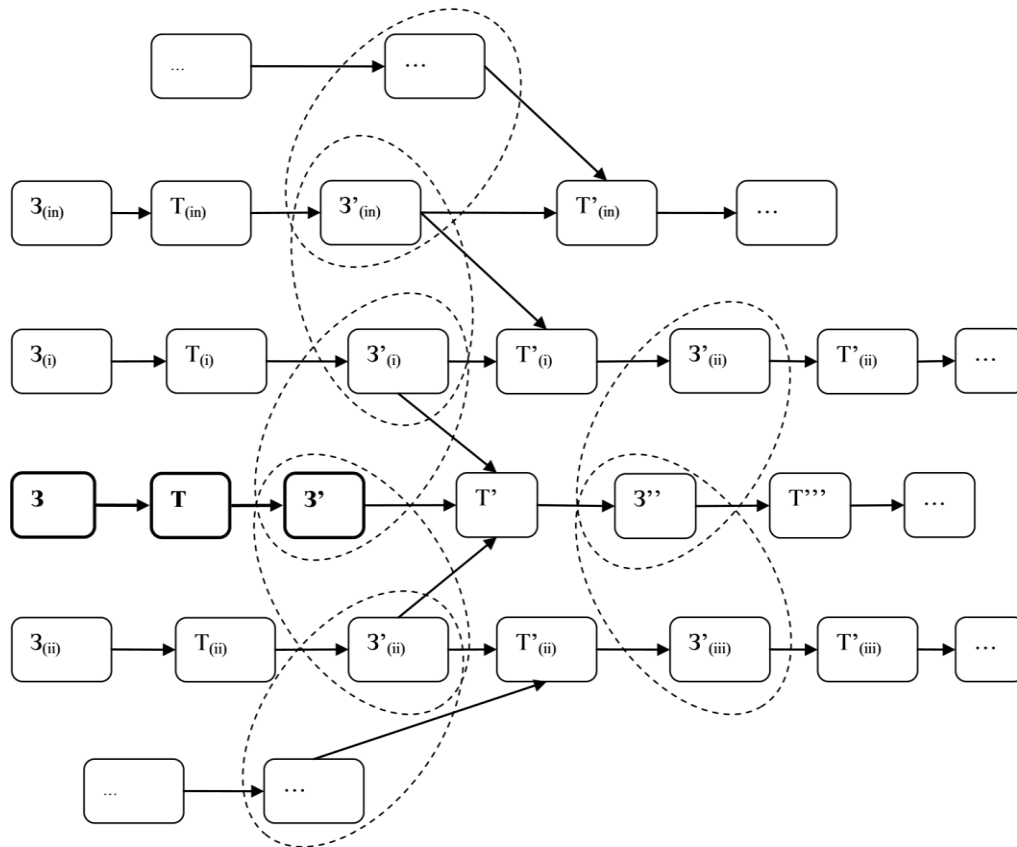
The suggested approach to the concept of technology as a commodity is an important basis for the implementation of technology transfer. For example, when developing the strategies of technology transfer developed at universities, such approach enables taking into account market phenomena that previously were considered indirect to the transfer of technology: synergy, convergence, multiplicity, spillover effect, crowd effect, etc. According to this approach, more attention should be paid to interdisciplinary communication and the role of knowledge that enhances the material component of technology during their transfer.

When the knowledge ( $K$ ) is used to create the technology ( $T$ ), then the implementation of  $T$  will lead to a new development stage  $K'$ , which will be different from  $K$

embedded in the beginning. Knowledge embodied in the technology and transferred from a developer to a consumer who, after introducing it into production (materializing), adds value to it when implementing the technology into practical activities. As a result, new knowledge  $K'$  is obtained, that is, the added value of which is the practical realization of  $K$ . This can be a way for introducing technology, the organization of production, organizational and managerial solutions for implementing this technology, options for its spreading, and so on. Technologies ( $T$ ) generate  $K'$ , which in future becomes the basis of new technologies ( $T'$ ). In turn,  $T'$  generates  $K''$  and so on ( $K_{in} \dots K'_{in}; T_{in} \dots T'_{in}$ ), which a technological advance. In this process, knowledge, with its aggregation and nucleation of a new technology, has convergent and multiplicative effects. The mutual penetration of knowledge is no longer an ordinary sum of the terms that are the components of knowledge but has a new added value. The interaction of knowledge and technology is explicit due to the actualization of their paradigmatic links.

The diagram of the suggested approach to the transformation of knowledge is given in fig. 6.

