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Specific characteristics of commercialization of intellectual property objects of universities and state scientific research institutions

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Abstract

The scientific article analyzes the issues of commercialization of intellectual property of universities and other state scientific research institutions. The author's comparative analysis of models and legislation of foreign countries in this field served to reflect the unique aspects of the article. This article describes the possibilities of commercialization of the intellectual property of scientific research organizations based on the improvement of the normative legal documents of the Republic of Uzbekistan and the measures to be implemented in the near future. The author puts forward a firm position that the main direction of finding a legal solution to these issues should be to liberalize the process of commercialization, reduce state intervention in this field, and strengthen autonomous regulation. At the same time, the article presents other suggestions and recommendations based on the analysis of existing problems in this field.

Keywords: Universities, state scientific research institutions, intellectual property objects, commercialization

Introduction

In recent years, the use of legal tools such as licensing of patents, as well as trademarks, samples and copyrights in the transfer of technologies and other intellectual property objects created in universities and other scientific research centers in economically developed countries is relevant. In this case, more state research organizations pay particular attention to the commercialization of intellectual property and obtaining income from it ^[1].

In particular, universities commercialize innovations developed by their faculty, primarily by licensing the intellectual property (usually patents) of these achievements to entrepreneurs, faculty, or established companies. Historically, university faculty and students have created a number of innovations that have brought them to market and helped launch new companies. Examples include Internet browser (Netscape), Internet search engine (Google) and various biotechnologies (Genentech) ^[2].

If we look at the international experience of commercialization of intellectual property belonging to universities and state research organizations, we can see that several models of this process have been formed over the years. Below we will analyze these models on the example of the experience of the USA and the CIS countries.

Materials and Methods

In the course of the research, an attempt was made to answer three questions: first, how effective is Uzbekistan's legislation on the commercialization of intellectual property belonging to universities and scientific research institutions; second, how the practice of applying the law in this area was formed; third, is there a need to fill gaps in legislation based on international experience?

In response to these questions, the author's position is developed, and suggestions are put

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^[1] Siegel, DS and M. Wright, 2007, Intellectual Property: The Assessment, Oxford Review of Economic Policy 23(4): 529-540.

^[2] Association of American Universities. 1998. University technology transfer of government funded research has wide public benefits. Retrieved from <http://www.aau.edu/research/TechTrans63.98.html>.

forward to fill the gaps in the legislation of Uzbekistan. So, this article is a conceptual, theoretical analysis of the organization of commercialization of intellectual property objects belonging to universities and scientific research institutions in Uzbekistan. and focused on practical understanding.

In this study, the methods of analysis, generalization, comparative-legal, logical, statistical, systematic structural, formal-legal study of scientific knowledge were used.

Results

Turning to the US experience, most US universities in the 1980s had no experience negotiating with industry and considering commercialization issues. However, with the passage of time and experience, universities, and most importantly, their teachers, have acquired expertise in invention and innovation. As university culture and discipline have evolved, some universities have begun to recognize that commercialization and innovation activities go beyond what can be done in a single administrative office, requiring the promotion and implementation of cross-university programmatic initiatives in classrooms and laboratories. The legal basis for this was also created and improved.

The following laws regulate the legal, organizational and financial foundations of universities in the USA in the field of commercialization of intellectual property objects:

1. Patent and Trademark Law Amendments Act and Bayh-Dole Act of 1980.
2. Stevenson-Wydler Act (Stevenson - Wydler Technology Innovation Act of 1980).
3. Federal Technology Transfer Act of 1986 (FTTA) ^[3].

As examples of universities that have moved to the above-mentioned direction, we can include the following US universities.

Massachusetts Institute of Technology (Massachusetts Institute of Technology), where many professors are founders of start-up companies.

University of Arizona

University of California

The BioInfoNano R&D Institute is part of the University of California experience, which was established to support the creation of a common space for collaboration while respecting the interests of its member companies and startups.

Berkeley's one-stop shop for industrial research partners is also a leader in socially responsible licensing programs ^[4].

In the development of these universities, not only their technology transfers offices, but also the work of pedagogues, employees and students is important. In this case, the researcher-pedagogues are the main agents of knowledge transfer, while having a deep influence on the researches carried out in their universities and their commercialization. Many innovations, ideas and technologies lie in their hidden knowledge.

