ственности. По оценкам специалистов экономический ущерб от использования 3D-печати, причиненный интеллектуальной собственности, к 2018 г. составит 100 млрд долл. США. Отставание Украины от стран, лидирующих в этой области, продолжает нарастать, особенно если принять во внимание скоординированные усилия правительств, промышленности и академических институтов стран-лидеров, направленные на распространение аддитивного производства в промышленности. Внедрение этих технологий невозможно без инвестиций в фундаментальные и прикладные исследования. Опыт других стран показывает, что данная задача не может быть решена без существенного участия правительства и продуманных финансовых стимулов. Развитие этой наукоемкой отрасли является основой технологической безопасности и независимости страны.

Ключевые слова: *аддитивные технологии, открытые инновации, изобретательская активность, 3D-печать, интеллектуальная собственность, патентный ландшафт.*

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IMPROVEMENT OF REGULATORY AND INSTITUTIONAL FRAMEWORK OF ACADEMIA-INDUSTRY KNOWLEDGE TRANSFER: EXPERIENCE OF UKRAINE, EU AND USA

Abstract. *The article examines activities and structure of departments, involved in identification, protection of intellectual property rights, accumulation, storage of patent information, which in today's world is useful and valuable product, as far as given the great competition on the technology market and rapidly increasing level of technology, it is important to develop own technologies and to possess information on the direction of the competition. There is considered practice of the National Academy of Sciences of Ukraine concerning organization of work on the identification, protection and use of inventions, as well as work on selection of inventions for patenting abroad, preparation of materials for the sale of licenses, inspections on patenting purity et al., which was assigned to the patent offices, patent and licensing departments of institutions of NAS of Ukraine. Also, there is given an example of US research universities — as far as licensing has given to universities the financial stimulation to bring developments and technologies to the market. In US-universities for commercialization of research results are responsible special centers (Technology Transfer Offices). Universities began to conduct actively additional researches in order to make results of basic research more attractive to private investors.*

Keywords: *scientific developments, inventions, technology transfer offices, patenting.*

INTRODUCTION

In development of the innovation infrastructure of research and educational institutions important role belongs to the State, as far as it often performs mediating role among research organizations, universities and companies.

In formation of the national innovation system in our country the significant role also is entrusted to Public research organizations (PRO): research institutes (RIs) and higher education institutions (HEIs), which have other purpose, then just students learning — research and innovation activities.

In Ukraine, according to Art. 8 of the Law of Ukraine "On the state regulation of activities in technology transfer sphere" and Resolution № 995 of the Cabinet of Ministers of Ukraine dated 1.08.2007 on the formation of structural divisions on technology transfer, innovation and intellectual property stipulated for Universities and research institutions of Academies of Sciences. Certain ministries as well as National Academy of Sciences of Ukraine have adopted their own regulations on activities of these offices.

At the same time, in many universities and research organisations such activities are governed by the statutory objectives and requirements of legislation of Ukraine that regulate only certain policy issues on protection of intellectual property rights and technology transfer.

However, in both cases they are currently facing the following problems:

– Lack of sufficient funding to hire qualified personnel for these departments;
– Lack of system of state commissioned staff training in the field of intellectual property and technology transfer for public research institutions accompanied by yet another problem — significant funds required from educational institutions to finance such training;
– Absence of system of qualifications improvement for the experts, of continuous exchange of experience, of adequate methodological support.

TOPICALITY OF THIS ARTICLE

Depends on the fact, that there are being studied activities and organization of departments, involved in the identification, protection of intellectual property rights, accumulation and storage of patent information. Such types of information can be useful and valuable, based on the fact that:

- it is a source of technical information;
- it allows to avoid unnecessary expenditures on researches withalready known results;
- it allows to find new solutions to technical problems;
- it allows to evaluate patentability of one's own inventions;
- it allows to monitor the activities of competitors;
- it helps to avoid copyright infringement and so on.

The aim of the article — is to study regulation of management of the protection and use of inventions in scientific institutions of Ukraine and other countries. This is closely connected with the current situation — given the high competition in the technology market and fast growing level of technologies, it is important to develop our own technologies, as well to posesinformation on the directions of the competitor's work.

