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## DEFINING DIRECTIONS FOR IMPROVING PUBLIC PROCUREMENT OF INNOVATION IN THE EUROPEAN UNION

*The object of research is the system of regulatory methods for identifying public procurement in the European Union, as one of the ways to stimulate innovation circulation. The research is aimed at solving the issue of improving the design of this support tool to the updated requirements of the European Union. The directions, methods and methods of improving the institution of public procurement are studied in order to bring it into line with real needs.*

*The study of the processes of regulating public procurement of innovations in the European Union has established their inconsistency with the real needs of participants in innovation circulation. It is proven that these inconsistencies negatively affect the level of support and scaling of innovation processes. The need to improve the regulatory approach to implementing public procurement of innovations in the European Union is substantiated.*

*The introduction of a new procedure for public procurement of innovations – public financial grant support – is proposed. The need to soften the requirements for the mandatory presence of an intellectual property right in the innovation is proven. The need to expand the circle of participants in the procedure for public procurement of innovations is substantiated. The need to amend Directive 2014/24/EU of the European Parliament and of the Council of February 26, 2014, the Horizon Europe Framework Programme; European Innovation Act is identified.*

*The research is aimed at developing general theoretical principles for improving the regulation of public procurement of innovations in the European Union. The results of this research can be used to improve the official rules for the dissemination and circulation of innovations, the formation of relevant decisions of government bodies, state innovation policy and the basis for further scientific research on the specified issues.*

**Keywords:** public procurement of innovations, regulation of innovations, innovative procurement, stimulation of innovations.

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### 1. Introduction

Innovations and their circulation are one of the key objects of economic relations within the European Union. On their basis, the stable economic development of this interstate entity is ensured. However, the innovation market of Europe does not function exclusively on autonomous and self-regulating market principles. The member states of the European Union, as well as the governing bodies of this interstate entity, actively intervene in economic relations in general and relations related to the circulation of innovations in particular. The general vector of intervention of the institutions of the European Union in innovation relations is defined at the level of its fundamental official regulatory documents. The main task of managerial influence is to scale up the processes of innovation implementation, stimulate innovation circulation, and maximize the spread of innovations in all spheres of the economy. There are a large number of means and techniques by which a general stimulating effect on innovation circulation is ensured. Public procurement occupies a special place among them.

On the one hand, they allow for the redistribution of public financial assets, directing them to the private law sphere of economic relations.

On the other hand, they allow for the creation of the necessary prerequisites for ensuring general social needs and functions of public administration. In the field of innovation circulation, public procurement allows for financial support for innovation projects at the expense of the European Union funds, as well as the budgetary resources of its member countries. This significantly contributes to the level of growth in the volume of support for innovation circulation and, accordingly, to scale the level of innovation activity within the economic system of this intergovernmental entity.

All of the above is confirmed by the steps that are currently being implemented in the European Union. The existing model of regulatory influence on public procurement within this intergovernmental entity is undergoing a stage of radical reform. The main strategic goals were proclaimed within the framework of the state policy reform program "A Competitiveness Compass for the EU". One of these goals is the development of a new European Innovation Act. This agreement should become a qualitatively new way of regulating innovation circulation in general and means of its support and stimulation in particular. It, as one of the main ways of increasing the efficiency of innovation circulation, has been determined to increase the level of efficiency of using

public funds for the purchase of innovations. Most of the management and regulatory methods of influence of the “European Innovation Act” are still at the stage of their development and public discussion. Its first results indicate the lack of a common understanding of how efficiency should be ensured. It is scientific research on this issue that should provide proposals for changing the current regulatory structures that are able to ensure the achievement of the set tasks. This determines the basis of the problem of both this research and those solutions that can be implemented on the basis of its results. The above indicates the relevance of scientific research on this topic, and on the other hand, determines the need to formulate proposals for improving (changing) the rules for the circulation of innovations in the European Union.

In the paper [1], the degree of interaction of private and public legal entities of the European Union (hereinafter referred to as the “EU”) within the framework of their interaction in the process of public (state) procurement of innovations was analyzed. According to the results of the analysis of statistical data, it was found that not every example of procurement of innovations with EU funds is guaranteed to lead to their successful implementation. Static and dynamic formats of interaction, as well as individual and group formats, were studied. The patterns of the success of the implementation of innovations were determined, provided that different formats were used and different types of participants were involved in public (state) procurement in the EU. It was proved that different formats of interaction with the market have a different, and sometimes negative, impact on innovations. It was proposed to include interactive learning services in the subject of public procurement. It was determined that the availability of such services increases the level of potential effectiveness of the implementation of innovations purchased within the framework of public (state) procurement. However, within the framework of this research, no general proposals were formed regarding the formation of universal regulatory structures or the improvement of official EU rules.

