

The work deals with the problems of innovation transfer and intellectual property management at enterprises. An approach reasoning the choice of innovations and the type of their transfer at an enterprise has been developed, which increases the efficiency of innovation processes. For this purpose, the essence of the category "innovation transfer" regarding the micro-level was clarified and determined according to the sources of innovations. A set-theoretic model of innovation selection based on evaluating the essence of innovations, their generators (suppliers) and implementation conditions has been developed. For such an assessment, a set of criteria has been proposed, a number of the most essential conditions for introducing innovations at an enterprise have been identified, and an optimization model for the efficiency of the innovation development process has been developed. They allow making an informed choice of innovations in accordance with the needs of the enterprise. Evaluation criteria for the innovative potential are proposed and their essence is determined. Testing of the evaluation confirmed the possibility of using the proposed criteria. A model of innovation transfer, which presents the main processes and participants in the transfer of external and internal innovations has been developed, which allows enterprises to ensure a high level of organization and implementation of the transfer. Given the direct relationship between the transfer of innovations and intellectual property, an approach to improving intellectual property management at the enterprise is proposed. A number of principles of intellectual property management have been determined. The stages of intellectual property management at the enterprise are proposed as a set of specific actions determining all processes directly or indirectly related to such management, as well as those responsible for these processes and resource provision

**Keywords:** innovation transfer, innovation potential, intellectual property management, transfer model

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# DEVELOPMENT OF APPROACHES TO INNOVATION TRANSFER AND INTELLECTUAL PROPERTY MANAGEMENT TO ENSURE ENTERPRISE COMPETITIVENESS

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## 1. Introduction

In the world economy, as in each country's economy, transformation processes aimed at its intensive development are being activated. According to the model of intensive economic development [1], it is provided mainly by the components associated with competition, innovation and human potential. Strong internal competition encourages enterprises to secure their advantages in a competitive market, create a new market outside, or a new segment in a competitive market. Innovative changes (innovations) are the basis of such processes. Global research confirms that the innovative activities of enterprises and conditions created for this by states contribute to the growth of countries' competitiveness. Reverse processes in a number of countries affect the decrease in their ratings on the Global Competitiveness Index. This is confirmed by the experience of Ukraine, which

took 83<sup>rd</sup> and 85<sup>th</sup> places in this rating in 2018 and 2019, respectively. At the same time, its positions on the indicator "Growth of innovative companies" were ranked 112<sup>th</sup> and 109<sup>th</sup> places, respectively [2, 3]. In particular, the number of innovatively active industrial enterprises in 2018–2020 decreased against 2016–2018 by 62 %. The share of enterprises that introduced innovations in the total number of industrial enterprises did not reach 17 % during 2013–2019 [4–6].

The process of innovation enhancement requires accelerating the transfer of innovations from the source of creation to stakeholders to benefit from their implementation. This is especially true for countries whose competitiveness in the world is low. A reasonable choice of the type of transfer and its carefully thought-out organization have a significant impact on the innovation effect. At the same time, ensuring an effective process of transferring innovations is not a guarantee of achieving the goal of their implementation and obtaining the

desired result by an enterprise. It is also influenced by the correct choice of the innovation itself, based on an assessment of its conformity with the needs of an enterprise, its impact on the enterprise's current state and further activities. Since enterprises use a wide range of innovations, research on the transfer of innovations in general, rather than individual types, in particular technologies, is being updated, focusing on various sources of their creation (external or internal).

Research of world experience shows an increase in the innovative activities of enterprises due to the transfer of external innovations and the use of their own new developments created by intellectual property objects. Enterprises need to carefully approach the formation, protection and use of the intellectual property to achieve the desired effect. In the context of global competition and modern digitalization opportunities, protection of the results of enterprises' new developments through registering intellectual property rights has become especially important.

According to the above, research on innovation transfer and intellectual property management of enterprises is relevant.

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## 2. Literature review and problem statement

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A significant amount of scientific research deals with the transfer of innovations to enterprises from outside and considers it in relation to technologies. However, enterprises use various innovations, as noted in the works of a number of scientists, a part of which is devoted to internal innovations. In [7], even successful commercial use of new ideas is considered an innovation. The authors [8] associate innovation with a new product, new service, new function of an existing product, which provide a new value to a customer. However, there is a number of internal innovations, in particular organizational and marketing, which provide conditions and approaches for the development and promotion of innovations (innovative products) to the market. In [9], innovations are divided into technological and non-technological ones, examining their different effects on the organizations' activities. The authors of [10] note that a comprehensive understanding of such innovations is critical for global competition. This emphasizes the need to study not only technology transfer. In [11], non-technological innovations include, in particular, marketing and organizational ones, and the relationship between them and the innovative efficiency of enterprises is determined. However, the problem of selection and transfer of innovations within enterprises is not explored. The authors of [12] emphasize that researchers and businesses should make a choice of technological and non-technological innovations taking into account the life cycle of the industry they work in. However, most non-technological innovations are mainly developed within enterprises. This reduces the time between an innovative idea and getting results of innovations, as the speed of their development and implementation is an important factor influencing the enterprise competitiveness. Therefore, innovation transfer within enterprises is essential for their activities.

The authors [13] emphasize the priority of internal innovations and believe that only "firms that cannot develop their own innovative capabilities or do it slowly can compensate for their shortcomings by turning to their external networks". The need for dynamic innovative processes to ensure the competitiveness of enterprises and maintain their market share is considered. But accelerating innovations without the corresponding dynamism of their transfer within enterprises will

not give such results. The research presented in [14] shows that not only the transfer of external, but also internal intangible assets (internal innovations) is necessary and useful. The possibility of their creation and the degree of use are associated with a number of factors, in particular, the size of a subject. However, internal innovations may not necessarily become objects of intellectual property, although considering a wider range of innovations and their transfer within the enterprise is necessary and important. In [15], the innovation process is seen as a sequence of processing input data (ideas and resources) for innovation, which creates value for an organization and its client. But the internal transfer of innovations is more complex, and there is also a wider range of innovations.

