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Small Innovative Business Development Experience

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***Abstract**:*

The article deals with the study of the experience and impact of establishing micro, small and medium-sized businesses, including innovative enterprises, in developed countries of Europe, the USA, and Russia, their development dynamics, as well as tools ensuring government regulation of their effective functioning.

In Russia, the right to establish small innovative enterprises was granted by Federal Law No. 217-FZ dated August 2, 2009. The article provides quantitative statistics of the accounting of small innovative enterprises operating in the scientific and educational sector of Russia's economy and the economic indicators of their activities, obtained based on monitoring results. The article also analyzes the US legislation in the innovation field.

The research allowed us to come to the following key conclusions: Micro, small, and medium-sized businesses play an important role in the European and American economies, being the most important source of innovation and new jobs.

In Russia, further development of a mechanism for commercialization of intellectual results requires improvement in terms of harmonization with international rules. The foreign legislative experience with respect to micro, small and medium-sized businesses is of particular interest for the improvement of the regulatory framework that would ensure the effective operation of small innovative enterprises in Russia.

Keywords: *Innovative enterprises, small business, medium-sized business, innovation legislation, scientific and technical developments, foreign practice, developed countries, Commercialization.*

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1. Introduction

Small innovative businesses play an important role in the economy of developed countries and are an essential element of the innovation process. Small enterprises are the most flexible, dynamic, and widespread form of enterprises. They are the driver of scientific and technological developments, refinement and implementation of inventions in production, various promising innovations.

2. Literature review

In the international economic literature, the term "innovation" means the end result of innovative activity in the form of new or improved products or technologies put on the market (Bogdanova *et al.,* 2016; Ermakova *et al.,* 2016; Mysova *et al.,* 2016). In foreign countries, small innovative businesses at universities began to develop in the 1960s. They have become the most widespread in such countries as Germany, Sweden, and the USA.

In foreign practice, there is no concept of a small innovative enterprise (SIE). Such organizations have several different names:

- an innovative small or medium-sized enterprise (innovative SME),
- a high-technology firm, a new technology-based firm (NTBF),
- a knowledge-based firm,
- "an explerent firm, i.e. an innovative company that deliberately takes significant risks, and its profits from the sale of new goods and technologies depend on the talent of the intellectuals working in the firm as well as their extraordinary fruitful ideas and proposals," etc. (Alexandrin, 2010; Asaul *et al.,* 2008; Brink, 2017; Rupeika-Apoga and Solovjova, 2017; Havlicel *et al.,* 2013).

➢ ***Germany:*** In Germany, small business support centers operate at universities. The largest research organizations among them are: The Max Planck Society, Fraunhofer Society, Leibniz Association and Helmholtz Association render consulting services on the establishment of innovative enterprises, including business plan development, investments, and subsequent innovation implementation (Smagulova *et al.,* 2014). The main activities of small innovative businesses at universities are: information and communication technology, optical and laser technology, materials science and engineering, biotechnology, medical equipment, energy saving technology, and environment protection. Small innovative businesses at German universities can receive support from HTGF (High-Tech Grundfonds), created by the Federal Ministry of Economics and Technology of Germany in conjunction with the KfW banking group and operating in the field of high technology. The fund invests in new promising companies, providing a share capital up to 1 million euros.

- ***Sweden:*** In Sweden, the mechanisms of cooperation between higher education institutions and private businesses are very diverse: these can be units at universities, engaged in commercializing innovations; consulting companies that help innovative firms to establish contacts with other innovation process actors; or units that provide assistance in economic and legal matters (Popova, 2013). The Government of Sweden has established 14 holding companies at universities. Centers for expert evaluation operate as a link between businesses, the government, and universities. The main task of the Center for Expert Evaluation is to contribute to problem-oriented interdisciplinary research, as well as to the transformation of new knowledge and competences into new products, processes, and services.

- ***United States:*** In the United States, large national laboratories have been established at the leading universities, and there are a number of small and medium-sized businesses operating around them. Most long-term innovative research is performed at universities. Universities provide private laboratories and industrial enterprises with innovative projects (Glushko *et al.,* 2014). In the United States, a significant number of scientific discoveries and inventions were made at small innovative enterprises operating at universities. Also, the authors of scientific discoveries establish small innovative enterprises by themselves.

3. Methodology

An analysis of the experience in the establishment and operation of small and medium-sized enterprises in the EU and the US, as set out in the article, was based on international standards and tools for statistical observation, primarily Eurostat's classification, which uses a modern approach to innovations based on market research, market needs, and predictive research, conducted as part of the foresight. Criteria for small and medium-sized businesses in Russia are set by Federal Law No. 209-FZ (2007).