In [2] examines how the use of intermediaries in public procurement affects the ability of public organizations to participate in public procurement. Focusing on the consulting brokerage and medical technology sectors in Sweden, the study identifies how intermediaries influence long-term market dynamics that are key to achieving strategic goals such as innovation and sustainability. It is found that the use of intermediaries can lead to limited transparency, reduced supplier competition and lost opportunities for innovation. It is proposed to take into account the negative impact of intermediaries on public procurement of innovation in the EU. However, the results of this research have not yet led to proposals for improving universal regulatory structures within the EU rules.

In [3] examines how innovation intermediaries mobilize their knowledge management capabilities to support public procurement of innovation. Different knowledge-intensive roles of intermediaries (e.g. as subject matter experts and trainers) are identified. New insights are offered based on a multifaceted case study of mediation in the UK defence context compared to similar EU rules. It is established that mediators should address gaps in knowledge and innovation-oriented capabilities in procurement and help improve their effectiveness. It is proven that mediators in the public procurement process have a positive impact on the level of efficiency of the implementation of innovations acquired within the framework of public procurement. However, the results of this research have not yet generated proposals for improving the existing regulatory impact within the EU.

In the work [4], using the example of Finland, it is analyzed how dynamic capabilities support innovative public procurement and affect the supply market. It is proven that the use of public procurement mechanisms significantly increases the economic effect of their implementation. The need for a wider implementation of public procurement of innovations is substantiated. The need for greater freedom of the parties to the public procurement contract is substantiated, in the part concerning the content of innovative activities. The conclusion was

formed on the need to determine the boundaries of wider freedom of the parties to public procurement relations. However, within the framework of this work, no proposals were formed to improve universal regulatory structures in this area.

In the work [5], using the example of the European Organization for Nuclear Research (CERN), the impact of large-scale research infrastructure projects on innovation was studied through the prism of the public procurement mechanism. It was determined that the formation of innovation and its subsequent registration as an object of intellectual property rights occurs no earlier than 5–7 years after the implementation of public procurement. The formation of selectivity criteria for participants in public procurement relations was proposed as a way to increase the efficiency of innovation activity. However, based on the results of these studies, no proposals were formed to improve the official regulatory rules of the EU.

Within the framework of scientific research [6], the rules of innovative public procurement within Finland and the EU are studied. It is substantiated that public procurement within the framework of innovation activities is the most effective tool for achieving strategic economic objectives of the EU and the EU member states. It is proven that the general mechanism for entering into public procurement relations is not able to satisfy all the needs of the parties to the relations regarding the transfer of innovation. As a way to overcome the identified drawback, it is proposed to expand the competence of customers within public procurement. It is proposed to provide them with additional public management powers regarding the preliminary selection of candidates for the role of executors within the framework of innovative public procurement.

In the scientific paper [7], an assessment of the effectiveness of innovative public procurement in the EU was provided. It was concluded that the existing regulation of these relations is based on too broad approaches. Directions for improving this procedure are proposed based on the introduction of additional criteria for selecting suppliers of innovations. It is proposed to include previous experience of successful procurements, social responsibility of the executor, participation in inclusive programs in such criteria. However, these proposals were formulated exclusively for the sphere of public-private partnerships in the field of clean energy and wind power plants. And according to the results of the conducted research, no proposals were formulated regarding the essence of regulatory structures on this issue.

In the study [8], the strategic and institutional dynamics of centralized public procurement in Romania were analyzed, with a particular focus on the National Office of Centralized Procurement (ONAC) and its role in ensuring the digital transformation of technical universities. An assessment of ONAC’s ability to implement procurement policies aligned with sustainable development goals and digital governance was provided. It was found that systemic inflexibility, insufficient use of digital tools and weak feedback mechanisms negatively affect innovative procurement procedures. It was proven that the existing regulation of public procurement does not meet the requirements of sustainable development goals, the tasks of innovative circulation and digital transformation. However, the research is limited only to identifying problems within public procurement relations. As a result of its implementation, no proposals were formulated to improve the existing means of regulatory influence.

In the scientific work [9], proposals were made regarding the possibilities of using artificial intelligence algorithms within the framework of public procurement of innovations in Italy. The study is supported by a review of early pilot projects and experimental initiatives that are already being implemented. It is proven that the regulatory techniques and means of influence defined by the Italian Public Procurement Code do not meet the objectives of the PNRR (Italian Economic Recovery and Resilience Plan). It is proposed, for the purposes of grant support for innovation circulation, to use mechanisms for automating the processes of selecting their recipients.

The feasibility of introducing automation algorithms based on artificial intelligence and blockchain technologies was established. It was determined that such automation mechanisms should be based on the principles of effective management. However, within the framework of this study, an assessment was mostly made of the potential for implementing automation mechanisms. No proposals were made for improving the official regulatory structures of EU legislation.