In [16], innovation transfer is considered as a process of commercialization of research results of various scientific and research structures and their introduction into the practical activities of business entities. However, the problem of justifying the choice of innovations is not solved and the ability of an enterprise to generate its own innovations is not taken into account. In [17], innovation transfer is studied as a form of "implementation of scientific and innovative knowledge" in the scientific field. A system of factors is proposed, which affect innovation transfer and relate to the interaction of enterprises with external innovation suppliers, but the conditions and factors for generating innovations within the enterprise are not taken into account. The work [18] highlights various forms of innovation transfer: "patent and licensing trade in rights to industrial property; formation of joint teams (enterprises) on an innovative basis; foreign direct investments to obtain modern equipment and technologies". In addition, the forms of innovation transfer include "rental (leasing) of equipment that embodies a new technology; transfer of mechanical engineering products made using technologies" [18]. But the transfer of innovations involves their transition from the developer (creator) to the entities wishing to use them in practice; so, in particular, investments and teams (personnel) only ensure the implementation of such a transfer. In [19], innovations are divided into those obtained from the external environment ("open") and those developed within companies. Open innovation is encouraged to give priority. But for a successful business, it is advisable to use and develop any areas of the formation and transfer of innovations, focusing on the effectiveness of their implementation, rather than on the method and source of their creation.

The transfer of innovations, in particular for agricultural enterprises, in [20] is associated with their movement and transfer of ownership between persons or from one to many persons. This can be done through an information and advisory service that would advise enterprises and facilitate their implementation. But the feasibility of creating an additional link for innovation transfer only with such tasks is questionable in the context of wide access to the Internet. The work [21] highlights approaches to innovation transfer at the macro- and meso-level, but enterprises are the main element in this process. The authors of [22] direct their research towards the formation of a methodology and the development of tools for regulating the transfer of external innovations, since the "company-region-state" system is considered. In [23], innovations are appropriately divided into those making radical changes in the business and those contributing to its continuous improvement. The authors believe that companies find it difficult to develop significant (radical) changes, so an external structure, a corporate incubator, is needed. But the study says that transferring innovation from this structure still requires companies to have an internal innovation structure. It substantially affects

the success of innovation transfer and subsequent implementation [23]. Indeed, the decision regarding significant changes in the company (for example, a radical change in the value of a product) causes an urgent need to obtain the results of scientific and technological progress (new technology, equipment) for implementation. Information on new research and its results will be needed to adapt to own business. In this case, cooperation with any external structure may be objectively necessary, and the authors' conclusions are important. But the transfer of various innovations from various sources, including those developed within a company, also requires significant attention.

In [24], only the transfer of technologies obtained from outside is highlighted. It is considered only as an interaction between business and science, noting that its imperfection hinders the commercialization of scientific developments for the development of the economy. However, enterprises require a wider range of innovations to be effective. The assertion in [25] that technology transfer is the main form for promoting innovations, given a wide range of their types, is controversial. In addition, such a transfer involves the transmission of technology and the implementation of necessary processes. Therefore, it is doubtful that technology transfer is carried out in the form of experience "or materials, machines, equipment" [25]. In [26], innovation transfer is also considered only in relation to technology transfer, that is, "as a transfer of a ready-to-use technology or a product created on its basis". Noting in [27] that technology transfer includes the transfer of products and technologies, the authors do not disclose the essence of this process in more detail and dwell on the characterization of innovation transfer as technology transfer. Innovation transfer refers to intermediary activity "in the field of technology transfer, which involves specialists in the commercialization of innovative developments" [28]. But companies can do it on their own.

In [29], innovation transfer is also associated only with technology transfer from research structures to businesses, and organizational measures to manage the intellectual property of research organizations by creating a technology transfer office are proposed. However, such management should be carried out by all enterprises, because part of innovations becomes an object of intellectual property. In [30], the authors also investigate the problem of external provision of enterprises with innovations, including intellectual ones. For this, the use of outsourcing is considered, in particular, several of its most important types are proposed, which can activate the processes of innovation transfer in the intellectual sphere.

In [31], the authors found that "the most competitive companies are those" that understand the high importance of "protecting innovation from imitation and exploitation by competitors". Indeed, the security and protection of innovations developed by enterprises significantly affect their competitiveness. In [13], the author notes that "companies can achieve competitive advantages only through the effective appropriation of value by protecting their innovative activities from being used by competitors".

Therefore, companies need to pay significant attention to intellectual property management. In [32], it is considered as a set of concepts, processes and methods for aligning intellectual property with the company's goals and business strategy. In [33], the authors also believe that intellectual property should be managed in accordance with the business strategy. Their suggestion to take into account the organization's innovative practice is important. The key functions of the intellectual property management system are proposed to include the following: "generation of intellectual property, management