The definition of a small innovative enterprise: The concept of structures promoting university entrepreneurship, which is mentioned in foreign publications, is of great interest. The definition of a small innovative enterprise (hereinafter, SIE) as a new company established with the purpose of using the results of university research and technological ideas of university staff and students is very close to the Russian concept (Rappert *et al.,* 1999). A narrower definition is connected with the definition of SIE as a new company, the purpose of which is to promote certain intellectual property assets created at the university (Shane, 2004). Such companies are allowed to use both the licensed intellectual property and that was not formally licensed by the institution that created it. Such an approach is blurring the difference between innovative university entrepreneurship and entrepreneurship in general. In addition, those include the “gray market of university entrepreneurship”, when the founders of new companies use technology, the inventors of which did not inform their university managers about it. This is a kind of “shadow market” of entrepreneurship, which makes it difficult to estimate the number of such SIEs. In foreign statistics, the

enterprises, similar to SIE in the Russian Federation, are accounted by medium-sized and small enterprises (SMEs), including microbusinesses.

4. Results

It is impossible to provide a direct comparison of Russian SMEs and those in the United States and the EU countries because of the differences in the criteria for inclusion of enterprises into the categories of medium-sized, small and microbusinesses. In Russia, the categories of enterprises are determined based on two criteria (the number of employees and revenues), while the EU uses three criteria (the number of employees, turnover, and overall balance), and the USA use two criteria (the number of personnel, differentiated by 1160 subsectors, and the revenue). Table 1 provides the criteria for determining the category of an enterprise in the EU and Russia (Eurostat, 2012a; Federal Law No. 209-FZ..., 2007; Kunday and Pişkinsüt Şengüler, 2015).

Table 1. *Criteria for enterprise categories in the EU and Russia*

Criterion	***Medium-sized businesses***	***Small businesses***	***Microbusinesses***
Number of personnel			
EU	<250	<50	<10
Russia	101–250	16–100	1-15
Turnover			
EU	≤€50 million	≤€10 million	≤€2 million
Russia	€28.4 million* (2 billion RUB)	€11.3 million (800 million RUB)	€1.7 million (120 million RUB)
Overall balance			
EU	≤€43 million	≤€10 million	≤€2 million
Russia	–	–	–

**At the ruble/euro rate of the CBR on 06.02.2018 (70.77 rubles/1 euro)*
Sources: (Eurostat, 2012a; Federal Law No. 209-FZ..., 2007).

In the EU countries, the share of SMEs in the total number of enterprises in general reached 92.1 % (Federation of Small Businesses; Global Information and Analytical Center). Table 2 provides data on the activities of SMEs in Germany in 2012.

Table 2*. Performance of independent SMEs in Germany in 2012.*

Enterprise categories	***Enterprises (ea.)***		***Number of personnel***		***Net gross product (€ million)***	
	Total	***%***	***Total***	***%***	***Total***	***%***
Microbusinesses	1732568	79.3	2222556	18.8	172249	22.4
Small businesses	269061	12.3	3652745	30.9	176222	22.9
Medium-sized businesses	26865	1.2	1922349	16.3	92283	12.0
ALL SMEs	2028493	92.9	7797650	65.9	440753	57.2

Source: *(Eurostat, 2012a).*

In 2016, SME employment in the EU (28 countries) increased by 1.6 % (in 2015 by 1.5 %). The added value of SMEs in the EU (28 countries) increased by 1.4 % in 2016 (by 5.8 % in 2015). This growth rate slowdown is due to a significant weakening of the euro against the pound sterling in 2015 and 2016 (European Commission, 2018). The high share of SMEs in the total number of enterprises and the number of employed personnel in the EU countries according to Eurostat reflects their great importance for this region (Table 3) (Eurostat, 2012b).

