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Vision 2020: Sustainable Economic Development and Application of Innovation Management  
from Regional expansion to Global Growth

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## **Science-Industry Interaction in the Conditions of the Knowledge-Based Economy: Perspectives of Using Innovation Voucher Scheme in the Republic of Kazakhstan**

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### **Abstract**

The role of science-industry interaction has received considerable attention in the case of knowledge-based economy. However, it requires some research in the field of funding mechanism, which can give incentives for key actors of the knowledge transfer process. The implication is using best practice of European countries experience in emerging economy countries in the aim of improvement science-industry interaction. On the other hand, it could be driving force to exchange and create knowledge in the framework of R&D cooperation. Besides it provides firms with the opportunity to better access the broad knowledge base of universities, leading to product innovations with a higher degree of novelty. The study further define perspectives of using innovation voucher schemes taking into account funding resources.

**Keywords:** science-industry interaction, R&D cooperation, voucher innovation scheme

### **Introduction**

Developed and developing countries are experiencing an equally acute shortage of natural resources and constant rivalry in this area. Science and technology are increasingly becoming the main source of competitiveness and sustainable development for all countries and regions. At the same time, the key indicator of the effectiveness of research and development is their applicability in practice, the ability to be commercialized. In this context, there is a growing awareness that intangible assets such as knowledge, know-how, social capital act as oil, diamonds of the 21-st century for both developed and emerging economies (Elias G and et al, 2015). On the international stage, the USA launched its “Star Wars Program” officially called the “Strategic Defense Initiative” (SDI); France put forward the industrial innovation plan “create tomorrow's products”; Germany introduced its “2020 - innovation partnership” and “standard innovation plan”; both the UK and Singapore launched an “innovation voucher program” (IVS); and Japan proposed a “digital Japanese innovation plan” (ICT) (Chen X., 2018). In this way, it is surrounded by a lot of issues around the intersection of government, business and science model. So it will be discussed researched questions about voucher innovation scheme using effect could improve science-industry interaction, which could give the possibility to estimate the perspectives of application such scheme in developing countries.

For Kazakhstan, as well as for the whole world in the conditions of the knowledge-based economy, the development of knowledge-intensive production is topical. An inherent part of this problem is the establishment of an effective model for financing knowledge-intensive industries. Particularly, it is emphasized that co-financing from the private sector should become an obligatory requirement for all applied research and development projects.

In knowledge-based economies, economic growth is increasingly dependent upon innovation whereby access to finance is seen as a critical factor in this process (Bygrave, 1992; Freeman, 1997; Pissarides, 1999; Wonglimpiyarat, 2007). Thus, effective ways financing of knowledge-intensive production could provide successful and fruitful cooperation between research institutes and the real sector of the economy.

## **Literature Review**

This paper can be focused on the estimating innovation voucher scheme in the framework of industry-science cooperation. Innovation vouchers are small lines of credit provided by governments to small and medium-sized enterprises (SMEs) to purchase services from public knowledge providers with a view to introducing innovations new products, processes or services in their business operations. (Pavla Matulova et al, 2015). Silicon Valley and Boston Route Route 128 are successful examples of the high-tech economy taking full advantage of the interaction process among the institutions within the regional innovation system (Saxenian A. L,1994, Wonglimpiyarat J., 2005). The consumer can use the voucher to purchase select goods and services, as the government commits to giving money to the seller in exchange for the voucher (Urpelainen J, 2018). The majority of scholars distinguish successful realization of state programs. One of the goals of the EC framework programmes was to strengthen research collaboration between member states and between universities and firms (Veugelers and Cassiman, 2005). Some scholars (Xu et al., 2007) focus on innovation strategies and how these might integrate different technological (i.e. product, process, and portfolio), and non-technological (i.e. market, organization, and institution) elements across time and space. On the other hand, there is opposite view of application the voucher-based system. The challenge is that inclusion on that list is valuable and could result in corruption, as producers seek rents from the market created by the vouchers and in this way possible solutions to this problem include basing the list on international practices, such as global quality standards, and giving civil society organizations the option to complain about the inclusion and exclusion of different products (Urpelainen J., 2018). A substantial body of evidence, however, suggests that practitioners do not use academic research results in developing strategies or carrying out actions (e.g. Porter and McKibbin, 1988, Mowday, R.T, 1997).