of an intellectual property portfolio, evaluation of intellectual property, competitive evaluation and strategic decision-making" [33]. However, the organizational components of this system are not covered enough. The work [34] states that the approach to intellectual property management should be aimed at its creation, protection, as well as promotion and income growth. However, the authors suggest that the organizational management structure should include the following components: leadership, decision-making and structure, people, workflows and systems, culture. At the same time, clear control rules and algorithms are not defined. The work [35] proposes an intellectual property management system. However, it is actually intended only for information support of processes associated with such management in the framework of two key functions: search and management of an intellectual property portfolio. Undoubtedly, information support and its organization play an important role in intellectual property management, but the use of information also depends significantly, in particular, on a number of organizational and human management factors. In [36], the authors suggest managing intellectual property focusing only on technology protection and commercialization. In [37], it is noted that the intellectual property management system should not duplicate the functions of other management systems (marketing, production, etc.) in relation to their innovative activities, which can result in the creation of intellectual products. However, their protection as an object of intellectual property should also be one of the tasks of the intellectual property management system. In addition, it should provide for the use (receipt and implementation in management processes) of intellectual property objects by all enterprise divisions (in all management systems). It is important that in [37], the intellectual property management system includes the most essential components: management of the intellectual products' creation, management of the portfolio of intellectual property objects and management of the organizational and methodological base. Their main functions are determined. But some of them refer to the functions of other management systems and the general management system of the enterprise, in particular, "creating conditions for generating new ideas", "forecasting human capital needs", "identifying employees' potential" [37]. These functions do not accurately highlight the essence of "intellectual product creation management" as a component of the intellectual property management system. Other components need to be clarified and functionally expanded. In addition, it is important not only to clearly define the components of intellectual property management, but to develop its stages to ensure effective management. The work [38] studies the problem of increasing innovation activity and the role of intellectual property management in this process. But the general approaches to solving the problem defined by the author need to be substantially detailed for enterprises. The approaches and forms of organizational support for intellectual property management are proposed in [39], focusing on the integration and coordination of internal and external (outside the enterprise) participants in such management processes. However, the outlined conceptual approaches require clarifying the place of such structures in the overall organizational structure of an enterprise, management algorithms and their use. In [40], only the components of the intellectual property management system (economic, innovation, personnel, organizational, informational) are defined. But they are too general and can be used to characterize other resource management systems. Only some of them are specific for intellectual property management. In [41], this management includes the analysis of external and internal information, the

results of which determine the management strategy. But after setting tasks to developers, they are considered as the object of management; therefore, stimulating the scientific and technical activities of developers is considered as the next stage of intellectual property management. However, the subsequent stages are again associated with the objects of intellectual property rights, namely, their protection, evaluation, commercialization and formation of an optimal portfolio of objects. The work [42] states that the intellectual property management system is used to manage own innovations. It is important that the authors emphasize the need for internal innovation and the role of intellectual property management in this process. Three main components of the management system are proposed: intellectual property creation, intellectual property use, and licensing strategy. However, not all innovations can be objects of intellectual property, and not all intellectual property objects used by enterprises are their own developments.

Existing developments address only certain aspects of these problems, since a significant number of studies are devoted to the transfer of only technologies from external sources, and approaches to intellectual property management relate mainly to the objects obtained from outside.

Analysis of literature sources related to innovation transfer and intellectual property management revealed the following unresolved issues:

- there is no criteria and model tools for assessing and justifying the choice of innovations and the type of their transfer by enterprises;
- the transfer of innovations is not considered in relation to internal sources of their generation; the organization of innovation transfer from different sources within an enterprise is not clearly presented;
- there is no comprehensive approach to the organization of intellectual property management at an enterprise.

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### 3. The aim and objectives of the study

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The aim of the work is to develop approaches to the selection of innovations and the type of transfer by an enterprise, as well as intellectual property management. This will increase the efficiency of innovation processes, which will activate the formation of strong competitive advantages of the enterprise to ensure its competitiveness.

To achieve the aim, a list of objectives was formed:

- to develop criteria and model tools to justify the choice of innovations and the type of their transfer by enterprises;
- to develop a model of innovation transfer from different sources within the enterprise itself;
- to develop an approach to improving intellectual property management at the enterprise.

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### 4. Research materials and methods

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The theoretical and methodological basis of the research is scientific, statistical and analytical sources. Their critical analysis, in particular, allowed improving the subject-categorical apparatus related to innovation and intellectual property management. The methods of comparative analysis and analysis of the dynamics of economic processes are used to substantiate the need to intensify innovation regarding innovation transfer. Set theory is used to model the choice of innovations and justify the choice of their generator. The

method of mathematical programming is used to develop a model of the efficiency of the innovation development process. The modeling method is used to represent the process of innovation transfer by enterprises. The expert method is used to test the evaluation of the innovation potential. The abstract-logical method is used to improve intellectual property management and substantiate the research conclusions.

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## 5. Results of studying approaches to innovation transfer and intellectual property management of enterprises

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### 5.1. Development of a set of criteria and model tools to justify the choice of innovations and the type of their transfer by enterprises

Depending on the business conditions and strategic management skills of the chief manager, an enterprise can choose different ways of innovative development: based on technological innovations or based on innovative changes in the value of products (products, services).

If a decision is made to innovate the value, an enterprise may need more than just a new production technology. It will need a complex of innovations, in particular, regarding the design solution of the product, technical support of its production, organization of processes and technologies. The decision on the need to introduce innovations determines the need in “transmitting” innovations from the developer to the personnel responsible for their implementation, that is, in the transfer of innovations. Since they do not relate exclusively to technologies but have a wider range of types and purposes, the categories “technology transfer” and “innovation transfer” should be clearly distinguished.

Given the interpretation of the category “innovation transfer” by other researchers, we propose to clarify its essence in relation to the microlevel. Innovation transfer is a set of processes and resources for transferring (transmitting) innovations (innovative ideas) from their generator (supplier) to the final entity that uses innovations in the enterprise’s activities. The directions of use can be different: creation or improvement of a product, changes in the organizational structure, improvement of the technical and technological base, improvement of demand research approaches, formation of innovation potential. Depending on the nature of innovations, their generators may include research organizations and institutes, universities, other enterprises, individual employees and personnel of an enterprise, individual citizens (for example, patent holders). Recipients of innovations are employees or departments that directly introduce innovations (use in their activities) to obtain the result for which the innovation transfer took place.

