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俄羅斯軟體產業國際競爭力分析: 波特鑽石模型觀點

International Competitiveness Analysis of Russia's Software Industry: Porter's Diamond Model Perspective

保羅

Paul Edvard Poliakov

指導教授：陳俊忠 博士

Advisor: Chun-Chung Chen, Ph.D.

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International Competitiveness Analysis of Russia's Software Industry: Porter's Diamond Model Perspective

本論文係保羅君（R04724064）在國立臺灣大學國際企業學研究所完成之碩士學位論文，於民國 106 年 06 月 27 日承下列考試委員審查通過及口試及格，特此證明。

口試委員：

（指導教授）

所　　長：

中華民國　106　年　06　月　27　日

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保羅 (Paul Edvard Poliakov) 謹誌
於台大國際企業研究所
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摘要

蘇聯於 1990 年解體之後，俄羅斯雖然成功從計畫經濟轉成市場經濟，但是它並沒有及時進行經濟轉型，並過度依賴自己的很豐富的天然資源，包含石油、天然氣、 各種金屬等等. 原物料價格高的時代，表面上的效果相當好，不過，最近幾年世界經濟跟俄羅斯經濟上的趨勢表明，這個發展策略並不合理. 俄羅斯經濟需要新的發展動力，而考慮到俄羅斯龐大土地、 基礎設施不足、 工業基礎較弱等因素以及俄羅斯現有的一些優勢，軟體產業是非常適當的選擇.

本研究嘗試用邁克爾·波特於 1990 年提出的, John Dunning 於 1993 年補充的鑽石模型來研究俄羅斯軟體產業競爭力. 本論文從外國公司來俄羅斯進行軟體開發外包，以及俄羅斯本土公司開發出具有國際競爭力的產品或服務等兩個面向看俄羅斯軟體產業發展現況與展望. 與以前的研究不一樣，本論文不但挑出俄羅斯軟體產業現有的強項跟不足之處，而且也提供一系列能夠加強優勢跟應對劣勢的政策意見供各層面決策者應用.

該政策意見被整理成一個系統，以鑽石模型四個要素為基礎，針對個別公司，產業組織，相關產業，政府和跨國公司等五個層面分別提出建議，並強調各層次之間合作的重要性. 所探索出來的問題以及解決方案都結合在一起形成一個表格，以進一步增加實用性並讓讀者能夠更快把握本研究的重點.

本研究發現，俄羅斯雖然在人才等方面具有一定的優勢，而且總體經濟環境惡化對俄羅斯資訊科技跟軟體產業的負面影響有限，但是，企業策略缺乏全面性、創業環境不完整、教育對職場需求反應過慢、國家減稅之外的支持嚴重不足而政策焦點放錯、國際化程度低等問題使本產業國際競爭力無法進一步提升．為了應對來自中國，印度等開發中國家的競爭壓力，各層次的決策者必須協力解決該問題，使軟體產業成為俄羅斯經濟的新的發展動力．

關鍵詞: 軟體產業，資訊科技，俄羅斯，鑽石模型

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Abstract

After the collapse of Soviet Union in 1990s, Russia has successfully transferred from planned economy to a market-based one; however, it has not performed so well in transforming its economic structure and chose to rely on its abundant natural resources such as oil, natural gas, metals etc. When commodity prices were high, Russia's economic development looked good at first glance, however, the recent trends in both global and Russian economy show that such strategy is not sustainable. Russian economy needs a new engine of growth, and, after taking into consideration the vast territory, lack of infrastructure as well as relatively weak industrial base, software industry seems to be a very suitable choice.

This study uses the diamond model proposed by Michael Porter in 1990 and amended by John Dunning in 1993 to assess the international competitiveness of Russia's software industry from two perspectives:

- feasibility for foreign firms to outsource software development to Russia,
- possibility for Russian firms to create products and services that are competitive on the global market

Unlike previous researches on this topic, this paper not only outlines the strengths and weaknesses that Russia's software industry has right now, but also proposes a series of policy measures for decision makers at various levels aimed at supporting the strengths and addressing the shortcomings.

In this study, policy implications have been arranged in a system based on the four determinants of Porter's diamond and have been divided into five levels, namely individual firm, industry, cross-industry, government and multinational; also, the importance of cooperation and coordination between various levels has been emphasized many times. The results have been organized into a table to make it easier to grasp the essence of this research.

It has been found that, while Russia does have competitive advantage in, for example, highly skilled human resources, also, the deterioration in macroeconomic environment has had a limited impact on the IT and software industry development, such issues as shortsighted firm strategies, shortcomings in startup ecosystem, slow adjustment of education system to latest tendencies on the labor market, serious lack of non-tax support from the government as well as low level of globalization has become

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an obstacle to a further improvement in global competitiveness of the industry in question. In order to withstand the competitive pressure from China, India and other emerging economies, policy and decision makers at various levels should coordinate their efforts in addressing those shortcomings and making software industry a new engine of growth for Russian economy.

Keywords: software industry, information technology, Russia, Porter's diamond

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Chapter 1. Introduction

1.1.1. Introduction

During the process of economic liberalization that started in the early 1990s when the Soviet Union collapsed, Russia has successfully transferred from central planning to the market-based economy; however, it has not performed so well in economic transformation. Being the biggest country in the world in terms of area, Russia has been well-endowed with natural resources, including oil, natural gas, coal, iron, nickel, precious metals etc. According to the Russian customs' statistics for 2016, majority of goods exported by Russia have been natural (mineral) resources or basic commodities made of them (See **Appendix A** for more details)[1]. Numerous studies have been made to find out if Russia does exhibit the symptoms of Dutch disease, when a boom in the natural resources sector causes an outflow of labor and capital from the manufacturing (tradable) and service (non-tradable) industries, decreasing the capacity of latter and leading to an increase in the real exchange rate due to price increase in non-tradable sector. The results vary (some researches do confirm the existence of Dutch disease symptoms in Russia, others deny it), however, Russia's reliance (and overdependence) on its natural resources sector is rarely (if even) disputed.

A decade of high oil prices with crude oil prices going as high as $117 for barrel has fueled the growth of Russian economy. However, since 2014, the decreasing oil prices as well as the new wave of confrontation with major Western powers, resulting in economic sanctions, made Russian economy go into a recession with negative GDP growth in 2015. Even if the problem of economic sanctions is resolved in the future (provided both sides are willing to solve the problem in a diplomatic way), the natural resources' prices are determined by a vast number of factors that cannot be controlled

[1] "Exports Of Goods From Russian Federation (All Countries) From Jan. To Dec., 2016", Federal Customs Service, Russian Federation, accessed May 2, 2017, http://customs.ru/index2.php?option=com_content&view=article&id=24781:----------2016--&catid=52:2011-01-24-16-28-57&Itemid=1978.

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by a single country and so the future fluctuations in the demand and supply of natural resources can hardly be predicted with a high level of confidence. So, staying on the same natural resource export-driven path that Russia followed in the 2000s is not sustainable anymore.

The key question that should be answered is which industry (or group of industries) should become a new engine for the growth of Russian economy. Should it be the manufacturing of some products or equipment, such as electronics? The vast territory, a lack of physical infrastructure, a huge gap in related technology (due to previous reliance on import), the patent protection of important findings, as well as a presence of powerful competitors such as China, India, Southeast Asia etc. (that offer better infrastructure and/or lower wages) make this choice not so viable. Due to poor macroeconomic situation in the recent years, the ability of government to invest huge amounts of money in infrastructure is limited and the capability of private sector seems not enough to make the country's economy follow this path. Even though back in late 2000s - early 2010s the talks about creating "a Russian-made smartphone" or "a Russian-made central processor unit" have been often heard, there are too many obstacles and competitive "disadvantages" that make the scenario of Russia becoming a new center for electronics manufacturing unlikely in the short or middle term.

