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**INSTITUTIONAL PROVISION OF  
INFOCOMMUNICATION SPHERE DEVELOPMENT  
IN THE CONDITIONS OF DIGITALIZATION OF  
NATIONAL ECONOMY**

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**Introduction.** The article examines the problems of institutional provision for innovative development of the infocommunications as a component of the sphere of digitalization of Ukraine. The subjects have been singled out and the shortcomings in relation to the institutional provision of the innovative development of the country's infocommunication sphere have been identified. Determining the leading role of the infocommunication sphere in the process of formation and development of innovation infrastructure of the national economy, and on the basis of research of organizational, economic, innovative and legal bases of regulatory activity of the system of state and non-state institutions proposals are made to improve institutional development of infocommunication sphere.

**Aim and tasks.** The purpose of the article is to study the features and problems of institutional provision for innovative development of the infocommunications as a component of the sphere of digitalization of Ukraine and provide suggestions on ways to improve it.

**Result.** An analysis of basic legal acts aimed at regulating scientific, technical and innovative activities of Ukraine is provided. The characteristic features of economic activity in the infocommunication sphere are highlighted and the factors that hinder the innovative development of the digitalization of Ukraine are formed. It is shown that the institutional provision of innovation in Ukraine is represented by an extensive structure, as government regulation should provide solutions to existing problems in the economy and concentrate available resources for the effective implementation of research and innovation. Conceptual bases of creation of innovation and investment hubs in the country are formed, principles of their formation are allocated, among which basic are - concentration, common interests and interaction, and models of their financial and infectious maintenance.

**Conclusions.** Based on the study, the authors proposed in the process of regulating the innovative development of the infocommunication sphere to apply a systematic approach with the definition of methods and mechanisms of state regulation, which should be formed and enshrined in law. The consequence of consistent state provision of the innovation and institutional environment will be the creation of favorable conditions for doing business in the country and the development of creative human potential.

**Keywords:** infocommunications, institutions, institutional provision, innovations, innovation and investment hubs.

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## ІНСТИТУЦІОНАЛЬНЕ ЗАБЕЗПЕЧЕННЯ РОЗВИТКУ СФЕРИ ІНФОКОМУНІКАЦІЙ В УМОВАХ ДІДЖИТАЛІЗАЦІЇ НАЦІОНАЛЬНОЇ ЕКОНОМІКИ

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**Вступ.** У статті досліджено проблеми інституціонального забезпечення інноваційного розвитку інфокомунікацій як складової сфери діджиталізації України. Виокремлено суб'єкти та визначено недоліки щодо інституціонального забезпечення інноваційного розвитку інфокомунікаційної сфери країни. Визначаючи провідну роль інфокомунікаційної сфери у процесі становлення та розвитку інноваційної інфраструктури національної економіки, та на основі дослідження організаційних, економічних, інноваційних та правових засад регуляторної діяльності системи державних та недержавних інституцій сформовано пропозиції щодо удосконалення інституціонального забезпечення інноваційного розвитку інфокомунікаційної сфери.

**Мета і завдання.** Метою статті є дослідження особливостей і проблем інституціонального забезпечення інноваційного розвитку інфокомунікацій як складової сфери діджиталізації України та надання пропозицій про способи його вдосконалення.

**Результати.** Надано аналіз базових нормативно-правових актів, які спрямовані на регулювання науково-технічної та інноваційної діяльності України. Виділено характерні риси економічної діяльності в інфокомунікаційній сфері та сформовано чинники, які заважають інноваційному розвитку діджиталізації в Україні. Показано, що інституціональне забезпечення інноваційної діяльності в Україні представлено розгалуженою структурою, оскільки державне регулювання повинно забезпечувати вирішення існуючих проблем в економіці та концентрувати наявні ресурси задля ефективної реалізації робіт з наукових досліджень та інноваційних розробок. Сформовано концептуальні основи створення в країні інноваційно-інвестиційних хабів, виділено принципи їх формування, серед яких базовими є - концентрація, спільні інтереси та взаємодія, та моделі їх фінансово-інвестиційного забезпечення.

**Висновки.** На основі проведеного дослідження авторами запропоновано у процесі регулювання інноваційного розвитку інфокомунікаційної сфери застосовувати системний підхід з визначенням методів та механізмів державного регулювання, які мають бути сформовані та законодавчо закріплені. Наслідком послідовної державної підтримки інноваційно-інституційного середовища стане створення сприятливих умов для ведення бізнесу в країні та розвитку креативного людського потенціалу.