As enterprises can use innovations of internal generators and external suppliers, it is proposed to distinguish between the transfer of external and internal innovations. Accordingly, the transfer of external innovations is a set of processes and resources for transferring innovations from their supplier to the final entity that uses innovations in the enterprise’s activities. The transfer of internal innovations is a set of processes and resources for transmitting innovations (innovative ideas) from their generator to the final entity that introduces innovations in the enterprise’s activities.

The choice of the type of innovation transfer depends on the source of their receipt, determined by the type of innovation. Selection of innovations as a basis for determining the main components and sequence of innovation transfer pro-

cesses should be carried out using the proposed set-theoretic model of innovation selection, including technological ones:

$$V = \langle S, K, G, E, U \rangle, \tag{1}$$

where *S* is the set of enterprise strategies; *K* is the set of evaluation criteria for innovation essence; *G* is the set of evaluation criteria for innovation generators (suppliers); *E* is the set of innovation generators; *U* is the set of conditions for implementing an innovation in an enterprise.

Innovations, in particular, technological ones, are proposed to be selected in the following sequence:

- 1) making a decision on the need for innovation;
- 2) selection of the innovation type and generator (supplier).

Decision on the need for innovation should be based on a system of enterprise strategies implemented through tactical plans, in particular innovation activities. The type of innovations (product, technology, labor organization, etc.) is chosen in relation to their impact on the current activities of an enterprise and sources of innovation. The choice of a certain type of innovation does not exclude considering several alternatives.

The criteria for evaluating each of the innovations, as well as for choosing one of several alternatives, include the following:

- the ability of an enterprise to develop an innovation independently;
- the cost of obtaining and using an innovation (development, implementation, further use);
- profitability after implementation and use;
- accuracy (compliance with the requirements or needs for which the decision on innovation is made);
- speed of development, transfer, practical use;
- the ability to protect innovation as an object of intellectual property;
- innovation potential (product, technology, etc.).

Particular attention is required to assess the innovation potential, which should be carried out by the proposed criteria (Fig. 1).

The synergy of innovation novelty means that its further use or implementation result leads to another new and more powerful innovative result or becomes a booster for new innovations.

Adaptation of an innovation to different enterprise processes implies using it not only to solve a specific problem (achieve the goal) for which it was developed and implemented, but also to change or improve other enterprise processes.

The potential profitability of an innovation assumes that it can provide the enterprise not only with the planned profit due to its implementation to solve the problem (achieve the goal), but also contribute to generating additional profit at an enterprise.

The prospects of an innovation mean that an enterprise can use it in the future to solve problems, similar to the one for which it was introduced, in the same process.

The values of these criteria should be determined using the expert method. We present a fragment of the innovation potential assessment carried out by the management of an industrial enterprise, where they planned to develop a

project for reengineering business processes. The enterprise considered the feasibility of introducing an innovative (for this enterprise) approach to project activities, namely the agile methodology, in particular, the scrum method. The innovation was considered by the initiators in accordance with all evaluation criteria for the innovation potential and provided their own arguments (Table 1).

To assess the innovation potential, a group of experts was involved, which included the heads of departments, chief specialists, project team representatives (excluding the innovation initiators) of an industrial enterprise. The degree of importance of each criterion, i.e. their weight factors, was determined by the paired comparison method according to the scale [43] presented in Table 2.

Table 1

Compliance of the agile methodology with evaluation criteria for innovation potential

Criterion	Compliance characteristic
Synergy of innovation novelty	Can lead to: – organizational innovation (holding meetings by the scrum method can be used to hold meetings and improve the dispute resolution system); – activation of project activities for innovative changes (successful development and implementation of the project encourages new projects); – innovations in production and marketing (the agile methodology, which can improve the project development process, can provide changes in the production and sales of products, in particular, using the kanban method)
Adaptation of an innovation to different enterprise processes	Can be used to improve the processes of production, sale of finished products, labor organization using the kanban method of the agile methodology
Potential profitability of an innovation	The enterprise expects to receive a certain amount of profit after the successful development and implementation of the project (for which the implementation of the agile methodology is considered), while additional profit can be obtained by improving the sales process using the kanban method of the agile methodology
Prospects of an innovation	The enterprise can use the scrum method of the agile methodology in the future to develop other projects, which will contribute to the development of its project activities

Table 2

Scale of relative importance of evaluation criteria for innovation potential

Level of importance	Value
Equal importance	1
Moderate advantage	3
Substantial or strong advantage	5
Significant advantage	7
Very strong advantage	9
Intermediate solutions between two judgments	2, 4, 6, 8

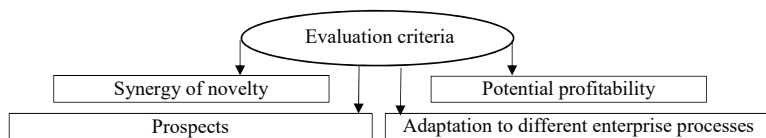


Fig. 1. Evaluation criteria the innovative potential of innovation

Based on the evaluation results, the weight factors of the criteria were determined (Table 3): the values of the elements of each row of the paired comparison matrix were summed up and the obtained values were normalized so that their sum was equal to one.