The scientific work [10] determined that public procurement is of significant importance for stimulating innovation. The compliance of the existing regulation of public procurement with the requirements of the state innovation policy was analyzed. It was determined that public procurement stimulates innovation. However, there are a number of organizational, managerial and regulatory barriers that do not allow increasing the level of their efficiency. Existing regulatory methods for identifying public procurement of innovations are not able to eliminate the identified shortcomings. In general, this study is mostly descriptive in nature. Its main task was only to identify existing problems. Based on its results, no proposals were formed for improving existing regulatory rules. Although, the conclusions drawn in the course of this study are of decisive importance for the formation of relevant proposals.

The mentioned studies [1-10] indicate the focus of scientific research on solving the issue of improving the regulation of public procurement of innovations within the EU. All this allows to state that it is advisable to conduct a study aimed at formulating proposals for improving regulatory methods of influencing the processes of public procurement of innovations within the EU.

*The object of research* is the system of regulatory methods of identifying public procurement in the European Union, as one of the ways to stimulate innovation circulation.

*The aim of research* is to substantiate the directions of improving the existing rules for implementing public procurement of innovations within the EU. This will make it possible to increase the overall level of efficiency of innovation circulation and create the prerequisites for its more widespread distribution.

To achieve this aim, the following objectives have been defined:

- identify the features of regulating public procurement of innovations within the EU;
- formulate proposals for directions of improving the regulation of public procurement of innovations within the EU.

## 2. Materials and Methods

The hypothesis of research is that the current methods of identifying regulatory influence on these relations do not contribute to the efficiency of innovation circulation and therefore need to be improved. When conducting this research, it was assumed that the inconsistency of the existing regulatory influence negatively affects the scaling of these processes.

During the conduct of this research, a simplification was applied, within which the feasibility of changes in the regulatory approach at the level of individual EU member states was not studied. Such a simplification is permissible, since the EU is currently in the process of improving the rules for public procurement of innovations, as a result of which a single and unified approach to regulating these relations should be introduced.

During the research, official EU regulations, information from open sources, recommendations of EU government bodies and institutions were processed. In addition, analytical data from international organizations, statistical data and public information were used.

This research used general scientific theoretical methods, namely: synthesis and analysis, deduction, induction, abstraction and comparison. As well as, systemic and functional methods, modeling, formal-logical interpretation of the content of regulatory categories. Methods of synthesis and analysis were used to form a list of the main inconsistencies of procedures for public procurement of innovations, the needs

of participants in their circulation. Methods of deduction, induction, abstraction and comparison were used to form generalized conclusions regarding all available forms of public procurement in the EU. Methods of formal-logical interpretation of the content of regulatory categories were used to determine the essence of regulatory definitions of existing EU rules for public procurement of innovations. Systemic and functional methods were used in the formation of proposals for areas of improvement of regulation of public procurement of innovations in the EU.

## 3. Results and Discussion

### 3.1. Identifying the specifics of approaches to regulating public procurement of innovations within the EU

The main official EU regulatory act that defines the general principles for conducting public procurement procedures is Directive 2014/24/EU of the European Parliament and of the Council of February 26, 2014 on public procurement [11]. It defines the basic principles and principles by which all public procurements should be carried out without exception in the EU, including in EU member states.

The general indicative mechanism (algorithm) for conducting public procurement in the EU is as follows.

The first stage is the publication of a notice of intention to conclude a contract, or a prior notice of future public procurement of certain goods, works or services. It is placed within the official websites of the relevant EU institutions. Such a notice is initiated by EU institutions, central or local authorities. Their status is identified as public customers.

The second stage is the submission of a tender offer. Such an offer is formed and sent by those business entities that have expressed a desire to carry out economic operations for the supply of goods, works and services. The recipients of such an offer are public customers. A tender offer is an official response of a business entity and must contain the main details of a future joint business transaction.

The third stage is the selection of the best tender offer, which is carried out by a public customer. At the same time, this participant in public procurement relations does not have the opportunity to make a decision on the selection of a tender offer at its own discretion. It is limited in advance in such a choice. The main means of such a restriction is the establishment of criteria for selecting the winner common to all business entities. The winner may be the one who offered the most economically advantageous offer. This includes either offering the lowest price for goods, works, services, or a larger quantity of them for the same price.

The fourth stage is the conclusion of a corresponding agreement (contract) for the implementation of the economic cooperation that was provided for by the terms of public procurement.

The fifth stage is the actual implementation of those economic transactions that were provided for by the terms of public procurement [11].

