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## Оценка результативности деятельности инновационных компаний в Сколково

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### Аннотация

В статье представлены результаты исследования показателей деятельности российских инновационных компаний на основе выборки участников проекта «Сколково». Рассмотрены следующие показатели деятельности российских компаний: число и квалификация работников, выручка, международные продажи, патенты и эффект Сколково на ВВП. Исследование также опирается на результаты опроса резидентов «Сколково», проведенного среди 137 компаний. Общие выводы подтверждают необходимость государственной поддержки молодых компаний.

### Ключевые слова

Инновации, стартапы, показатели деятельности, ВВП, патенты.

### Introduction

Skolkovo Innovation Center is one of the first state-owned science parks of its kind<sup>1</sup> in Russia. On November 12, 2009, Russian then-president Dmitry Medvedev announced that Skolkovo in Moscow had been designated as a high-technology business area. Financed primarily from the Russian federal budget, it also attracts domestic and international investments, which exceeded 8.6 billion rubles in 2010–2014. Urban and technological development parallel and influence each other. A new university and a technology park are the main landmarks of Skolkovo; they are surrounded by high-tech office buildings, laboratories and recreation areas. Skolkovo comprises five research and business clusters: IT, energy, nuclear technologies, biomedicine, and space technologies. The innovation center is connected with the Moscow downtown through efficient rail transport and shuttles, which enables commuters to reach Skolkovo from the center of Moscow within 40 minutes. Its population has reached 21 000 people and continues to grow. One of the parameters of the success of this massive project is the efficiency of the state investments and its impact on the development of businesses; these factors ensure the growth of the city and provide jobs.

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<sup>1</sup> Actually many science parks were established in the Soviet Union, including science parks in Novosibirsk, Zelenograd and Dubna, but Skolkovo is different because it uses Western and Soviet best practices.

Three stages of Skolkovo development can be distinguished: initial foundation, fast growth, and revised understanding (rethinking) of the mission. Since the foundation of Skolkovo in 2010, the performance indicators of Skolkovo and its companies have evolved significantly. At the beginning, the main focus was on the interaction of Skolkovo companies with the Russian and international business communities. In 2011, at the stage of fast growth, new indicators were introduced. These included the assessment of partners, infrastructure, and intellectual property. Later, at the stage of redefining the mission, additional new indicators emerged related to such areas as business revenues and number of jobs provided. The details of these changes can be found in the article by A. Efimov<sup>2</sup>.

It is evident that the performance indicators of Skolkovo companies are better structured today than they have been previously. Skolkovo has started to track the international sales of its companies, which is a good indicator for customer base measurement. The indicators themselves are reliable because they combine various factors ranging from patents to international sales, but today Skolkovo faces a number of challenges related to the overall crisis in the economy, geopolitical tensions with the European Union and the United States and the drop in energy prices. The overarching goal of the article is to improve the performance indicators of Skolkovo companies and to track their performance.

### *Theoretical background*

This article explores the main performance indicators of innovative Russian companies and tracks their performance based on the dataset of Skolkovo, using direct polls and interviews. Our research used methods of common logic, including inductive and deductive reasoning, statistics and some methods of econometrics. It also relied on the results of a poll conducted in 2015. 137 companies from different clusters (IT, energy efficiency, nuclear, space, and biomedical) have taken part in the poll. The poll was conducted using the methods of data analysis<sup>3</sup>.

We offer the following algorithm to justify the sample size. Let us suppose that the set of forms  $A$  (the general set) in the poll is infinite. Each form  $A_n$  has items  $B_i$  items, so that  $B_i = 1$  (the option is positive) or  $B_i = 0$  (the option is negative)  $i = 1, \dots, I$ . Let the probability of  $B_i = 1$  in  $A_{in}$  in the general set be  $P_i$ . Let the variable  $A_{in}$  associated with the form  $A_n$  be  $A_{in} = 1$ , if  $B_{in} = 1$  and  $A_{in} = 0$ , if  $B_{in} = 0$ . We have a primarily independent selection of  $N$

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<sup>2</sup> *Ефимов А.* Эволюция системы показателей результативности мер государственной поддержки инноваций на примере ИЦ «Сколково» // Фонд «Сколково» [Сайт]. 18.08.2014. URL: <http://sk.ru/news/b/press/archive/2014/08/18/evolyuciya-sistemy-pokazateley-rezultativnosti-mer-gosudarstvennoy-podderzhki-innovaciy-na-primere-ic-skolkovo.aspx> (дата обращения: 10.06.2017).

<sup>3</sup> *Петрунин Ю.Ю.* Информационные технологии анализа данных. Data Analysis. М.: КДУ, 2010.

forms  $A_n, n = 1, \dots, N$  from the general set. Let the number of forms  $A_n$  with  $A_{in} = 1$  be  $N_i$  in the selection,  $i = 0, \dots, I$ . Thus  $N_i = \sum_{n=1}^N A_{in}$ . Variable  $N_i$  is random and asymptotically has Gauss distribution in the selection with the average value  $E\{N_i\} = P_i * N$ . The probability evaluation of  $P_i$  in our selection shall be  $p_i = \frac{N_i}{N}$ . In accordance with central limit theorem the distribution of  $p_i, i = 1, \dots, I$  is normal in the case of large amount of  $N$  and random sampling<sup>4</sup>.