Table 3

Weight factors of evaluation criteria for innovation potential

Criteria	Weight
Synergy of innovation novelty	0.306
Adaptation of an innovation to different enterprise processes	0.247
Potential profitability of an innovation	0.235
Prospects of an innovation	0.212
Total	1.000

The compliance of the innovation with the evaluation criteria for innovation potential was determined by experts on a scale of 1 to 10 (1–4 – low level, 5–7 – medium level, 8–10 – high level), the results are presented in Table 4.

at the enterprise and the type of innovations. For example, new nanotechnology is unlikely to be developed at a machine-building enterprise. However, the technological innovation for manufacturing machines and mechanisms is a real challenge for such enterprises with the appropriate intellectual potential and conditions at the enterprise to solve it.

So, first of all, the enterprise needs to consider itself as a generator of innovations and evaluate the possibility of their independent development. Such an assessment is necessary, because an innovation developed by an enterprise can more closely match its needs and specifics. This will allow faster achievement of the goals for which it is developed, while external actors creating, for example, certain technological innovations, are often focused on the industry as a whole.

Table 4

Results of evaluating the innovation potential of the agile methodology

Evaluation criteria	Weight factor	Experts									Average score	Weighted average score
		1	2	3	4	5	6	7	8	9		
Synergy of innovation novelty	0.306	8	7	7	8	9	8	8	7	8	7.81	2.39
Adaptation of an innovation to different enterprise processes	0.247	7	8	7	8	10	7	7	8	6	7.58	1.87
Potential profitability of an innovation	0.235	6	7	7	7	8	7	6	5	6	6.58	1.55
Prospects of an innovation	0.212	9	9	9	8	9	8	9	8	9	8.69	1.84
Total	1.0	×	×	×	×	×	×	×	×	×	×	7.65

Let  $Q$  be the set of innovation needs of all industrial enterprises, in particular, technological innovation, i.e.  $Q = \{q_1, q_2, \dots, q_n\}$ . Let  $W$  be the set of specific innovation needs of an individual enterprise, namely  $W = \{w_1, w_2, \dots, w_n\}$ , then the result of choosing an external source of innovation can be represented as:

$$R = \begin{cases} 0, & \text{if } Q \cap W = \emptyset, \\ 1, & \text{if } Q = W, \\ 0.5, & \text{if } Q \cap W = Z. \end{cases} \quad (2)$$

The results of the weighted assessment of the innovation potential (agile methodology) were interpreted according to the proposed scale (Table 5).

The set  $Z = \{z_1, z_2, \dots, z_n\}$  contains some specific needs of the enterprise, which are also inherent in other enterprises in the industry.

Table 5

Evaluation scale for innovation potential

Weighted score	Evaluation result
1–2	Very low potential
3–4	Low potential
5–6	Average potential
7–8	High potential
9–10	Very high potential

So, the agile methodology, which is proposed as an innovative approach to the project activities of an industrial enterprise, has high innovation potential, affecting a positive decision on its implementation. If the company evaluates several innovations, then the one with higher potential will be selected according to this criterion.

Objectively, employees are more aware of the problems that can be solved through innovation than a third-party organization. The set of innovative ideas they generate can be significantly larger than that of such a structure. In addition, the active participation of personnel in innovation processes enhances the innovative activity of enterprises, increases the number of innovations and accelerates their implementation. Creating own innovations takes less time, since the speed of innovation development is important for enterprises. This process usually consists of a number of stages, the duration of which should be as short as possible. If the enterprise needs innovation in a certain period, then the total amount of time spent on its development will be

$$E = \sum T \cdot v, \quad (3)$$

where  $T$  is the time for each stage of the development process;  $v$  is the development stage.

In accordance with the proposed model (1), in addition to the essence of innovation, it is necessary to evaluate its potential generators (suppliers). The results of such an assessment determine the choice of the type of innovation transfer and the algorithm for organizing it.

Innovation is useful when the characteristics of the innovation ( $m$ ) satisfy or exceed all the needs and requirements of the enterprise ( $p$ ) that have determined its development, i.e.

$$m \geq p. \quad (4)$$

The choice of innovation generators (suppliers) is based on an assessment of the generators' (suppliers') capabilities to satisfy the needs of the enterprise with innovations that best meet these needs in a shorter period. The generator or supplier of innovation is selected based on the following criteria:

All the time spent on innovation development and each stage of this process consists of two main parts, namely

$$T = z \cdot p + s \cdot m, \quad (5)$$

- accuracy of innovation (compliance with the requirements or needs for which the innovation decision is made);
- speed and timeliness of its development and transfer;
- cost of development (acquisition) and transfer.

The choice of an innovation generator (supplier) essentially depends on the availability of the intellectual potential

where  $z$  is the time for the initial formation of needs and requirements for each stage of innovation development;  $s$  is the time for direct innovation development (creation) at each

stage, including possible clarification of enterprise requirements when performing this process.

Therefore, the optimization model of the efficiency of the innovation development process, according to which the time spent should be minimal, can be represented as:

$$\begin{aligned}
 E &= \sum T \cdot v \rightarrow \min, \\
 T &= z \cdot p + s \cdot m, \\
 z &\leq s, \\
 m &\geq p, \\
 s &> 0; \quad z > 0; \quad p > 0; \quad m > 0.
 \end{aligned}
 \tag{6}$$

The model determines which stages and processes are of considerable duration, in particular, how accurately and comprehensively innovation requirements are described and presented to a developer. This allows him to quickly give the company the desired result (innovation). Having identified the areas of ineffective spending of time for innovation development, the company will determine the reasons for delays and the possibility of speeding up this process.

Considering the possibility of independent innovation development, an enterprise should assess the available intellectual potential, which implies an assessment of its human and structural potential regarding the possibility and degree of their use for the development of a certain type of innovation.