**Ключові слова:** інфокомунікації, інституції, інституціональне забезпечення, інновації, інноваційно-інвестиційні хаби.

**Introduction.** Transformation of innovative development of the national economy model is associated with the transition from local innovations to their mass production, informatization of society and intellectualization of labor on the basis of technologies and services of the infocommunication sphere as a component of digitalization, produces the transformation of innovation into the main economic and sociocultural system, as most of the added value is created through research and innovation. The production of innovations in developed countries functions as an independent industry, the key role in this process belongs to the infocommunication sphere, on which the success of other activities depends.

The transition of the national economy of Ukraine to an innovative vector of development and management of innovation at the state, regions and enterprises is constrained not only by lack of investment provision for innovation processes and development of innovative developments, inconsistency and inefficiency of innovation policy, but also a low level of institutional provision for the innovative development of the infocommunication sphere for the formation of a favorable innovation environment.

Thus, the presence of tasks of innovative development of the domestic economy, the formation of the information society necessitates research on the formation of effective institutional provision for innovative development of the infocommunication sphere as a necessary condition for modernizing the innovation infrastructure of the national economy.

The aim of the article is to study the features and problems of institutional provision for the innovative development of the infocommunication sphere of Ukraine and to formulate proposals for ways to improve it.

**Analysis recent research and publications.** The study of the problems of innovative development of the infocommunication sphere is devoted to the work of V.M. Granaturova, I.A. Korablinova [1], I.V. Litovchenko [2], which thoroughly investigates the theoretical issues of development and management in the field of infocommunications, and especially - the practice of competitiveness management.

Issues of stimulating the effectiveness of innovation and institutional aspects of economic development management are reflected in the scientific works of such scientists as V.M. Geets, V.P. Seminozhenko [3], O.L. Hetman, O.A. Iermakova, O.I. Laiko [4], N.I. Khumarova [5].

The study [6] reveals the principles of development of innovative digital system as part of the market infrastructure in the framework of international digital transformation in order to increase the effectiveness of state regulation of innovative development of infocommunications.

The study [7] substantiates the measures of marketing, financial and digital technologies that affect the development of infocommunications in the system of innovation infrastructure and the conditions of implementation of strategies for the development of infocommunications in accordance with the principles of digital technology reform.

The foundations of the general theory of institutional change were laid in the early 20th century by T. Veblen [8], and it is associated with the names of supporters of institutionalism: D. North [9], J. Stiglitz [10] and others. These scientists assigned to the institutional system of countries the basic function of efficient functioning of the economy, which creates incentives for productivity growth. In addition, J. Stiglitz emphasizes that the creation of institutions is impossible without a basic infrastructure.

As for the peculiarities of the institutional provision of innovative development of the infocommunication sphere, this problem is currently the least developed. At the same time, Ukraine has not yet formed the basis for institutional provision for innovation in general, and the infocommunication sphere in particular. At the same time, as the analysis of the latest researches of the problem defined in the article shows, there are not enough scientific works on institutional provision of innovative development of the infocommunication sphere of Ukraine.

**Results.** Institutional provision of innovative development of the infocommunication sphere is the existence of legal, organizational, innovative and economic conditions necessary for the innovative

development of the infocommunication sphere under the influence of a set of state and non-state institutions that regulate innovation.

In order to determine the object of our study, we will provide the structure of the infocommunication sphere of the national economy. In our opinion, the infocommunication sphere can be presented as a set of interacting four large segments:

- innovation (production, services, providing the basis of functioning) (research and development in the ICT sphere; infocommunication know-how), innovative design; implementation, commercialization of innovative technologies; artificial intelligence systems, sensor products and networks, CALS-technologies, etc. ; interactive smart computer and telecommunications systems and networks; training and education of IT-specialists; distance education)

- production - production of tangible and conventional intangible products (hardware, computer systems, terminals, servers and storage systems, equipment and components; production of electronic components (electronic chips, semiconductors, microelectronic components); audiovisual equipment and consumer electronics (digital cameras, camcorders, TVs, monitors, etc.); means (subscriber and network equipment, telecommunication equipment, means of communication, etc.); peripherals, office equipment (printers, telephones, faxes, copiers, etc.); production of data carriers (magnetic, optical data carriers, etc.); production of software products (software development tools, system, infrastructure and related software - operating systems, BIOS programs, applications and maintenance programs, etc.); content creation (content industry) - information content - Internet, TV-audio-video content, such as: creation and production of thematic electronic sites, radio programs, TV programs, etc.);