However, in the modern world, "hardware"[2] manufacturing is not the only one sector that drives the world economy. The value added by the service industry has been estimated as 68% of the world GDP in 2014 (World Bank data), with the figures for agriculture and industry both dropping year after year. Among services, software industry seems a viable option to develop:

- As the computer hardware is largely uniform around the world, so are the main programming languages and frameworks, the software and IT services market has a global reach and is not so fragmented between different countries;

[2] Here "hardware" means not only the computer hardware, but some aggregate term for various end-consumer and industrial electrical and electronic equipment.

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- It does not require too much "physical" infrastructure[3] such as roads, bridges, factories etc., so it does not require a well-developed industrial base that modern Russia lacks;
- Its development does not require large capital expenditures (and the sunk costs that are associated with them) from the private sector;
- The import and export of software and services is also much easier than the related procedures for physical commodities, also, the related costs are lower;
- The software industry comprises a wide variety of sub-industries – even if some of them (such as packaged software market) are approaching decline, there are others (such as cloud technologies) that are in the process of high-speed growth. As these different sub-industries share some common skills and capabilities, the problem of being tied to an obsolete technology is not so acute here.

These factors make us think of software industry as a possible candidate for being an engine for the Russian economic growth in the future.

1.1.2. The goal and structure of the research

The goal of this research is to find the competitive advantages and disadvantages of Russia's software industry in the global market, to assess its performance and potential and to offer some policy implications aimed at supporting its strengths and repairing its weaknesses. This research will view the Russian software industry from both outsourcing (foreign companies outsourcing software production to Russia) and local development (local companies producing solutions that can compete on the global market) perspectives.

This research will use the "diamond" national competitiveness model developed in 1990 by Michael Porter and modified by John H. Dunning in 1993 as the methodological base. The Porter model and the contributions made by Dunning will be

[3] Except, probably, the facilities needed for wired or wireless Internet

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reviewed in Chapter 2.

Then, in Chapter 3 we will use this framework to study the current conditions in Russia's software industry. Chapter 4 will be dedicated to existing problems and will contain policy implications for various levels, from individual firm to the government and multinational enterprises, to address them. The issues and corresponding solutions will be then summarized in a table for the readers' and policy makers' convenience. Chapter 5 will serve as a brief conclusion to this paper.

1.1.3. Definition of "software industry" in the subsequent chapters.

Before proceeding, we need to clarify the term "software industry" that will be used in the subsequent chapters.

In the Russian National Industry Classification System (RNICS), the "computer software development" (code 62.01) is characterized as "the development of structure and content, or the creation of a computer program that is designed to accomplish a certain task, including operating systems and updates for them, applications and updates for them, databases, webpages, as well as set-up of an existing software for it to fit in the client's information system"[4]. However, the software market is not limited to computers (whether PC or laptops) anymore. Since the birth of IoT (Internet of Things), there is software in almost any electronic device. As CompTIA suggests, "Because software is now woven into the fabric of every device, system, or service, it can be challenging to identify where the software category ends and other categories begin."[5] We will face the same challenge in the current research. The RNICS definition will be used as a basis, however, the definitions of "computer program" and "information system" will be expanded to encompass the latest trends in the software industry. At the

[4] Federal Agency on Technical Regulating and Metrology, Russian Classification Of Economic Activities - 2014 (Rev. Oct., 7, 2016), 2016.

[5] Computing Technology Industry Association, IT Industry Outlook 2016, 2015, pg. 9, accessed December 3, 2016, https://www.comptia.org/resources/it-industry-outlook-2016-final

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same time, we will try to distinguish those IT-related activities that don't have notable connections with the software industry, such as web hosting services or the Internet portals that get their revenue mostly from advertisement.

1.1.4. Previous studies on the subject and the novelty of current research

Even though the materials on the competitiveness of the Russian software industry are largely fragmented, there have been some attempts to do a complex research of the subject, for example, the works of Bardhan and Kroll (2006)[6] and Kotlarsky, Levina and Kuraksina (2013)[7]. While providing very valuable insight into the development of Russian IT and software industry, both have some important disadvantages. The latter views the industry only from the outsourcing perspective and does not study the ability of local software firms to produce their own products that can compete globally instead of limiting themselves on fulfilling foreign customers' orders. The former is a much broader research, that touches not only the factor conditions but also the clustering (related and supporting industries), industry structure and the role of government; also, it offers an interesting comparison between the software industries of Russia and India based on SWOT analysis. However, it offers almost no policy implications (except some brief suggestions), also, the situation in Russia has changed significantly since 2006 and so there is a need in a research that uses newer data on the subject.

The differences between the current research and the previous studies on this subject are:

- Besides evaluating the attractiveness of Russia as a destination for the offshoring of software development by foreign companies and MNEs, the potential of local software industry, including both mature companies and startups, to offer their

[6] Ashok Deo Bardhan and Cynthia A. Kroll, "Competitiveness And An Emerging Sector: The Russian Software Industry And Its Global Linkages", Industry & Innovation 13, no. 1 (2006), pg. 73

[7] Julia Kotlarsky, Natalia Levina and Ekaterina Kuraksina, "Evaluation Of Russian's Attractiveness As IT Offshoring Destination", in Oxford Handbook On Global Employment And Offshoring, ed. by. Ashok Deo Bardhan, Dwight M. Jaffee and Cynthia Kroll, 1st ed. (Oxford: Oxford University Press, 2013), 436-461.

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products on the global market will be studied. Moreover, an attempt will be made to assess the startup environment and startup ecosystem in Russia, including such question as key strengths and weaknesses, common pitfalls and mistakes that IT-related startups make, access to financing, as well as the measures taken by the government to support the entrepreneurship in IT industry.

- An amended version of Porter's diamond (see Chapter 2) that addresses the shortcomings of the original framework will be used.
- More attention will be paid to firm strategy, not only to factor conditions.
- The availability of the 2015-2016 data will let us analyze the impact of financial crisis that started in late 2014 on the development of the Russian software industry and see both the opportunities and threats brought by the new political and economic environment.
- Finally, a set of policy implications to address the existing problems and shortcomings will be developed to make this research valuable not only for academic, but also for practical purposes.

1.1.5. The review of primary and secondary data used in this research

As this research is a qualitative one, it has been based mostly on secondary data. First, the ideas of Michael Porter (summarized in the book "The Competitive Advantage of Nations") and John H. Dunning (summarized in the book "The Globalization of Business") have been the methodological base of current research. At the same time, several research papers written by Alan M. Rugman in collaboration with Alain Verbeke and Joseph R. D'Cruz have also been studied as they state some important drawbacks of Porter's model and provide their own solutions to address them.

Second, the abovementioned works by Bardhan and Kroll and Kotlarsky, Levina and Kuraksina, as well as a paper by Mamun, Zayed and Hossein presenting a Porter's diamond-based analysis of ICT industry in Bangladesh were used as a starting point for this research. All three of them are applying the diamond model whether to software

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industry or to the ICT industry in general, and the respective methodology can be partially used in current research.