The object of creative activity, which was recorded in  $T$  when  $K$  was affected on and, as a result,  $K'$  and  $IPR$  objects were obtained which is the basis of  $K$ , are independent legal categories. The transfer of each these right is an independent legal fact that generates, changes, terminates the legal relationship. This confirms the correctness of the hypothesis about the conceptual difference between  $K$  and  $K'$ , as well as the way of their development.



Note: the dotted line conventionally indicates the areas of convergence of knowledge and the multiplicative effect from their aggregation.

**Fig. 6.** A fragment of the diagram of transforming knowledge into technology and generating a new knowledge

At each point where the technology is produced, there is a creation the added value is created, which has a multiplicative effect on other business spheres.

### Discussing the results

Summarizing the mentioned above, the conceptual approach to understanding the growth of technologies on the basis of knowledge transformation chains is developed. Knowledge, as an intangible component of

technology, which together with a tangible product technology is transferred, stimulates a new knowledge. In this way, the intangible component of the technology enhances its tangible component and causes the added value. In this process, technology can be subject to market effects or generate such effects itself.

The conducted study enabled distinguishing essential determinants that reflect the concept of technology taking into account its development on the basis of knowledge transformation chains (table 1).

**Table 1.** Essential determinants of the concept of technology

Determinants	The content of determinants
1	2
The essence of the technology	Creating a new value is incident to human activity (technology is considered both as an independent factor of production and as a means of increasing the factors of production in the context of scientific and technological progress)
The principle of technology understanding	Technology is the ordered knowledge
Areas of technologies application	Take place all kinds of human life. The technology is also considered as a branch of knowledge devoted to developing and implementing technology in the life of the society on the basis of science
Forms of technologies	Invention, utility model, industrial design, plant species or technical information as a certain set of documents, experience or skills of specialists, and so on
The nature of technology development	Dynamic, extractive. Technology is an operation on knowledge acquired on the basis of the implementation of other technologies, which also arose as a result of the development of knowledge. Collecting material (knowledge) for the realization of new knowledge on the basis of the technologies is mandatory
Interconnection of knowledge and technology	Both concepts, being fundamentally different, are implemented in a close relationship. The interaction of knowledge and technology is explicit due to the actualization of their paradigmatic links.

The end of the **Table 1**

1	2
Features of technology development in time	The role and significance of technologies is intensified during the transition from the industrial age to the information one
Technology Properties	Convergence, spillover effect, diffusion, synergy, "crowd" effect, multiplicative effect, and so on
Technology Concepts	The subject of labour, the means of labour, the carrier of technological functions, the level of technological development of the society
The criterion of technology truth	Technology practical application
Types of technologies	Tangible intangible. High, intermediate, low.
Communication structuring	Accumulation of the knowledge of the society. Added value to the existing physical environment.

The efficient technological progress of the countries of the world is possible under the condition of innovative development of all factors of production. In its turn, it requires producing and applying the latest scientific knowledge, the constant growth of the professional level of developers, scientists, as well as people who are involved in promoting innovative technologies, consumers, and so on, as well as their effective interaction.

### Conclusions

The tendencies of the world and domestic economy emphasize the need for changes in approaches to understanding the concept of technology and technological development. The study of the concept of technology that is based on the accumulation of knowledge determines the institutional grounds for the types of activities related to technology. However, the

importance of studying the concept of technology does not lie only in the understanding of the levers of technological development, but also in the fact that it is eventually used as a way for understanding the world around.

The suggested conceptual approach to understanding the development of technologies on the basis of the principles of knowledge transformation enables increasing the level of substantiating the processes of technology management in the context of the present paradigm of their transfer, taking into account market phenomena, in particular: synergy, convergence, diffusion of technologies, multiplicative effect, spillover effect, "crowd" effect, and so on, and, consequently, to assess the business opportunities stimulated by these phenomena.

The problem of technical development is not simple, both from a theoretical point of view and in a practical sense. The search for ways to manage the development of technology on the basis of the chains of knowledge transformation is the subject of further scientific work.