Sources database. The issue of activity of patent departments of scientific institutions and universities was highlighted in the scientific articles and reviews of such Ukrainian scientists as Androshchuk G., Butnik-Seversky A., Bogdanov V., Kapitsa Y., Kossko T., Makhnovsky D., Orlyuk O., Khomenko I., Shulga N. and others. Studied laws and regulations of Ukraine, the US and the EU [2; 5; 6; 12–14].

Foreign experience of regulation of intellectual property rights objects (IPRO), created at the expense of budget funds. Foreign experience shows, that despite the differences among introduced schemes, most countries have a lot in common. In the United Kingdom, France and Japan there are traditionally strong state institutions to commercialize results, obtained from the budget [17]. At the same time, the US under certain conditions transfer IP rights, created at the expense of budget funds to organizations — developers. There is the most widespread model, where company-contractor has the greatest potential in commercialization management.

At the early stages of formation of commercialization system, when research universitiesand research institutions did not have adequate competence in the field of IPR management, specialized government agencies in this area had been playing a significant role — such organization as British technology group (BG) in the UK [19], ANVAR in France [16]. An important trend in the development was also forming of self-driving (corporate) entities, acting as spokesmen both for the interests of scientific organizations and simultaneously as partners for state public authorities.

Common feature for the developed countries is growing role of the lower parts of the system — universities and scientific organizations in the process of disposal of rights to the results of scientific and technological activities.

The main trend is that in order to widely involve IP results into state economy turnover, the State concessions rights on the results of scientific and technical activities, financed from the state budget, for the performers of works (contractors): universities, public research institutes.

The second important trend — dissemination of public-private partnership on pre-competition

stage. Such partnerships are using IPR as a mechanism to encourage firms to cooperate with public research institutions.

The experience of Western countries shows, that getting ownership over the IPR, heads of universities and other scientific and technical organizations have been able to achieve significant success in their commercialization. Thus, in the case of public-private cooperation partner from the private sector is involved into the work at an early stage — this approach accelerates development of new technologies. Use of such a mechanism does not only accelerates technologies transfer, but also create sustainable partnerships with the private sector. Special feature ofIPR regulation — is balance of interests in the distribution of income between the parties: if one party (the State or executor) is entitled to commercial use of the results of state institution developments, the other party (the performer or the State) — receives right to earn income.

In Austria, Denmark, Germany and Norway [17], have been enacted laws, under which the rights to IP, created at the expense of budget funds, belong to the universities. In Japan and Korea legislation also strengthens the role of universities, enabling them to have more control over those developments, being made by their employees. In those countries, where historically all rights to IP are being allocated according to the "professor privilege", also tend to transfer those rights to organizations, where these professors work. The reason for all these changes is that the property, belonging to universities and research institutes, as opposed to IP, that belongs to individual researchers or the state as a whole, provides greater transparency for companies, interested in commercialization of IP, thus reducing costs for partners and provides more formal and effective transfer of knowledge and technology. Theoretically, the transfer of IP rights to their inventors should contribute to the intensification of disclosure of inventions and their commercialization, although in practice inventions protection is quite expensive, especially in the case of registration of patents abroad.

Trends in the forms of IP implementation suggest, that universities and public research institute prefer to receive non-exclusive but royalty-paid licenses, while private firms and small businesses — prefer to get exclusive license to compensate all risks.

Regarding ways and proportions in the distribution of income from the sale of IP, there are two veritable characteristics. Some countries, represented by the Ministry of Science and sponsoring agencies, set standards for the distribution of royalties for the public research institutes and universities. In other countries there are being set "framework rules", and organizations themselves define specific proportions and amounts of payments. Countries, where currently law reform in IP is undergoing, transfer to the second approach, understanding, that organizations need a certain autonomy and flexibility to effectively respond to requests from industry and researchers.

Let's consider as an example the model of Stanford University (Palo Alto, CA, USA)*. Office of Technology Transfer of Stenford University (further — OTT) was founded in 1970s. The model of Stanford OTT provides, that a successful licensing depends on the successful marketing of inventions, while functions on patenting and paperwork can be effectively carried out by its own patent attorneys and other University staff. In OTT the employees with academic degrees, with experience in the industry (mostly marketing) and previous experience in technology transfer, are being actively involved into the licensing process.