The study of current situation in Russia's software industry was mainly based on materials that can be grouped into several major categories. The first one are annual publications by **global organizations**, such as the World Economic Forum (publishing the Global Competitiveness Index), and **international industry associations**, such as the U.S.-based The Computing Technology Industry Association (CompTIA) publishing its IT Industry Outlook. The second one is publications (annual or quarterly) by **Russian industry associations**, such as RUSSOFT (data on software industry development) or Russian Venture Capital Association (data for venture capital market trends). The report by former has been especially useful in determining the current issues with Russia's software industry and developing policy implications to address them. The third one is **official documents** (including laws, strategic plans, reports etc.) and **statistical data** (even though official statistics for IT industry is available only for some partial areas). The "Strategy for the development of IT industry in Russian Federation in 2014-2020 and up to 2025" has been used as a summary of planned government policy towards IT. Moreover, some other research papers by Russian and foreign authors were used in the study of some particular areas, for example, the quality of IT education. There have also been some auxiliary sources of data, such as media publications or press releases by certain companies. The fourth chapter (issues and policy implications) was primarily based on the previous results, which have been analyzed and systematized to form a clear and logical plan of actions.

In Taiwan, there has been only one research paper on the competitive position of Russia's software industry, written by Yang Wen-Ting from National Chengchi University in 2012[8], however, it's rather a review than a deep research of the subject. In Mainland China, there has been a paper titled "The current situation and the

[8] Wen-Ting Yang, "The Analysis On The Competitiveness Of Russian Software Industry (俄羅斯軟體產業競爭力分析)", Taiwan-Russia Trade (台俄經貿), no. 11 (2012): 48-53.

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development of Russian IT industry" by Zhang Dongyang[9] (2015) that describes some important aspects of IT (not only software) industry development in Russia, however, it does not use any specific methodology such as the diamond model during the research.

[9] Dongyang Zhang, "Current State And Development Trends Of Russian Software Industry (俄罗斯信息技术产业现状及发展趋势)", Asia Economy (欧亚经济), no. 2 (2015): 68-82.

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Chapter 2. The Porter's model and its evolution

Before proceeding to the main subject of this research, we need first to give notes on the theoretical framework of it – the "diamond" model created by Michael Porter and described in his book "The Competitive Advantage of Nations" published in 1990. Also, a major addition made by another prominent strategist and "the father of international business" John Dunning that made the "diamond" model more suitable for the world that is in the process of globalization will be discussed. Moreover, we will also have a look at the five forces model, which has also been developed by Michael Porter and will be helpful for this study.

2.1.1. An introduction into the original "diamond" model

As noted by Porter in the very beginning of his book, "Firms, not nations, compete in international markets"[10]. The idea that the competitiveness of a particular industry in a particular country is determined more by firm strategy than by government policy has become the key point in Porter's research. The model that was presented in "The Competitive Advantage of Nations" consists of six nodes: four primary, called the *determinants*, and two auxiliary, that can be called *external variables*[11]. The scheme resembles the "diamond" image that appears on playing cards (that's how it has got its name), however, it is not a flat but a three-dimensional figure. The model is usually depicted as Figure 1 below.

[10] Michael Porter, The Competitive Advantage Of Nations, 1st ed. (New York, NY: Free Press, 1990), pg. 33

[11] Alan M. Rugman and Joseph R. D'Cruz, "The "Double Diamond" Model Of International Competitiveness: The Canadian Experience", Management International Review (Special Issue) 33, no. 2 (1993), pg. 19

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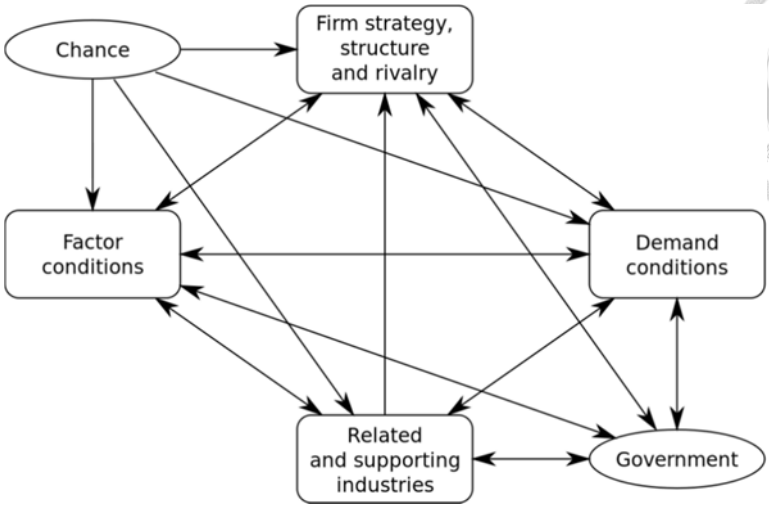

Figure 1. The original diamond model

Source: Reproduction from Porter, 1990

The four determinants of national competitive advantage are:

- **Factor, or supply conditions** that represent inputs needed by the industry. In his book, Porter provides several ways to categorize them, but the most popular option is the division of factors into “basic” and “advanced” ones. The former ones are usually inherited by the country from the very beginning (the classical examples are location, climate, mineral deposits, availability of unskilled and semi-skilled labor etc.), while the latter (such as skilled labor, infrastructure etc.) require significant investments for their development, but also provide a much more stable competitive advantage than the basic ones. The division of factors into generalized and specialized is also used. While the latter have a much narrower scope of use, Porter suggests that they may create a more stable competitive advantage as it’s much harder for foreign competitors to copy them. The factors, especially the advanced and specialized ones, can be created by the efforts of both public and private institutions; also, a disadvantage in a certain factor may create a pressure for the firms to innovate and create advantage in another one.
- **Demand conditions,** representing the quantity and, more important, quality of demand for the products of the industry. In his book, Porter argued that the most important are the demand conditions on the home market, as “firms are better able

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to perceive, understand and act on buyer needs in their home market and tend to be more confident in doing so"[12] so that "selling to foreign buyers is not a good substitute"[13]. Such elements as segment structure, buyer sophistication and anticipatory buyer needs (when home buyers have needs that anticipate those of other markets) are important for creating a healthy demand and stimulate the firms to innovate and create new competitive advantages. The size, growth rate and saturation[14] of home market should also be considered.

- **Related and supporting industries**, representing the cross-industry ties that are beneficial for both industries. Here it's not the availability of inputs, such as raw materials, but rather the coordination, knowledge flow and reduced transaction costs is important. As Porter suggests, "a nation need not possess national advantage in all supplier industries to gain competitive advantage in an industry" as "inputs without significant effect on innovation can be readily sourced from abroad"[15].
- **Firm strategy, structure and rivalry,** representing the key strategies, management practices, organizational structure implemented by the local firms as well as the rivalry between local competitors which, as Porter argues, has a positive effect on the industry competitiveness.

A mistake that is sometimes made is the reduction of the "diamond" to these four determinants, making it a two-dimensional one. However, it's wrong as there are two external variables that contribute to the competitive advantage of an industry:

- **Chance**, representing unexpected events that are usually outside of the firms' and government control, such as new inventions, technology breakthroughs, market shocks, decisions made by foreign governments, wars etc.;
- **Government**, representing the influence that the national government has on the four determinants of the "diamond". The government can influence factor supply (for example, by improving the skills of the workforce through the public education

[12] Porter (1990), pg. 86
[13] Ibid, pg. 87
[14] In Porter's opinion, early saturation of a particular market will also create a pressure on the firms to innovate and lead to the emergence of stronger local rivals
[15] Porter (1990), pg. 104

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system), demand conditions (through government purchases), as well as conditions within the industry itself and its related and supporting industries by administrative, fiscal and other means. At the same time, as Porter suggests, this influence is bi-directional, as the changes in any of the four determinants do in turn influence the government decisions.