In relation to the structural potential of the enterprise, the following is assessed:

- the potential of existing patents and other components of knowledge bases that can be fully or partially used in innovation development;
- the availability or the possibility of creating a research, design, or any other innovation department;
- the availability or the possibility of purchasing the necessary software and hardware.

Human potential is assessed at the level of knowledge and experience of different categories of employees, and not just a special innovation department.

Enterprises can order the development of any innovation from third-party organizations. In this case, they should carefully formulate all innovation requirements and monitor its characteristics at the development stage for possible clarification. This approach is effective, although it may require additional time to set the problem to developers, study the problems of an enterprise, as well as higher payment for an individual order.

The purchase of a ready-made innovative product (technology) is carried out on the basis of the requirements formed by the enterprise, similar to the requirements for its development, followed by their comparison with the characteristics of the finished product (technology). Their conformity and

acceptability of the product cost are the main factors influencing the decision to purchase it. But this does not exclude the need in the future to improve the product in accordance with new application conditions or any changes in the enterprise's activities. The ability to ensure such product changes depends on the supplier's customer interaction policy. Ordering or purchasing a product from third parties is associated with the company's dependence on them. So, it is necessary to take into account as much as possible all the risks and benefits of obtaining a ready-made innovative product.

The model of innovation selection provides for the need to assess and take into account the conditions for introducing innovations at the enterprise, including the following most significant:

- organizational conditions;
- sufficient human capital and potential to implement this process;
- readiness of the technical and technological base (depending on innovations).

### 5. 2. Innovation transfer model

The innovation transfer approach involves two directions (transfer of external or internal innovations) according to the proposed model (Fig. 2).

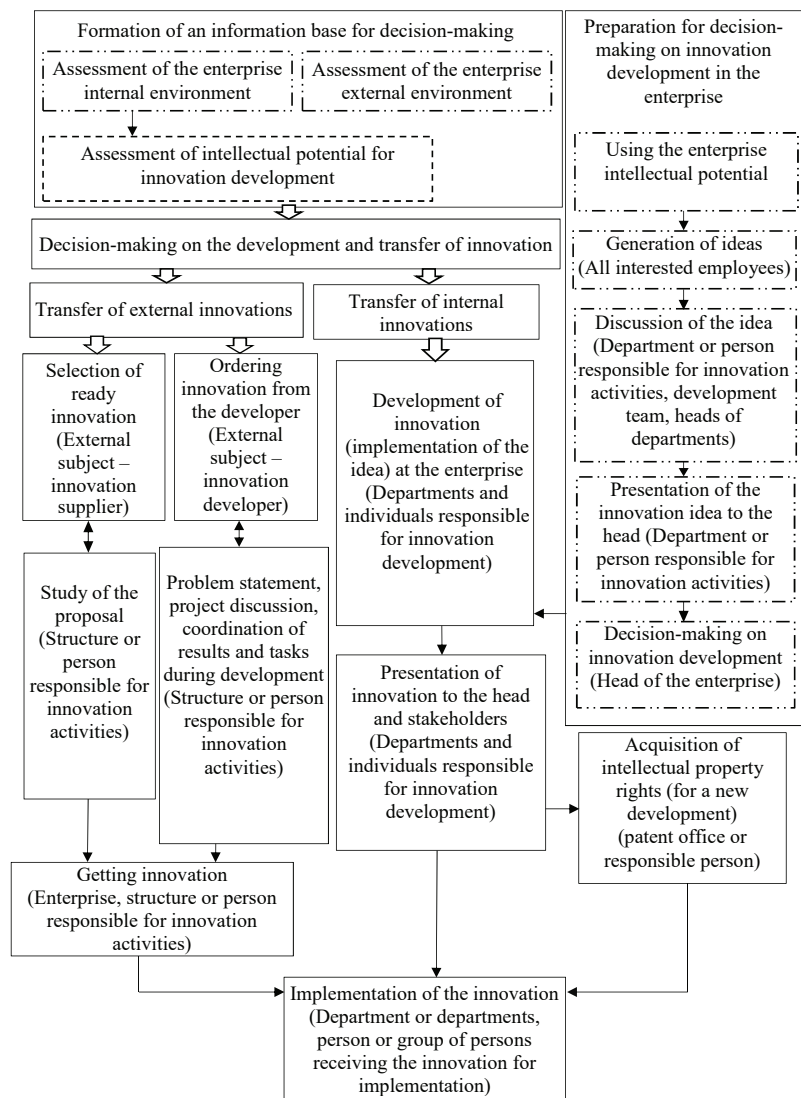


Fig. 2. Innovation transfer model

Each direction corresponds to innovation transfer, which the enterprise selects depending on the decision to develop a certain type of innovation and type of transfer. The model presents the sequence of the main processes of the internal and external transfer of innovations to the subjects that directly use them in the enterprise. For all processes, the responsibility of personnel for their organization and execution is determined. Preparation for decision-making on innovation development in an enterprise is presented in more detail. This will increase the validity of such decisions and reduce the likelihood of failure. The model focuses the attention of enterprises on the need to form an information base for deciding on the feasibility of innovation development, its essence and type of transfer. It allows companies to ensure a high level of organization and implementation of this process.

### 5. 3. Development of an approach to improving intellectual property management in an enterprise

It is advisable for enterprises to secure their rights to the maximum number of their innovative developments (device, process or method, industrial design, computer program, etc.) that can become objects of intellectual property. Securing such rights ensures protection against the use of developments by other subjects without the permission of the owner enterprise and maintains competitive advantages created by intellectual property. This increases the relevance of improving its management in the enterprise, although protection is not the only purpose. Management of the enterprise's intellectual property should apply to all of its objects, regardless of whether they came through an internal or external innovation transfer.