Thus the expected value in the selection is  $E\{p_i\} = P_i$  and the dispersion is  $D_{p_i} = \sum_{n=1}^N (A_{ni} - p_i)^2 / N = p_i * (1 - p_i) / N \leq 0,5^2 / N^5$

Then the mean square deviation is  $\sigma_{p_i} = \sqrt{D_{p_i}} \leq \frac{0,5}{\sqrt{N}} = 0,0427, N = 137$

With the probability of 99,73% we can calculate the confidence interval using  $3\sigma$  rule<sup>5</sup> for  $N = 137$ .

$$3\sigma \leq \frac{3 * 0,5}{\sqrt{N}} = \frac{3 * 0,5}{\sqrt{137}} = 0,128$$

The confidence interval will be:

$$p_i \in (P_i - 0,128; P_i + 0,128), i = 1, \dots, I$$

This article relies on the ideas expressed in the book “How Google Works”. For example<sup>6</sup>, the author gives the following definition of innovative: “For something to be innovative, it needs to be new, surprising, and radically useful”. The book also points out the importance of “smart creatives” for successful business development.

The main objectives of the article are to:

1. improve the performance indicators of Skolkovo companies;
2. evaluate the effect of Skolkovo on the GDP of Russia;
3. clarify the role of patents in business growth;
4. determine the role of government grants for Skolkovo companies;
5. compare the features of Skolkovo and Silicon Valley;
6. determine, if Skolkovo companies can lead to the internationalization of Russian economy;
7. measure the level of state regulation in Russia for Skolkovo companies;
8. determine the impact of the financial crisis on Skolkovo companies.

<sup>4</sup> Королев В.Ю. Теория вероятностей и математическая статистика. М.: Проспект, 2007. С. 44.

<sup>5</sup> Петрунин Ю.Ю. Указ. соч. С. 70.

<sup>6</sup> Schmidt E., Rosenberg J. How Google Works. New York: Grand Central Publishing, 2014.

### ***Performance Indicators***

Scholars and practitioners have developed numerous indicators of company growth<sup>7</sup>. However, it is difficult to name a generally accepted performance indicator and each industry might have its own indicators. For instance, in the area of innovation specific indicators are often employed such as R&D inputs, patent counts, patent citations and new product announcements<sup>8</sup>.

One of the best indicators of business performance is business valuation and its dynamics<sup>9</sup>, however it is quite difficult to measure. Often the market valuation of a company during the merger and acquisition process exceeds its intrinsic value because of irrational investors. An independent appraisal can be conducted, but the accuracy of independent evaluation is also subject to debate. Often the valuation of innovative companies is so complex, that investors analyze the team qualifications and evaluate the business performance primarily using this criterion. In the last few years, several M&A were carried out on the basis of team qualifications: the investor explores the team and makes the decision if it is able to reach the goals. Team qualifications are more important than the number of workers: smart creatives are crucial for business performance.

The cash flow method is one of the most transparent performance indicators<sup>10</sup>. However, it often does not suit fledgling IT companies<sup>11</sup>. For many businesses, the customer base is more important than projected cash flow. It is difficult to make a sound cash flow forecast when there are no products or proof of concept. There are many opportunities to commercialize the customer base, even though the business may not generate high revenues now.

Currently, Skolkovo performance indicators include:

1. number of IP applications;
2. number of patents;
3. private investments;
4. revenues of Skolkovo participants;
5. number of publications indexed by the Web of Science;

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<sup>7</sup> *Al-Mubarak H., Wong S.F.* How Valuable Are Business Incubators? A Case Illustration of Their Performance Indicators // European, Mediterranean & Middle Eastern Conference on Information Systems 2011 (EMCIS2011), Athens, Greece, May 30–31, 2011. P. 30–31.

<sup>8</sup> *Hagedoorn J., Cloudt M.* Measuring Innovative Performance: Is There an Advantage in Using Multiple Indicators? // *Research policy*. 2003. No 8. P. 1365–1379.

<sup>9</sup> Финансовый менеджмент: проблемы и решения / Под ред. А.З. Бобылевой. М.: Юрайт, 2014.

<sup>10</sup> Там же.

<sup>11</sup> *Koshelek G.* Express Diagnostics of Financial State of the Enterprise Means Liquid Cash Flow // *Economics of Enterprise: Modern Challenges in Theory and Practice: Thesis of the II International Conference Hold at the Odessa National Economic University (September 26–27, 2013)*. Odessa, 2013. P. 27–28.

6. share of Skoltech graduates involved in innovative activity;
7. the integral contribution of the Skolkovo project to the economy;
8. reduction of average market launch time by Skolkovo companies.

In general, Skolkovo has developed a balanced set of indicators. However, these indicators could be improved. For example, Skolkovo does not provide open access to the ratios for these indicators and the raw data, this is why it is not possible to check these figures. Moreover, some indicators are not easy to compute: for example, integral contribution of Skolkovo to the economy and reduction of average market launch time. The “integral contribution” is tricky, because Skolkovo tries to measure how large corporations use Skolkovo innovations, but corporations do not share this data openly. The indicator “reduction of average market launch time” is also tricky due to the fact, that each industry has different launch time (IT vs. biotech). We would recommend Skolkovo to include in its KPIs international sales and satisfaction of startups by Skolkovo. International sales are very good, because they prove the competitive advantages of Skolkovo products on international markets. Satisfaction of startups demonstrates if Skolkovo reaches its goal of creating a sustainable ecosystem of entrepreneurship and innovation.