- infrastructure (providing the basis functioning) (network systems) (Internet, intranet, etc.), information retrieval and similar electronic-virtual systems, data and information channels, means of switching and management of information flows, organizational and management structures that ensure the functioning of the ICT sector logistics, market,

financial structures operating in the field of ICT, legal and regulatory mechanisms governing and regulating the activities of the infocommunications system),

- consumer services (telecommunications services provided to consumers (communications, telephony), audio, video, data transmission), information services (programming, data processing, maintenance of Internet portals, software products, content maintenance, hosting, etc.); consulting (software and hardware consulting, planning, provision and maintenance); postal and courier services; maintenance and provision of equipment and systems, networks (installation, dismantling, integration, adjustment, repair, etc.); ensuring security control (networks, programs, databases, etc.).

The infocommunication sphere is developing rapidly, new activities, goods and services are appearing, some old ones are disappearing, traditional ones are changing in the form of presentation and production technologies. We have identified the characteristic features of the infocommunication sphere, which in one way or another affect the modern economic, managerial, business activities; production and economic relations – reflect and shape them. Economic activity in the field of infocommunication has a number of features (Fig. 1).

If we turn to the indicators of ICT development, then according to this index, Ukraine is in 94th place out of 139 countries (Table 1), which indicates that the country does not create favorable conditions for the development of infocommunications.

As for the rating on the political and regulatory component, our country ranks 113th, that is in the 30 worst countries in the world. The sub-index, which characterizes the business and innovation environment is 4.3 compared to the value of 6.0 that has the leader - Singapore. According to the value of this sub-index Ukraine ranks 67th [11].

The UN Department of Economic and Social Affairs publishes an e-government development rank every two years. The index includes three sub-indices that characterize the state of human capital, ICT infrastructure and the web presence of public authorities.



**Fig. 1. Characteristics of economic activity in the field of infocommunications**

Source: formed by the authors.

**Table 1. Political, regulatory, business and innovation environment of the ICT sector development in 2018**

Rating (from 139 countries)	Country / Economy	Index value	Political and regulatory environment		Business and innovation environment	
			Rating	Index value	Rating	Index value
1		6,0	2	5,9	1	6,0
2	Singapore	5,6	3	5,9	6	5,4
3	New Zealand	5,6	5	5,7	5	5,5
4	Great Britain	5,6	14	5,4	2	5,8
5	Hong Kong	5,6	4	5,8	9	5,4
6	Finland	5,5	6	5,7	7	5,4
7	Norway	5,5	7	5,6	8	5,4
8	Switzerland	5,5	8	5,6	10	5,4
9	Netherlands	5,5	1	5,9	27	5,0
10	Luxembourg	5,4	15	5,4	4	5,5
	Canada					
93	...	3,8	68	3,8	106	3,8
94	Laos	3,8	113	3,2	67	4,3
95	Ukraine	3,7	103	3,3	75	4,2

Source: compiled by the authors based on data [11].

To calculate the first two indicators statistics is used, the latter is determined on the basis of a survey and review of websites of the government and five ministries: Finance, Health, Education, Labor, Social Security, they are evaluated in terms of content, functionality, as well as their use for the maintaining of public services in electronic form. According to the UN report, in 2018 Ukraine entered the group of countries with a high level of e-government development and took 75th place in the ranking of 193 countries surveyed. Compared to 2016, the country has improved the index of electronic participation from 0.608 to 0.6854 [11].

The factors that hinder the development of the infocommunication sphere of Ukraine, in our opinion, include the following:

1. Insufficient filling of the Ukrainian market with computers and low coverage of the Internet, which is the basis of infocommunications infrastructure.

2. There is a significant difference in the income of the population, which is an obstacle for some segments of the population to personal use of the benefits of infocommunications.

3. Low costs for the infocommunication sphere by the state.

4. Excessive tax burden on manufacturers of software, information, telecommunications and other services.

5. Difficulty of customs clearance and value added tax refund.

6. Insufficient number of highly qualified personnel in the field of IT technologies.

7. Almost complete lack of innovation infrastructure in Ukraine, as a result - the lack of networks of technology parks and business incubators, which significantly complicates the growth and development of infocommunications.

