KAMRAN IMANOV

Knowledge and Technologies + Investments and Intellectual Property = Ecosystem of Human Capital of Universities and Industry (from the experience of adaptation of the WIPO's Model Intellectual Property Policy for Universities and Research Institutions)

Baku – 2018

Kamran Imanov,

Chairman of Board of the Intellectual Property Agency of the Republic of Azerbaijan.

Knowledge and Technologies + Investments and Intellectual Property = Ecosystem of Human Capital of Universities and Industry (from the experience of adaptation of the WIPO's Model Intellectual Property Policy for Universities and Research Institutions). Baku, 2018

This book was prepared on the base of welcome speech and presentation on "Knowledge and Technology + Investments and Intellectual property = Ecosystem of Human Capital of the Universities and Industry" (from the experience of adaptation of the WIPO's Model Intellectual Property Policy for Universities and Research Institutions)" of Kamran Imanov, Chairman of Board of the Intellectual Property Agency of the Republic of Azerbaijan presented at the international seminar "Intellectual property policy at the Universities and research institutions" held by the Copyright Agency jointly with the Ministry of Education and the State Committee on Standardization, Metrology and Patent of the Republic of Azerbaijan, and World Intellectual Property Organization on 29-30 June 2017.

CONTENTS

Knowledge and Technologies + Investments and Intellectual Property = Ecosystem of Human Capital of Universities and Industry

(from the experience of adaptation of the WIPO's Model Intellectual Property Policy for Universities and Research Institutions)

Welcome Speech

Dear friends, ladies and gentlemen!

I welcome everybody and wish luck to the participants of international seminar "Intellectual Property policy at Universities and research institutions" which has become a tradition. I direct my special greetings to the foreign guests and WIPO officials.

This seminar organized by three state structure of Azerbaijan – Copyright Agency, Ministry of Education and State Committee on Standardization, Metrology and Patent with support of WIPO has great importance and due to its actuality it is related with adequate response search of our knowledge society to the new and innovative challenges which our country faced. Noting becoming a tradition to hold the conferences in this directions, at present it is expected to conclude a great cooperation agreement on issues with WIPO.

As you know, wide issues are carried out for the purpose of increasing the efficiency of scientific-research results and quicken its application and it is undeniable fact that support of intellectual property policy in these issues have been become foreground. WIPO's materials and the Agency's presentation have been published as booklets in seminar "Intellectual property policies at the Universities and research institutions" held by WIPO with

Azerbaijan in June 2016, and have been distributed to interested organizations. In the result of WIPO support and initiative of leadership of the Ministry of Education the opinion of holding new wide conference on this topic has been created and a special Agreement document has been prepared by supporting of Mr. Francis Gurry, Director General of WIPO to the strengthening of cooperation. WIPO's methodical documents have been translated by the Copyright Agency and new brochures of the Agency have been published and presented to the participants of the conference held in November 2016. New methodical documents have also been added today's seminar and a particular database which increases IP knowledge on application and commercialization of scientific researches is creating. An educational base and relevant educational courses are ready in the Agency, also famous specialists, invited by WIPO are ready to give advice to scientific institutions and to exchange their knowledge. And finally, Science Development Foundation under the President of the Republic of Azerbaijan has joined to the issue on increasing of science efficiency. All these steps build particular confidence to carry out these duties properly.

Emphasizing the importance of the event I would like to stop on four important factors related to this topic.

Firstly – influence of economic reforms of Azerbaijan and execution of new duties; secondly – wide transformation process at leader universities of the world; thirdly – changed role of IP and efficiency and fourthly – our scientific resources and capacities which wait for their use.

Dear participations of the conference!

I have to note especially that the root of the issue is in the new economic policy executed by the head of the

state, in serving of implemented works to this policy, in strengthening of place of scientific and educational institutions in innovative development and in giving decent contributions.

Azerbaijan providing sustainable development in the background of the crises happening in the world has been ranked to the 37th place in the World Economic Forum's Global Competitiveness Index and at present successfully goes to the stage of economic reforms for the purpose of preventing negative tendencies by the initiative of the head of state.

Since Azerbaijan enters into the important branch of new economic policy – **innovative development.** Innovative development is an ecosystem of human capital that created by knowledge and technologies, investments and intellectual property. For gaining the crop of this ecosystem from one side the state held and is holding several important events, including lending the investment projects on favorable terms, financing with state and sharing of risks, simplifying the administrative procedures connected with business, state support to those who carry out the efficient activity, application of tax and border exemptions, granting the subsidies.

As President Mr. Ilham Aliyev said in his speech during official reception on the occasion of the 28 May – Republic Day, "Azerbaijan economy has been adapted to the existed situation, our national currency has been stabilized, non-oil export is increasing. The economic index of four months is more positive…"

These economic motives are the factors with first importance that intellectual property policy and commercialization and transfer of technologies should be brought to forefront at the Universities and scientific organizations.

The second factor is connected with radical transformations in higher education and scientific system of economically developed countries. Their essence is decisive role of the universities in innovative development and economic growth. It means change of social-economic functions of the universities: along with traditional educational and scientific missions, it is creation of economical activeness sphere which quickly develops. Preparation and transfer of technologies, commercialization and bringing to the market of the products of academic science, creation of new business, and the finally administration of IP for the purpose of obtaining income include to this frame.

The universities become to the corporative subjects in knowledge-based economy, they have obtained name of “University 3.0” and it consider number of missions of logical university of informed metaphor in their names like number: 1.0 - only education, 2.0 – education and researches, 3.0 – education, researches and commercialization of knowledge.

At present, more than 80% of formalization of major leader industrial fields are connected with innovations discovered at universities. In modern time, transferring from business-incubator models as a Silicon Valley to distributed partnership schemes which play decisive role at university has been observed here. However, in Europe within the framework of “excellent networks” conception the scientific environment of universities is changed to network structures in global level and strong sides of every participant is used here.