Also, patenting in US universities is considered as one of

the types of commercialization of their licensing. Meanwhile, they have shifted from a "licensing model" that aims to maximize revenue from patent licensing to a "volume model" that measures the amount and speed of bringing university innovations to market.

There are also several types of volume models, the main ones are discussed below.

"Free agency" model is a term taken from the world of sports, and according to this approach professors and teachers (faculty members) is given the right to choose third parties (or themselves) to negotiate the conclusion of license agreements for conducting business activities. This is allowed only under one condition. If it is, they will have to return part of their income to the university. A university or inter-university technology transfer office may be a third-party provider of services, but others may compete with them in the types of services and expertise offered.

The Wisconsin Alumni Research Foundation (WARF) is an example of this model. Although this fund Although established as a special technology transfer organization of the University of Wisconsin-Madison, it is independent from the university. University researchers are not obliged to use its services. However, almost all of them use the services of this fund. Because this fund has many years of experience. According to open data, the fund currently has more than 1,700 technologies for licensing in pharmaceuticals, agriculture, information technologies, clean technologies, medical devices and other fields ^[5].

Free agency creates serious competition for the tech office. Meanwhile, this model is best suited to researchers with deep commercial experience and social connections to facilitate commercialization.

Is a downside to free agency, in that university researchers often do not have the resources to pay for patent searches and applications? These are functions performed by the TTO. This problem can be solved by profit-sharing agreements between researchers and their lawyers or third-party commercial agents.

It is possible to solve this problem by signing license agreements with third parties on the use of their inventions by researchers, including the condition that patent costs are covered by the licensor in the agreement.

Regional Alliances

Another model involves expanding technology transfer activities through regional alliances. In this model, several universities form consortia that develop commercialization mechanisms. As the scale increases, it reduces the cost of the overall commercialization functions, and universities can share these costs among several participants.

This model may be particularly attractive to small research universities that do not have the capacity and resources to provide experienced and highly skilled licensing and commercialization staff on their own.

However, there are two main problems with the regional alliance model. First, an under-resourced regional TTO may resemble a "super TTO" by seeking to maximize licensing revenues for the entire consortium rather than the number and speed of commercialization opportunities. In addition, when commercialization is carried out in cooperation with several researchers from different

^[3] Internet source: <https://www.sec.gov/spotlight/jobs-act.shtml>

^[4]Robert E. Litan, Lesa Mitchell and EJ Reedy. Commercializing University Innovations: Alternative Approaches to Innovation Policy and the Economy, 2007, Vol. 8 (2007), p. 47 // URL: <https://www.jstor.org/stable/25056198>

^[5]Wisconsin Alumni Research Foundation (WARF) // URL: <https://www.warf.org/>

universities, and one or more universities are in conflict with other universities, coordination problems or conflicts regarding the inventive step may be encountered. Disputes may also be related to the amount of money contributed.

Faculty loyalty

A final, and perhaps the most radical, model that many universities should consider is one in which universities give up their intellectual property rights and instead give those rights back to the university for a portion of their revenue. Are presented to loyal professors and teachers (faculty members). Although giving up rights in favor of researchers seems drastic, this strategy provides the greatest incentive for external commercial agents to participate in the commercialization process.

In the experience of the United States, many such cases have been observed. For example, in 2005, Remicade was invented by Dr. Ian T. Wilczek (Ian T. Wilczek), who works in the Department of Microbiology at the New York University School of Medicine, and his colleague. 105 mln. as a result of the royalties received from the medicine (Remicade) by scientists to the faculty. Dollars presented [6]. The obvious downside of the "loyalty" model is its inherent and significant risk. There is always the possibility that successful academic entrepreneurs will not voluntarily share their success with their employers. This risk is even higher for universities that have a complex relationship with the researcher.

Meanwhile, Robert E. Litan, Lesa Mitchell and EJ Reedy (Robert E. Litan, Lesa Mitchell and EJ Reedy), the risk is worth taking for most universities. Because researchers pursue their work in many ways because of their thirst for knowledge and discovery. Although they may be motivated by money, most scientists are determined to bring commercially viable innovations to market. When financially successful professors return to their universities, they set positive examples for their colleagues. In addition, the loyalty model avoids the trade-offs associated with intellectual property rights and thus theoretically helps to commercialize inventions faster than either of the two models above. In particular, the loyalty model poses very low risks for universities that support collegiality and are well-governed.