8. Weak ill-considered state policy in the field of infocommunication.

9. Lack of centralized targeted state provision in the promotion, implementation, production of innovative, informational, communication products and services.

The above confirms the relevance of the study of institutional provision for innovative development of the infocommunication sphere. Organizational conditions for institutional provision of innovative development of the infocommunication sphere in Ukraine are provided by the bodies of state and non-state institutions. The structure of governing bodies responsible for the implementation of innovation policy in Ukraine can be represented

by a set of national and regional institutions. The President of Ukraine, the Verkhovna Rada of Ukraine, and the Cabinet of Ministers of Ukraine, one of the tasks of which is to ensure the development and state provision of scientific, technical and innovative potential of the state, are among the national subjects of institutional provision for innovation in Ukraine. The following governing bodies responsible for innovation should be identified: the National Academy of Sciences of Ukraine, the Ministry of Education and Science of Ukraine, the Ministry of Economic Development, Trade and Agriculture of Ukraine, the Ministry of Digital Transformation of Ukraine, the National Commission for State Regulation of Communications and Informatization (NCCIR) and others (Fig. 2).

In the process of studying the infocommunication sphere as part of the innovation infrastructure of the national economy, it should be noted that the governing body responsible for innovation in the infocommunication sphere is the National Commission for State Regulation of Communications and Informatization (NCCIR). implementation of a unified state policy on state regulation, implementation of the state development strategy in the field of telecommunications, informatization and development of the information society, use of radio frequency resources, provision of postal services.

Thus, the institutional provision of scientific, technical and innovative activities in Ukraine is represented by an expanded structure, which is due to the need for state regulation of market processes through the comprehensive ability of market regulators to solve existing economic problems and the ability to avoid wasting resources through irrational duplication of research and development.

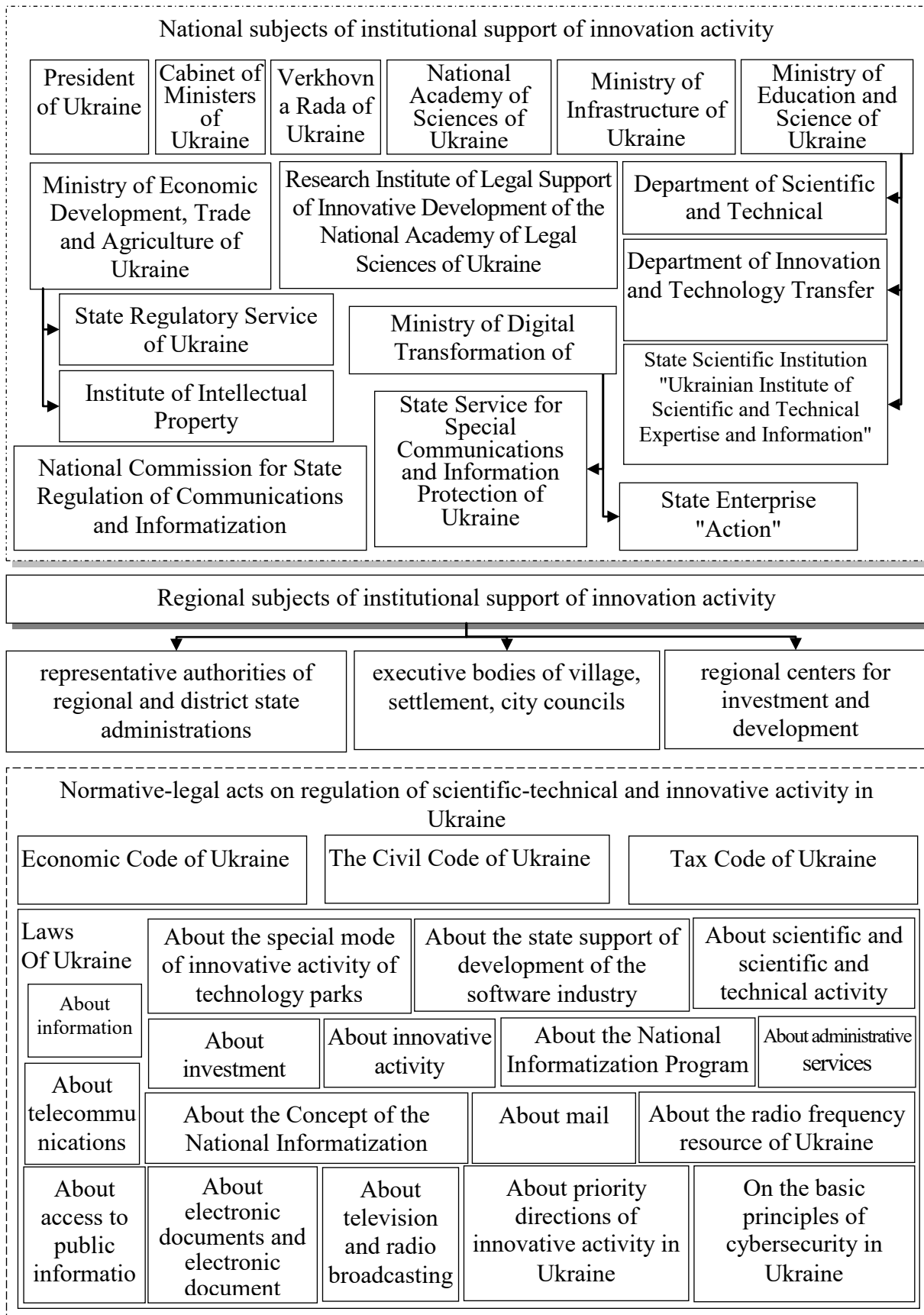
Given the European integration processes, it is advisable to present the structures of state institutional provision for innovation in some countries. For example, in Finland there is the Finnish Innovation Fund (Sitra), which promotes stable and balanced development in Finland, and the Finnish Academy, which funds