The algorithm of the Stanford OTT work is that first there is conducted search for potential licensee (sometimes even there is signed license agreement), and then a decision on invention patenting is being taken. Therefore, the patenting itself is a subordinate part of a OTT licensing strategy. Income from licenses is being spread as follows:

- 15% — goes to OTT;
- 85% — distributed among the inventor, department and faculty.

Office of Technology Transfer at Stanford University consists of the following core sectors:

1. Sector of partners. (Composed of director, five senior associates (partners), two companions (partners), a specialist in copyright and marketing, coordinator for Patents and contacts with authors;

2. Sector of contracts searches and licenses sale — includes seven experts in biology specialist.

3. The industrial contacts sector includes — manager, a senior inspector for industrial contacts, two specialists on industry contacts, specialist in transfer of ownership of nonmaterial assets.

4. Sector of patenting.

5. Sector ofInformation.

In yy. 2015–2016, Stanford received almost $ 95 million from transferring rights on 779 licensed technologies.

While commercialization of developments, the OTT uses the following concept of marketing: before one gives a license, it is necessary to conduct marketing searches on the questioned development, meaning that the development should be

* Statistical information: http://www.stanford.edu/research/

Table 1

Results for Technology Transfer at Stanford University in yy. 2009–2010

Indicator	Result
Number of disclosed inventions	467 units
Number technologies, that generated income	553 units
Number of issued licenses	90 units
The total number of received royalties	$ 65.5 million
Number of technologies	32 units
Income from sale of units — property of star-ups	$ 1,29 million

advertised to those, who may be interested in using it. Usually this process takes 3 months and during this period the OTT is responsible for determining the best source forapplication of this development.

The OTT shapes its policy, proceeding from the assumption, that the most promising commercialization — is the creation of start-up companies with the entrepreneur, who will deal with further development of the technology. This company may be the best licensee in case of presenting specific plan for successful technology commercialization.

In general, Office has 20 workers, dealing with up to 1100 inventions, licensed in all countries. 220 of these inventions generate revenue in the form of royalties in the amount of 44 mln. USD** (**Table 1**).

Experience of Ukrainian research institutions and universities in the sphere of creation, protection and use of intellectual property rights. Despite significant legislative changes in Ukraine in 1991–2003 yy., while reducing funding for research, lack of demand from industry on research and development results, the number of patent departments, technology transfer, innovation and intellectual property departments in most organizations is getting smaller, and number of employees in these departmentsin state academies, some universities has been reduced to one or several persons. Level of payment of patent researchers is being reduced versus payment of scientific staff.

At the same time, the experience of foreign countries shows essential role of patent offices in the commercialization of innovations. Thus, significant attention is paid to licensing, transfer of rights on intellectual property objects, developed by venture companies of universities.

Organization of creation, protection and use of intellectual property rights in scientific institutions and universities in Ukraine. In the sphere of effective protection and use of IP by Universities and research organizations of Ukraine the key issue here is existence of well-functioning and effective knowledge transfer offices. This calls for adequate state-level support to knowledge transfer activities and advancement of qualifications of knowledge transfer professionals.

It's actual (relevant) to stipulate that the staff of such knowledge transfer offices (KTO) will include positions of researchers dealing with patent research, marketing, market research and technology transfer issues. High-level expertise is needed to perform these tasks.

In general raising awareness and building capacity (at international, national and institutional levels) is an important precondition for successful knowledge transfer. And it's important also to align knowledge transfer with traditional research and educational practices and policies (routines) of academic organisations. Creation of KTOs remains clearly insufficient, if knowledge transfer objectives and activities are not integrated into other management elements (e.g. if they are not integrated into the criteria for academic staffing, or if the faculties and research units fail to put these activities into practice, etc.).

Recommendations on knowledge transfer suggested to Public research organizations (PROs) and high education institutions (HEIs) to develop and publish their licensing and spin-off policies. The aim of these policies is to harmonize practices within public research organisations and HEIs, to ensure conformity of technology transfer with legislative requirements, determine adequate compensation, and concerning spin-offs: determining long-term relations with such companies. This document should define policy objectives, such as the development of Ukrainian economy, safeguards allowing the continuation of research (e.g. in case where research results protected as a patent are sold, it should still be possible to conduct research in this field), etc. which have to be adhered to. In

** Information on the OTL: http://otl.stanford.edu/about/resources/about_resources.html (accessed 01.08.2012).

the absence of such policies, practices of public research organizations could substantially differ which could have an adverse impact on national and international cooperation.