Discussion

In the 1980s and 1990s, in the USA, great attention was paid to the commercialization of intellectual property belonging to universities and it took a step towards development, while in the countries of the former USSR, in general, in the socialist camp, almost no attention was paid to this issue.

As a result, the process of technology and knowledge transfer from universities and other public research organizations has faced two problems related to previous system failures in most transition economies.

The first problem arises in the intellectual property right system itself [7]. A second problem relates to how research

[6]Phan, Phillip H., and Donald Siegel. 2006. The effectiveness of university technology transfer: Lessons learned, managerial and policy implications, and the road forward. Retrieved from http://www.papers.ssrn.com/sol3/papers.cfm?abstract_id=900605

[7]Karpova, N., 2003, Legal Protection and Commercialization of Intellectual Property in Russia, in: United Nations Economic Commission for Europe (ed.), Intellectual Assets: Valuation and Capitalization, Geneva and New York, pp. 102-130.

was organized in the pre-transition period.

During the former Soviet Union, neither universities nor enterprises played a significant role in research. Instead, the main part of the applied research was conducted in the field research institutes of the line ministries [8]. Due to the extreme centralization and subordination of the Soviet economic system, these institutes could not gather experience in the field of technology transfer and their commercialization.

In addition, due to the fact that these institutes themselves did not conduct any relevant research, the capacity of enterprises to adopt and commercialize technologies and the ability to cooperate with universities and other state research organizations are not sufficiently developed.

This legacy from the former Soviet Union is still felt today in some aspects. For example, businesses spend far less on research and development (R&D) on average than developed countries, contribute far less to funding university-wide research, and collaborate far less with universities on joint research projects. On the other hand, universities and other state research organizations may also face special problems in knowledge transfer and commercialization due to the lack of demand for new technologies and other knowledge from the business sector.

The "triangle model" (triple helix model) model is widespread in Russian universities, the former center of the socialist camp [9]. This model is also called the research triangle model. One of the important aspects of the concept of the model is to consider the university not only as an educational institution, but also as a center for the development of innovative ideas and their subsequent commercialization. There are logical reasons for creating such a model of the university, which is determined by the Federal state standards, taking into account the requirements for the percentage of teachers with scientific qualifications who train students in various scientific fields. Accordingly, universities are centers of scientific capital and capacity building. Universities should be one of the main institutions that create the results of intellectual activity within the country's economic system.

We can see that this model is becoming more popular in Uzbekistan today. According to open data provided by the Ministry of Innovative Development (now the Agency for Innovative Development), 455.1 billion will be spent by scientific and research institutions in 2018-2022. scientific developments in the amount of soums were commercialized, of which 366.8 bln. products worth 324.8 billion soums were sold and services worth 88.3 billion soums were provided [10].

In particular, in the spring stages of the commercialization forum, within the framework of the "Scientific-Scientific Organization-Region" system, the Republic of Karakalpakstan and regional leading organizations will

[8]Graham, L., 1992, Big Science in the Last Years of the Soviet Union, Osiris 2nd Series, Vol. 7, pp. 49-71.

[9]A. Kulyagina, Yu.B. Kolozhvari, SVKoval. An Analysis of the Forms of Commercialization of Intellectual Property Objects of Higher Education Institutions: Russian and International Experience. Advances in Economics, Business and Management Research, volume 128 // International Scientific Conference "Far East Con" (ISCFEC 2020) P. 618

[10]The main results of the Ministry of Innovative Development of the Republic of Uzbekistan in 2018-2022. Tashkent - "Innovative Development Publishing House" - 2022. Page 41

allocate 6.48 billion for 37 developments in 2021. 8.93 billion soums for 44 developments in 2022. Soum funds have been directed.

17.1 billion within the autumn stage of the 2022 commercialization forum. Soum contracts, as well as 2.78 mln. Practical works have been launched within the framework of export contracts in the amount of US dollars. New types of innovative and import-substituting products were created within the framework of 66 projects presented under the “Scientific-Scientific Organization-Network” system.