basic research in Finland. In Germany, there is the Federal Ministry of Economics and Technology, which creates conditions conducive to successful economic activity, as well as KfW Bankengruppe - a bank that offers provision to promote sustainable improvement of economic, social, environmental living and business conditions [12].

The institutional provision for Austria's innovative development is represented by the Silicon Alps Electronic Cluster, which brings together industry, science and government to develop the electronics and microelectronics sectors. The Swedish government's prerogative is to formulate a strategy for innovation development by the Swedish Agency for Innovation Systems. The Japan Science and Technology Policy Council is responsible for formulating innovation policy and supporting innovation. The President of the United States is fully responsible for the implementation of research programs, decides on the allocation of resources for innovation, and Congress analyzes the areas of scientific and technical research and prioritizes them through numerous scientific commissions. In France, there are Bpifrance (French Investment Bank), the Regional Agency for Economic Development, Exports and Innovation, and Transferts (Regional Innovation Agency), which promote innovation and internationalization of business, provide financial, technical and marketing provision to enterprises, provision regional companies in innovation activities [13].

It should be mentioned that in the EU countries the priority is to research and provision innovation in such key technologies as: modernized production; modern materials and nanomaterials; valeology; micro- and nanoelectronics; Artificial Intelligence; security and communication.

Ukraine's path to integration with the European Union, where economic development is characterized by a high level of innovation, requires the creation of an appropriate model in the country. At the same time it is important to create an effective institutional environment conducive to the formation and development of relations in the field of innovation.



**Fig. 2. The system of institutional support for innovative development of the national economy**

Source: generated by the authors.



The specifics of creating an innovative product is associated with the passage of the stages of the innovation cycle. In this regard, the institutional environment should be supported by legal provision of economic relations at the stages of development, implementation and consumption of innovative products, and in interaction with the components of innovation infrastructure.

Legislation that forms the legal basis for institutional provision of scientific, technical and innovation activity in Ukraine and which regulate the activity of infocommunication sphere, is systematized and grouped in six levels [14]: the first - international documents, the second - Laws of Ukraine, the third - Decrees of the President of Ukraine, the fourth - Resolutions and Orders of the Government of Ukraine, the fifth - Orders central executive bodies, sixth - Decisions of state regulatory authorities.

Analysis of the relationship between the regulation of scientific, technical and innovation activities with the main regulations governing the activities of the infocommunication sphere of Ukraine revealed that the high and medium level of the relationship are the following areas: tax regulation of innovation, administrative services, regulation of radio frequency resource, television and radio broadcasting, informatization. The following areas of activity of the infocommunication sphere are not covered, or partially covered by legislative regulation - cyber security, state provision for the development of the software industry, access to public information. This has a negative impact on the effective functioning of the infocommunication sphere of Ukraine in general and confirms the need to improve the institutional provision of its innovative development in particular.