An important note that should be made regarding the Porter's model is that the relationships between all the nodes (with an exception for "Chance" that has a stochastic and unpredictable nature) is bi-directional. For example, while the sophisticated home market demand intensifies the industry rivalry (primarily due to the pressure on producers to innovate and due to a threat of yesterday's buyers becoming today's entrants in B2B industries), industry rivalry in turn may also make the home demand more sophisticated as innovation and differentiation are widely used by firms to win over competitors. Such two-way relationship exists between other nodes too. The only exception, as noted above, is "Chance" that influences other five nodes but can't be influenced by them.

2.1.2. The discussion around Porter's model.

The "Porter's diamond" is indeed a very important tool for analyzing national competitiveness (though it's argued by Rugman and Cruz that Porter hasn't invented the determinants of the model but brought them together "in a matter useful for business and government strategy"[16]), however, as any "universal" model does, it has some very important gaps that have been noted by other economists and business strategists at the time. In 1993, a special issue of Management International Review was dedicated entirely to the discussion of the "diamond" model and proposing ways to deal with its shortcomings.

The article on "double diamond model" by Rugman and D'Cruz notes quite a lot

[16] Rugman, D'Cruz (1993), pg. 20

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of deficiencies in Porter's study. Some of them (such as the questionable framework behind the creation of "league tables" where a number of countries was compared on their share of exports in particular clusters) have limited impact on the correctness of study in general, however, there are some that can be considered critical. The authors note a flawed approach towards FDI and a very narrow definition of them (that takes into account mostly the outward but not inward foreign direct investments) and a lack of a clear approach towards MNE activities as examples of latter. In their research, Rugman and Cruz argue that the Porter's model is applicable mostly to the countries within the "big triad", such as U.S., European Economic Community[17] and Japan, and is inapplicable to smaller open economies such as Canada that depend heavily on trade (in case of Canada, it's the trade with the US). For latter, the authors propose the "double diamond" of Canada and the United States as the solution to explain Canada national competitiveness using the Porter methodology[18].

Another article by Rugman and Verbeke gives more details on why the Porter's approach towards MNEs is flawed. "The Competitive Advantage of Nations" suggests that "a firm can only have one true home base for each distinct business or segment"[19]. Rugman and Verbeke summarize the Porter's view as "a simple distinction can be made between an MNE's home base, which provides the main source of the firm's competitive advantages, and other nations, which can be tapped into selectively, but are certainly not as important as the home base"[20] and consider it to be incorrect, as it "does not adequately address the complexities of real world global strategic management"[21], especially if the companies from smaller countries are studied. It's not rare when an MNE has several home bases (the home base is "dispersed" across several countries) for the same business or activity, and the operations in these various countries

[17] The European Union was established in November 1993, so it did not exist when the article was published
[18] Rugman, D'Cruz (1993), pg. 13
[19] Porter (1990), pg. 606
[20] Alan M. Rugman and Alain Verbeke, "Foreign Subsidiaries And Multinational Strategic Management: An Extension And Correction Of Porter's Single Diamond Framework", Management International Review (Special Issue) 33, no. 2 (1993), pg. 73
[21] Ibid

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are so interconnected (and complement each other) that is extremely difficult to choose which of the "home bases" is the main one. In this case, the firm should consider the "diamonds" of all these countries as significantly important, which makes the standard Porter approach not suitable.

Besides these two papers, there was much more criticism on Porter's model at the time. In this research, we are going to describe only one important addition to the Porter's diamond made by John H. Dunning, a father of such field as "international business".

2.1.3. Multinational business activities as new variable for Porter's diamond

In the abovementioned issue of Management International Review, there's also an article written by Dunning. Though he does not give any concrete ideas on "rebuilding" the Porter's diamond there (probably due to the limitations on the article size), he notes one of the major deficiencies in Porter's model which seriously underestimates the importance of multinational enterprises (MNEs) in modern economy. As quoted by Dunning[22], "about three quarters of the world's trade is undertaken by MNEs, and a good proportion of this (between 35% and 40%) is internal to these same enterprises"[23] – which means that in national competitiveness MNEs should play a much more important role than the one given to them in Porter's work.

The idea of a modified "diamond" model that is able to reflect the importance of MNEs is described by Dunning in his book "The Globalization of Business", which was first published in 1993. Here Dunning proposes a diamond that has the same number of determinants as the one created by Porter, but three external variables: the original "chance" and "government" plus the new one titled "MBA" (multinational business activities), with the latter comprising inward and outward foreign direct investment by

[22] However, he's probably estimating the number as no source is given
[23] John H. Dunning, "Internationalizing Porter's Diamond", Management International Review 33, no. 2 (1993), pg. 14

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foreign and domestic firms respectively. In Chapter 5 of the abovementioned book Dunning step by step explains how MNE activities on the one side and four Porter determinants plus one variable ("Government") on the other can influence each other. Even though he concludes that it's impossible to tell whether outward and inward FDI are always good or bad for home and/or host nations (in other words, do they improve their competitive advantage) as too much depends on the specific circumstances[24], however, it's a serious improvement over the relatively one-sided approach used by Porter where he supports outward FDI[25] but has much less support for inward FDI which are, in his opinion, "not entirely healthy"[26].

The framework created by Dunning is much more suitable for analyzing the competitive advantage of nations in modern world where it's not only the "indigenous resources and capabilities"[27] that determine the success or failure of industries. The amended "Dunning's" diamond is presented as **Figure 2** below. For a comparison, **Appendix B** shows the "double diamond" model that can be seen in the abovementioned article by Rugman and Cruz.

[24] John H. Dunning, The Globalization Of Business, 1st ed. (London: Routledge, 1993), pg. 127
[25] Rugman, D'Cruz (1993), pg. 24
[26] Porter (1990), pg. 671
[27] Dunning (1993), pg. 107

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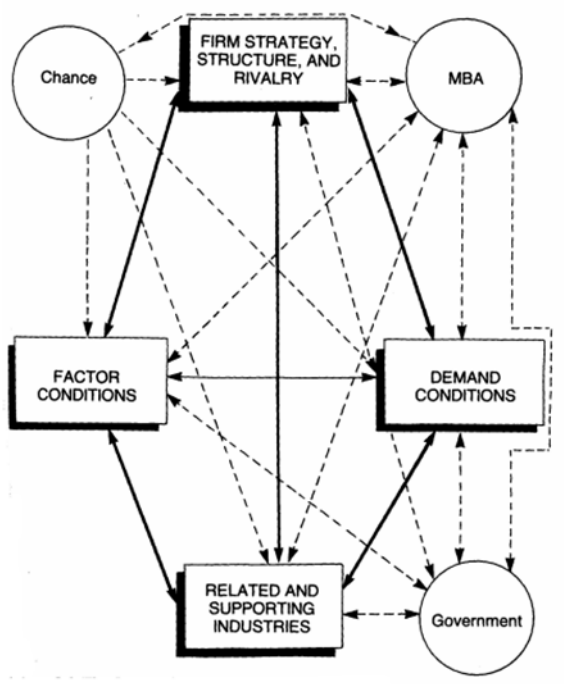

Figure 2. The diamond model modified by John H. Dunning

Source: Dunning, 1993

2.1.4. The conclusion on Porter's model and its applicability

It's very difficult, if not impossible, to give a single verdict on the Porter's framework. While some researchers, such as Davies and Ellis, consider that "the book was enormously rich in its range and scope but that there were too many conceptual flaws, particularly of elision, for the theory to amount to more than a useful taxonomy"[28], others, like Dunning, are much more optimistic, claiming that "the good news is that Porter has left the IB scholar plenty of interesting research to do"[29]. In this research, we consider the Porter's diamond to be not an ideal model, but still a useful tool that allows us to study the competitive advantage of a particular industry in a particular country in an organized way. At the same time, we consider it necessary to use not the original "diamond" but the one that is described in the work of Dunning in order to take into account the impact created by multinationals and to avoid the mistake

[28] Davies, Ellis (2000), pg. 1189
[29] Dunning (1993), pg. 127

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of displaying Russia's software industry as an isolated one which development is based only on internal determinants. Even though there exist other alternatives, such as the "double diamond" model, the Dunning approach is more universal, as it's rarely the case when all or most of the outward and inward FDI are limited to one particular country (in such circumstances, the "double diamond" will have to become "triple", "quadruple" or even more complex).