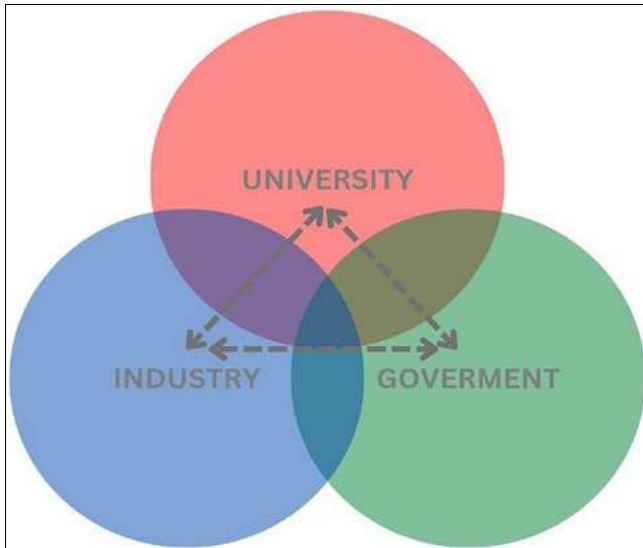


Fig 1: ^[11]

In general, the concept of this model is compatible with the concept of “University 3.0”.

In the concept of “Development of the higher education system of the Republic of Uzbekistan until 2030”, approved by the Decree of the President of the Republic of Uzbekistan No. PF-5847 of October 8, 2019, education, science, innovation and scientific - the task of gradually introducing the “University 3.0” concept, which implies the inextricability of commercialization of research results, was established.

Because the main trend defining the changes in the modern university is its transition from the University 1.0 model to the University 3.0 model.

In this case, the university 1.0 is only engaged in educational activities, it is the transfer of knowledge, personnel training and social development provides.

University 2.0 is a research university that simultaneously fulfills two missions - teaching and scientific research. University 2.0 functions include the creation of new knowledge through research activities and consulting services for market participants. University 2.0 carries out scientific research on industrial orders and creates “custom” technologies. The main task of such a university is the reproduction of new knowledge, and personnel training is included in the scientific process.

University 3.0 has an even higher status because it has a

third mission - a system of commercialization of knowledge and technologies. Such a university manages intellectual property rights, forms an entrepreneurial ecosystem, promising technological markets, and becomes a platform for creating the country's economic superiority on a global scale. It is these universities that determine the face of the modern technological revolution ^[12]. University 3.0 to achieve the UN's global sustainable development goals is a contributing educational institution.

University 3.0 is an educational institution of the post-industrial society, combining education (training students), science (creation of new knowledge) and innovation or entrepreneurship (application of knowledge in practice, creation of business structures). That is, the essence of a new type of university is that the university simultaneously fulfills three missions:

1. Education.
2. Scientific research.
3. Aimed at the commercialization of innovative knowledge.

An organization ^[13] that is a source of entrepreneurial potential for innovative business.

If we look at the history of this system, at the beginning of 2000, the improvement of the quality and efficiency of the research work carried out in the Western universities made them the leading representative in the commercial development of scientific knowledge. As a result of cooperation between universities and industry, scientific discoveries have been transformed into innovative products and commercialized using appropriate business models. Consequently, the system of Higher Education 3.0, which combines education, science and commercialization of knowledge, was established ^[14].

Today, there are 210 Higher education institutions (HEIs) in Uzbekistan, of which 115 are HEIs owned by state bodies, 65 are non-state higher education institutions, and 30 are foreign HEIs and their branches ^[15].

According to the information of the Ministry of Higher Education, Science and Innovation about the income and expenses of 69 state universities in the republic in 2022, the total income of these higher education institutions last year was 8 trillion 770 billion 728 million soums, and the expenses were 8 trillion 102 billion 825 million soums. amounted to soums.