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## РОЗВИТОК ТЕХНОЛОГІЙ НА ЗАСАДАХ ЛАНЦЮГІВ ПЕРЕТВОРЕННЯ ЗНАНЬ

Предметом дослідження є теоретичні і прикладні аспекти розвитку технологій на засадах ланцюгів перетворення знань. Сучасний науково-технічний прогрес провідних країн світу позначений зростанням рівня інтелектуалізації та скороченням життєвого циклу технологій. Це спонукає до вивчення особливостей генерування і поширення знань, як рушійної сили

поступу технологій. Розуміння характеру перетворення знань є підґрунтям для ефективного управління розвитком технологій. З огляду на зазначене, **метою** роботи є дослідження розвитку технологій на засадах ланцюгів перетворення знань. Для цього розв'язано низку **завдань**: досліджено еволюційний розвиток підходів до розуміння поняття технології; вивчено концепцію технології як товару; розглянуто природу технології, що обумовлює особливості її сучасного поступу у ланцюгах перетворення знань; встановлено детермінанти поняття технології, продиктовані ланцюгами перетворення знань. Під час проведеної наукової роботи застосовано такі методи: метод групування, метод структурно-логічного аналізу, методи аналізу та синтезу, графічний метод. **Результатом** дослідження є розроблений концептуальний підхід до розуміння розвитку технологій на засадах ланцюгів перетворення знань. Знання, як нематеріальна складова технології, що разом із уречевленим товаром-технологією піддається трансферу, визначає виникнення нового знання. У такий спосіб нематеріальна складова технології посилює її матеріальну складову та обумовлює створення додаткової цінності. У цьому процесі технологія може підпадати під дію ринкових ефектів або сама генерувати такі ефекти. На підставі запропонованого концептуального підходу виділено істотні детермінанти, що відображають поняття технології, враховуючи її розвиток на засадах ланцюгів перетворення знань. **Висновки**: запропонований концептуальний підхід до розуміння розвитку технологій на засадах ланцюгів перетворення знань дає змогу підвищити рівень обґрунтування процесів управління технологіями в рамках сучасної парадигми їх трансферу, враховувати виникнення стимульованих технологіями ринкових явищ (зокрема: синергію, конвергенцію, дифузію технологій, мультиплікативний ефект, спілловер-ефект, ефект "натовпу" тощо), та, відповідно, оцінювати бізнес-можливості, обумовлені даними явищами.

**Ключові слова**: технологія, науково-технічний розвиток, знання, ланцюги перетворення знань, інновація.

## РАЗВИТИЕ ТЕХНОЛОГИЙ НА ОСНОВЕ ЦЕПЕЙ ПРЕОБРАЗОВАНИЯ ЗНАНИЙ

**Предметом** исследования являются теоретические и прикладные аспекты развития технологий на основе цепей преобразования знаний. Современный научно-технический прогресс ведущих стран мира отмечен ростом уровня интеллектуализации и сокращением жизненного цикла технологий. Это побуждает к изучению особенностей генерации и распространения знаний, как движущей силы развития технологий. Понимание характера преобразования знаний является основой для эффективного управления развитием технологий. Учитывая указанное, **целью** работы является исследование развития технологий на основе цепей преобразования знаний. Для этого решено ряд **задач**: исследовано эволюционное развитие подходов к пониманию понятия технологии; изучена концепция технологии как товара; рассмотрена природа технологии, которая обуславливает особенности ее современного развития в цепях преобразования знаний; установлены детерминанты понятия технологии, продиктованные целями преобразования знаний. В ходе проведенной научной работы применены следующие методы: метод группировки, метод структурно-логического анализа, методы анализа и синтеза, графический метод. **Результатом** исследования является разработанный концептуальный подход к пониманию развития технологий на основе цепей преобразования знаний. Знание, как нематериальная составляющая технологии, вместе с ошестествленным товаром-технологией подвергается трансферу, при этом определяет возникновение нового знания. Таким образом, нематериальная составляющая технологии усиливает ее материальную составляющую и обуславливает создание дополнительной ценности. В этом процессе технология может подпадать под действие рыночных эффектов или сама генерировать такие эффекты. На основании предложенного концептуального подхода выделены существенные детерминанты, отражающие понятие технологии, учитывая ее развитие на основе цепей преобразования знаний. **Выводы**: предложенный концептуальный подход к пониманию развития технологий на основе цепей преобразования знаний позволяет повысить уровень обоснования процессов управления технологиями в рамках современной парадигмы их трансфера, учитывать возникновение стимулированных технологиями рыночных явлений (в частности: синергию, конвергенцию, диффузию технологий, мультипликативный эффект, спилловер-эффект, эффект "толпы" и т. д.), и, соответственно, оценивать бизнес-возможности, обусловленные данными явлениями.

**Ключевые слова**: технология, научно-техническое развитие, знание, цепи преобразования знаний, инновация.