An evolution of Universities 3.0 is a serious social and economic problem for Azerbaijan. Because, today such kind of universities must play leader role in modernizing of society and

transformation to knowledge economy, universities must be changed to active factors of economic reforms held by initiative of the President.

The third important factor is connected with changed role of IP in modern knowledge society.

New context of IP has changed it to the dominant of economy based on knowledge, the important tool of digital society and provider of safety of cultural heritage. Analyses show that a creation center of wealth is directed material assets, capitals to non-material assets, intellectual capitals during recent decades. Therefore, competitive focus is changed, the vector of investment flow is directed to IP. Thus, in 80th years of last century the share of non-material assets (especially assets protected by IP) in microeconomic level was 5%, at present this number increased to 80% in corporations included in "S&P500" stock market index. **Changes in microeconomic level** leads that the spheres on IP has reached to the half of GDP in developed countries. U.S.Chamber International IP Index "The Roots of Innovation", published in February in 2017, confirmed a positive influence of IP to the economy.

According to the report of the Word Bank (2012), Azerbaijan takes 79th place among 146 countries for Knowledge Economy Index (KEI&KI Indexes, 2012) which's top is intellectual property.

Share of knowledge economy in GDP is in overage of 8% in Azerbaijan (especially "on account of creative economy: 5.1%"), 15% in Russia, 35% in developed countries of Europe, 45% in USA. 31 start-ups were registered in Azerbaijan in global start-ups map (www.startupblink.com) by the middle of 2016 (for comparison 972 in Russia, 33797 in USA). Changed

influence environment of IP requires changing of our thoughts regarding to IP and its role.

The fourth important role is our resources expecting use of created infrastructure and scientific capacity!

Dear friends!

Azerbaijan was in the 85th place in Global Innovation Index QII-2016, was the 82nd place in 2017. **If we take away some contradictions connected with a place of Azerbaijan and incompatibility coming from the report, it is clear that we have great resources that we must work. In case of ranking 81st place in Innovation Input Sub-Index in 2016 (78th place in 2017), relevantly the result of 13 and 12 stairs down – 94th (89th) place is observed in Innovation Output Sub-Index, so it is a sign of enough resources for realization of innovative capacity.**

At the same time, if "results of creative activity" block of "innovative results" sub index is in 87th place taking into consideration of statistical variations, a weaker result – 101st place in 2016, 104th place in 2017 is shown in "results in the "Knowledge & technology outputs" block that this extends the deficiency of use effectiveness of innovative capacity.

Besides this, institutions block was in the 76th place in 2016 and in the 74th place in 2017 in sub index "innovative resources", results on "knowledge & technology outputs" was in the 101st place in 2016, in the 104th place in 2017.

As it is seen, there is a difference between innovative opportunities and innovative results that we use created by state.

We must note that either choosing the protection like IP or commercialization model of technology is weakly used at the Universities of Azerbaijan, almost it is at the

beginning level. Nevertheless, our country has rich scientific and educational capacity and it is proved by figures. Therefore, according to the Research & development (R&D) in Global Innovation Index (2016 and 2017) Azerbaijan is in the 69th and the 70th place in the world.

If we look through the other important reports – World Economic Forum's Global Competitiveness Index for 2016 and 2017 we see that Azerbaijan is in the 1st place in CIS (49th place in the world) for innovative basis index, especially because of **"innovative opportunities"** are higher: the 42nd place in the world. Except this, we have scientific activity opportunities, because Azerbaijan takes the 68th place for "quality of research institutions" index. And taking the 68th - 73rd places in the world for IP protection it is in leader trio in CIS. According to the reports of QII-2016 and QII-2017 Azerbaijan takes 94th and 99th places for "PCT patent applications". It is doubtless that our wish is increasing patents and objects of intellectual property. But slogan must be changed: "There are many patents, there is not income" slogan must become invalid.

Naturally, commercialization of technologies is bilateral way between universities and industry. There are serious duties in front of the industry. Thus, the sub index "protection of investors" of Azerbaijan was in the 36th place in the report of the World Economic Forum (2016-2017), "attractiveness of investments" index (venture and special capital) was in the 104th place among 125 countries.

Dear colleagues!

We do not have to overlook the world tendencies. Analyses for World Bank show that our graduates belong to medium level and class, their growth exceeds the job

growth and income of those who belong to this section is increased. So, within the framework of these proposals there is need on programs directed to business activity at universities, establishment of student companies is very necessary.

Except this, the analysis carried among 20% of universities and 22% of businessmen included in VIP list of Global University Venturing (GUV) show that corporations and firms incline cooperation with universities being open for business and ready for business activity.

We have many opportunities, “University 3.0” will be formed in Azerbaijan. **I am sure that certain steps taken should accelerate this process.**

Firstly, In accordance with the Law “on Science”, universities and research institutes have been transformed into a legal entity of public law, their Charters have been approved by Mr. President, and these institutions have become intellectual property holders.

their statutes are approved by Mr. President (Baku Engineering Academy, Baku State University, Azerbaijan State University of Economics and Azerbaijan University of Languages under the Ministry of Education of the Republic of Azerbaijan) and thus higher schools become intellectual property owners.

Secondly, according to the Orders of President Ilham Aliyev dated July 13, 2016 and June 2, 2017, a number of steps related to the transfer and commercialization of technologies, as well as creation of centers for commercialization of technologies are intended within the framework of the Action Plan to increase the business climate in the Republic of Azerbaijan and to further improve the position of our country in international ratings.

Thirdly, as a result of subsequent steps taken by the Ministry of Education and ANAS, Azerbaijani universities have improved their positions in the Thomson Reuters and h-indexes in recent years, even our “Applied and Computational Mathematics” journal is the leader of the Thomson Reuter system among the CIS countries.