It is noted that the income of HEI was formed from the following:

Funds financed from the budget (25 percent of total

^[11] Haziman Zakaria, Diana Kamarudin, Muhammad Ashraf Fauzi, Walton Wider. Mapping the helix model of innovation influence on education: A bibliometric review. *Front. Educ.*, 22 March 2023 Sec. Higher Education Volume 8 - 2023 | <https://doi.org/10.3389/educ.2023.1142502>

^[12]Narimanova O.V. The concept of University 3.0: perspective realizations in Russia and new technological revolutions. // *Lichnost v menyayushchemsya mire: zdorove, adaptatsiya, razvitiye: setevoyurn.* 2019. T. 7. No. 2 (25)

^[13]University 3.0: formation of new markets and talents. June 2017. – URL: <http://www.tohim.ru/vishee/7563-university-30-formirovanie-novyh-rynkov-i-ohota-za-talent.html>

^[14]Vasetskaya N.O. Functional university and economic science. // *Business. Education Pravo* 2019. No. 2 (47). S. 86-89

^[15]of 2023 the first in half the most many p income and harm saw higher education institutions known done // URL: <https://m.kun.uz/news/2023/08/04/higher-education-institutions-known-in-the-first-half-of-2023-the-most-income-and-losses-done?q=%2Fuz%2Fnews%2F2023%2F08%2F04%2F2023-higher-educational-institutions-with-the-highest-income-and-loss-in-the-first-half-of-2023-year>

revenues).

receipts for training based on a fee-contract (71.6 percent); income from development funds (3.4 percent) ^[16].

According to the statistical materials published in the first half of 2023 by the Ministry of Higher Education, Science and Innovation, according to the information provided by the Ministry of Higher Education, Science and Innovation about the income and expenses of 70 state universities in the republic during the first six months of 2023, state higher education institutions total income - 4 trillion 501 billion 238 million soums, and expenses - 5 trillion 86 billion 667 million soums.

From this

From the budget (29.4 percent of total revenues); payment - receipts for training on the basis of a contract (67.5 percent); Income from ^[17] development funds (3.1 percent).

These statistical indicators show that there is a lot of work to be done to advance the concept of "University 3.0".

At this point, it is worth emphasizing the organization of intellectual property management in "Asian Tigers". Korea Institute of Advanced Technology (KAIST) ranks first among innovative universities in the Asian region based on the analysis of the number and quality of scientific publications and patents. Since the university was founded with the financial support of the United States of America, the scope of research works is similar to the "entrepreneurial university" model. The rating results show a successful combination of Eastern culture and the Western model of business organization.

In addition, in foreign practice, the "cluster" approach is very popular in the implementation of research development programs with the participation of universities. The use of clusters makes it possible to partially solve the material and technical issues of conducting scientific research in universities. In local practice, such an approach is reasonable, but the weak resource base of scientific research companies is an obstacle to the implementation of this model, which may be due to the lack of resources allocated to this type of activity in small and medium-sized businesses.

In general, it can be said that in recent years, important steps have been taken towards the creation of legal bases for the commercialization of intellectual property objects belonging to universities and scientific research institutions in Uzbekistan.

According to Article 51, Part 2 of the new version of the Constitution of the Republic of Uzbekistan, which was adopted by popular vote in the referendum of the Republic of Uzbekistan held on April 30, 2023, higher education organizations, in accordance with the law, have academic freedom, self- it was established that they have the right to freedom of administration, research and teaching.

This does not open the way for the commercialization of intellectual property objects of these organizations.

The decision of the President "On additional measures to increase the effectiveness of the commercialization of the

results of scientific and scientific and technical activities" established that from October 1, 2018, additional one-time awards will be introduced for the following.

To authors of patented intellectual property objects in the amount of ten times the minimum salary from the extra-budgetary funds of the institution.

To the authors and the scientific team involved in the development and commercialization of the results of scientific and scientific and technical activities in the amount of 40 and 30 percent, respectively, of the funds coming to the account of the institution from their commercialization.

As a result, in 2018-2022, a total of 1,115.63 mln. soum one-time premiums have been paid.

This proves that the research triangle model is working as a mechanism for encouraging the author of inventions by the state.

of the Republic of Uzbekistan for 2022-2026, approved by the Decree of the President of the Republic of Uzbekistan No. PF-165 of July 6, 2022, measures to increase the quality of scientific research activity and ensure the effectiveness of its commercialization .