These indicators are used at macro level of Skolkovo, but companies at micro level have their own indicators. Based on our analysis we offer the following indicators to track the performance of Skolkovo companies at micro level:

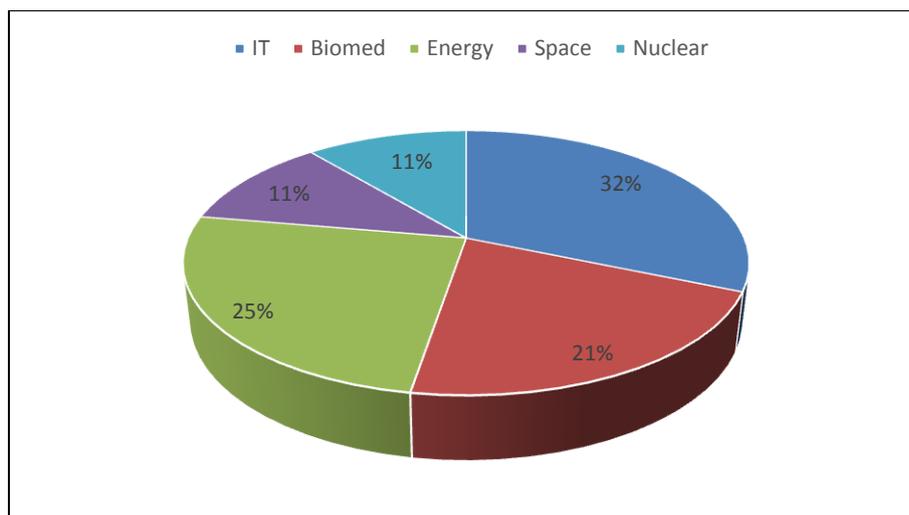
1. business valuation and its dynamics (as integral indicator)<sup>12</sup>;
2. customers (i.e. using, monthly active users for IT);
3. investments;
4. revenues (including international sales);
5. number and qualification of workers;
6. patents, patent applications and patent citations.

### ***Specifics of the Skolkovo cluster structure***

The distribution of Skolkovo companies in clusters illustrates the Skolkovo industry structure (Figure 1). The majority of Skolkovo companies belong to the IT cluster (32%). All these clusters rely on traditional Russian STEM education and research.

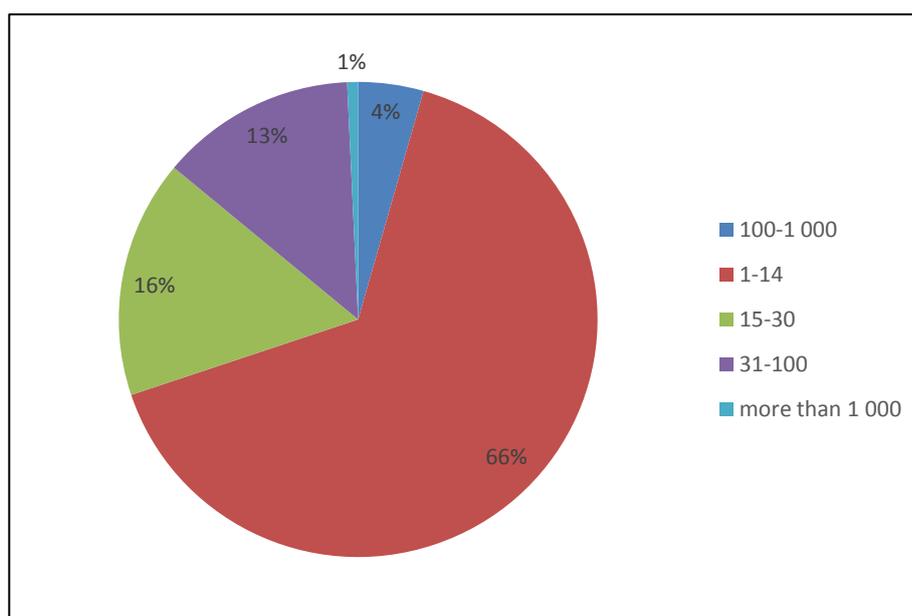
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<sup>12</sup> Often, it is not possible to make business valuation when there are no sales, customers, intellectual property or a brilliant team.



**Figure 1. Distribution of Skolkovo companies by clusters<sup>13</sup>**

The poll results indicated that in most Skolkovo companies the number of workers ranges from 1 to 14 (66%) (Figure 2).

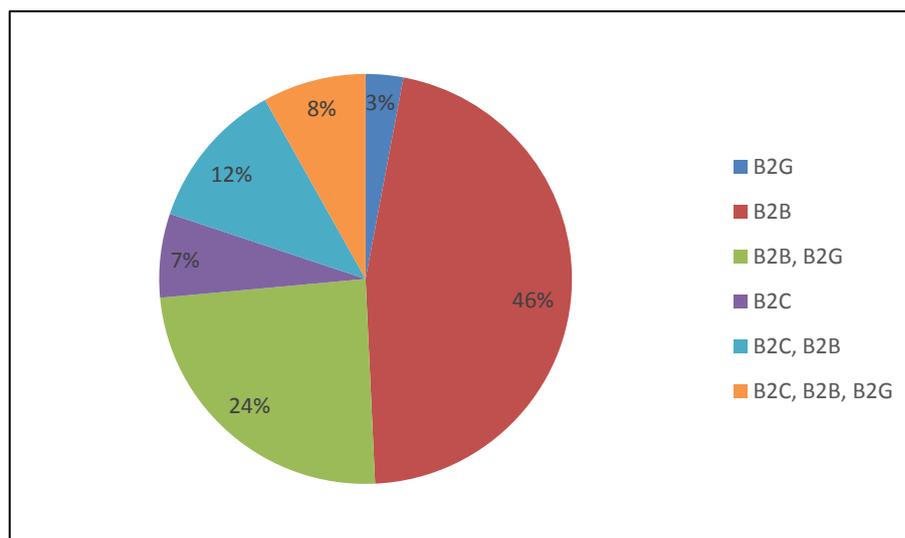


**Figure 2. Number of workers in Skolkovo companies<sup>14</sup>**

The business model of most Skolkovo companies is B2B (46%) (Figure 3). This is logical because B2B ensures the scalability of business development: partners help to disseminate new technologies and accelerate growth. Also this business model may not require as much marketing and advertising as the B2C model.