Table 3. *Number of SIEs and employed people in 28 EU countries as of 2012.*

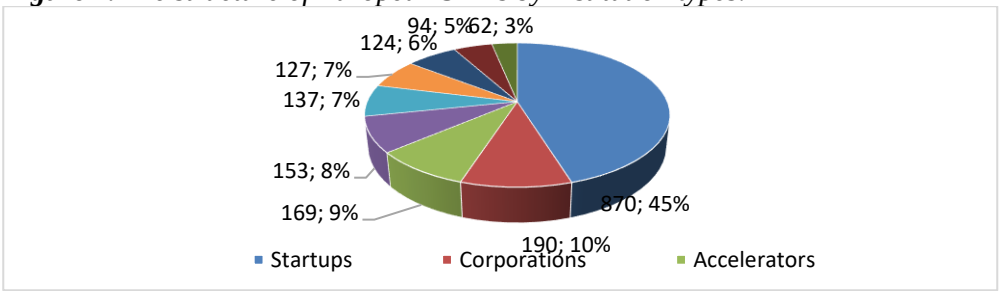
	Enterprises		*Number of employed*	
Country	*Total (ea.)*	*% of SMEs*	*Total (people)*	*% of SMEs*
European Union, 28 countries	**22478887**	**99.8**	**134180742**	**67.0**
Belgium	566006	99.8	2718355	70.1
Bulgaria	312608	99.8	1872997	75.5
Czech Republic	1007441	99.9	3521520	69.8
Denmark	213358	99.7	1602105	65.0
Germany	2189737	99.5	26401395	62.5
Estonia	58408	99.7	393545	78.1
Greece	726581	99.9	2198986	86.5
Spain	2385077	99.9	10923323	73.9
France	2882419	NA	15495621	NA
Croatia	148573	99.7	1002905	68.3
Italy	3825458	NA	14715132	NA
Cyprus	46139	99.9	224915	NA
Lithuania	141893	99.8	835630	76.2
Latvia	91939	99.8	573580	78.8
Luxembourg	29265	99.5	242533	68.3
Hungary	528519	NA	2430681	NA
Malta	26796	99.8	119224	79.3
Netherlands	862697	99.8	5359446	66.7
Austria	308411	99.7	2671477	68.0
Poland	1519904	99.8	8326839	68.9
Portugal	793235	99.9	2942895	NA
Romania	425731	99.6	3837868	66.4
Slovenia	119644	99.8	574479	72.3
Slovakia	398392	99.9	1417228	69.7
Finland	226373	99.7	1457599	63
Sweden	661822	99.8	3025006	65.4
United Kingdom	1703562	99.7	17784620	53.0
Norway	278899	99.8	1510838	67.6

Source: *(Eurostat, 2012b).*

In the EU, there is an integrated business support network that promotes the small business development. In 2015, the network of European SMEs integrated the

institutional units shown in Figure 1. The effectiveness of SMEs for the economies of developed EU countries can be estimated by their share in the net gross product (NGP), as shown in Table 4. Small countries, such as Estonia, Greece, Malta, Latvia, Lithuania, have the most significant share of SMEs (about 70 %) (Eurostat. 2012b).

Figure 1. *The structure of European SMEs by institution types.*



Source: https://europa.eu/youreurope/business/start-grow/start-ups/index_en.htm.

Table 4. *Share of SMEs in the net gross product of 28 EU countries as of 2012.*

Country	*NGP*				
	Total, € million	*% of SMEs*			
European Union, 28 countries	**6327068**	**57.5**			
Belgium	189086	62.2	Latvia	9269	69.2
Bulgaria	18246	62.3	Luxembourg	19250	70.7
Czech Republic	84142	56.0	Hungary	46497	NA
Denmark	119936	62.5	Malta	3548	74.9
Germany	1385501	53.3	Netherlands	310022	62.9
Estonia	9338	74.9	Austria	164976	60.5
Greece	54703	72.8	Poland	171627	50.1
Spain	434156	63.0	Portugal	66360	NA
France	890597	NA	Romania	48432	NA
Croatia	19155	54.8	Slovenia	17140	62.8
Italy	646476	NA	Slovakia	32922	60.5
Cyprus	7864	NA	Finland	86957	59.6
Lithuania	12155	68.5	Sweden	210859	58.5

Source: *(Eurostat. 2012b). NA = no data available.*

SMEs are an important part of the national economies of the US and the UK. As of 2014, the share of SMEs in the total number of enterprises in these countries was 97.6 % and 99.2 %, respectively. The SME sector in the UK amounted to 4.8 million businesses; and the employment reached 78.6 % of the economically active population (about 23 million people); the turnover of small businesses was about 49 % of the UK turnover. Small businesses implement about 64% of commercial innovations. At present, 650 US universities are engaged in commercializing research and development. The commercialization process is ensured by specialized offices

(the Office of Technology Commercialization at the University of North Carolina; The Office of Licensing and Ventures at the Duke Research University; The Office of Technology Management at the Pittsburgh University, etc.), established at the universities, and other innovation infrastructure facilities (business incubators, research parks, research parks, etc.). Annually, the share of newly established SMEs is 17–20 % of the operating start-ups (Table 5) (Association..., N/d).