2.1.5. The five forces model: another framework by Michael Porter

Even though before we have been associating Michael Porter's name primarily with his "diamond" model of competitive advantage, it has been not the only framework developed by him. Early in 1979, he has published an article (his first one in this journal) in Harvard Business Review titled "How Competitive Forces Shape Strategy", where a model of five competitive forces has been introduced for the first time. Later in 2008 Porter has revisited the five forces in another article for the same journal, titled "The Five Competitive Forces that Shape Strategy", with more detailed explanation and more up-to-date (it has been almost thirty years since the first article was published!) examples provided.

The Porter's idea is that the firm should analyze the industry not on the basis of straightforward indicators such as growth rate or technological advancement, but rather by digging deeper to understand the underlying competitive structure of it. The latter can be viewed as a model of five forces shown below:

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Figure 3. The five forces model

Source: Porter, 2008

The five forces are, namely:

a. Threat of new entrants, including the availability of economies of scale, capital requirements, switching costs of existing customers, presence of strong incumbents, administrative barriers for entry etc.;
b. Threat of substitutes, meaning the availability of other solutions which offer the same or different function by different means[30];
c. Bargaining power of suppliers, including the relative concentration of supplier industry (-ies) in comparison with the industry in question, the firm's switching costs, availability of alternatives for current suppliers' solution etc.;
d. Bargaining power of consumers, including price sensitivity and negotiation leverage of buyers (the latter may emerge if there are only few strong buyers for the industry product or service);
e. Rivalry among existing competitors, including the number of competitors, exit barriers, as well as the possibility of differentiation (the latter determines the

[30] Porter (2008), pg. 84

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likeliness of a strong price competition which may have devastating effect on firms' profits).

The system of five forces is what determines the attractiveness of the industry in the eyes of firms. In an extreme example of all the five forces being very strong, the industry will hardly look attractive, as it will remind the textbook case of perfect competition with minimum profit margins and growth opportunities for every participant. However, in most cases the strength of five forces is unequal, with some being stronger than other. In his 2008 article Porter advocates that the firm may be able to adapt to these conditions by carefully selecting its strategy – and even change the competitive landscape towards more favorable. The five forces model will be used later to analyze the competitive structure and attractiveness of Russia's software industry.

In the next chapter, we will use the methodology described above to analyze the current situation in the Russian software industry.

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Chapter 3. The current situation in Russia's software industry

In this chapter, we will use Porter's methodology to evaluate the current situation in Russia's software industry. The first section will examine the supply and demand conditions which form the landscape for the firms to compete. Then, the next one will be dedicated to the "industry", including both software as well as the industries with which it has significant ties. The third section will deal with such variables as government and MBA activity[31].

Due to an inevitable time lag that exists between the end of period (for example, a year), the collection of data and the publishing of them, most materials used in this chapter present the situation as it was in 2016 or even earlier; however, as this research pays more attention not to the short-term volatility but to the longer-term trends, such lag may be acceptable for this purpose.

3.1. Supply and demand conditions

3.1.1. Supply (factor) conditions

In this part of research, we will sometimes compare the factor conditions of Russia with those of other three BRIC nations (BRICS less South Africa) as we consider latter, especially India and China, to be strong competitors for Russia in this industry.

3.1.1.1. Basic factors and their relevance for this study

The basic factors do have quite a limited influence on such advanced industry as software engineering; the only factor that might have a possible impact is population. The research paper "ICT Landscape in BRICS countries: Russian Federation" by Makarov, Schandera and Simon quotes that "By 2014 Russia will have more Internet-

[31] In this research we will not study "Chance" due to its stochastic and unpredictable nature.

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users than any other country in Europe, overtaking Germany: 3% of all Internet-users in the World with 2% of global population."[32]. In this section, we will skip the first part of the sentence about (as internet penetration will be discussed later) and look at the 2% number. According to the table compiled by World Bank, Russia ranks the 9th among the countries of the world in terms of population[33]. However, the figure becomes smaller if compared with other BRIC countries, especially with India and China that are the competitors for Russia in the world software market. The population growth in Russia is also slower than in other BRIC nations (0.2% annually versus 0.9% for Brazil, 1.2% for India and 0.5% for China)[34]. Under these circumstances the population factor seems insufficient to create a competitive advantage for Russia in the world software industry. Much more important are the advanced factors that will be discussed below.

3.1.1.2. Advanced factors: developing a theoretical framework

Before proceeding to the data gathering and analysis, an example of the use of Porter's diamond model with regard to IT and ICT industry has been studied. In 2013 Al Mamun, Zayed and Hossein have published a study titled "Using Porter's Diamond to Determine the Condition of ICT in a Developing Country: A Study on Bangladesh"[35]. Even though the welfare level in Bangladesh and Russia differs a lot, both countries are regarded as a part of developing world, so the methodology of that article may be partially used in this study.

In the case of Bangladesh, the advanced factors have been divided into following groups: human resources, entrepreneurial culture (incl. venture capital access), telecom

[32] Valentin Makarov, Stefan Schandera and Jean-Paul Simon, "The ICT Landscape In BRICS Countries: 5. Russian Federation", Digiworld Economic Journal 83, no. 3 (2012), pg. 161

[33] "World Population 2015", World Bank, last modified 2016, accessed February 4, 2017, http://databank.worldbank.org/data/download/POP.pdf

[34] "Population Growth (Annual %)", World Bank, last modified 2016, accessed February 4, 2017, http://data.worldbank.org/indicator/SP.POP.GROW?name_desc=true

[35] Abdulla Al Mamun, Nurul Mohammad Zayed and Shakib Hossain, "Using Porter's Diamond To Determine The Condition Of ICT In A Developing Country: A Study On Bangladesh", International Journal of Business and Management Review 1, no. 3 (2013): 138-150.

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and Internet availability, other supporting infrastructure, business climate and marketing and promotion. In this research, a similar structure will be used, however, some corrections will be made. First, “Human resources” will be split into bigger “Education system” and smaller “English proficiency”. Then the Internet penetration will be discussed, putting an emphasis on broadband access but also mentioning mobile Internet access; the aspect of price availability will also be studied. Moreover, as this research will try to focus not only on the factors that encourage multinationals to offshore their software development to Russia, but also on the factors that may stimulate FDI (such as establishment of R&D centers and offices by MNEs) and the growth of domestic firms, important notes on business climate and capital access will be given.