## **Methodology**

The research was based on a structured literature review, including key features of mechanisms supporting the transformation of knowledge into innovation, which analyze the foreign experience of innovation voucher scheme in the case of science - industry cooperation and quantitative estimating perspectives of using it in the Republic of Kazakhstan. Firstly, it was given a review of European countries experience in realizing innovation voucher scheme, which is necessary for the study of the creating an effective financial mechanism for interaction between science and business. At the next stage, the research emphasizes the role of government in investment knowledge-based economy, which could the context for the analysis of science-industry cooperation.

## **Evidence of innovation voucher scheme**

The experience of individual European countries deserves attention in the part of forming an effective financial mechanism for interaction between science and business.

Particularly, the Basque Country in Spain and the West Midlands in the UK have introduced a number of policy schemes to foster innovation in the private sector. Programs include measures enhancing the development of linkages between regional science base and industry, in other words, mechanisms supporting the transformation of knowledge into innovation. (Borowik, 2014).

**Table 1: briefly highlights major initiatives that exist in the two regions**

Initiatives	The West Midlands	The Basque Country
Private sector innovation	<p>Grant for R&amp;D (GRD)-Grants for research and development of technologically innovative products and processes</p> <p>The GRD scheme was introduced in the UK in 2003 and since 2005 was delivered by the regional authorities</p> <p>Firms improved their attitudes/culture towards R&amp;D and innovation (70 %), the commercial feasibility became clear (84 %), skills were improved (91 %), better able to manage innovation and technical risk (78 %), increased their R&amp;D expenditure (62 %)</p>	<p>GAITEK: Grants for development of new products through R&amp;D</p> <p>The scheme offers grants for projects for the development of new products through R&amp;D in different socioeconomic sectors. Beneficiaries of this Basque funding program are the small, medium, and large companies, as well as associations and foundations of companies.</p>
Developing links between the business sector and regional science and technology entities	<p>University-industry voucher scheme- Purchase of academic and research support (fostering collaboration between science and business base) by enterprises</p> <p>The scheme of innovative vouchers offers SMEs to apply for a voucher, which makes it possible to pay for the services of a research organization. The pilot program was launched in June 2007 in the West Midlands and over 660 vouchers were provided for 4 years.</p> <p>Collaborative Research and Development-Grants for businesses working together and with the knowledge base to develop and exploit new ideas</p> <p>Knowledge Transfer Partnerships - increase interactions between the knowledge base organization and companies through the mediation of the associate</p> <p>The program is UK-wide and is headed by the Technology Strategy Board and supported by 21 other public sector-funding organizations.</p>	<p>ETORGAI: Public-private collaboration in strategic industrial research</p> <p>The program selects the best R&amp;D industrial projects through a selection conducted by external professional evaluators. The program is one of the best examples of public-private partnerships and a key player in the Basque system innovation. The budget for this measure has been rapidly increasing every year from €2 million in 2008 to €42 million in 2012</p>
(Borowik, 2014)		

One of the most popular mechanisms promoting knowledge exchange for innovation in European countries is University-Industry Voucher Scheme.

An innovative voucher is a certificate that gives its holder the right to receive support from a scientific or consulting organization in the implementation of their innovative project. The main goal of the innovation voucher is the creation of new types of innovation activities or the development of existing ones with the aim of enhancing their competitiveness in cooperation with research institutions, as well as stimulating the innovative activity of small and medium-sized enterprises that

do not have their own research capacity or financial resources to organize the necessary for their purposes research.

Schemes for the use of innovative vouchers in European countries vary, but there are common features. Firstly, innovative vouchers provide enterprises with the opportunity to use innovative services. It is organized using accelerated procedures for application, processing, and reporting in comparison with standard financing programs. However, they are limited in terms of usage sphere and total cost of services (usually within 20 thousand euros).

Another method of financing science-intensive production, popular in European practice, is a grant for research and development.