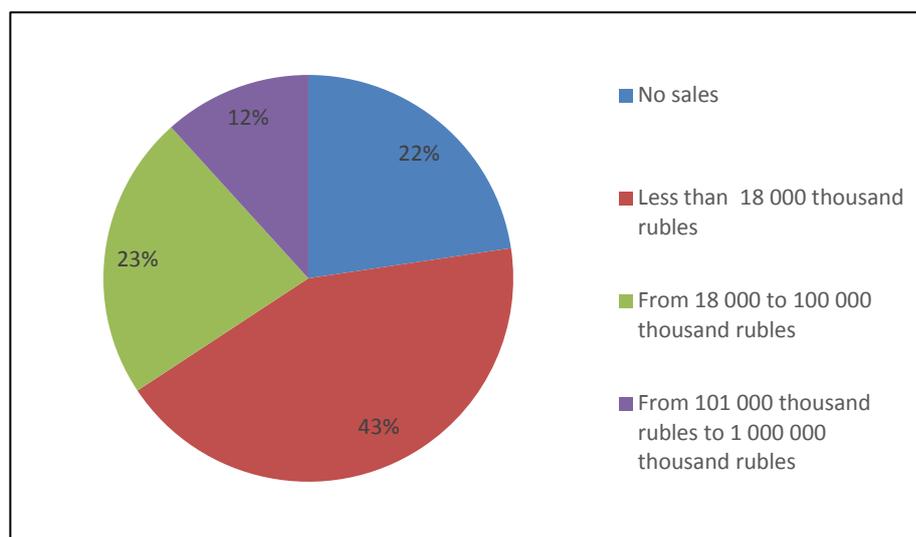
<sup>13</sup> Source: Годовой отчет фонда «Сколково» 2014 // SlideShare [Сайт]. URL: <https://www.slideshare.net/SkolovoFoundation/sk-annual-report?related=1> (дата обращения: 11.06.2017).

<sup>14</sup> Source: Poll of Skolkovo companies by authors (2015).



**Figure 3. Business models of Skolkovo companies<sup>15</sup>**

Figure 4 demonstrates that, based on sales, Skolkovo companies are mostly small businesses (in accordance with federal Russian legislation middle businesses have revenues of more than 2 000 000 rubles)<sup>16</sup>.



**Figure 4. Sales of Skolkovo companies<sup>17</sup>**

The Russian government decreed in 2015 that small businesses must be given preference in state purchases, and no less than 10% of state contracts must go to small businesses<sup>18</sup>. This

<sup>15</sup> Source: Poll of Skolkovo companies by authors (2015).

<sup>16</sup> Investmoscow.ru [Инвестиционный портал города Москвы]. URL: <https://investmoscow.ru/> (дата обращения: 11.06.2017).

<sup>17</sup> Source: Poll of Skolkovo companies by authors (2015).

<sup>18</sup> Перечень госкомпаний, обязанных делать закупки у малого и среднего бизнеса, утвердило правительство РФ // БайкалФинанс [Сайт]. 13.11.2015. URL: <http://baikalfinans.com/biznes/perechen->

regulation applies to the 35 largest state corporations of Russia, including Rosneft and Gazprom. It should help increase the revenues of Skolkovo companies in the future.

### ***Relationship between patents and business growth***

The role of patents in business is obvious: patents create opportunities for business growth. It is well described by several authors, including Hagedoorn, and Cloudt<sup>19</sup>. However, the relationship is not direct. There are historical cases in which patents did not help businesses survive in dynamic external environments. One example is Kodak. The company had losses for several years despite its rich patent portfolio. Eventually it was forced to sell its patent portfolio for \$525 million<sup>20</sup>. This case shows that despite its patents a company can lose the market share.

The experience of Soviet enterprises shows that patents should be in line with market trends and development. In the Soviet Union engineers made hundreds of inventions (for example, 96 536 in 1981)<sup>21</sup>, but few of them were successful as products. It is thus possible to make many inventions, but they might not be useful to the consumers.

The statistics for patents and revenues in 2013 and 2014 are given in Table 1.

**Table 1. Skolkovo revenues and patents<sup>22</sup>**

<b>Year</b>	<b>2014</b>	<b>2013</b>
Revenues, billion rubles	27,8	5
Patent applications	645	484
Number of patents	27	29

It is difficult to make judgments based on these statistics, but it can be stated that patents create the foundation for growth and can accelerate the growth. Patents contribute to the growth of revenues, but they are only one of many factors, such as the business model, the team, financial resources, and the business climate in the country. The statistics shows that global innovative companies with sustainable revenue growth rate file a lot of patent applications: for example, Samsung filed 2 457 patent applications in Jan-May 2015 and

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[goskompaniy-obyazannyih-delat-zakupki-u-malogo-i-srednego-biznesa-utverdilo-pravitelstvo-rf-13112015-14577856.html](http://goskompaniy-obyazannyih-delat-zakupki-u-malogo-i-srednego-biznesa-utverdilo-pravitelstvo-rf-13112015-14577856.html) (дата обращения: 10.06.2017).

<sup>19</sup> Hagedoorn J., Cloudt M. Op. cit.

<sup>20</sup> Martin A. Kodak to Sell Digital Imaging Patents for \$525 Million // The New York Times. 19.12.2012. URL: [http://www.nytimes.com/2012/12/20/business/kodak-to-sell-patents-for-525-million.html?\\_r=0](http://www.nytimes.com/2012/12/20/business/kodak-to-sell-patents-for-525-million.html?_r=0) (accessed: 10.06.2017).

<sup>21</sup> Джермакян В.Ю. Мифы и «утки» о заявках на изобретения // Патенты и лицензии. 2004. № 10. С. 14–17.