Management of the enterprise's intellectual property implies its development, protection of rights to and their exchange of intellectual property objects, analysis of capabilities and the market for intellectual property objects.

The development of intellectual property involves planning, creation, accumulation of intellectual property objects, as well as motivation of the employees who create them. The exchange of intellectual property objects involves the acquisition or transfer of rights to them, joint research and development activities to create an innovative product.

Ensuring effective intellectual property management implies that enterprises comply with a number of principles:

- the management (owner) is aware of the role of intellectual property for business and possesses information on associated legal rights;
- identification of necessary and available intellectual property objects, determination of the need for new developments that can become objects of intellectual property and ensure the enterprise competitiveness;
- formation of information support regarding the availability of competitive intellectual property on the market;
- timely registration or acquisition of intellectual property rights;
- assessment of the cost-effectiveness of the available intellectual property;
- protection of intellectual property rights.

Intellectual property management is proposed to carry out in accordance with the following stages:

- defining the goals of intellectual property management, in particular, achieving a certain competitive position in the market, obtaining certain competitive advantages, profiting from the transfer of licenses;
- determination of the management strategy in accordance with the general strategy of an enterprise;

- regulation of intellectual property management carried out by various departments and specialists to avoid duplication of operations, processes, functions, as well as inconsistencies in documentation and information support;

- determination of the links of intellectual property management with other main processes of an enterprise, their direction (direct or reverse) and interaction, as well as the necessary results of such interaction;

- determination of resource provision for all processes and their coordination;

- establishment and delineation of responsibility of individual departments and employees for the processes of intellectual property management: organization and planning, development and protection; control and analysis of the results;

- establishment and delineation of responsibility of individual departments and employees for the development of preventive and corrective measures to improve management, introducing changes in the regulation and documentation of processes, motivation of employees;

- planning management resources, which allows avoiding failures and obstacles in its processes;

- accumulation (creation or acquisition of rights) of intellectual property objects by an enterprise based on a reasonable choice of the method of development and transfer of innovation in accordance with the models proposed above;

- acquisition and securing by the enterprise of rights to its developments as objects of intellectual property, in particular, patenting;

- selection and use of methods of protecting rights for intellectual property objects for their commercialization and retaining competitive advantages;

- commercialization of intellectual property objects by an enterprise using its economic activities;

- formation of a system of efficiency indicators of intellectual property management, which should reflect it comprehensively, include benchmarks for management processes, as well as qualitative and quantitative indicators to assess management effectiveness;

- development of schedules of control measures at certain stages of intellectual property management in order to achieve the necessary indicators of its individual processes;

- analysis of deviations of indicators from the planned level by the results of monitoring the processes of intellectual property management;

- determination of shortcomings of management processes and their causes, problems of relationships between structural units (individual employees) involved;

- development of a system of measures to further improve intellectual property management, which is carried out on the basis of the analysis and provides their justification; a list of performers and deadlines, efficiency indicators of intellectual property management.

The competitiveness of an enterprise essentially depends not only on the quantity and quality of intellectual property, but also on the ability to manage it.

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## 6. Discussion of the developed approaches to innovation transfer and intellectual property management at an enterprise

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As a result of the research, an approach to innovation transfer has been developed. It is based on the definition of the category "innovation transfer", which, in contrast to the



existing approaches [22, 28], is presented in relation to the microlevel and sources of innovation. Unlike other studies on innovations, in particular [11], an approach to their selection and transfer is proposed. The correct choice of innovations is essential for the effect of their implementation. The new approach, in contrast to the existing ones, is based on the innovation selection model (1), which includes the main components of this process. According to the model, it is necessary to evaluate not only the essence of innovations, taking into account the innovation potential, but also generators (suppliers) of innovations, conditions for their implementation, which ensures high efficiency of the innovation process. The absence of such conditions negatively affects or makes it impossible to introduce certain innovations in an enterprise. These include not only its technical and technological state, but also the available human capital and potential, strategy and tactics regarding their formation and use. Unlike other studies, in particular [16, 17], the problem of justifying the choice of innovations is solved, which determines the type of their transfer by enterprises. For this purpose, according to the model (1), a set of criteria is proposed, including evaluation criteria for the essence of an innovation, which makes it possible to reasonably choose the best innovative alternative in order to create (strengthen) competitive advantages in the existing economic conditions. The prospects for using an innovation in the future are also taken into account. They are based on an assessment of innovation potential according to the proposed criteria (Fig. 1). The paper presents their essential characteristics, simplifying the practical use of evaluation criteria for the innovation potential by enterprises. Such an evaluation was tested at an industrial enterprise by the expert method (Tables 1–5). The assessment technique can be adjusted by experts regarding the weight of the evaluation criteria and supplementing them. It demonstrates the feasibility of using the proposed evaluation criteria for innovation potential as a component of criteria to justify the choice of innovation. It also includes a number of evaluation criteria for innovation generators (suppliers) regarding their ability to meet the needs of the enterprise quickly and efficiently. Therefore, an optimization model of the efficiency of the innovation development process is also proposed (6) to minimize the time for obtaining an innovation, which meets the needs of the enterprise. Reducing the time of innovation development accelerates the implementation result, so it is an important criterion for choosing an innovation generator. Determination of the stages and processes of innovation development characterized by a significant duration on the basis of the model (6) allows us to find out the reasons for delays and develop measures to accelerate this process. Evaluation of innovation generators (suppliers) has a decisive influence on the choice of the type of innovation transfer.