3.1.1.3. Human resources: Education

A company that wants to employ a software engineer, whether of junior or senior level, will assess candidates primarily on their technical skills. To create a supply of high-skilled engineering specialists that will be employed both within the country and overseas, a superior education system is required. For software engineering, the education process has two main components: mathematics (necessary to develop the logical thinking skills) and computer science.

In May 2016 the team of Saint-Petersburg State University won a high-level ACM (Association for Computing Machinery) International Collegiate Programming Contest, leaving behind such famous institutions as US’ Harvard University and China’s Shanghai Jiao Tong University; the team from Moscow Institute of Physics and Technology has also entered the top-4[36]. It is indeed an important event and a great achievement by Russian students; however, is the computer science education in Russia superior to other countries?

[36] "Team From Russia Wins World's Largest And Most Prestigious Collegiate Programming Competition", ACM, last modified 2016, accessed March 5, 2017, https://www.acm.org/media-center/2016/may/icpc-2016.

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The study and comparison of Russian education system in comparison to other countries has been hampered by a lack of data and a well-established framework. Currently, the best-known instruments for comparison of universities in different countries are the numerous university rankings, including QS, Times Higher Education and ARWU (the last is also known as "Shanghai Ranking"). But the achievements of Russian universities there are not too spectacular. The only institution that has made it to the top-100 of general rating[37] was Moscow State University (MSU) (scoring the 87th in the ARWU 2016)[38], also there have been three Russian institutions (MSU, Saint-Petersburg State University and Moscow Institute of Physics and Technology) who have made it to the top 100 of the Times Higher Education Reputation Ranking. The subject-based rankings (in engineering subjects) show almost the same picture.

However, when analyzing the rankings above, two main drawbacks should be taken into consideration. First, not only tuition quality but also research activity (including research budgets), international cooperation (including the programs for exchange and visiting students), reputation, staffing etc. are considered and are assigned a certain weight in the total score. So, a medium or low performance in certain area may lower the total score even despite the higher score in other areas. Second, not all the criteria in these rankings can be assessed in a completely unbiased way. For example, the reputation part of the general ranking and the standalone reputation ranking are usually based on extensive interviews with professors around the world. It is basically the collection of the opinions of people, and these opinions cannot be completely objective due to various personal reasons. The assigning of weights to different components is also a task that doesn't have a single solution, so certain assignment decisions are sometimes criticized for being "perception-based and […] highly subjective"[39]. It does not imply the complete uselessness of such rankings, however,

[37] University ranking are often divided into general, taking in account all the subjects and faculties, and subject-based

[38] "ARWU World University Rankings 2016", ARWU, last modified 2017, accessed January 18, 2017, http://www.shanghairanking.com/ARWU2016.html.

[39] M.K. Surappa, "World University Rankings And Subject Ranking In Engineering And Technology (2015 – 2016): A Case For Greater Transparency", Current Science 111, no. 3 (2016): 461-464.

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they should not be used as the only source of information.

The opinions on the quality of computer science education in Russia do vary greatly. It's often criticized within the country for being "obsolete" and "of low quality" (however, it may also reflect a gap between elite and mass institutions). In the "Strategy for the development of IT industry in Russian Federation in 2014-2020 and up to 2025" the Russian government noted that "Currently the education programs for a large number of professions (including system architecture, product management, project management and Internet marketing) that meet a strong demand on the labor market are underdeveloped or not developed at all"[40] and "only 15% of those graduates can be employed immediately"[41]. However, it may be not the low quality, but the lack of practical skills among the students (except those who have completed a part-time job, internship or similar program organized by software companies) contributing to this figure. Employing a graduate that possesses solid theoretical base but lacks practical knowledge means that the employer will have to spend time and resources on additional education before putting the employee to work on some real and complicated projects. The question will be examined in more detail later.

At the same time, The Global Startup Ecosystem Ranking by Compass, Co. (published in 2015) puts Moscow on the 2nd place in its "Talents" rating (after the Silicon Valley)[42], which may be considered an indirect praise for Russian IT education (though the rating took such factors as salary level etc. into consideration too). The mathematical education in Russia is also often praised (the "Russian School of Mathematics" has even become a brand to some extent[43]). There is also an informal opinion that Russian EGE (the high school graduation exam) in mathematics is

[40] Strategy For The Development Of IT Industry In Russian Federation In 2014-2020 And Up To 2025 (Pravo.gov.ru legal information portal, 2013).
[41] Ibid
[42] Compass Co., The Global Startup Ecosystem Ranking, 2015.
[43] Beth Teitell, "There's Fear Of Math. And Then There's Fear Of 'Russian Math", The Boston Globe, last modified 2016, accessed January 19, 2017, https://www.bostonglobe.com/lifestyle/2016/03/15/there-fear-math-and-then-there-fear-russian-math/Gn1XU68cOEw5G0UM8gIOhM/story.html.

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noticeably more difficult and demanding than US' SAT test[44] (so that Russian school graduates are better prepared to take mathematics classes at the university), however, there's no proof of this theory, also, the validity of direct comparison between EGE, SAT, Gaokao in China etc. is questionable.

The same "Strategy" emphasizes an undersupply of graduates in IT-related fields that creates a huge deficit of highly qualified specialists[45]. It states that Russia has experienced a low birth rate in 1990s, which makes the country unable to compete with such countries as China and India in the number of graduates in IT-related fields. However, the estimations of the future software developers' population cited in the report have been criticized by industry experts. For example, as the documents states (quoting the research by Evans Data but not putting a link to it) that the overall number of software developers by 2018[46] will be 4.5 million in the U.S., more than 5 million in India and roughly 2 million (1.9 million in the original research) in China, it does not mention the situation in Russia. However, the original Evans Data research has the figure for Russia: it estimates the "developer population" of the country to constitute 1.3 million people by 2018[47]. It is much less than both U.S. and India, however, it's quite close to China especially if we consider the huge difference in both countries' population that is unlikely to get significantly narrower during two or three years.

At the same time, high quality of engineering education is not the only factor that matters if we look at the education system. As the goal for Russia is not only to become an attractive destination for IT outsourcing, but also to develop its own competitive software industry, not only the engineering, but also management and marketing professionals are necessary to fulfill the task. Even the most outstanding idea may fail if

[44] According to this logic, the freshmen in Russia are much better in math than the freshmen in many other countries, which may explain the former' superior skills

[45] Strategy (2013)

[46] It is written "by 2019" in the "Strategy", however, the figures presented in the Evans Data report estimate the number of developers in particular countries "by 2018"

[47] Patrick Thibodeau, "India To Overtake U.S. On Number Of Developers By 2017", Computerworld, accessed May 17, 2017, http://www.computerworld.com/article/2483690/it-careers/india-to-overtake-u-s--on-number-of-developers-by-2017.html.

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poorly marketed, leading to the failure of a startup. In this section, some notes on business education in Russia should be given too.

It's quite difficult to perform an objective assessment of the quality of business/management education in Russia and compare it with other countries as there is a lack of well-established methodology. However, there are some indirect data showing that business education in Russia needs serious improvement. In the Global Competitiveness Index reports for both 2013 and 2014 years, in such indicator as "Quality of management schools" Russia occupied the 104th and 100th place respectively among ~140 (the exact number is different each year) countries, which can be considered an extremely poor performance. In 2015, the country made a huge leap to the 74th place, leaving the bottom-40; however, it still loses both to China (61st) and India (43rd). Even though the scores presented in the Global Competitiveness Index are usually based on the survey conducted among the executives of large companies and can't be considered the universal truth, the situation still needs attention.