There are also certain differences from the general algorithm (procedure) of conducting public procurement. At the same time, the open procedure is conditionally "classical", its characteristics are completely identical to the general indicative procedure for public procurement in the EU. The procedure with limited participation is characterized by the fact that the public customer independently selects a certain range of economic entities that it invites to participate in the public procurement procedure. Within the framework of the competitive procedure with negotiations, all economic entities that submitted tender offers are notified of the content of similar offers from other entities. This gives them the opportunity to adjust their content so that their offer is more economically advantageous than the offer of a conditional "competitor". When conducting public procurement in the form of competitive dialogue, the public customer additionally evaluates the proposed methods of achieving the economic result that is being purchased by economic entities.

An innovation partnership aimed at developing an innovative product, service or work and the subsequent purchase of the resulting products, services or work. At the same time, such an innovative product (work or service) must meet the requirements of the objects of innovation circulation (be new, necessary and have price significance). Mixed public procurement provides for the possibility of using several of the above procedures simultaneously [11].

Additional procedures for public procurement of innovations in the EU are determined by the provisions of the Horizon Europe Framework Program [12]. Within the framework of this official regulatory act, two additional procedures for public procurement of innovations are determined – public procurement of innovative solutions and pre-commercial procurement. Public procurement of innovative solutions is a procurement in which public buyers act as the primary purchaser of innovative goods or services that are not yet available on a large-scale commercial basis. And pre-commercial procurement means the phased procurement of research and development services, which involves the sharing of risks and benefits under market conditions. At the same time, there is a clear separation of the purchased research and development services from the implementation of commercial volumes of the final product. All available forms of public procurement of innovations in the EU are shown in Fig. 1.

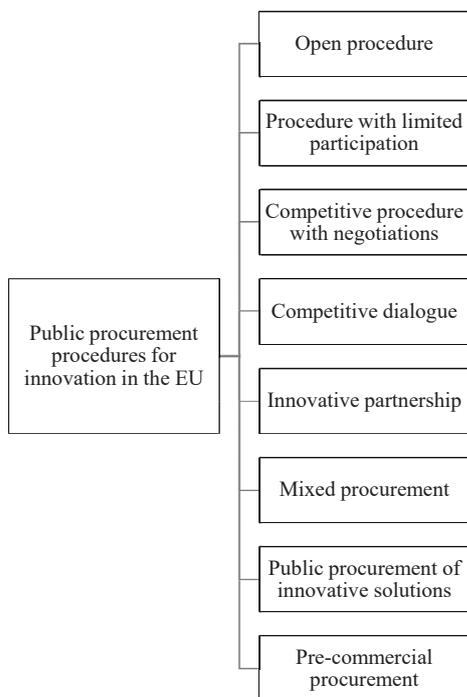


Fig. 1. Types of public procurement procedures for innovations in the EU

Within the EU, a procedure for reforming the methods of regulating innovation circulation has been launched. Thus, in 2025, the EU launched a reform of the regulation of the status of innovations and innovation circulation. It is about a new intergovernmental agreement within the EU – the European Innovation Act [13]. This document should be a cardinal change in the process of regulating innovation circulation in the EU. However, at the time of this study, the indicative draft of this agreement had not yet been published. However, its main principles can be formed on the basis of official announcements and communiqués of the EU institutions [13]. In addition, the fundamental principles of prospective regulation of innovations and their circulation are recorded in the EU state policy reform program to increase its competitiveness “A Competitiveness Compass for the EU” [14]. The implementation of the European Innovation Act can be assessed without

exaggeration as a separate page in the renewal of the processes of state regulation of innovation circulation within the EU. There are a large number of potential changes that are guaranteed to occur with its entry into force. One of them is the change in the existing rules for public procurement of innovations [15]. This necessitates the study of the effectiveness of public procurement procedures for innovations in the EU, as well as their compliance with the needs of participants in the innovation circulation.

As part of previous scientific research on this issue, a number of key inconsistencies of standard public procurement procedures with the requirements and needs of the innovation circulation were identified. Thus, procurement under an open procedure, a procedure with limited participation, and a competitive procedure with negotiations are poorly suited for the purpose of the innovation circulation [1–10]. Such a conclusion was formed in the vast majority of scientific studies, but the grounds for such conclusions were different. Within the framework of scientific research [1], the feasibility of introducing mixed (individual and group) procedures was substantiated. The main idea of such proposals is to establish special algorithms for dialogue between the public customer and the future executor. These procedures should cover the process of agreeing on the parameters of the future innovation before the start of the procedure for their public procurement. It was also determined that a mandatory condition for these procedures is the involvement of a team of specialists on the side of the future executor. The grounds for this were the results of the analysis of statistical information, according to which the presence of a team of specialists on the side of the executor increases the efficiency of the procurement of innovations. The main disadvantage of such a proposal is that it involves the formation of the final result of public procurement within the framework of discussions with those business entities that will be the executors of such an order in the future. This is a violation of the established official rules of public procurement in the EU. Thus, the implementation of such mechanisms is possible only in the event of a change in the regulatory approach to innovative procurement. At the same time, in the course of this research, no such proposals were formed. However, it is possible to partially agree with the above conclusions. The open procedure for public procurement in the EU involves fixing all the qualitative and quantitative characteristics of the result that is to be purchased in the future. At the same time, innovation cannot be called an ordinary object of economic relations. It always has a risky nature and its final characteristics cannot be known in advance. Determining such characteristics in advance will lead to the absence of submitted tender offers from business entities. They will not be ready to take full responsibility, since the economic result of their work is probabilistic, not guaranteed. This drawback can be eliminated in another way, different from the previously proposed one. In the event of a change in the subject approach to determining the circle of possible executors of public orders and its expansion, the labor collectives of scientific and research institutions will be able to participate in these processes.