The innovative activity of the infocommunication sphere permeates all its activities (investment, scientific, scientific and technical, etc.), which are related to the creation of the product, and its implementation covers all spheres of society [15].

Therefore, the development of innovation regulation that, in turn, will provide conditions for the formation of an effective innovation

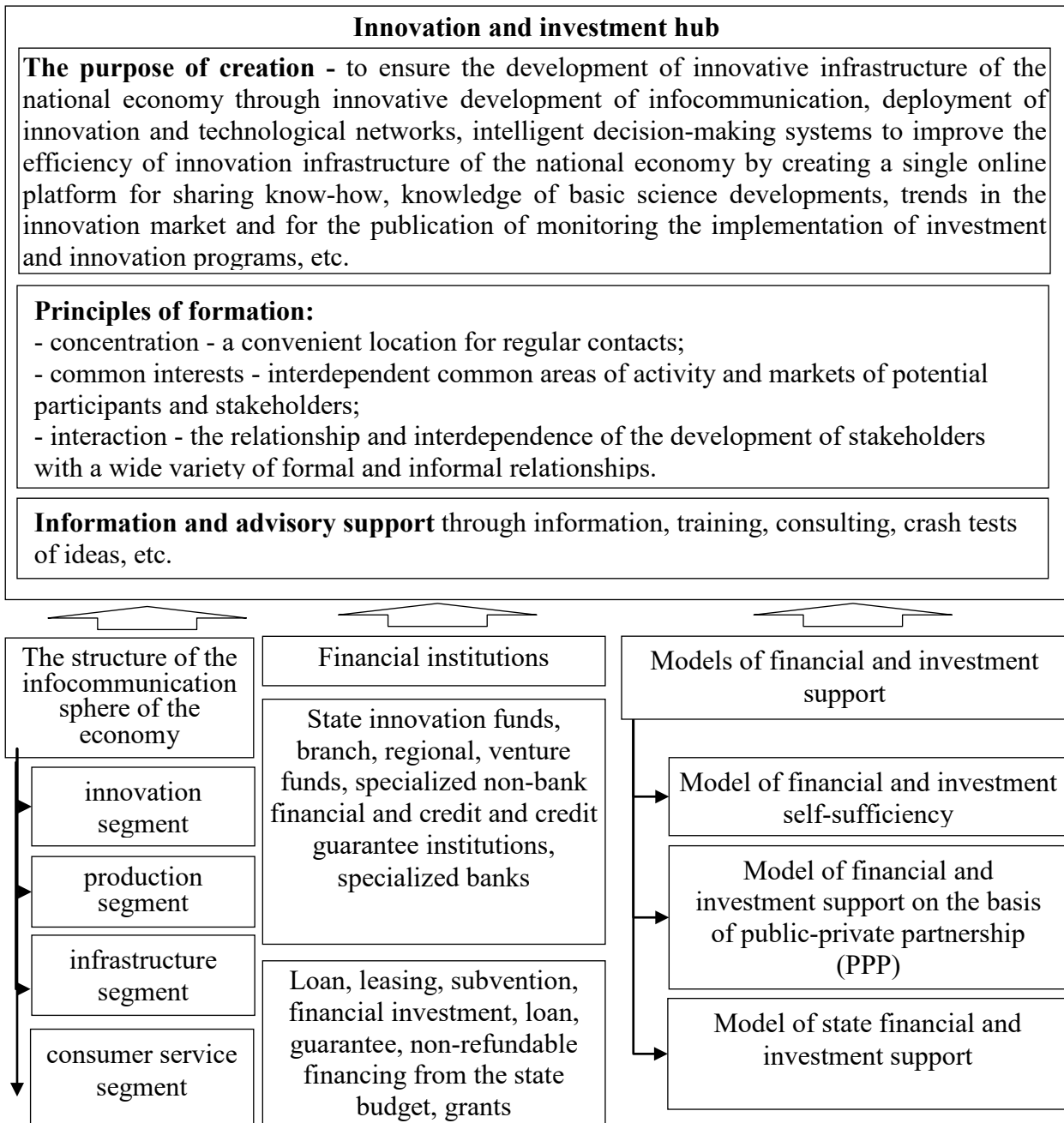
infrastructure of the national economy, is a key area of state innovation policy in Ukraine.