Table 5. *Dynamics of the number of established and operating start-ups at the US universities.*

Year	***Number of startups established***	***Number of start-ups operating as of the year-end***
2007	555	3388
2008	595	3381
2009	596	3423
2010	651	3657
2011	671	3927
2012	705	4002
2013	818	4206
2014	914	4688
2015	1012	–
2016	1024	–

Source: *(Association..., N/d).*

The Association of University Technology Managers (AUTM) systematically conducts surveys of university SMEs. The obtained data allow estimating the performance of the US university start-ups (Table 6) (Association..., N/d).

Table 6. *Dynamics of the main performance indicators of university start-ups in 2007–2016.*

Years	***Net sales, $ billion***	***Number of new commercial products created under university licenses***
2007	–	686
2008	–	648
2009	–	658
2010	–	657
2011	36.0	591
2012	36.8	591
2013	22.8	719
2014	28.0	965
2015	28.7	879
2016	–	800

Source: *(Association..., N/d).*

The provided data generally confirm the stable trend of a growing number of new commercial products created under university licenses in 2007–2016. At the same

time, we need to mention a significant growth of technology transfer in 2016, according to the AUTM (Table 7) (Association..., N/d).

Table 7. *Technology transfer indicators at the US universities in 2016.*

Indicators	***2016***	***Change in 2016 compared to 2015, %***
Number of new patent applications	2507	33.6
Income from licenses, USD million	2962	17.5
Number of federal grants received	8208	6.2
Patents issued in the USA	7021	5.1
Number of startups established	495	5.1

Source: *(Association..., N/d).*

The Bayh-Dole Act: In December 1980, the United States, being one of the leaders and ideologists of university entrepreneurship, adopted the Bayh-Dole Act. The act granted universities, research institutions, and other non-profit organizations the right of ownership for federal inventions, income from the use of patents and licenses, as well as the right to distribute profits in favor of inventors. This law clearly formulated the objectives of public funding: from the creation and ownership of intellectual property assets to their implementation (Loise and Stevens, 2010). Universities having the status of non-profit organizations were entitled to create SMEs (start-ups) based on inventions funded from the federal budget, scientific developments and technologies patented and licensed by the universities. The Bayh-Dole Act became an "institutional model of academic property rights," (Boguslavsky and Svetlanov, 2008). In exchange for these preferences, the universities were required to comply with the following requirements:

- to provide the federal agency sponsoring research and development with the information on each published discovery;
- to notify the government of patents and inventions, which universities would like to obtain ownership for;
- to ensure protection of patent rights;
- to commercialize inventions, scientific developments, and technology;
- to grant exclusive licenses preferably to industrial enterprises and small businesses;
- not to have the right to transfer technology (with some exceptions);
- to provide the federal government with the right for gratuitous use of university patents for its own purposes after obtaining an irrevocable non-exclusive license without the right for assignment;
- to pay license royalty to inventors;
- to use profits from the use of inventions (including royalty) for educational purposes, training, and research.

The adoption of the Bayh-Dole Act, of course, was a kind of state investment in R&D, recouped through increasing tax revenues from the sale of new innovative products. The role of the Bayh-Dole Act consists in unifying the legislation in the field of patenting and licensing inventions by the US universities. Though many universities

had historically been working closely with the industry. According to Thursby and Thursby (2011), universities can benefit from commercializing their research if they proactively perform both fundamental and applied research. Another point of view was expressed in work by Nowery and Ziedonis (2002): patent licensing of university technologies instead of stimulating the transfer of technology can restrain it and adversely affect the research process.

The Stevenson-Wydler Act of October 21, 1980 (as amended by the America Competes Reauthorization Act of 2010 (2010)): is aimed at transferring technology from state laboratories to industry, universities, to the local and state governments. It conceptually coincides with the provisions of the Bayh-Dole Act.

The Small Business Innovation Development Act (S. 881(97th), 1982): Based on this law, the Small Business Innovation Research (SBIR) program was adopted. The law obliged federal agencies to provide small businesses with financial support for R&D.

The University and Small Business Patent Procedure Act (H.R. 2414(96th), 1980): Universities and small businesses were granted the right to sign contracts for R&D with agencies at the expense of federal budget, as well as patent the inventions they made as a result of such R&D. The law authorized the federal agency financing R&D to provide exclusive licenses for developed technology to private firms as grants. Preference was given to universities and small firms.

The Federal Technology Transfer Act (H.R. 3773(99th), 1986): This law provided universities, federal laboratories, private companies, and state governments with the right to enter into cooperative agreements for joint R&D. They were granted access to scientific and technological resources of federal laboratories. However, the law had some restrictions, including those related to important commercial information in the case of technology commercialization.