In scientific studies [2, 3], the use of specialized intermediaries that centrally represent the interests of a certain group of business entities has been proposed. These are associations of entrepreneurs or their similar associations within a certain region or sector of the economy. Their task is to eliminate the shortcomings of general public procurement procedures, where their economic result must have specific quantitative and qualitative characteristics. And an innovation, at the stage of its procurement, as a rule, does not yet have such characteristics, or their achievement is likely. On the one hand, such intermediaries provide public customers with more detailed information about the characteristics of the innovation that may be available on the market (the role of an expert). On the other hand, they conduct consultations for the executors of such orders, bringing to their attention more detailed requirements for the characteristics of the innovation (the role of a trainer).

It is partly possible to agree that the role of such intermediaries for innovation processes is extremely important. However, their involvement will inevitably entail a violation of competition rules, since such intermediaries are already interested parties. Thus, the researchers themselves determine that in Sweden, a number of specific cases of violation of the rules of free competition in the market were recorded. They occurred when the involved intermediaries of trade associations reported information exclusively about innovations that can be created only by members of such an association. This deprived public customers of access to objective information about existing innovative objects, and provided anti-competitive advantages to business entities from such an association [2]. These shortcomings can be changed only by transforming the current regulation of the process of innovative public procurement. The significant positive effect of involving specialized intermediaries in participation in public procurement of innovations is obvious. However, their interest in the circle of entities that is involved in the processes of developing innovations for public funds is inevitable. It is unacceptable from the point of view of the basic principles of public procurement. The optimal way to solve this problem is to change the regulation in such a way that the involvement of intermediaries takes place on the basis of their impartiality. Such impartial intermediaries can be specialized institutional infrastructure intermediaries of the innovation type already existing in the EU. It is about technology transfer centers, technological, innovation and science parks. These infrastructure entities were organized to support all innovations without exception in the EU. They are financed by scientific (scientific and educational) institutions and EU funds and therefore can provide more objective and unbiased information.

According to the results of the study [4], it was proposed to provide participants in public procurement of innovations with the possibility of current adjustment of the quantitative and qualitative characteristics of innovations, after selecting the winner. Such a method was proposed as the possibility of adjusting the essential terms of the public procurement contract, after its conclusion. Such proposals are inappropriate, as they contradict the basic principles of procedures for attracting public funds to innovation activities. It is provided that such opportunities are provided to the public customer, the latter will not have any restrictions or guidelines for determining the degree of possible adjustment. Also, making such an adjustment of contractual terms in favor of one economic entity with a simultaneous refusal to another will certainly lead to violations of the established competition rules in the EU. The inappropriateness of such changes is also due to the fact that the possible negative consequences of their implementation cannot be compensated by any other means. In such conditions, providing participants in innovative public procurement with the opportunity to freely adjust the final characteristics of the innovation will certainly lead to the loss of the main purpose of this procedure.

As part of the scientific research [5], an assessment of the feasibility of the requirement for the mandatory presence of an intellectual property right object in an innovation was provided. It is about innovations that apply for participation in public procurement procedures. In other words, only those innovations that have already been registered as objects of intellectual property rights can be the object (subject) of public procurement. According to the results of the research, it was concluded that such requirements are inappropriate, since they become a kind of conditional "barrier". It is possible to agree with this statement, since not all innovations by their nature can receive the status of objects of intellectual property rights. When it comes to product (commodity) innovations, they are endowed with such an opportunity. At the same time, managerial or organizational innovations do not have such an ability. As a result, due to the presence of requirements for the mandatory presence of an intellectual property right object in an innovation, not all innovations can receive public support. It seems appropriate to propose our own way of solving the above-mentioned problems.

It is based on a change in the current regulatory approach and provides for a conditional relaxation of existing requirements. Where instead of a strict requirement for the presence of an object of intellectual property rights, requirements will be introduced for the presence of an object that is endowed with the features of an object of intellectual property.