To increase the efficiency of the national innovation infrastructure in Ukraine, we consider it appropriate to create a single online platform for the exchange of information on innovation. This unique Regional Innovation Monitor platform created by RIM Plus was created in 2010 in Europe and is currently actively developing. In the context of the goals set in the European Commission's Europe 2020 strategy, RIM Plus provides information provision for the implementation of innovation policy in 181 regions in 19 EU member states. The platform contains information on the online inventory of regional measures of investment and innovation policy and program documents [16].

Today in Ukraine there is an insufficiently effective system of state provision for innovative development of the national economy and its infrastructure. Therefore, to ensure the innovative development of the infocommunication sphere, the deployment of innovation and technological networks, intelligent decision-making systems to increase the efficiency of the innovation infrastructure of the national economy, it is necessary to create innovation and investment hubs (Fig. 3).

The principles of formation of innovation and investment hubs are concentration (convenient location for regular contacts), common interests (interdependent common areas of activity and markets of potential participants and stakeholders), interaction (relationship and interdependence of stakeholders with a wide variety of formal and informal relations).

Information and advisory provision of innovation and investment hubs should be provided through information, training, consulting, crash tests of ideas, etc. Given the leading role of the infocommunication sphere in the formation of innovation infrastructure of the national economy, when creating innovation and investment hubs it is necessary to take into account its structure, consisting of innovation, production, infrastructure and consumer services.



**Fig. 3. Conceptual bases of innovation and investment hub of innovative development of infocommunication sphere of national economy**

Source: formed by the author.

In the process of functioning of innovation and investment hubs it is also necessary to provide financial and investment support, which is supported by relevant financial institutions (state innovation funds, industry, regional, venture funds, specialized non-bank financial and credit and credit guarantee institutions, specialized banks) through loans, leasing, subventions, financial investments, loans, guarantees, non-refundable financing from the state budget, grants.

At different stages of operation, it is advisable to use three models of financial and investment support: self-sufficiency, public-private partnership and public security.

In our opinion, methods and mechanisms of state regulation of innovative development of infocommunications should be formed and legally enshrined. Such a document could be a draft Law "On the main provisions of state policy in the field of infocommunications", which would include:

- strategic short-term plans for state provision for innovative development of the infocommunications sector (up to 5 years);

- state computerization program and increase the level of technical literacy of all segments of the population,

- national technological plan, that would provide for the establishment of the R&D Fund, the formation of national innovation infrastructure, investment and innovation hubs, grants and tax benefits for R&D in the private sector, training of scientific personnel and provision of educational services;

- strategy of development of international cooperation in the field of information technologies;

- measures to improve the institutional conditions of doing business; information products from the state;

- system for assessing the effectiveness of public spending on innovative development infocom.

Regulation of innovative development of the infocommunication sphere, with the development of mechanisms and ways to achieve effective results, should be formed on the basis of a single system approach. State provision should be aimed at improving the innovation and institutional environment for doing business, while reducing administrative barriers and creating conditions for human capital development.

**Conclusions.** Today in Ukraine there is a self-organized, well-developed, successfully operating integrated system that combines infocommunication and innovation resources, technologies and all other elements that make up the infocommunication sphere, necessary for its normal functioning.

At the same time, there is insufficient provision of the institutional basis for its innovative development. In our opinion, ensuring the innovative development of the infocommunication sphere is closely connected with the formation and development of interconnected elements of the innovation infrastructure in the country.

Based on the research, in order to increase the efficiency of innovation infrastructure of the national economy as a necessary condition for institutional provision of innovative development of the infocommunication sphere, it is advisable to create a single online platform for exchanging know-how or knowledge of major scientific and technical developments of the innovation market and for the publication of monitoring the implementation of investment and innovation programs, the creation of innovation and investment hubs, the deployment of innovation and technology networks, intelligent decision-making systems to integrate into the globalized innovation and technology space.

Thus, due to the creation of innovation and investment hubs, it is possible to directly attract foreign investment on the basis of economically stable enterprises, which requires interaction with free economic zones and innovation centers of different regions of Ukraine. Effective integration of the results of innovation and investment hubs and advanced global innovation projects will promote the development of innovation infrastructure of the national economy.

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