Fourthly, the Ministry of Education, the Copyright Agency, the State Committee for Standardization, Metrology and Patents, the Science Development Foundation and the WIPO will sign Memorandum of Understanding on the joint implementation of the "IP Policy in Universities". Today the third international conference is held in this direction, a number of methodological documents and brochures were prepared, distributed and disseminated, and a roadmap for this commercial conference was demonstrated. The results have already started to appear: start-ups, incubators, commercialization centers are created, start-up competitions are held, start-up festivals are organized in leading universities, a techno park started working in ANAS, etc.

Based on the statement of Mr. President Ilham Aliyev "... our sustainable development in the economy, a knowledge-based society and investing in human capital are our main strategic goals for the near future," I hope that we will make every effort to make a worthy contribution.

I wish you success!

”The true sign of intelligence is not knowledge but imagination”
(Albert Einstein)

I. Introduction

Based on Einstein's thought, we need to see "the key notion of intellect in human imagination, not in knowledge". In the competition of human imagination and creative ideas (as well as knowledge), universities and research institutes play a special role in developing and sustaining ideas.

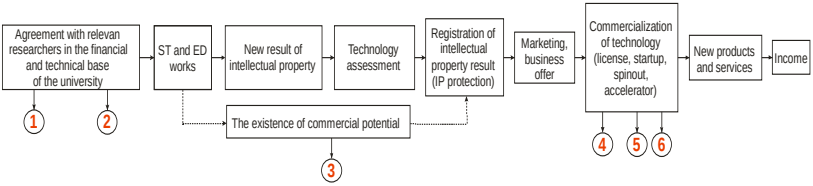
1. Before the presentation of the thesis of my speech I would like to draw your attention to a footnote.

Firstly, I believe that the participants (Azerbaijani experts) are familiar with WIPO's methodological guide "Intellectual Property Policy in Universities and Research Institutions", translated and distributed by the Agency, and two methodological materials distributed at an international symposium jointly held with WIPO.

Secondly, it is necessary to take into account that the mandatory and necessary steps for the formation of IP policy by universities (U) and research institutes (hereinafter - universities) are the legal and correct choice of the right holder and the status of the right holder. For this reason, the corresponding agreement (the form is given in the above-mentioned methodological documentation) with the researcher (teacher, researcher, graduate student, master, student) of each research conducted on the basis of the material and technical base of the university should indicate that **the rights holders of the scientific results (SR) obtained are universities** (except for scientific articles).

Thirdly, the rules for the distribution of income derived from this Agreement should also be reflected, the division between the author (researcher), the university and the faculty of the university, as well as the recommendations are as follows: 10% to the author and 30% to the universities to pay for administrative costs, 50% of the rest of net income should be in favor of the author, and 50% in favor of universities, and 85% of the 50% share of the university should be directed to the faculty, and the remaining 15% should focus on the future IP development.

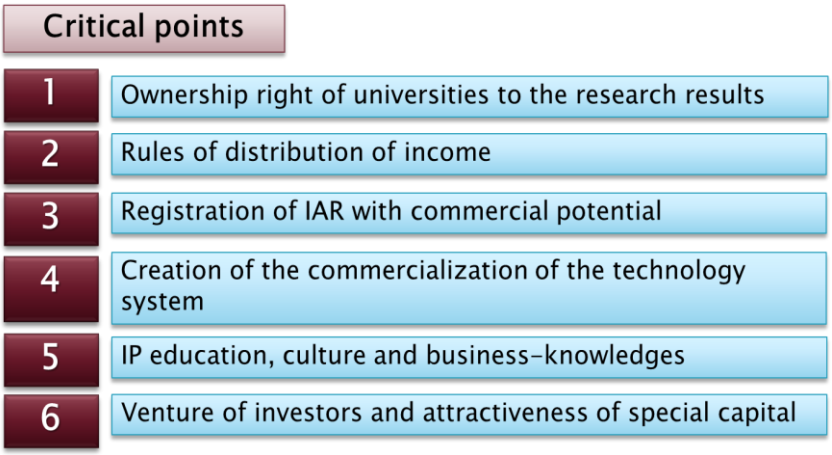
2. As the name of the presentation implies, the key concepts in the creation of the human capital ecosystem of universities and industry are "knowledge", "technology", "investment" and "IP". An analysis of WIPO's best international practices and methodological recommendations will allow the “University-Industry” to develop an agreed scheme of cooperation, and our proposals will be based on this scheme



The scheme we represent is characteristic and must be owned by variability and dexterity. Nevertheless, let us examine these six (6) critical and crisis points, and examine them in detail.

II. “University-Industry” critical points in the creation of human capital

1. The critical points mentioned in the generalized scheme are as follows:



Due to the principled character of paragraphs 1 and 2, we give them a special place in the "Introduction" section. The fact is that the transformation of the intellectual activity results into IP and its subsequent commercialization, without being affiliated with the legitimate property of the university, is spontaneous, and it is in the hands of researchers. On the other hand, the stimulation of research and the promotion of searches remain unchanged when there are no rules for distributing pre-income and / or not distributed posts. Experience shows that if these problems are not resolved, the chances of success will be reduced and even violated.

2. The critical point in the registration of the intellectual activity results - IAR (patent, know-how, copyright, etc.) also plays an important role. Experience of world leading universities shows that, when the SR and R&D activities end with the new IAR, information about that result is delivered to the University's Technology Commercialization Office (TCO) (a special form is filled) and the new technology underwriting here is evaluated. If the examination shows that the IAR is not a commercial potential, it will be sent for recycling or will be rejected.

Therefore, only commercially effective results are selected and the experts decide which form of IP is more favorable (for example, whether a patent application should be filed (for example, patent registration is a very expensive operation in Western countries).