Thus, the Collaborative Research and Development Grants are intended to:

- create mutually beneficial collaborations between universities and private or public sector partners that lead to advancements that will result in economic, social or environmental benefits for the country;
- expand the scope of research undertaken at universities, fostering dynamic interaction between discovery-based and innovative research, and allowing the research results to be translated into new knowledge, products or processes;
- provide an enhanced experiential learning environment for graduate students;
- allow partners to access the unique knowledge, expertise, infrastructure, and potential highly educated and skilled future employees graduating from universities.

## **Perspectives of development science-industry interaction in the Republic of Kazakhstan**

According to the World Economic Forum Global Competitiveness Ranking for 2017 (figure 1), Kazakhstan is ranked 75<sup>th</sup> out of 137 countries in the "Cooperation of Universities and Business in R & D" indicator, the UK is ranked 6<sup>th</sup> and Spain 67<sup>th</sup> accordingly (The Global Competitiveness Report, 2017). This position in the rating suggests that Kazakhstan still has a lot of work to do in order to improve the efficiency of cooperation between science and the real sector of the economy. Besides, it can be clearly noticed, that research and development expenses in GDP of Kazakhstan takes only 0.16% and in it is ranked 95<sup>th</sup> in the «Company spending in R&D», which explain 84<sup>th</sup> place in the ranking of «Innovation capacity». In this way, the level of research and development in GDP of the UK and Spain is higher than in Kazakhstan and shows 1,7% and 1,21% accordingly. In addition to that, they take 53<sup>th</sup> (Spain) and 14<sup>th</sup> (the UK) place in the ranking of «Company spending in R&D», and 49<sup>th</sup> (Spain) and 11<sup>th</sup> (the UK) in the ranking of «Capacity for innovation». Consequently, there is noticed significant interaction between science and industry in these two countries, which increase capacity for innovation, whereas the low level of capacity for innovation in Kazakhstan is connected with a weak interaction between science and industry. Thus, it is important to research the successful experience of the UK and Spain in funding mechanisms, which let improve science-industry interaction. Particularly, university-industry links in SME may involve a majority of research centers and require enough legislation environment for such activities as patenting and licensing.

At present, Kazakhstan's science relies more on state funding sources. This is evidenced by the data of the Statistics Committee of the Ministry of National Economy. In the structure of sources of financing of domestic expenses for R & D of Kazakhstan companies in 2017, the largest share was taken by the Republican budget (51.3%) (Bulletin of the Statistics Committee, 2017). At the process of evaluation funding potential of Kazakhstan, figure 2 reveals data of government statistics about SME financing for six years period and it is noticed that SME funding takes more than 20% in the total volume of credits in the economy and the level of financing SME by second-tier banks of Kazakhstan for the last year was decreased to 10% which could be connected with restricted risk appetite of the banks. Consequently, it is noticeable to consider the possibility to tend this funding to the science-industry interaction in the framework of voucher innovation.

The National Science Report for 2016 (National Science Report, 2016) also notes the fact that there are almost no representatives of entrepreneurs from the real sector of the economy among the sources

of R & D financing. At the same time, financing of research and development in all developed countries is now 60-75% realized by the business sector of the economy.

Such structure of R & D financing sources, with a predominant share of government participation, suggests that most researchers prefer not to work with commercial structures, venture funds, and foreign investors, but with the Ministry of Education and Science of the Republic of Kazakhstan. However, the state is working towards increasing the efficiency of investments in the knowledge-based economy. Thus, the issue of effective cooperation between science and business is important for Kazakhstan, including by building an optimal model for financing science-intensive production.

### Conclusion

The review of the experience of foreign countries has shown the existence of a sufficiently developed mechanism for financing science-intensive industries, which makes it possible to establish close ties between science and production. In this context, the West Midlands uses the Voucher scheme, Knowledge Transfer Partnerships, Collaborative Research & Development grants. Also, both regions encourage enterprises to collaborate with each other, for instance in the Basque Country through GAITEK, while in the West Midlands through the Collaborative Research and Development grants.

The effectiveness of the most UK's schemes for financing knowledge-intensive production was evaluated at the national level. The practice of the voucher scheme for financing knowledge-intensive production was recognized as the best, in particular, with respect to the profitability of investments and the minimum level of bureaucracy.