The choice and components of the transfer of innovations depend on their type and source (generator). In contrast to the existing approaches, in particular [22, 24, 27], the developed innovation transfer model (Fig. 2) presents the main processes of transfer of external and internal innovations regardless of their types. The model presents participants in each stage of all types of transfer, which makes it easier to organize and implement it. The proposed innovation transfer model provides for the choice of transfer based on the information base formed by the results of assessing the external and internal environment of an enterprise. In addition, the processes for preparing decision-making on innovation development by an enterprise and, accordingly, the transfer of

internal innovations are presented in detail. This approach increases the validity of the choice of transfer, rationally generates resources for its implementation, and accelerates the achievement of innovation goals. The model presents two possible options for the transfer of external innovations. The feature of the innovation transfer model is that this process ends when the innovation is transferred to the employees who directly implement (use) innovation in their activities. This ensures the organizational completeness and rational resource provision of the transfer process.

An approach to improving intellectual property management at an enterprise is proposed, which, in contrast to the existing ones, in particular [33, 34], defines its principles and stages. Compliance with the proposed principles of intellectual property management provides high efficiency of such management and management of an enterprise as a whole. The proposed steps of intellectual property management at an enterprise, in contrast to the existing ones, in particular [35, 37], do not contain the functions of other management systems and are intended not only for information support of intellectual property management. Compared to other approaches, in particular [39, 40], they are a clear set of organizational and methodological foundations, which provide for the need to identify all the processes associated with such management, appoint those responsible for these processes, and determine their relation to other processes of the enterprise. This allows you to get a clear organizational basis, avoid inconsistencies in processes and documentation, and determine management resources. Among the stages of intellectual property management, the place of selection and transfer of innovations, their model tools is shown, which makes it possible to determine the source and features of the management object and adjust the processes accordingly. The proposed approach to intellectual property management provides for the control and adjustment of management processes and indicators. Practical use of this approach will significantly increase the level of management, which will be facilitated by a system of measures to further improve intellectual property management, which is proposed to be developed by enterprises. The proposed approach can be used in various industrial enterprises to manage intellectual property and ensure its effectiveness.

Limitations on the use of the proposed approaches may relate to low innovation activity at enterprises and the lack of a strategic vision of the formation and use of intellectual property objects. Practical application of the proposed approaches requires flexible and effective organizational support.

Further research should be aimed at developing an organizational mechanism for activating innovation processes and transferring internal innovations, as well as developing strategies for intellectual property management.

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## 7. Conclusions

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1. To develop an approach to substantiating the choice of innovations and the type of their transfer at the enterprise, the essence of the category “innovation transfer” should be clarified. This is done regarding the micro-level and determining its components in accordance with the sources of innovations, that is, “transfer of internal innovations” and “transfer of external innovations”. A new set-theoretic model of innovation selection has been developed. It lies in the fact that to make a choice, it is proposed to evaluate not only the essence of innovations, but

also their generators (suppliers) and introduction conditions. For this purpose, a set of evaluation criteria, in particular, for the essence and generators (suppliers) of innovations is proposed. They allow making a reasonable choice of innovations in accordance with the needs of an enterprise. One of the criteria is innovation potential, which allows an enterprise to consider alternative options, focusing on the prospects of their use in the future. Evaluation criteria for the innovation potential are proposed, their essence is determined, and its evaluation is tested at an industrial enterprise. A number of the most essential conditions for introducing innovations at an enterprise have been identified, which need to be assessed to ensure the high efficiency of the innovation process. Evaluation criteria are proposed to justify the choice of a supplier of external and generator of internal innovations (the enterprise itself), which allows enterprises to choose the one that can most quickly and efficiently meet their needs. In addition, an optimization model of the efficiency of the innovation development process is proposed. It allows minimizing the time for obtaining an innovation that meets the needs of an enterprise. Using the model to assess the enterprise's capabilities to develop an innovation independently makes it possible to determine which stages and processes of innovation development have significant duration, and find out the reasons for delays and the possibility of accelerating this process. When exploring the possibility of independent development of innovations by an enterprise, special attention should be paid to assessing the available intellectual potential (human and structural potential).

The proposed methodological approach to the selection of innovations and the type of transfer by enterprises solves the problem of the validity of such a choice and determining a clear sequence of transfer, in particular internal, using a set of criteria and model tools.

2. A model of innovation transfer has been developed, which, in contrast to the existing ones, presents the main processes and participants in the transfer of external and internal innovations, allowing enterprises to ensure a high

level of organization and implementation of the transfer. This improves the innovative activities and increases the efficiency of enterprises. In this model, unlike others, the transfer of innovations is completed when they are transmitted to a person or a group of persons who directly implement (use) them in an enterprise. A feature of the model is the availability of preparatory processes for the selection and implementation of innovation transfer, namely the formation of an information base for decision-making and detailing of the process of preparing a decision on innovation development by an enterprise itself.

3. An approach to improving intellectual property management at an enterprise, taking into account its direct connection with innovation transfer, is proposed. In particular, one of the components of the transfer of internal innovative developments is the acquisition of rights to them as objects of intellectual property. The management of such objects, as well as those obtained through external transfer, plays an essential role in ensuring the enterprise competitiveness. The definition of the category "intellectual property management at the enterprise" is proposed, which creates the basis for the formation of all its components. A number of principles of intellectual property management at an enterprise have been determined, which provide high efficiency of intellectual property management at enterprises and, accordingly, increase it in relation to the enterprise management as a whole. The stages of intellectual property management at an enterprise are proposed, which, in contrast to the existing ones, are presented as a set of specific actions determining all processes related directly or indirectly to such management. Those responsible for these processes and resource provision have also been identified. The stages of intellectual property management at an enterprise provide for the control and adjustment of its processes and indicators to improve management. This makes it possible to develop and improve the intellectual property management system, determine mechanisms and implement processes of intellectual property management.

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