In scientific works [6–8, 10], a number of similar directions for improving the procedure for public procurement of innovations were formed, based on modifying the existing open procurement procedure. Among such proposals, the introduction of additional criteria for selecting suppliers of innovations [6], or the presence of previous experience of successful procurements [7]. Wider use of digitalization tools, which should provide wider information about the possibilities of participating in public procurement [8]. However, general public procurement procedures, in general, have rather strict requirements for the principles of their conduct. Therefore, changing something that is unsuitable in advance is not advisable. However, it is not necessary to forget that the basis of the interest of participants in innovation relations in extending to them the opportunity to participate in public procurement. First of all, this is the opportunity to receive financial support from budget funds accumulated at the EU level and its individual institutions [2, 4, 6]. Secondly, this is a significant level of scaling of the final result of innovation activity [3, 9, 10]. Thus, according to Tenders Electronic Daily (hereinafter referred to as "TED"), the total amount of financial support for public procurement procedures in the EU is 815 billion EUR [16]. Of course, not all of these funds are directed to the benefit of participants in innovation circulation. Most of them are directed to the purchase of traditional goods, works and services, which are subsequently directed to meet the needs of the EU public sector. However, according to Eurostat, a significant amount of budget funds within public procurement are directed to the sphere of innovation circulation. And their size is increasing. Thus, as of 2020, the total amount of budget funds spent on public procurement of innovations is 145 million EUR [17]. Detailed data are given in Table 1.

Table 1

Amount of budget funds allocated to public procurement of innovations in the EU in 2020 [17]

Regional links	Units	Total amount of funds spent on public procurement of innovations	Amount of funds spent on the purchase of innovations from the budgets of EU member states
European Union	Thousand EUR	145186	89687

At the same time, in 2022, about 200 million EUR were spent on public procurement of innovations within the EU [18]. Detailed data are given in Table 2.

Table 2

Amount of budget funds allocated to public procurement of innovations in the EU in 2022 [18]

Regional links	Units	Total amount of funds spent on public procurement of innovations	Amount of funds spent on the purchase of innovations from the budgets of EU member states
European Union	Thousand EUR	200951	128723

Analysis of the data presented in Tables 1 and 2 makes it possible to establish that in the period from 2020 to 2022, the total increase in budget funds spent on the acquisition of innovations in the EU increased. The total amount of such an increase is almost 38.5%. At the same time, this amount of funds is only 0.02–0.025% of the total amount of all funds spent within public procurement in the EU.

However, in any case, the funds allocated for the purchase of innovations within public procurement in the EU are significant. It is this factor (the significant amount of funds spent on the acquisition of innovations) that is the circumstance due to which public procurement of innovations is a way of significantly supporting their implementation. In order not to lose such an effective way of supporting the implementation of innovations, it is considered advisable to develop a special procedure. Such a procedure should, on the one hand, take into account all the features of the innovation cycle, and on the other hand, it should be intuitive and understandable for its participants. Only within the framework of such a special procedure of public innovation procurement, will it be possible to take into account most of the actual needs of participants in innovation relations.

As part of scientific research [9], the use of artificial intelligence algorithms within the framework of public innovation procurement has been proposed. Such proposals are considered premature, since the technology of "artificial intelligence" itself is experimental. Perhaps, over time, when all the features of the functioning of such technologies will be predictable and guaranteed, their use will be appropriate.

A systematic analysis of the provisions of official EU regulatory acts allows to find several additional inconsistencies that are an obstacle to participation in public procurement procedures. Thus, according to the provisions of Directive 2014/24/EU of the European Parliament and of the Council of February 26, 2014 on public procurement [11], tenders may be submitted only by economic entities. In other words, only those participants in these relations who have previously been registered as economic entities have access to participation in public procurement of innovations. At the same time, the provisions of the Horizon Europe Framework Programme [12] define a wider list of participants in innovation relations. In addition to economic entities, this includes scientific and research institutions that do not have such status. In addition, participants include individuals who are individual developers of innovations, teams and communities of people united by common labor or contractual functions. In addition, under such requirements, small (medium) enterprises cannot be admitted to participate in public procurement of innovations procedures. And such entities are key within the EU economic system [19]. Family businesses are also key for innovation circulation in the EU, which are also not always endowed with the status of a business entity. This circumstance can be singled out as a key inconsistency of the procedure for public procurement of innovations in the EU. It should also be noted that within the framework of Directive 2014/24/EU of the European Parliament and of the Council of February 26, 2014 on public procurement [11], the final result of such procurement must be determined in advance. At the same time, innovation activity is always risky, since at its beginning it is far from always guaranteed to achieve the final result [20]. This circumstance hinders the participation of participants in innovation circulation in public procurement procedures, since their tender offers may not meet the established requirements and may not be taken into account by public customers.

In general, it is possible to form a generalized list of those inconsistencies that negatively affect the possibility of public procurement of innovations in the EU.

Systematization of the main inconsistencies of the regulation of public procurement of innovations to the needs of participants in innovation relations is shown in Fig. 2.