<sup>22</sup> Source: Годовой отчет фонда «Сколково» 2014 // SlideShare [Сайт]. URL: <https://www.slideshare.net/SkolkovFoundation/sk-annual-report?related=1> (дата обращения: 11.06.2017).

received 3 052 patents in the U.S. only<sup>23</sup>, which exceeds the indicators of Skolkovo companies. It is interesting to note that Skolkovo measures patent counts only and does not measure patent citations or R&D inputs. Obviously, it is related to the fact that it is more difficult to track patent citations than just patent counts.

Many successful technological businesses do not hold patents for inventions. For example, the Russian cloud-based surveillance service iVideon does not have any patents, although it has more than 200 000 users around the world, including Rosneft and Honda<sup>24</sup>. However, we know that iVideon owns other intellectual property and software. In the future, it would be interesting to analyze the correlation between patents and revenues in Skolkovo, but the data available is not adequate for doing so now.

### *The effect of Skolkovo companies on the Russian GDP*

Gross Domestic Product (GDP) is not considered by some scholars to be the best indicator of economic performance<sup>25</sup>. Many researchers state that GDP is an unreliable indicator for assessing overall societal well-being and economic growth. Joseph Stiglitz stressed that GDP does not take into account such factors as access to education or people's health or ecology<sup>26</sup>. However, there can be growth without development and vice versa. Development indicators should therefore be taken into account to measure the "quality of growth".

**Table 2. Skolkovo revenues and GDP<sup>27</sup>**

Year	2014	2013	Change
Skolkovo revenues, billion rubles	27,8	5	22,8
GDP of Russia, billion rubles	70 975,6	66 755,3	4 220,3
Share of Skolkovo revenues in total Russian GDP growth, %	0,04	0,01	0,54

<sup>23</sup> Purcher J. Samsung and IBM Dominate Patent Activity in the U.S. in 2015 with Apple Falling Dramatically // Patently Apple [Site]. URL: <http://www.patentlyapple.com/patently-apple/2015/06/samsung-and-ibm-dominate-patent-activity-in-the-us-in-2015-with-apple-falling-dramatically.html> (accessed: 10.06.2017).

<sup>24</sup> Как российский сервис видеонаблюдения Ivideon покоряет мир // iVideon [Сайт]. 11.08.2014. URL: <https://ru.ivideon.com/blog/kak-rossijskij-servis-videonablyudeniya-ivideon-pokoryaet-mir/> (дата обращения: 10.06.2017).

<sup>25</sup> Is GDP a Satisfactory Measure of Growth? // OECD Observer. December 2004 — January 2005. No 246/247, URL: [http://www.oecdobserver.org/news/archivestory.php/aid/1518/Is\\_GDP\\_a\\_satisfactory\\_measure\\_of\\_growth.html](http://www.oecdobserver.org/news/archivestory.php/aid/1518/Is_GDP_a_satisfactory_measure_of_growth.html) (accessed: 12.06.2017).

<sup>26</sup> Piling D. Has GDP Outgrown Its Use? // Financial Times. URL: <https://www.ft.com/content/dd2ec158-023d-11e4-ab5b-00144feab7de?mhq5j=e1> (accessed: 10.06.2017).

<sup>27</sup> Source: Rosstat; Годовой отчет фонда «Сколково» 2014 // SlideShare [Сайт]. URL: <https://www.slideshare.net/SkolkoFoundation/sk-annual-report?related=1> (дата обращения: 11.06.2017); Кантышев П. «Сколково» перевыполнило план по выручке // Ведомости. 03.06.2015. URL: <http://www.vedomosti.ru/technology/articles/2015/06/03/595036-skolkovo-perevipolnilo-plan-po-viruchke> (дата обращения: 10.06.2017).

It is a daunting task to measure the impact of Skolkovo on the GDP of Russia. The revenue of Skolkovo companies contributed 0,04% to the GDP of Russia in 2014 (see Table 2). This amount is small, but it is increasing. If we measure the contribution of Skolkovo not to GDP, but to the growth of GDP from 2013 to 2014, we see that the importance of Skolkovo is higher: the input of Skolkovo revenues into the growth of the GDP of Russia was 0,54% in 2014.

Skolkovo companies are too small at this time to influence the GDP growth significantly. However, they can affect GDP growth indirectly. Skolkovo companies are developing technologies that can radically improve the productivity of work by providing the necessary technologies for large corporations, such as Gazprom, RZD, and MTS. These technologies can increase the overall productivity of the Russian economy and accelerate the GDP growth. For example, intelligent video-surveillance solutions developed by Skolkovo residents or other start-ups can vastly improve the labor productivity of remote operators. We think that the principal cause of this small influence of Skolkovo on the Russian GDP is Skolkovo's relatively short existence, since it may take years to grow a billion dollar company from a startup.

### ***Relationship between grants and business growth***

Government grants can be a good tool for business growth because they are often used to support long-term projects, including fundamental research, which does not give an immediate return. At the same time, it is often difficult to measure business performance after a grant receipt. A crisis can decrease sales, even though the product is good. Another problem is that companies after grant receipt start focusing not on customer needs, but on the requirements of the government body that provided the grant. In this case, the grants may not improve business performance.