Without clear regulation, undesirable behavioral patterns (e.g. conflicts of interests cannot be avoided, etc.) could emerge. The EU recommendations on knowledge transfer suggest to carefully assess transfers of IP ownership and exclusive licenses. Particular emphasis is placed on the provision of corresponding compensation for granting licenses — either financial or any other kind. When we consider licensing as a mechanism of knowledge transfer, it could be said that in Ukraine some PROs and HEIs have experience in concluding licensing agreements and other technology transfer agreements.

However, concerning a large number of organizations, there is lack of professional support to help draft contracts and negotiate appropriate terms (especially with foreign partners). It is important to have guidelines how to determine royalty rates. The data on royalty rates and other marketing information should be collected and analyzed, as well as possibilities of getting marketing information about national and foreign markets should be set forth [1].

When we regard creation of spin-offs as a mechanism of knowledge transfer, it could be said, that Ukrainian research organizations gained experience in formation of small innovative enterprises (spin-off companies) from the 90s and early 2000s. However, due to the adoption of the Law of Ukraine "On management of state property object" in 2006 and limitation of rights of budgetary institutions to set up such companies, this activity has actually stopped.

Experience of NAS of Ukraine. Organization of work on identification, protection and use of inventions, as well as work on selection of inventions for patenting abroad, the preparation of materials for the sale of licenses, checking of technical objects on non-infringement, and others was assigned to the patent office, patent and licensing departments of institutions of NAS of Ukraine.

In 1992 — patent and licensing departments of NAS of Ukraine worked according to the Decision of the Presidium of NAS of Ukraine № 65 from 12.02.86 y., which approved the Model Regulations on patent licensing unit, inventive work of agencies, institutions and enterprises of the Academy of Sciences, which did not meet the new market principles [4; 6; 7; 9; 10].

In 2006 came into force the Law of Ukraine "On state regulation of activity in the field of technology transfer" [3].

Pursuant to this law and Decree of the Cabinet of Ministers of Ukraine of 1 August, 2007# 995 "Some issues of implementation of the Law of Ukraine "On state regulation of activities in technology transfer sphere", with the aim to enhance IPR protection in the institutions of NAS of Ukraine, and to provide marketing of results of scientific developments and expansion of their implementation, Presidium of NAS of Ukraine adopted the Order #15 of 16.01.08 y. [11], which approved:

- Model Regulation on the structural unit for technology transfer, innovation and intellectual property of research institutions of NAS of Ukraine (structural unit);
- Regulations on the use of intellectual property objects in the NAS Ukraine;
- Model contracts on service intellectual property rights objects and remuneration for their use and Model contract between authors of intellectual property objects.

Paragraph 2, Annex 2 "Regulations on the use of intellectual property rights in the NAS of Ukraine" to the Order of NAS of Ukraine #15 of 16.01.2008 regulated activities for creation, protection and use of intellectual property in the NAS of Ukraine.

Thus, the structural unit may be established:

- as a research unit (department, laboratory, etc.) allowed to have scientific thematic topics, in accordance with the "Procedure for the formation of topics and monitoring of scientific researches at the National Academy of Sciences of Ukraine" (unit on researches on technology transfer, innovation and intellectual property in the sphere of specialization of the NASU institution);
- as a unit, that performs scientific and technical, scientific and organizational, scientific and methodological work.

The structure of stuff enlarged with scientific researchers positions, dealing with patent researches, marketing, market research and technology transfer (in particular, may be introduced positions of senior researcher, leading researcher, researcher, junior researcher) and other positions.

The main tasks of the structural unit are:

- conducting and organization of researches to identify the IPR Objects, created as a result of scientific and technical activity of theinstitution, conducting patent researches, non-infringement researches, ensuring protection of inventions, utility models, industrial designs, trademarks, scientific discoveries, integrated circuits, trade secrets, computer programs, databases, plant varieties and other IPR Objects, created in the NASU Institution;
- conducting and organization of marketing, patent and short-term studies;
- implementation of results of researches and developments, of high technology products of the Institution, support of the institution's licensing activity andtechnology transfer.

- conducting of technology transfer and licensing activities.