All the inconsistencies listed in Fig. 2 should be used as the basis for proposals aimed at changing EU regulatory rules in order to eliminate their negative impact. Most of the identified factors and circumstances can be eliminated by improving the provisions of those official acts that determine the status and main obligations of participants in innovation circulation and public procurement.

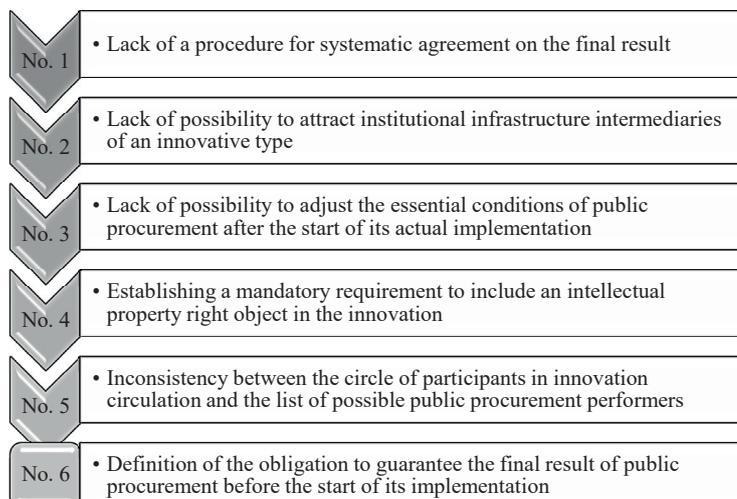


Fig. 2. Systematization of the main inconsistencies of the regulation of public procurement of innovations to the needs of participants in innovation relations in the EU

### 3.2. Formation of proposals for areas for improving the regulation of public procurement of innovations in the EU

The basis for the formation of areas for improving the procedures for public procurement of innovations in the EU should be based on the already identified shortcomings of existing regulatory methods. On their basis, it is advisable to formulate the following proposals for improving the regulation of public procurement of innovations in the EU:

The first direction of such improvement should be the emergence of a new, special procedure for conducting public procurement of innovations. It is advisable to make this procedure as close as possible to the procedure for obtaining grant funding for an innovation project. An approximate working title for such a procedure could be "public grant financial support for innovations". The main requirements for such a procedure are defined by the regulations of the Horizon Europe Framework Program. Grant financial support mechanisms are the main ones within the innovation circulation in the EU. As a result of their repeated and systematic use, they have become familiar to most participants in innovation relations. Introducing an already familiar algorithm of actions as a new public procurement procedure will contribute to their faster adaptation to the needs of participants in innovation relations. Establishing more flexible requirements for the participation of a public customer within the framework of public grant financial support for innovations will eliminate a number of existing inconsistencies. Thus, when forming grant support for innovation activities, all participants in this process must independently determine the level of probability of the expected economic result. They are able to independently determine preventive measures to minimize the potential risk of failure of the innovation process. They are entitled to jointly adjust the mutual plan of joint actions for the implementation of the innovation throughout the entire innovation cycle. Including the possibility of jointly adjusting the essential conditions of joint cooperation for the implementation of the innovation. All these opportunities should be provided for participants in public procurement of innovations. In this case, on the one hand, this will significantly increase the level of access of participants in the innovation circulation to budget support funds, and on the other hand, it will more closely correspond to the essence of innovation activities. The second direction of improvement should be a change in the official regulatory approach to the mandatory presence in the innovation of a component that has already been registered as an object of intellectual property rights. It does not seem appropriate to exclude this requirement from the official rules of public procurement in the EU.

However, the existing restrictions are more negative than positive. It would be reasonable to propose to supplement the existing regulatory structure with a caveat that a future innovation within the framework of public procurement may also contain an object that is endowed with the features of an intellectual property object. Using such an approach when the tender offer of a participant in public procurement of innovations may contain one of two objects will significantly simplify access to this procedure. There are systematic cases when innovation developers cannot register their development as an object of intellectual property rights. And the main reasons are the complexity of the procedure, as well as its significant cost. Patent fees and their size often become an obstacle to obtaining the status of an object of intellectual property rights. Most participants in innovation relations who seek financial support are forced to take this step due to the lack of equity. And the more preliminary expenses they will need to make, the fewer potential participants in innovation relations will apply for such support. But it is not possible to forget that such requirements are appropriate and justified. The presence of an intellectual property right object in the innovation is a qualitative barrier that allows to weed out pseudo and outdated innovations. Therefore, a complete refusal is unacceptable. A form of such improvement is to amend the rules defined by Directive 2014/24/EU of the European Parliament and of the Council of February 26, 2014 on public procurement [11]. Its text should include a reservation that an innovation within the framework of public procurement must include either an intellectual property right object or an object that is endowed with such features, but is not registered as such.