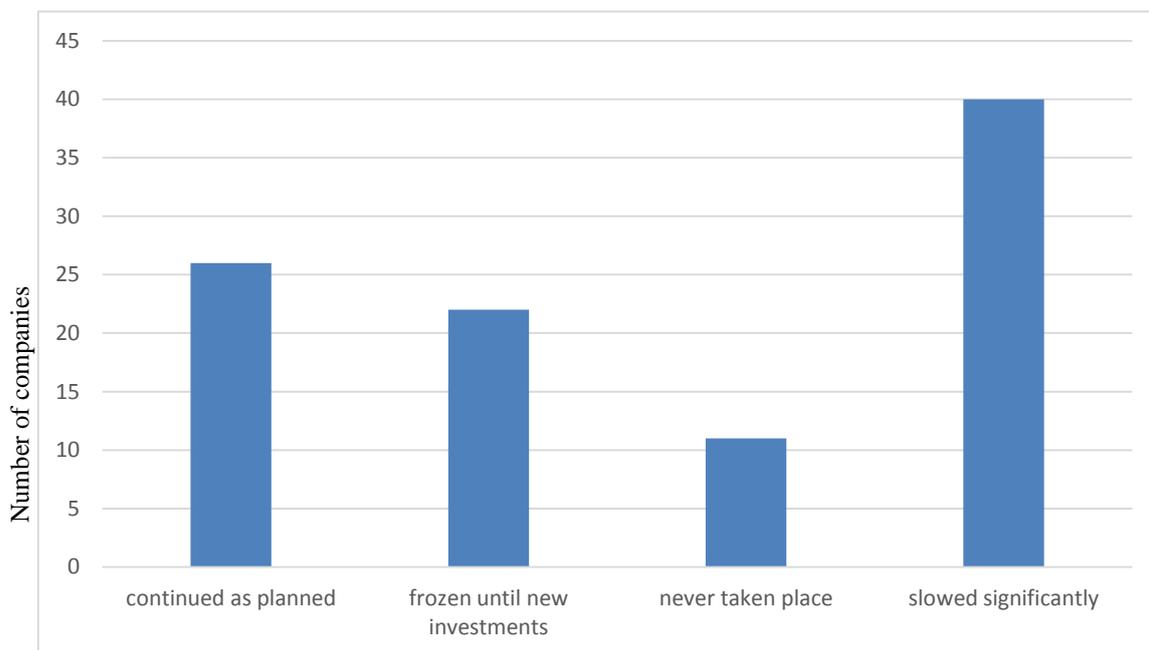
Another role of grants to start-ups is risk-sharing between venture capitalists and the government. Government money usually comes (as in the Skolkovo case) with thorough external expertise<sup>28</sup>. The majority of Skolkovo's grants are so-called matching grants with different proportions of external financing to government financing. This helps venture capitalists not only to decrease the payback time but also to improve the evaluation of a project's risks.

In our poll of Skolkovo companies, we asked: "If you had not received a grant from Skolkovo or other support from the institutions of the Russian Federation, your project would

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<sup>28</sup> Кантышев П. Указ. соч.

have...” The results of the poll underscore the importance of government support for project development, which is especially relevant for Russia (Figure 5).



**Figure 5. Importance of government grants to Skolkovo companies<sup>29</sup>**

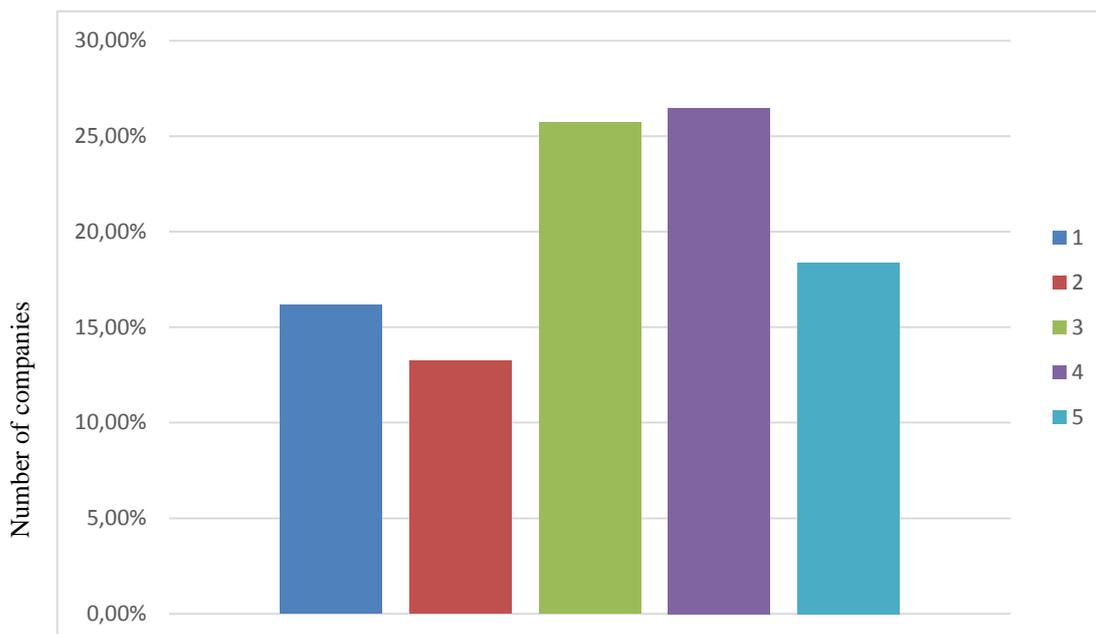
The number of companies is fewer than 137, because not all of the companies have answered this particular question.

### ***Public regulation of Skolkovo companies***

Russia is often criticized by domestic and foreign businesses for overregulation — for example, in a Moscow Times article entitled “Foreign Investors Complain about Russia’s Unpredictable Laws”<sup>30</sup> — but the results of our poll at Skolkovo indicate that the level of state regulation is not extremely high (5 is maximum) (Figure 6). This leads us to the conclusion that the majority of Skolkovo companies think that the level of regulation is not extremely high (5) and more than 50% think level of regulation is medium (3 and 4): the government burden on the Skolkovo companies is less than on traditional businesses.