However, along with the form of IP protection, TCO also selected for the optimal technology commercialization model.

3. Attention! The choice of IAR and the technology commercialization model is as important as the next step and it is the fourth critical point.

As the fact that the TCO has been given information about the research and its market capabilities and the feasibility of obtaining a patent, as I have noted, the following base variants occur: a license of technology to an existing, operational and applicable company; assignment of a business entity to a new company (start-up, spin-out); search for similar technologies by other universities to obtain better products and to account for their combination in the future.

- Let's say that it's more convenient for a new company to provide an IP object. In such circumstances there is

a question of creation of spin-out company or start-up. Spin-out is a company that is separated from the main university and carries out its independent business. Start-up is also a newly established company, and in a broader sense it is a place for an enterprise and consists of more students.

Typically, start-ups refer to scientific spin-outs. But there are differences. Thus, spin-out differs from a traditional or student start-up, so that the main university has a share of spin-out's own capital (for example, patents, etc.).

According to US researchers, spin-outs are more stable, durable than start-ups. But it would be expedient to see their problems even when they were created.

Firstly, the technologies that spin-out companies using are usually risky and require additional processing, and transition from conception to functional business forces them to overcome the "dead valley", i.e. the lack of funding from outside (university or investor risk) often kills the invention.

Secondly, it is the problem of forming of spin-out team and choice of a leader. Practice shows that business people want to see a reliable, experienced, competent and reliable partner who is not the scientific leader in the management of spin-out.

- The main alternative to Spin-out companies is the licensing of the university to the existing company. Depending on the technology and the necessary partner, the license agreement may be promising for the university, since the initial cost is small, and no complicated problems facing the spin-out are required. Even if the Agreement is terminated, the University's right to grant royalties during the validity or renewal of the patent remains in effect.

At the same time, the license agreement deprives universities of profits from spin-outs and in addition negatively affects to jobs. As I mentioned, the royalty distribution has several options, but the general guideline is that the distribution should be made between the author, the university, and the faculty.

Thus, the experience of leading universities in the world shows that the use of the license is more advantageous, i.e., to an existing company with a commercial interest through a license, if the IP object is out of researcher's scope or there is pressure to earn early capital investment.

Creation of the spin-out company is considered more relevant if the researcher is in the process of being able to participate in the next process or whether the prohibition is long-term.

Moreover, the **license agreement is more beneficial** when the market segment is small or not attractive, and if the IP object is not so profitable

Technology itself plays an important role in licensing or spin-out (start-up) selection. Thus, the licensee is complicated if the information about the technology is missing or not properly prepared. **When the information is complete, creation of spin-out is the most affordable option.**

Consequently, the key role is related to economic factors: is there a viable economic model and which ways does bring more income to the university. Let's also focus on one important point:

- As an important tool to attract the attention of licensed companies, the university has an open, easy accessibility environment to its own IP. It looks like the Open Door Day for some of the universities, which is a great experience for university entrants. The University

offers opportunities through its portal to provide scientific research and access to the IP, while the potential licensing is their proposal, but on important terms for a particular university, approval of licensing as a source of IP and submitting an annual report as a licensor, the term of validity of the license in case of non-use of the IP for a year. In addition, the licensee must agree that the university has the right to use the IP in its scientific research without any restrictions.

Another form, mechanism of easy accessibility is called “innovation commitment”. In order to communicate with anyone looking for a solution, universities and companies place their own innovation profiles on a special portal (mutual portals are linked to innovations), i.e. inventions can be "ordered" to eliminate barriers in activities of companies (corporations).

- The next mechanism of providing maximum return from universities’ technology is the university's cooperation with other institutions and corporations. Collaboration is implemented through the University's spinouts (For example, Fraunhofer Institute (Germany), Auckland University (New Zealand), “Skolkovo” Innovation Center (Russia) has established corporate relationships with Microsoft and Intel with the use of the Russian scientific-research base has partnered with the Cambridge and Harvard Universities, the Massachusetts Institute of Technology, and has established a venture fund with the Chinese Cybernaut Investment Group; cooperates between Israel's Tel Aviv University and China's Tsinxua University).

After several introductory words, let's get acquainted with the situation in Azerbaijan.

4. The share of knowledge-based economy in Azerbaijan's GDP is around 8% (mainly due to "creative economy: 5.1 %"), 15% in Russia, 35% in developed countries of Europe, 45% in US. 31 startups were recorded in the global startup map (www.startupblink.com) for the middle of 2016 in Azerbaijan (972 in Russia, 33797 in the United States).

Azerbaijan is ranked 85th in the Global Innovation Index (GII-2016) and 82nd in 2017. **If we put aside a number of contradictions regarding the rank of Azerbaijan and the discrepancies in the report, it is clear that we have huge resources. The point is that while the "innovation resources" sub-index (innovation system access) is 81st in 2016(78th in 2017), the sub-index of "innovation results" is 13 and 12 ranks lower respectively (94th and 89th), which is an indicator of the inadequate performance of innovative activity and innovation potential.**

At the same time, if the "innovation results" sub-index of the "creative (creative) activity" block is on the 87th, taking into account statistical variations, weak results on the "results in the field of knowledge and technology" block (101th place in 2016 and 104th place in 2017) point to the lack of efficiency of innovation capacity utilization.

Besides this, institutions block was in the 76th place in 2016 and in the 74th place in 2017 in sub index “innovative resources”, results on “knowledge &

technology outputs" was in the 101st place in 2016, in the 104th place in 2017.

As it is seen, there is a difference between innovative opportunities and innovative results that we use created by state.

We must note that either choosing the protection like IP or commercialization model of technology is weakly used at the Universities of Azerbaijan, almost it is at the beginning level. Nevertheless, our country has rich scientific and educational capacity and it is proved by figures. Therefore, according to the Research & development (R&D) in Global Innovation Index (2016 and 2017) Azerbaijan is in the 69th and the 70th place in the world.