Structural IPR Unit together with other units of the Institution takes measures to use R&D results, IPR Objects of the Institution, organizes and performs marketing, including short-term patent research and provides technical assistance for them.

As part of market researches, the structural IPR Unit:

- determines, based on analysis of product market, trends of scientific-technological development,needs in the results of R&D, IPR Objects, high technology products, that may be developed by the Institution, and provides proposals for the management of institutions for further research;
- explores the possibility of placing on the market of existing R & D results, IPR Objects, high technology products of the Institution (hereinafter — products);
- identifies potential connercal partners of the Institution, it proposes to the Management of the Institution partners for further negotiations.
- studies patent licensing situation concerning products of institutions, including the dynamics of patenting, mutual patenting, patents-analogues, geography of patenting of the analog products.

Adoption of the new Provisions resulted in renovation of structure of patent licensing activity in NAS of Ukraine and brought it in consistence with the requirements of present day and introduced new types of activities for the IP Units, aimed largely at commercialization of developments of scientific institutions (timely, high-quality IP protection, use of IPR).

CONCLUSIONS

Analysis of foreign experience of innovative development allowed us to determine not only the general trends in the development of innovative policies, but also to identify some of problematic issues, facing innovation system of Ukraine, and for solving which one must perform the following tasks:

1. It is crucial to concentrate on creation and adequate protection of commercially valuable knowledge. Commercial viability can be achieved through initial well-structured, systematic and strategic industry-academia co-operation. This also creates framework conditions for the subsequent knowledge transfer.

2. The government should support universities and other public research organisations in developing knowledge transfer strategies (e.g. by providing advice, hiring intellectual property management experts) and provide funds for seeking IP protection (especially in the western countries).

3. Well-functioning knowledge transfer office should be integrated into the activities of public research organisations and it should be accessible to researchers and industry. Several round-tables and seminars should be organised to discuss the issues of knowledge transfer. The effectiveness of the activities of KTO should be developed and reinforced at all levels (University, Academies of Sciences, Ministries) in the following areas: a) communication area (availability of the KTO's staff, user-friendly access to information and transparency of the procedures); b) scientific area (assessment of the viability and potential development of the invention; c) information area (availability of adequate information tools and services related to patent information, search of prior art, freedom of operation, evaluation of possible markets); d) legal area (assistance in IP protection, enforcement, drafting technology transfer agreements, etc.); e) funding area (availability of IP protection and commercialisation of funds — the availability of sufficient funds to involve qualified personnel in departments of technology transfer and intellectual property protection and patenting), and f) commercial area (assessment of commercial potential of the invention, marketing, business network access, search of suitable partnerships, business development, negotiation and administration of licensing contracts etc.).

Financial and career incentives should exist for knowledge transfer professionals and researchers, participating in transfer process.

4. In order to disseminate and increase visibility of researches, conducted in Ukrainian public research organisations, it is appropriate to:

- publicise the work results of public research organisations on their websites and make available lists of research results, offered for use and contact person responsible for academia-industry relations. The information should be in English (possibly in other languages as well). The information should be kept up-to-date;
- using information networks, Enterprise Europe Network, in particular, to disseminate information on developments in Ukraine, the EU and other countries.

5. Recommendation for academia: it's advisable in scientific institutions and universities to adopt guidelines for the protection of intellectual property and knowledge transfer (technology transfer), taking into account the EU Recommendations in this field, and to allocate resources for this activity by emphasizing the idea of importance of knowledge transfer to researchers and mid-level managers and by offering incentives to emplo-

yees, who create objects of intellectual property rights.

6. It would be useful for scientific institutions and universities in Ukraine to adopt the guidelines and regulations regarding knowledge transfer and commercialisation of intellectual property in line with the provisions of the EU Recommendations.

7. It is a challenge for the governing bodies of institutions to adhere to strategic goals because the revenue received from the knowledge transfer activities, is relatively modest in most universities. However, the costs of competence building for creating KTOs together with enforcement of knowledge transfer systems within a research organisation might be substantial.

8. It's important for public research organisations (independently or together with the ministries, the Academies of Sciences, to which they are subordinated) to develop detailed regulations concerning the creation, protection, and use of research results (protectable by copyright, related rights and industrial property) with commercial potential, the ownership of research results, the assessment and protection of research results and remuneration to inventors and authors — In accordance with EU Recommendation [18] and WIPO documents [15].