<sup>29</sup> Source: Poll of Skolkovo companies by authors (2015).

<sup>30</sup> Hobson P. Foreign Investors Complain About Russia’s Unpredictable Laws // The Moscow Times. 19.10.2015. URL: <https://themoscowtimes.com/articles/foreign-investors-complain-about-russias-unpredictable-laws-50346> (accessed: 12.06.2017).



**Figure 6. Level of state regulation as perceived by Skolkovo companies<sup>31</sup>**

#### ***Comparison between Skolkovo and the Silicon Valley***

The data confirms that Skolkovo companies are much smaller than American research-intensive businesses, as the American tradition goes back to the formation of the Silicon Valley, which was successful in part because of the nearby presence of the Stanford University and governmental support<sup>32</sup>. IT companies are broadly present in science parks associated with many other U.S. universities, such as the MIT, the Stanford University and the Michigan State University. Many of these IT companies show years of sustainable growth. There is no detailed data comparing these companies to Russian IT companies either at Skolkovo or in other science parks. Moreover, even in the case of the Skolkovo companies, a great deal more about their similarities to and differences from U.S. companies remains to be discovered. The number of patent applications filed by Skolkovo in 2013 was 684. Silicon Valley had 16 975 patent applications that year. Cumulative revenues of Skolkovo companies reached \$1 bn at the end of 2014, while the revenue of Apple alone amounted to \$182,35 bn in 2014. Thus, Silicon Valley is much larger than Skolkovo. However, we should not underestimate the role of Skolkovo companies because they can influence Russian economy indirectly through technological advancement.

<sup>31</sup> Source: Poll of Skolkovo companies by authors (2015).

<sup>32</sup> Rice-Oxley M. Inside Skolkovo, Moscow's Self-styled Silicon Valley // The Guardian. 12.06.2015. URL: <https://www.theguardian.com/cities/2015/jun/12/inside-skolkovo-moscows-self-styled-silicon-valley> (accessed: 11.06.2017).

Skolkovo has launched numerous successful start-ups — companies that have gained a share in both Russian and global markets. One good case is the Vist Group, which develops driverless trucks for the mining industry in a joint venture with Kamaz and Belaz factories. Vist Group has already implemented successful projects abroad — for example, in the North Africa mining industry.

Bravo eGo is an ultracompact electric car developed by Saransk engineers. It reaches a speed of up to 90 km per hour and uses a tablet computer instead of a traditional steering wheel. The target market for Bravo eGo is Europe<sup>33</sup>.

Skolkovo companies have achieved significant results in robotics, specifically in the area of drones, driverless trucks, and exoskeletons. The first Russian exoskeleton was created in Skolkovo in 2014. Kamaz driverless trucks will be tested in 2016–2018. Promobot, a multipurpose supporting robot developed in Skolkovo, won the Startup Superstar Contest (SLUSH 2015 in Finland)<sup>34</sup>. The technologies of Comindware Tracker are used in the maintenance and service centers of the United Nations to automate the business processes of certain departments<sup>35</sup>.

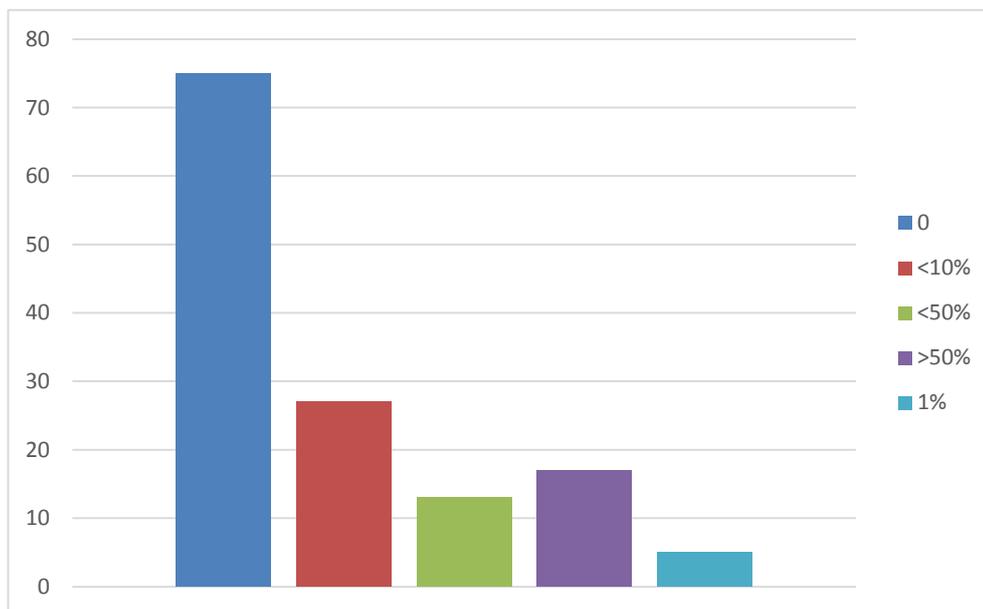
Skolkovo companies can also lead the internationalization of the Russian economy. Figure 7 shows the results of our Skolkovo poll, which proves that the majority of companies did not have international sales. Still, almost half of them did. The geography of sales is also crucial. The European Union and the United States remain the leading target markets for Skolkovo companies. They also make sales to China, the Middle East, and the CIS countries. International sales are a good indicator of business growth, because they show that the product has competitive advantages.

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<sup>33</sup> Ханцев З. BravoEgo: все факты о доступном отечественном электромобиле // Колёса [Сайт]. URL: <http://www.kolesa.ru/article/bravo-ego-vse-fakty-o-dostupnom-otechestvennom-elektromobile-2015-02-05> (дата обращения: 10.06.2017).