If we look through the other important reports – World Economic Forum's Global Competitiveness Index for 2016 and 2017 we see that Azerbaijan is in the 1st place in CIS (49th place in the world) for innovative basis index, especially because of **"innovative opportunities"** are higher: the 42nd place in the world. Except this, we have scientific activity opportunities, because Azerbaijan takes the 68th place for "quality of research institutions" index. And taking the 68th - 73rd places in the world for IP protection it is in leader trio in CIS. According to the reports of QII-2016 and QII-2017 Azerbaijan takes 94th and 99th places for "PCT patent applications".

Looking at the earlier results, we see that according to the Global Innovation Index (2014), Azerbaijan is ranked 4th in CIS region, after Russia, Kazakhstan and

Ukraine (53th in the world) for the quality of education. Azerbaijan ranks 4th in that ranking on university researches (81st place in the world). But, on patent applications, it is only 6th place (89th place in the world).

If we look at the World Economic Forum's Global Competitiveness Index 2014-2015, 2016-2017, we see that Azerbaijan is the 1st in the CIS (49th place in the world), moreover is 68-73rd on protection of IP results in world, it occupies the third place in the top three in the CIS region. However, when we get acquainted with the report of the WIPO (2013), we face the next controversy. Thus, according to the PCT applications, Azerbaijan takes only the 8th place in the CIS region and the fourth place according to the Eurasian applications. So, we have the opportunity and resources and they should be used.

5. Analysis of SR and TCO, technology commercialization and new IAR registration (patents, etc.) in leading foreign and Azerbaijani universities leads to the following conclusions:

Goals	Foreign leading universities	Azerbaijani universities
Purpose of SR and TCI	Commercialization; knowledge and technology applied for the benefit of the economy and society; Evaluating the success of scientific activity not from quantitative but qualitative perspectives	Patents and articles (in general) are only for the purpose of fulfilling contractual obligations; the criterion of research success is measured by

		the number of registered patents and published articles (quality and application are ignored)
Purpose of technology commercialization	The focus is on achieving revenue and ensuring the accessibility of new technologies in the market; commercialization is financed and is viewed as an investment in society's favor	There is no clear understanding; In most cases, commercialization is just imagined as a tool to make a profit
Purpose of IAR registration (patents etc.)	Enforcement (protection, safeguarding) of the invention (new technology) is conducted in terms of commercialization and practical application; "thoughtful patenting", strong protection of IP and strong commercial potential	Patents and other IP are primarily viewed as commitments for the use of dissertation and state contracts and are directed to statistical reports of universities – «formal patenting»; weak protection of IP and low level commercial potential

III. Commercialization models and licensing agreement

1. Let's take a look at the first two of the basic models of technology commercialization:

- a license agreement with companies that are already available and prone to application;
- creation of start-up (spin-out) based on the use of the university's IP.

In both cases, the Licensing Agreement is required to be signed: this Agreement is concluded on the basis of existing or licensed technology

What is the essence of the agreement?

Under the agreement, the licensee (licensing company) must pay to the licensor (university) a certain amount of author's award – royalty. If the License Agreement is signed by a new start-up, which is unable to pay such royalties, so the university may be co-owner of that company. It is obvious that creating start-up on the base of university has certain advantages: administrative and advisory support of the university, attraction of capital and accessibility of the university's scientific resources. The success of a university-based start-up depends on the organizational and technological entrepreneurship talent of the inventor, on the other hand, the innovation ecosystem of the region, the flexibility of the university, its intellectual potential, and other factors. For example, in accordance with the practice in the United States, license agreements are usually signed by a licensor familiar with the inventor (professor).

Following the signing of the License Agreement, TCO conducts and monitors it.

A few interesting points would be worth paying attention:

- ✓ The licensing agreement for technology commercialization differs in the case of exclusive or non-exclusive license, for patented or non-patentable cases, but the terms are standardized, except for financial terms for each type;
- ✓ it is necessary that licenses be issued to licensors on a non-exclusive basis or that a limited framework be applied, as long as there is a high level of accessibility to the technologies;
- ✓ The possibility of using the universities licensed technology for non-commercial purposes (use in educational and scientific research, etc.)**.**

2. As the TCO mentioned above plays an important role, its various forms of action should be based on:

First, the most widespread form of TCO is the small (2 members) department of the university. Usually, this department is created within the middle-class universities, neither fund nor incubator nor directive services.

The advantage of the department is the ease of setting up, but departments can not effectively assist in the transfer of technology.

Secondly, TCO acts as an integrated unit. Here are some additional features (corporate communications, technology licensing, etc.). This model has the most durable and highest rating (eg: Massachusetts Institute of Technology).

Thirdly, the innovation department: here is a comprehensive use of innovation services, and the overall innovation strategy is under control. The difference from the integrated division is that this department (UCL Enterprise) operates separately from its research office and has a special pro-rector at the forefront (For example, University College London -

Department is leaded by a Vice-Rector in the UCL, has its own financial department, technology commercialization controlled, supervision of student venture companies, training of employees, business support, etc.).

Fourth, the structure of commercialization of its own business-driven technologies. In fact, the department-company mentioned in Figure 3 leaves the parent-university, gaining appropriate autonomy. Even though the general brand is at a parent university, this structure is more freely exercising commercial strategies (eg, Isis Innovation at Oxford University).

Fifthly, partly owned businesses mean that the transfer of the technology of the mother-university is carried out through a special structure, but this structure is managed by another university, and the parent has a 20% share (eg, Imperial Innovations of London's Imperial College).

Sixth, the technology transfer technology can also be an independent organization that works with a parent university (For example, Kardirf and Sheffield has delegated this activity to another British company, Fusion IP), or regional transfer companies (for example, France).