In order to improve the Kazakhstani practice of financing knowledge-intensive production, in our opinion, such financing models as voucher scheme, knowledge transfer partnerships, collaborative research & development are attractive. These models of financing knowledge-intensive production allow establishing a direct link between research institutes and production. Furthermore the experience of European countries in using methods of knowledge-based production funding, especially innovative vouchers, has shown that the effectiveness of financial instruments to stimulate the development of knowledge-intensive production is difficult to assess. Therefore, before implementing new methods of financing knowledge-intensive production in Kazakhstan, it is necessary to learn how to evaluate their effectiveness.

### Figures and Tables

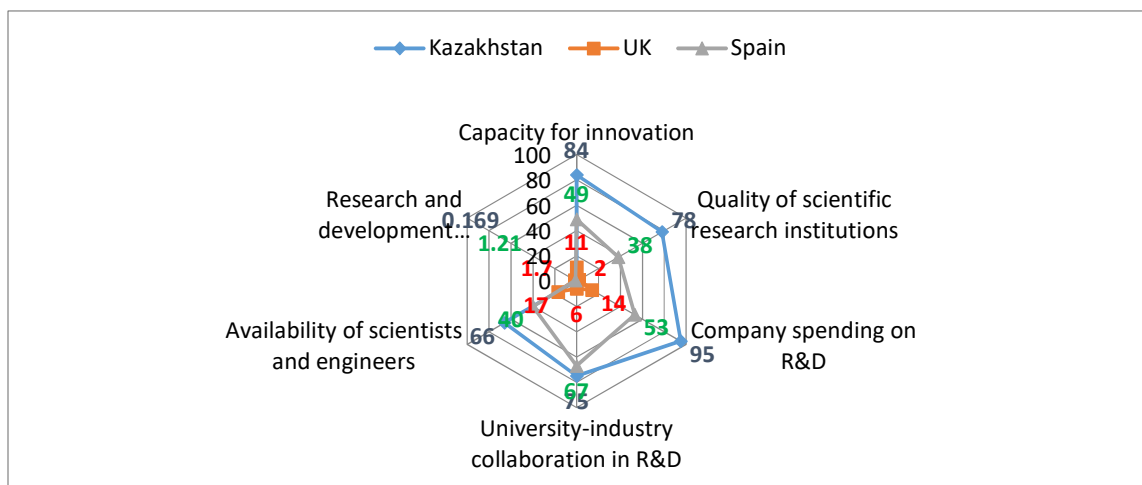
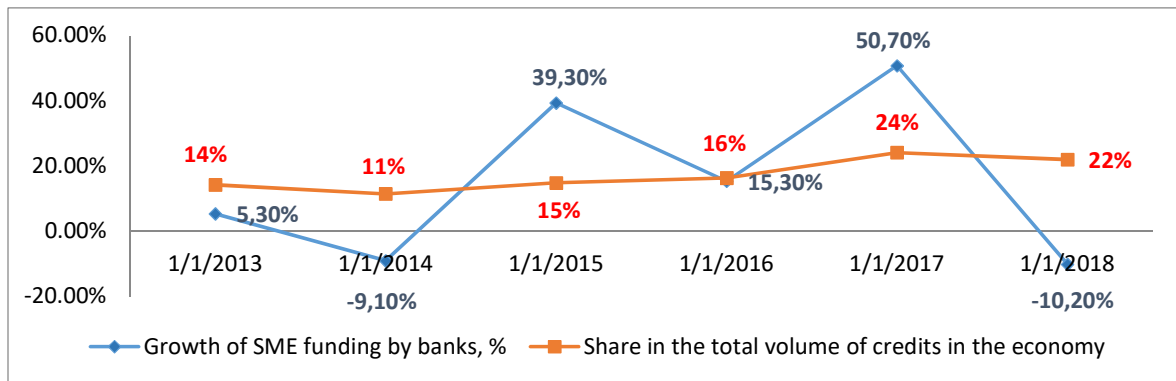


Figure 1: The World Economic Forum Global Competitiveness Ranking



**Figure 2: Funding of SME in the Republic of Kazakhstan**

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