9. Recommendations on knowledge transfer have to be suggested to the PROs and HEIs to develop and publish their licensing and spin-off policies.The aim of these policies is to harmonise practices within the public research organisations and HEIs, to ensure conformity of technology transfer with legislative requirements, determine adequate compensation, and concerning spin-offs: determining long-term relations with such companies [17, par. 11].

10. This document should be in line with general state policy objectives, such as the development of Ukrainian economy, it should allowe the continuation of research (in case where research results, protected as a patent, are sold — it should still be possible to conduct research in this field), etc. which have to be adhered to. In the absence of such policies, practices of public research organisations could substantially differ which could have an adverse impact on national and international cooperation.

11. It is imperative to create a system of retraining specialists in technology transfer and intellectual property protection and system of skills improvement of specialists in order to provide research institutions and universities with qualified personnel. Wide introduction of courses on intellectual property and technology transfer at universities are highly recommended.

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ІНСТИТУЦІЙНЕ ТА НОРМАТИВНО-ПРАВОВЕ РЕГУЛЮВАННЯ ПЕРЕДАЧІ ЗНАНЬ ІЗ НАУКОВИХ УСТАНОВ І ВНЗ ДО ПРОМИСЛОВОГО СЕКТОРУ: ДОСВІД УКРАЇНИ, США ТА ЄС

Резюме. *У статті досліджується діяльність та організація відділів, що займаються виявленням, охороною прав на інтелектуальну власність, накопичення, зберігання патентної інформації, яка в сучасному світі є корисною та цінною, адже враховуючи велику конкуренцію на ринку технологій та швидко зростаючий рівень техніки, важливо розвивати свої технології та володіти інформацією про напрями розвитку конкурентів. Розглянуто практику Національної академії наук України щодо організації роботи з виявлення, охорони та використання винаходів, а також роботу з відбору винаходів для їх патентування за кордоном, з підготовки матеріалів для продажу ліцензій, перевірки об'єктів техніки на патентну чистоту тощо, яку було покладено на патентні служби, патентно-ліцензійні відділи установ НАН України. Надано приклад дослідницьких університетів США — адже ліцензування дало університетам фінансовий стимул виводити розробки й технології із лабораторій на ринок. В американських університетах за комерціалізацію наукових досліджень відповідають спеціальні центри (офіси). Університети стали активно проводити допоміжні дослідження до тих пір, поки результати основних досліджень не стали привабливими для приватних інвесторів.*

Ключові слова: *наукові розробки, винахідницька діяльність, патентні підрозділи, патентування.*

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ИНСТИТУЦИОННОЕ И НОРМАТИВНО-ПРАВОВОЕ РЕГУЛИРОВАНИЕ ПЕРЕДАЧИ ЗНАНИЙ ИЗ НАУЧНЫХ УЧРЕЖДЕНИЙ И ВУЗОВ ПРОМЫШЛЕННОМУ СЕКТОРУ: ОПЫТ УКРАИНЫ, США И ЕС

Резюме. *В статье исследуется деятельность и организация отделов, занимающихся выявлением, охраной прав на интеллектуальную собственность, накоплением, хранением патентной информации, которая в современном мире является полезной и ценной, ведь учитывая большую конкуренцию на рынке технологий и быстро растущий уровень техники, важно развивать свои технологии и владеть информацией о направлениях развития конкурентов. Рассмотрена практика Национальной академии наук Украины по выявлению, охране и использованию изобретений, а также работа по отбору изобретений для их патентирования за рубежом, по подготовке материалов для продажи лицензий, проверки объектов техники на патентную чистоту и др., которая была возложена на патентные службы, патентно-лицензионные отделы учреждений НАН Украины. Также предоставлено пример исследовательских университетов США — ведь лицензирование дало университетам финансовый стимул выводить разработки, технологии из лабораторий на рынок. В американских университетах за коммерциализацию научных исследований отвечают специальные центры (офисы). Университеты стали активно проводить вспомогательные исследования до тех пор, пока результаты основных исследований не стали привлекательными для частных инвесторов.*

Ключевые слова: *научные разработки, изобретательская деятельность, патентные подразделения, патентование.*

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