3. The following notes would also be:

First, the registration of patents in Azerbaijan is not so much, but at least we are in the middle in the CIS region. But their commercialization is about 2%, i.e., this is a weak point. It's not secret that our patents have no legal capacity or defense capability at the level of American patents.

Moreover, the process of obtaining patents in Azerbaijan compared to the United States is not so complicated, labor-intensive and expensive, and the requirements for patenting are relatively easy. Of course,

these reasons have an impact on the defense power of the patent.

Moreover, we still do not have any legal or procedural basis for the initial patented mechanism.

Secondly, there are or may be the four main models of technology development in Azerbaijan.

- ► state contracts and grants allocated for scientific research;
- ► business contracts (economic contracts);
- ► University based start-ups in the level of small and medium enterprise (SME);
- ► licensing.

The first two directions are active in Azerbaijan, but they do not pay proper attention to the apply research works. The other two are weaker, whereas they are a leading force in technology commercialization. Strengthening 3rd and 4th direction models is our most urgent issue, and for this purpose:

a) the commercial potential of the IAR should be noticeable;
b) Service personnel and resources, technology advancement and entrepreneurial competence, strong teams;
c) It should be acknowledged that the technology-commersilization of based on universities should be developed, and we are not yet talking about entrepreneurship universities.

4. At the end of this section, I would like to focus on incubators and accelerators, funding and venture funds of universities. **İncubators are important in the support and guarantee of student start-ups and spin-outs and in the creation of favorable environments**. As it is seen from the world practice, there are actually three

types of incubators in the universities: the university's own, university, and independent incubators.

4.1. Start-ups provide business incubators with the opportunity to develop ideas, build team members, gain access to their customers, and see the fruits of their reflection.

Universities create a number of themselves incubators. Comparison of business incubators is carried out through the UBI Index, SETsquared (Universities of **Bath, Exeter, Bristol, Surrey, Sonthampton)** is now considered the best university business incubator in Europe for two consecutive years, and left behind only by the US Rice Univecity incubator in the world rankings.

During 10 years, there are created over 1,000 companies, 80% of which served more than 3 years and were funded 1,5 billion $ through outsourcing in that incubator. Set-Squared is the result of 5 British universities' initiatives.

4.2. As for the university-related business incubator, an example is the Start-X incubator, created and managed by Stanford University students. This incubator, which emerged as a student nonprofit spin-out company in 2011, was rapidly evolving into an integral part of Stanford University's growing high-tech cultural center. Incubator was originally consist from volunteers, was funded 800,000$ by the Kauffman Foundation philanthropic fund 800,000 $ in 2011 and then 400,000 $ from several companies in the Silicon Valley.

The development of WifiSlam GPS (Apple has acquired for 20 million $ in 2013) demonstrated its potential and subsequently attracted Stanford University to participate directly in the incubator's activity. The university has been established 1,2 million $ annual

grant. Currently, the incubator serves as a tool for investment by the university and invests 500,000 $ of business and venture investors to companes of Start-X students and graduates. Generally, 31 million $ has been invested to 82 companies by the University, 220 companies have passed the incubator, and they are invested 700 million $ over the last four years and finally, the leading technology firms (Apple, Linkedin, Yahoo, Dropbox) acquired companies created in the incubator.

4.3. Independent incubators are usually created in geographical areas close to universities, and universities use this type of incubator as a platform for investments, as the regular income of the start-ups is around 25,000 $, as the Dreamit (USA) company has its own programs in New York, Baltimore, Philadelphia and Austin Texas universities.

4.4. What kind of financing is it to provide? As a rule, when the "dead valley" is over, there is a financial deficit between the idea and supportive business, and the concept is reached by the relevant financial fund at the stage of approval (proot-of-concept). The financing of the approval phase of the concept creates opportunities for the spin-out-company to be "livelier" of the business model and related technologies. Funding is usually made through 5,000 $ - 1,500,000 $. While such financial support is favorable for spin-outs, it usually leaves the student out of the reach. So, some universities are using start-ups. **But the most important support is through the venture fund of the university.**

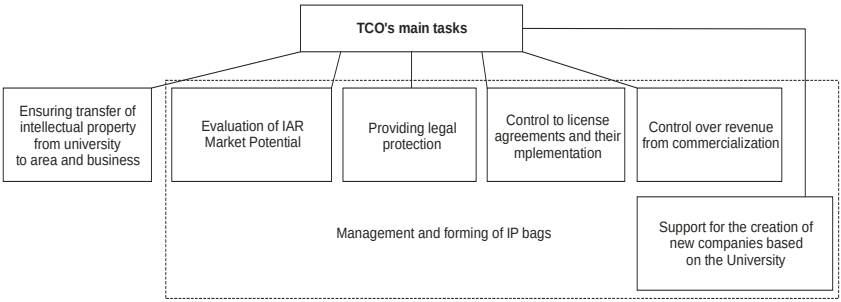
At present, it is envisaged to use four forms of venture capital of universities (direct venture with venture fund, joint venture fund, venture capital, and venture company). According to the Economic Development Organization, in 2014, there were 73 direct venture funds

in Europe. According to Global University Venturing, in 2015, 90 venture funds have attracted over $ 5 billion in investments.

The University's Venture Fund is operated by the Technology Commercialization Office (TCO). For example, the Cambridge Innovation Capital (CIC), owned 80 million $. The largest technical cluster in Europe is in the serve of the University.

IV. Various aspects of technology commercialization

1. "Technology Commercialization Office" (TCO) plays an indispensable role in the commercialization of technology.



In addition to these responsibilities, other technology-related tasks are also being implemented in leading US universities: accelerating the transfer of new technologies from the university to the market; providing services to the university's academic staff and potential business partners (training, patronage, consulting); defining the fair market price of the university and negotiating the Agreement; dispute settlement between researchers, field partners, and university.