3.1.1.4. Human resources: Foreign language (English) proficiency

Even though the candidate's technical skills are the most important concern for a company wishing to employ a computer science or software engineering specialist, foreign language ability is still essential if the employer is located overseas. Specialists with high foreign language proficiency are also needed in those local software companies that want to expand their business overseas and to compete globally.

In this section, English has been chosen to represent the "foreign language" as, due to a variety of historical, political and other reasons it has become the primary language of international communication at least in the IT industry. The best-known benchmark here is English Proficiency Index (EPI) published annually by EF (Education First), measuring the English ability of population in 72 countries. In this benchmark, Russia has scored the 34th, up from 39th in 2015, which is still considered a "low" level (the

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"medium" band starts from 33). As new countries are added into the rating almost every year (there has been a notable increase from 44 countries in 2011 to 72 countries in 2016), it's hard to give a definite answer on whether did the country go up or down in the rating during the last 6 years, however, we may compare it with some other developing economies such as BRIC countries.

Due to historical reasons, India has scored 22nd (in the top of the "moderate" band)[48]. The second of the four countries is Russia scoring 34th, then there are China (39th) and Brazil (40th). The significant feature for Russia and China (Brazil shows the same tendency too) is the wide gap in scores between more- and less-developed regions. In case of Russia, the average score for the country is 52.32[49] and the separate scores for its regions vary from 49.63 for East Siberia to 53.36 for Central Russia. In China, the gap is wider, 45.69 (Yunnan Prov.) to 55.54 (Shanghai City) while the average score for the country is 50.94. In Brazil the situation is quite the same as in China. However, what should be noted is that the English level for major Russian (St. Petersburg and Moscow) and Chinese (Beijing, Tianjin, Shanghai) cities is almost the same (the scores are in the range of 52 to 55 points).

Along with the general index, EF also publishes a number of special reports, including one for the company managers and recruiters all over the world: however, the findings present there do not differ much from those in the general version.

3.1.1.5. Internet availability and Internet penetration

The development of the IT industry in general and software engineering in particular does not require a lot of "hardware" infrastructure such as highways, ports etc., however, it does require wide availability of Internet access, including both the penetration rates, average speed and price affordability. In this section, we will consider

[48] It would be interesting to check how does the language proficiency vary across the Indian cities and regions, however, EF does not provide the regional-level data for India

[49] "EF English Proficiency Index", EF EducationFirst, accessed May 17, 2017, http://www.ef.edu/epi/.

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mainly the broadband access, as it can be used:

- **At the workplace**: a software engineer regardless of his proficiency level still has to use a lot of knowledge and documentation resources in order to resolve all the problems that arise as he is working on a certain project;
- **For remote work**: remote work model is very popular in the software industry as the physical presence of an employee in the office is often not required for a successful completion of the project; it also makes it possible for the IT talents to work for foreign companies or MNEs without having to move to another country;
- **In the education process**: Internet can be widely used at the information technology-related courses in educational institutions in order to make the tuition more efficient (as due to a constant development of new techniques and methods in software engineering the information in the textbooks may get obsolete quickly);
- **For self-education**: due to a wide availability of e-learning solutions, an IT specialist can learn new skills or improve the skills he already has through a variety of online courses.

According to a World Bank report "Broadband in Russia" dated early 2015, "Russia has strong indicators of broadband affordability, especially when compared with OECD countries. Only 10 percent of the households cannot afford broadband, and the cost of a broadband connection exceeds three percent of available average income in only two Federal Districts[50] (Far Eastern and Southern), which is considered a good indicator of affordability"[51] and "Russia has outpaced some developed countries in terms of fiber penetration"[52]. The report acknowledges the potential of Russia in the offshore programming market, stating "Meanwhile, the fastest growing segment of its IT market is offshore programming which now makes Russia the world's third biggest destination for outsourcing software, just behind India and China"[53].

[50] Since 2000, the territory of Russia has been divided into eight federal districts mostly in order to make it easier to govern the operations of various government agencies across the large territory of the country.
[51] Carlo Maria Rossotto et al., A Sector Assessment: Broadband In Russia (World Bank Group, 2015).
[52] Ibid
[53] Ibid

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According to the Russian Federal State Statistics Service (Rosstat), in 2015 on average 70% of the country's population had access to the Internet (it's not stated whether the access is broadband or not); the respective figure for 2014 has been 67%[54]. It seems logical that for such a big country the penetration figures should vary from region to region. However, the difference may be not so big. Even though there is a significant gap of 39 percentage points between the maximum of 90% and minimum of 51%[55], both mean and median levels are at 68.5-69 percent with a standard deviation of 6.48 that is not enough to call the sample widely scattered; also, there are only 4 regions of 96 that exhibit a figure lower than 60%.

In 2016 GfK, a market research firm originating from Germany, published a report that estimated the percentage of Internet users in the country's population (over 16 years old) to be 70.4%[56]: almost the same figure that was presented by the government. The highlight of the GfK presentation is the huge leap forward made by the country in the last 8 years: according to the data presented by the company, the Internet penetration in 2008 was mere 24.5%, which implies almost a threefold increase in 8 years[57].

According to the company' analysis, the engine for the growth was the increasing use of mobile devices[58]. The mobile high-speed Internet in Russia is a strong competitor to the fixed broadband, often outperforming it. While the overall Internet penetration around the country is at the level of 70%, the penetration of fixed broadband is twenty

[54] "Internet Users Per 100 People", Central Statistical Database, Russian Federal State Statistics Service, accessed May 1, 2017, http://www.gks.ru/dbscripts/cbsd/dbinet.cgi?pl=9420052

[55] The leader here was surprisingly not Moscow or Saint Petersburg but a distant Yamalo-Nenets Autonomous Region known for its natural gas deposits, while the outsider was the Republic of Ingushetia located in the North Caucasus mountains

[56] GfK, Internet Penetration In Russia: The Results Of 2015, 2016, accessed January 5, 2017, http://www.gfk.com/fileadmin/user_upload/dyna_content/RU/Documents/Press_Releases/2016/Internet_Usage_Russia_2015.pdf.

[57] However, the data presented by GfK tend to be lower than the Rosstat figures: for example, for 2013 GfK claimed the percentage of Internet users in the country to be 57.1%, while the Rosstat figure for the same year is 64% that is notably higher

[58] "The Number Of Internet Users In Russia Is Increasing", VESTI-Finance, last modified 2016, accessed May 6, 2017, http://www.vestifinance.ru/articles/66749.

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percentage points lower: only 50.4%[59]. The Russian newspaper Vedomosti brings a case of Moscow Oblast', the region just outside of the capital city of Moscow, where a wide availability of 3G and 4G mobile networks has contributed to a low popularity of fixed broadband solutions: according to Telecom Daily report, only 30.2 percent of the region population uses fixed access (that is in the bottom 20 for the country). The availability of 3G and 4G networks offering the connection speed not inferior to the fixed solutions may also contribute to the development of Internet access in remote areas where the costs for building optical fiber infrastructure to every household are high enough.

However, the country still has a long way to go. In the Internet Development Index (IDI) published annually by the International Telecommunications Union (here the index for 2015 was used), Russia, as well as other eight CIS[60] states, falls below the average level for developed nations (7.41 points) with the score of 6.91 points (45th place in the global rank), and also loses the first place among CIS country to its smaller neighbor state of Belarus (36th place). The performance of Russia in the IDI is described in more detail in **Appendix C.**

3.1.1.6. Business climate

Even though the software industry widely relies on the outsourcing model, and a foreign or multinational company does not have to set up a physical branch in a country to employ talents from there, however, giving foreign companies incentives to set up offices, R&D centers and even regional headquarters in a country can bring benefits both for the industry and for the country's economy in general. A large group of factors called "business climate" plays one of the most important roles in a process of deciding whether to invest or not. The definition of this term is vague, generally, it means the

[59] "The Penetration Of Broadband Internet In Moscow Region Is One Of The Lowest In The Country", Vedomosti, last modified 2016, accessed April 2, 2017, http://www.vedomosti.ru/technology/articles/2016/11/03/663454-provodnogo-interneta-podmoskove.