In addition, by the decision of the President of the Republic of Uzbekistan No. PQ-221 of April 26, 2022, the strategy for the development of the field of intellectual property in the Republic of Uzbekistan in 2022-2026 was approved. In this strategy, there are many tasks, in particular, for students of higher education organizations (light industry, pharmaceuticals, agriculture and other areas) in order to ensure a seamless connection between education and practice, the Ministry of Justice the tasks of introducing the internship procedure at the state institution "Intellectual Property Center" under

Attention is paid to the fulfillment of these tasks at the state level. In particular, on May 6, 2022, at the meeting on the mobilization of new reserves in the field of electrical engineering, held in the presence of the President of the Republic of Uzbekistan, the President objected to the indicators achieved in the field of electrical engineering, and in the Development Program until 2026, electrical engineering products he emphasized that it is aimed to increase the production volume by 2 times and export by 3 times, that the volume of copper production will increase by 2 times in the coming years, that it is necessary to deeply process it in-house, and to export competitive finished products. For this purpose, the President pointed out the need to establish an industrial cluster, which includes a complete chain of ^[18] "education-innovation-production-service".

From the above-mentioned models, it can be concluded that the universities of Uzbekistan are proceeding mainly from the research triangle model of commercialization. At the same time, some elements of the free agency model are emerging.

Judging from the above models, the following are the most effective forms of commercialization of intellectual property objects in higher education institutions:

1. Fulfillment of an order under a contract (a state or

^[16]In 2022, higher education institutions with the most income and losses were announced // URL: <https://kun.uz/97737539?q=%2Fuz%2F97737539>

^[17]Information on income and expenses of state higher education institutions as of January 1, 2023 (year 2022) // URL: <https://edu.uz/media/53f956aa-be00-124a-3f8f-90a6fbd8bdf.pdf>

^[18]New tasks have been set in the electrical engineering network // URL: https://kun.uz/kr/news/2022/05/06/new_tasks_in_the_field_of_electrical_engineering_have_been_set?q=%2Fnews%2F2022%2F05%2F06%2F In the field of electrical engineering, new tasks have been set #!

- municipal order contract for state and municipal needs and contracts for the performance of scientific research, experimental design and technological work, including contracts for the alienation of rights).
2. Licensing and transfer of rights.
 3. Establishment of small innovative enterprises (from 2022, 17 specialized in the production of scientific and innovative products (goods and services) in Uzbekistan, operating in the fields of agriculture, food industry, construction, health care, automotive industry it is determined that new innovative (spin-off) enterprises will be launched).
 4. Industrial cooperation as a simple partnership (establishment of clusters).
 5. Engineering (organization of engineering centers).

As a general conclusion, a number of points can be expressed.

In particular, in addition to licensing the results of patented research, there are several other methods of technology transfer, each of which has its own requirements from the point of view of intellectual property rights management. Such methods include startups by university staff, industry-sponsored research, consultations, publications and presentations, as well as direct support of local and regional innovation through technology (science) parks and business incubators. In addition to generating income for the university, the need for technology transfer activities is very high, as such activities provide sufficient grounds for innovation to "swim" into the local economy by stimulating new scientific developments (R&D) and the creation of additional jobs at the university^[19].

In this case, the experience of European countries can be useful for the economy of Uzbekistan. The attractiveness of the form of commercialization of these countries is that new enterprises (start-up companies) can be established in them with the participation of scientific institutions and direct researchers (authors of inventions, industrial samples and other intellectual property objects). In this regard, the legislation provides scientific institutions and researchers with such rights as a participant (founder) in the authorized capital of such companies, becoming its shareholder, participating in the company's management, administrative or supervisory board (Ireland, Germany, Netherlands, France).

We may also be analyzing a wide variety of higher education institutions with different strengths and weaknesses, values, organizational cultures, different goals, and different business models derived from their predecessors. This, in turn, may be due to the fact that intellectual property management differs significantly from one university to another (eg a technical university versus a law university), so there is no universal intellectual property commercialization model or strategy for universities. Instead, the strategy should be "tailored" based on the business model and other local characteristics of the particular institution. However, it is important for universities to find new individual ways of financing their activities, build their brands, expand and deepen their

^[19] Siegel, DS, R. Veugelers and M. Wright, 2007, Technology Transfer Offices and Commercialization of University Intellectual Property: Performance and Policy Implications, *Oxford Review of Economic Policy* 23(4): 640-660.

networks by building trust, change their old-fashioned attitudes about "traditional universities", and their close ties with the business sector. conducting, maintaining competitive advantages and turning into "entrepreneurial universities" means the responsibility and at the same time^[20].