<sup>34</sup> Promobot — SlushStartup Superstar-2015: Победитель индустриального трека GenerationS-2014 празднует очередной успех // GenerationS [Сайт]. 17.11.2015. URL: <http://generation-startup.ru/news/articles/16271/> (дата обращения: 11.06.2017).

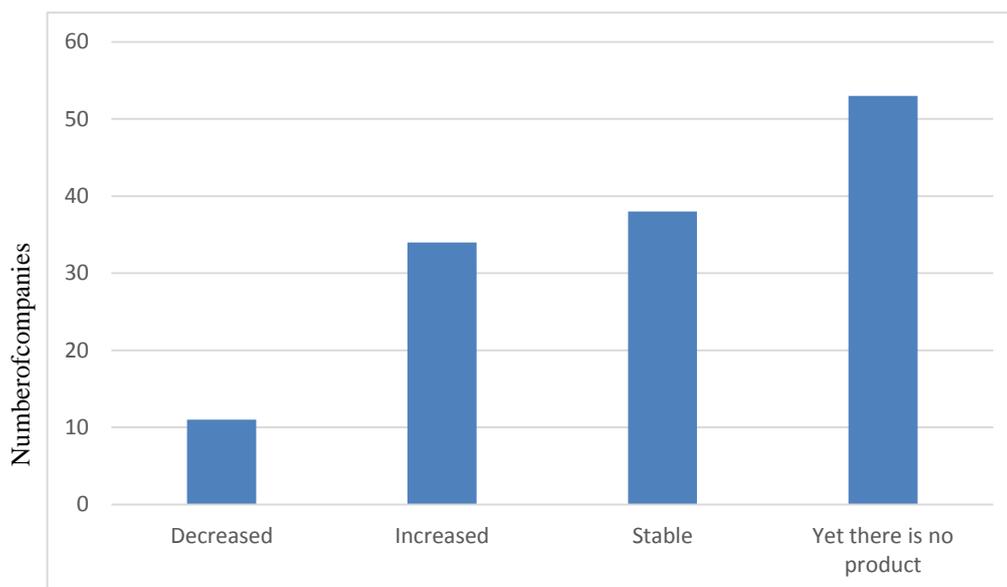
<sup>35</sup> Шустиков В. Comindware оптимизирует работу сервисных центров ООН // Фонд «Сколково» [Сайт]. 08.09.2015. URL: <http://sk.ru/news/b/pressreleases/archive/2015/09/08/comindware-optimiziruet-rabotu-servisnyh-centrov-oon.aspx> (дата обращения: 10.06.2017).



**Figure 7. Percentage of sales of Skolkovo companies that are exports<sup>36</sup>**

***The effect of the financial crisis on the Skolkovo companies***

One of the questions in the poll was the following: “How did demand for your products change in 2015?” As the graph shows, despite the financial crisis in Russia at that time, the demand for products created in Skolkovo remained stable or even increased. The conclusion from this figure is that the crisis did not affect the Skolkovo companies significantly.



**Figure 8. Effect of the financial crisis in 2015 on the demand for Skolkovo products<sup>37</sup>**

<sup>36</sup> Source: Poll of Skolkovo companies by authors (2015).

### **Conclusions**

To sum up, several indicators should be considered to track the performance of IT startups in Skolkovo such as business valuation, quantity and qualification of workers, business model, revenues, international sales, investments, patents and patent citations. The poll results indicate that the **European Union and the United States** remain the leading target markets for Skolkovo companies.

Skolkovo innovation center is **much smaller compared to the Silicon Valley**. For example, Skolkovo companies have filed **24,82** times less patent applications in 2013 than the innovative companies in the Silicon Valley. The revenues of Apple alone were **~182 times** larger than those of all the Skolkovo companies combined in 2014 (\$1 bn compared to \$182,35 bn). We can state, that revenues and patents are related, but the relationship is indirect. Patents create the foundation of growth.

Grants are a good tool for supporting business growth, assuming that they are properly used. In Russia government grants are the principal option for supporting businesses. In Skolkovo, fewer than 30% of the companies would continue business without grants. **Skolkovo companies have a slight effect on the growth of the domestic GDP**: the share of Skolkovo companies' revenue in the growth of the Russian GDP was **0,54%** in 2014.

Further research could be done on the comparative relevance of financial, ecological, and social metrics in the innovation ecosystem. The correlation between patents and revenues can be computed once additional data are available for Skolkovo. Besides, it would also be useful to explore whether “first to file” or “first to invent” system is better for start-ups in various regions.

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<sup>37</sup> Source: Poll of Skolkovo companies by authors (2015).

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### **Measuring Innovative Performance of Skolkovo Companies**

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#### **Annotation**

Scholars and practitioners have developed numerous indicators of business performance, however it is difficult to name a generally accepted performance indicator. This article explores the performance of Russian innovative companies using the dataset of 137 Skolkovo companies. The authors employ several performance indicators of Russian start-ups, including number of workers, business model, revenues, international sales, patents, and effect on the GDP. The overall conclusions confirm the essential role of governmental support in the growth of start-ups during the crisis. In Skolkovo, fewer than 30% of the companies would continue business as usual without grants. The causes of small influence of Skolkovo companies on Russian GDP are explored. The direct contribution of Skolkovo revenues to the growth of the GDP of Russia was 0,54% in 2014.

The comparison between the Silicon Valley and Skolkovo shows, that the Skolkovo innovation center is still relatively small: Skolkovo companies have filed 24,82 times less patent applications in 2013 than the innovative companies in the Silicon Valley. The revenues of Apple alone were ~182 times larger than those of all the Skolkovo companies combined in 2014.

#### **Keywords**

Innovations, start-ups, business performance, GDP, patents.