2. Analysis of the aspects of commercialization of technology from leading foreign and local universities:

Aspect	Foreign universities	Azerbaijan universities	Recommen-dations
1. University Policy in the field of techno-logy transfer	Universities can only be involved in patent acquisition, other forms of comer-cialization of success stories (copyright, knowledge and skills, technical documentati on, know-how, etc.).	In most cases, it does not fit the transfer of techno-logy in other forms of technology, involving technology acquisition and patent acquisition	It is advisable not to involve all potential to patenting of IP, broader approach to commerciali-zation and use of multifaceted opportunities
2. State programs supporting SR and R$D	Joint funding of research and development activities of universities and enterprises is considered as the ultimate goal	In most cases, the university does not consider the necessity of comerciali-zation and application of technology generated by	Commercializ ation and implementati-on of state-funded programs should be mandatory

	of practical application of scientific knowledge and technologies	SR and R&D financing	
3. Interaction between university and business	Universities are open to business, and there is a sudden administration and operative decision-making, "rules of the game" clear to all.	There is no considered policy, understanding is difficult, administrative procedures are complicated, no dexterity.	A new policy should be created
4. Responsibility related to IP and innovation, training and preparation of new entrepreneurial	There are experienced experts in science and commercial activities, administrative assistance is provided to employees and students in concluding	Inadequate IP management and innovation, lack of knowledge about business management, and so on. Development of a	Works related to issues are required

genera-tion	licensing agreements and start-ups, and suggestions are made to assess potential partners. The preparation of a new generation of entrepreneur ship has been set up and most of the teachers of business and engineering specialties are experienced in business.	new generation of entrepre-neurs has not improved and innovation entrepreneur ship teachers have not gained business experience	

3. I have specific notes to comparable tables:

Firstly, the main burden of scientific development in Azerbaijan is on the state. The state, on the one hand, focuses on the creation and improvement of physical infrastructure (incubators, techno parks, foundations) for innovative development, and on the other hand, funds research activities. In short, the innovation policy goes

“from top to bottom”. In fact, innovations should be supported independently on the basis of innovation culture, and in such circumstances the success of innovation is growing, new initiatives are emerging. Thus, universities have a lot to do in this direction.

Secondly, huge resources of universities are available for the formation of the IP culture. It would be crucial if the leadership, faculty, students and postgraduates of the universities get acquainted with the key concepts and basic principles of IP at the relevant level, namely It is the time to give special importance to that key of the IP knowledge will be at players.

I consider that IP education should not end with only law and a number of media and cultural fields: the teaching of specific subjects on IP for economic specialities and especially for students (for future technological entrepreneurs) at technical universities should be on the agenda for a long time. We repeat this idea over and over again.

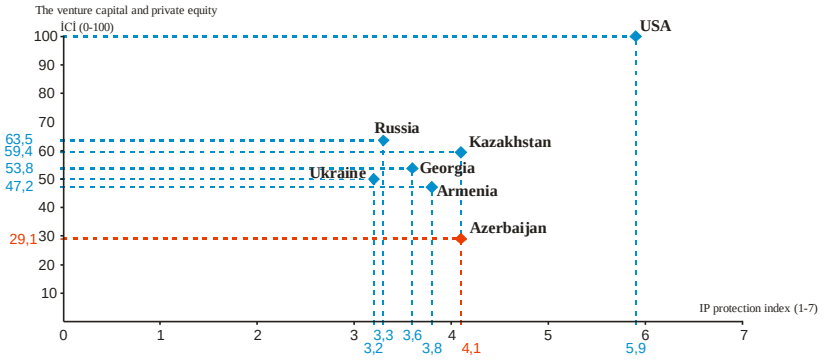
It is not right to put the responsibility of application of technology to authors; objectivily, inventors do not have the capacity and the ability to do this work: the university should be at the top of this matter.

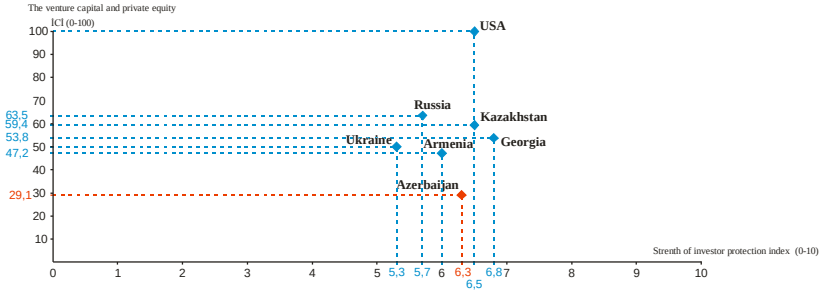
Thirdly, Azerbaijan government supports the development and advancement of new knowledge and technologies (for example, targeted programs of the Science Development Foundation under the President of the Republic of Azerbaijan, the Ministry of Education and the ANAS). However, after state funding is over, technology is not ready for market release, the producing team is incompetent or does not want to launch technologies for certain reasons, to start independent businesses, and at the same time there is not administrative and consulting support for them. As a

result, development of technologies and the establishment of new successful ventures rarely happen.

Fourthly, but not last issue because of the importance of the matter. This issue is related to the significance of IP protection I mentioned earlier and, in addition, the weakness of our patents. Nevertheless, “Intellectual property protection” sub index of the World Economic Forum’s Global Competitiveness Report determines that Azerbaijan shares the 68-73th place among 138 countries (this is the row of those that completed the first semi-table in the countries’ row and this sub index is presented here as "above average").

For “Strength of investor protection” sub index in the Report Azerbaijan’s rank is 36, value is “high”, but the "investment attractiveness index" (venture and private capital) shows its weakness, as the 104th place among 125 countries (value is “weak ") and this study was carried out by IESE Business School.