In short, the intellectual property strategy and the knowledge transfer strategy should be fully aligned with the University's mission. Most research universities in leading economies have established their own technology and knowledge transfer offices over the past decade. These offices serve as mediators between suppliers of inventions (university scientists) and entrepreneurs who can successfully commercialize innovations (business angels, venture capitalists)^[21].

At the same time, in the experience of Uzbekistan, clear and uniform mechanisms of commercialization of intellectual property belonging to universities and scientific research institutes have not been established. This is especially important for the results of intellectual activity created at the expense of state funds. For this reason, it is appropriate to adopt the documents regulating this field. This can be done according to the American experience, as defined in the Bayh-Dole Act of 1980, or according to the experience of Belarus, where the legal system is relatively close^[22].

Adoption of these documents should be aimed at creating a favorable environment for the development of mutually beneficial cooperation between the state and the private sector, creating an effective mechanism for encouraging inventors (authors), and establishing organizational and legal issues for the establishment of independent technology transfer centers.

It is also desirable to require each higher education or research institution to adopt its own intellectual property policy documents. Based on the model regulation of the World Intellectual Property Organization (WIPO) on intellectual property policy for universities and scientific research institutions and the guidelines for its adaptation, a model adapted for Uzbekistan in cooperation with the World Intellectual Property Organization it is appropriate to develop a regulation. This regulation is significant in that it clearly defines the boundaries of the legal relations of the participants of the intellectual property relations of the University (research institution), and the procedure for the distribution of income from them.

Conclusion

The research highlights the importance of effectively commercializing intellectual property (IP) generated by universities and scientific research institutions in Uzbekistan. Drawing on international experiences, particularly from the United States and European countries,

^[20]Sapir A, & Oliver AL 2017 From academic laboratory to the market: Disclosed and undisclosed narratives of commercialization *Social Studies of Science* 47(1) 33–52

^[21]A business angel is a natural person who owns shares and shares of a start-up in exchange for investing in high-risk start-up projects, as well as providing financial support to a start-up and providing organizational support to it.

^[22] By the decree of the President of the Republic of Belarus No. 240 of June 18, 2018, the regulation "On the commercialization of the results of scientific and scientific and technical activities created at the expense of state funds" was approved // URL: <https://pravo.by/document/?guid=3871&p0=P31300059>

several models and strategies have been analyzed to improve Uzbekistan's legislative framework and practical approaches.

Key Findings

1. Current State and Gaps

- Uzbekistan lacks clear and uniform mechanisms for the commercialization of university IP, especially for research funded by state resources.
- There is a need to adopt comprehensive regulatory documents akin to the Bayh-Dole Act in the US or relevant Belarusian laws to streamline the commercialization process.

2. Effective Models of Commercialization

- **Research Triangle Model:** Predominantly followed by Uzbek universities, which integrates research, education, and commercialization.
- **Free Agency Model:** Although emerging, it is less common but encourages individual researchers to negotiate their licensing deals, returning a portion of the income to the university.
- **Volume Models:** These focus on bringing innovations to the market quickly, rather than maximizing revenue from patents.

3. Best Practices

- **US Universities:** Institutions like MIT and the University of California have successfully implemented models where faculty members actively participate in startups and technology transfer activities.
- **European Approach:** Emphasizes creating startup companies with direct involvement from researchers, allowing them to participate in the management and equity of these ventures.

4. Recommendations

- **Adopt Comprehensive Legislation:** Introduce laws that establish a clear framework for IP commercialization, incentivize researchers, and encourage public-private partnerships.
- **Develop Institutional Policies:** Each university or research institution should have its own IP policy, potentially modeled on WIPO guidelines, to clearly define the roles and revenue-sharing mechanisms among stakeholders.
- **Promote Entrepreneurial Ecosystems:** Encourage universities to transition towards the "University 3.0" model, integrating education, research, and commercialization to drive economic and technological advancements.

By adopting these recommendations, Uzbekistan can create a more favorable environment for the commercialization of intellectual property, fostering innovation and economic growth through enhanced cooperation between academic institutions, the state, and the private sector.

This comprehensive approach aligns with the overarching goal of transforming universities into entrepreneurial hubs that not only generate knowledge but also actively contribute to the commercialization and practical application of research outcomes.

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