The third area of improvement should be to expand the circle of participants in public procurement of innovations, who should be given the right to submit tender offers. In addition to the already mentioned business entities, individuals who develop innovations, small (medium) and family businesses, labor collectives, communities of people, public organizations and scientific institutions should be included there. All of the listed entities are active participants in the innovation cycle. They are involved in most of the main and auxiliary processes of the innovation cycle. They are entitled to receive all means of financial support provided for by the provisions of the Horizon Europe Framework Program. However, they do not have the opportunity to submit a tender offer within the framework of any procedure for public procurement of innovations.

The optimal place for implementing the identified areas of improvement in the regulation of public procurement of innovations in the EU should be their official regulatory acts. These include:

1. Directive 2014/24/EU of the European Parliament and of the Council of February 26, 2014 on public procurement;
2. Horizon Europe Framework Programme;
3. European Innovation Act.

### 3.3. Discussion of the research results on improving public procurement as a means of stimulating innovation circulation

The scientific results obtained during this research (in terms of areas for improving public procurement of innovations in the EU) are explained by the need for a comprehensive solution to the identified problems. Substantiated areas for such improvement resolve most of the identified inconsistencies in the existing regulation.

During this research, limitations were identified due to the lack of the text of the European Innovation Act and the active process of reforming the rules of innovation circulation in the EU. The lack of regulatory structures for the definition of "innovation" is an objective obstacle to conducting a comprehensive study. The main disadvantage of this proposal is the uncertainty regarding the essence and place of innovations within the framework of EU law, due to the non-adoption of the "European Innovation Act". This disadvantage can be compensated by the implementation of existing mechanisms for regulating innovation circulation in the EU with their subsequent revision if necessary. Given the level of stability of the regulation of the economic system in the EU,

such a procedure for unification is seen as effective. An additional disadvantage of this research is that the experience of individual EU member states was not taken into account within its framework. Given that each country pursues a separate public procurement policy, the directions of their development are quite different from each other and their systematization requires a separate scientific study of this issue. The main advantage of the proposals formed is that they take into account all the identified shortcomings of public procurement regulation in the EU to the maximum extent possible. All other proposals are not endowed with such a level of universality, completeness and systematicity and are fragmentary. An additional advantage of the research is that the results obtained can be used in official EU regulatory acts. Further study of the outlined issues will allow obtaining results of practical orientation that can be used within the framework of state policy measures. In the case of the formation of official regulatory structures, the substantiated directions will require some refinement and change. In any case, the scientific conclusions obtained can become the basis for both further scientific developments and future regulatory and legal acts. All previously conducted studies [1-10] do not have signs of systematization and do not apply to public procurement relations in general. No scientific studies were found that would contain proposals for changing the current regulatory rules for public procurement of innovations. Based on the results of the work carried out, several directions for solving the issue of improving the regulation of public procurement in the EU have been formed. However, all these results do not have signs of systematization and do not apply to the majority of participants in relations related to the transfer of innovations. The research results substantiate the directions, solutions to most of the identified problems, and improvements in public procurement of innovations in the EU. In addition, the identified proposals provide for more effective mechanisms for solving the problems of public procurement of innovations in the EU than in studies [1-10]. The main directions of further scientific research may be the formation of directions for improving public procurement of technologies, and the results of scientific research and development work.

## 4. Conclusions

1. It has been determined that the existing regulation of public procurement of innovations does not meet the needs of participants in the innovation circulation. The main inconsistencies are:

- a) the rigid nature of procurement procedures;
- b) the need to determine the quantitative and qualitative characteristics of the innovation before its development begins;
- c) requirements for the mandatory presence of an intellectual property right object in the innovation;
- d) the inability to submit a tender offer for most participants in the innovation circulation.

2. Directions for improving the regulation of public procurement of innovations in the EU have been formed:

- implementation of a new special procedure for public procurement of innovations – public financial grant support;
- easing the requirements for the mandatory presence of an intellectual property right object in the innovation;
- expanding the circle of participants in the public procurement procedure.

These directions allow solving most of the identified shortcomings of the rules for public procurement of innovations in the EU. They are of practical importance, as they can be used in shaping the content of official EU regulatory acts. It has been determined that the main place (form) of change in the regulation of public procurement of innovations in the EU should be Directive of the European Parliament and of the Council No. 2014/24/EU of February 26, 2014, "On Public Procurement"; Horizon Europe Framework Programme; European Innovation Act.

## Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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## Data availability

Manuscript has no associated data.

## Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies in creating the submitted work.

## Authors' contributions

**Oleksandr Davydiuk:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review and editing, Visualization; **Tetiana Shvydka:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review and editing, Visualization; **Iuliia Ostapenko:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review and editing, Visualization; **Oleh Tarasov:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review and editing, Visualization; **Oleksii Bytiak:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review and editing, Visualization.

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