When place cordinate points of countries by the abscissa properly, “Intellectual property protection” sub index (from 0 to 7) and “Strength of investor protection” sub index (from 0 to 10) and by ordinate "Investment attractiveness" (from 0 up to 100), their intersections give coordinates for Azerbaijan, US, Russia, Ukraine, Georgia and Armenia.

Comparative analysis of coordinate points (status of listed countries) provides the following results:

a) Azerbaijan for “Intellectual property protection” sub index falls behind only the proper sub index of the US falls behind all listed countries under the "Investment attractiveness" sub index and, as seen from the graph, it is in the lowest position. Also, by "Strength of investor protection" sub index, it falls behind only the US, Georgia and Kazakhstan, and by "Investment attractiveness" sub index it stands behind all.
b) Even if we take into account double standards and mistakes in such studies (as "investment attractiveness"), we see explanation of the situation, i.e. low investments of venture and private capital in objective and subjective reasons.

1. There is no legislative and normative-legal basis for investment in venture capital and its encouragement.

Nevertheless, it is clear from the experience of foreign countries, especially the US, which is the hotbed of venture business, as well the EU documents, the absence of such a special act. Subjects of venture activities operate in a "common" legal space related to investment, innovation and other similar fields. However, it is also true that the history of the support to venture activity in the western countries is older than ours for over a decade, and therefore it is actual to adopt a separate law or amendments to current laws on venture activity, and moreover certain privileges to such kind of organizations in the tax legislation (income tax) can play a positive role too.

2. Another problem complicating the situation is the lack of financing culture of long-term, risky projects by local entrepreneurs. Our businessmen are inclined to return more investments in the short term, and consequently, refuse the financing of risky, long-term projects.

4. Taking into account certain world trends.

- Analyses suggests that at present, European and US students after graduating are facing difficulties with their jobs in the middle-class marketplace, because in recent years, the number of jobs by a lot of sectors in that market has not increased and in the past 20 years, revenue has declined in this sphere. Studies of Homo Kharas and Geoffrey Gertz ("The New Global Middle Class") show that in the period of 2009-2030, the middle class in Europe and the US will increase up to 1 billion people, which means growth equal to only zero (0). At the same time, there could be a six-fold increase in the global middle class, it will be 3.2 billion people in the Asia-Pacific region (mainly India and China).

- In addition, special study for World Bank "Global Income Distribution: From the Fall of the Berlin Wall to the Great Recession" by Branko Milanovic and Christoph Lakner shows that income has decreased in developed and increased in developing countries. The presented information increases the need for business-oriented activity and encourages tthe ignition of "green lights" for creation of students' businesses.

Firstly, the relationships of universities and research institutes with industry create a shared research ecosystem, develop a network of opportunities, and provide a new wave of business people with experience and resources. So, the result of the progressive study, carried out a few years ago with participation of 20% of universities' VIP-list of the Global University Venturing (GUV) and 22% of the VIP-list of influential business people and of the progressive experience is that innovatively leader corporations are more likely to cooperate with universities that are open to business and are ready for business activity. Corporations explain this by having access to university ideas, professionals and start-ups for their use. So it would be useful to consider the situation created by universities..

Secondly, the opportunities offered by universities are of great importance in supporting the human capital ecosystem, from the initial stage, i.e. starting from venture investments, technology transfer and incubators, to the creation of a human resource supply for the idea and a favorable environment. The research is usually transmitted to the technology transfer (commersialization) office and, the market prospects for the technology and the feasibility of obtaining a patent are resolved there. That is, one favorable should be choosen from of three possibilities here: license for the technology is given to a

company that in some activity; or the new IP object should be given to a new company; or the combination of similar technologies in other universities' research and the organization of search for getting a better quality product.

There are important, which affect last success, components of variants that I have mentioned. These questions should stand in front of every university. So when does the creation of start-up company be favorable? Under what conditions can the licensing process be an alternative to creating spin-out or start-up? In what ways can universities easy access to IP objests through companies? When is it possible to take maximum return benefit from technology created at universities during cooperation with other organizations and corporations? Which is more appropriate to transfer technology through the university's office, or special innovation structures in the sub-structure, including through regional structures? Taking into account the positive effects of the generated incubators on start-ups and spin-outs, which variant is more useful: simply university, its certain structure or fully independent organization? Finally, how should be organised the sustainability of funding and capital of venture funds of universities?

In the words of the head of state, "human capital and intellect are crucial in the progress of modern world civilization as a new quality factor. The road leading to welfare and prosperity of each state goes through development based on science and innovations."

The following words also belong to Mr. President Ilham Aliyev: "...Sustainable development of our economy, the formation of a knowledge-based society, and investing in human capital are our major strategic

goals for the near future." Based on these words, I wish everyone success in the conference in solving of issues on the human capital ecosystem, the results of intellectual activity created in the cooperation of Universities, research institutes and industry and transforming of them to IP and selection of infrastructure for their commercialization.

Conclusions

1. Recommendations and advice presented from the sounded analysis and experience of advanced universities in the commercialization of technologies should be implemented, primarily based on national features (opportunities, legal space, etc.).
2. The main target of scientific researches should be towards specific commercial use and knowledge of researchers in the field of IP is one of the necessary conditions for successful outcome.
3. Commercialization of technologies, as a rule, is indirectly connected to scientific activity, this connection is in mediation relationship with science and it is related more to market, customers, partnership, marketing and financial resources. Therefore, needs of end-producer to innovative products should be kept in mind in this field.

It is required from all parties involved in the commercialization of technology to keep in mind the main question of commercialization at all times, "what does manufacturer need?", instead “what do we have?" Therefore, those who involved in this process should use their imagination more, than their knowledge.

Prepared in the Intellectual Property Agency
of the Republic of Azerbaijan.