Federal Law No. 217-FZ (2009) in Russia granted the right to budget-funded institutions of science and education and scientific and educational institutions of state academies of sciences to establish small innovative enterprises (SIEs) with the purpose of practical application (implementation) of results of intellectual activity. According to the information on SIE establishment notice accounting, the database contains data on 2834 SIEs. Of them, 2588 SIEs were created at 301 higher educational institutions, and 272 SIEs were established at 134 research institutions, including 26 SIEs created jointly by higher educational institutions and research institutions. The largest number of SIEs has been established in the system of the Ministry of Education and Science of Russia: 204 higher educational institutions (46.8 % of all founders) established 2162 SIEs (75.2 % of the total number of established SIEs) (Turko *et al.*, 2018). Among the Russian regions, the largest number of SIEs has been established in Moscow (308) and in St. Petersburg (197) (Fedorkov *et al.*, 2017). The SIE activity survey conducted in 2017 showed that the total payroll of SIE workers included 6357 employees as of 01.01.2016. As of January 1, 2017, the

total number of SIE personnel was 8729. As of July 1, 2017, their total number was 8502 (Fedorkov et al., 2017). Small innovative enterprises created in the Russian scientific and educational sector for RIA implementation operate with the purpose of implementing university innovations in production (Andreev and Lukasheva, 2017). In recent years, Russian regions, as well as higher educational institutions, have achieved a significant progress in building their innovative systems and have created an infrastructure for supporting innovation activities, which includes all necessary elements (Yushkov *et al.,* 2017; Anikina *et al.,* 2016). This infrastructure is the basis for further creation of new SIEs.

5. Discussion

The materials of the article were discussed at the meeting of the Scientific and Technical Council of the Federal State Budget Scientific Institution "Scientific Research Institute – Republican Research and Consulting Center for Expert Evaluation," one of the leading institutes of the scientific and technological sector of the Russian Federation, which provides expert, scientific, methodical, technical, and information support for scientific, technical and innovation activities in the Russian Federation. As a result, these issues were recognized to be relevant. Issues associated with the creation and operation of SIEs in Russia were also discussed by the periodical of the Financial University under the Government of the Russian Federation "Economic Science and Education" (#5(90), 2012, pp. 197–202), by Doctor of Economic Sciences S.N. Seliverstov et al. in "The Development of Innovative Infrastructure at Socioeconomic Universities".

In Russia, according to official statistics, the share of all SMEs in various economic sectors is less than 30 % of the total number of enterprises. Giving that the formation of small business just began in the mid-1990s. Only for 2013–2016, the total number of small enterprises (SE) increased from 2063.1 to 2770.6 (by 34.3 %) (Small and Medium..., 2017). In the scientific and technical field, the number of SMEs has also been steadily increasing, despite the fact that the share of enterprises engaged in it is very low (0.7 % in 2013–2015), the government pays much attention to this sector (Federal Law...No. 127-FZ, 1996; Federal Law...No. 273-FZ, 2012).

6. Main conclusions

The experience of foreign legislation in relation to innovative SMEs is of particular interest for improving the regulatory framework for the effective operation of SMEs in Russia. In Russia, the mechanism for the RIA commercialization through the creation of innovative SMEs needs to be better harmonized with international standards. The issues of innovative SIEs in Russia among others include the lack of a rigorous methodology for intangible asset valuation and the legal regulation of the SIE liquidation or cessation of the university's participation in them.

7. Practical recommendations

The study shows the Russia needs a rigorous methodology for intangible asset valuation and legislative regulation of SMEs liquidation or cessation of the university's participation in them. It is also necessary to create a tooling for statistical monitoring of innovative SMEs in Russia, harmonized with international standards. The implementation of such a statistical monitoring tool in Russia will allow:

- identifying the concordance of the activities of small and medium-sized innovative enterprises to the priorities in the development of science, technology, and engineering in Russia and to the list of critical technologies of Russia;
- evaluating the human, economic, scientific and technical potential of small and medium-sized innovative enterprises (the number of employees, including students, post-graduate students, faculty, researchers, employees with academic degrees, the average age of employees, the value of charter capital, the book value of equipment and tangible production assets, as well as intangible assets);
- evaluating the economic, innovative, scientific and technical activities (the number of jobs created, the type and volume of innovative products, the amount of dividends paid to the founder, the R&D volume of small and medium-sized innovative enterprises, the number of their registrable results of intellectual activity, and the average monthly wages of employees).
- producing a separate specialized collected publication reflecting the trends and state of development of innovative SMEs for Russia in general, by regions of Russia, by ministries and agencies, by higher educational institutions, and by scientific organizations. It would partly reflect the rating of regions by the development of innovations and, apparently, would be essential for all government agencies and the scientific and educational community.

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