[60] The Commonwealth of Independent States is a regional organization formed after the collapse of the Soviet Union and including nine former Soviet republics

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complex of factors and indicators that define the easiness and efficiency of investing and doing business in a country. These factors may include government transparency and efficiency, tax regime, product and labor market, financial market, infrastructure, technological development etc.

One of the most well-known frameworks for such analysis is provided by the World Economic Forum in its Global Competitiveness Index (**GCI**) where each country is assessed by a variety of factors grouped into 12 "pillars"[61]. In this research, we can't assess each of the factors in big detail as it has enough complexity to be a topic for a separate paper, so only the most important findings will be described.

Regarding the Global Competitiveness Index, one important remark should be made before starting the research. Among more than 140 criteria, only some may be assessed numerically. There are many factors (for example, "intellectual property protection" or "effect of taxation on incentives to work") that can be assessed only indirectly, through someone's opinion. For this purpose, World Economic Forum uses the Executives Opinion Survey – where business executives of firms of various origin and size are asked for their opinion. It's not explicitly mentioned in the report whether each executive is asked only about the situation in his own country, however, due to a large number of both questions and countries this variant seems the most plausible; otherwise, the costs of such survey may get too high. As for a lot of questions not the exact situation but the industry participants' attitude is reviewed, results may get biased (as the attitude may be influenced by stereotypes and each individual's perception), however, this attitude may as well shape the firms' management decisions and so is worth to study. Apart from it, there's no other viable option to assess a particular country as comprehensively as the GCR does.

Spider diagrams that compare the performance of four BRIC countries for 2014

[61] Namely "institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication and innovation"

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and 2015 can be found in **Appendix D**. Currently, Russia outperforms its competitors in two areas: higher education and training (with a large margin) and infrastructure (with a small margin). At the same time, Russia underperforms seriously in institutions, financial market development as well as business sophistication. The macroeconomic environment, innovation base and goods market efficiency also leave much to be improved. A breakdown of best and worst performance of Russia in various areas of the report can be found in **Appendix E**. Russia did score well in education (especially the tertiary education enrollment) as well as telecom (mobile and fixed phone lines, Internet and mobile broadband subscription and also Internet access at schools). The country has also got in top-40 for such indicators as government debt and number of procedures to start a business. At the same time, the most of the negative scores are for such areas as government regulation (including regulative, tax, non-tariff burden), macroeconomic situation (high inflation levels) and financial market development. In general, the editors note that "The Russian Federation fell into recession in 2015, with its GDP shrinking by 3.7 percent, but nonetheless remained rather stable in terms of its competitiveness"[62]. The most problematic factors for doing business in Russia according to WEF Executive Opinion Survey will be described in more detail in **Appendix F.**

3.1.1.7. Access to early-stage financing

Besides business climate which is more important for more mature firms and MNEs, entrepreneurial culture, including access to financing, is crucial for the development of small and micro enterprises that are often called "startups". Enabling local businesses which are small right now to grow and compete with multinationals on the world software market is extremely beneficial for the country and for the industry and so this goal should be pursued both by the government and by the private organizations (including venture capital funds, accelerators etc.). Encouraging the growth of domestic IT software and service providers has the potential to make the

[62] World Economic Forum, Global Competitiveness Index 2016-2017, 2016, pg. 306

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country more than just an offshoring destination for software engineering.

Here we should recognize that there has been a decline on Russian VC market since 2013 (even before the financial crisis that the country is experiencing right now) after the boom of 2010-2012. As the report by RUSSOFT suggests, quoting PwC and RVCA (Russian Venture Capital Association) as sources, in 2013 the decline was believed to be caused by stricter target selection standards as more unsustainable projects were denied financing (and so it meant that the Russian VC market was becoming more mature), however, since 2014 the main reason behind the decline was unstable and deteriorating macroeconomic situation[63].

The RVCA report for the first 9 months of 2016 suggests that the decline on the PE and VC market is of limited magnitude and there's even some positive dynamics in the sector of VC (the report for 2015 goes further and states that there are signs that the decline in investment activity started in 2013 has stopped and the market is stabilizing[64]). At the same time, the total capitalization of PE and VC funds is decreasing the second year in a row, with devaluation of national currency[65] and macroeconomic instability being important reasons behind it; also, the total volume of PE and VC investments in first nine months of 2016 has shown signs of decreasing (only 50% of the level of 2015). However, an attention should be kept to the fact that the statistical data above include both PE and VC investments even though they have some very important differences. If we recall the overall positive commentaries about venture capital by the report authors, we may conclude that, even though the Russian VC market has been negatively influenced by unstable and deteriorating macroeconomic environment; however, it will be an exaggeration to call the situation a crash or a major decline.

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63 RUSSOFT, The 13Th Annual Survey Of Russian Software Industry Exports, 2016, pg. 98

64 Russian Venture Capital Association, A Review Of Russian PE And VC Market: 2015, 2016, pg. 6

65 RVCA measures the capitalization of funds in US$, using the weighted average USD/RUB exchange rate to compensate for the exchange rate volatility in the last few years.

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The Russian VC market is driven both by public and private efforts. It's interesting that, as the RVCA report suggests, while in 2015 the main driver in VC segment have been the structures created by government initiative, in the first 9 months of 2016 the best-performers have been the private structures. The government-backed funds don't limit themselves by choosing only ICT enterprises but also do significant investments in such areas as medicine or industrial equipment, however, they also account for a significant amount of venture capital in software industry as RVCA has found. More notes on the government role on VC market will be given in Section 3.

However, financing might be not the only (and not the main) obstacle that prevents more Russian startups from becoming successful locally and especially globally, which will be discussed in subsequent sections and chapters.

3.1.1.8. Remaining factors and notes

The factors studied above are all important for the development of Russia's software industry; however, they are not the only one that shape the competitive position of it.

Firstly, the incentives for multinationals to hire personnel in Russia may be shaped not only by the technical skills, but also by the relatively low salary. The Global Startup Ecosystem Report mentions that "employing a software engineer in Moscow is 75% cheaper than in Silicon Valley". At the same time, the research by Zhang (2015) based on 2013 data tells that "The average salary of an employee in IT industry in Russia is higher than in most Asian countries; it is comparable with Ukraine and Eastern Europe and is slightly lower than in Western Europe and U.S."[66]. Due to a notable fall in ruble value that started in the fourth quarter of 2014, the wages denominated in rubles have

[66] Zhang (2015), pg. 74

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actually decreased relative to major foreign economies[67]. However, it's questionable whether the low salary advantage can be sustainable if the competitors are other developing nations, not only China and India, but also some new emerging markets. Also, it does not consider the widespread practice of adjusting the salary (paid in national currency) according to the change in exchange rate or pegging it to US$ or other foreign currency that is quite common in IT industry, especially in those segments that are related to IT offshoring. We will return to the question of exchange rate later in the third section of this paper.

Secondly, Kotlarsky et.al. (2013) notes both the shorter cultural distance (compared with India or China) and more convenient time zones as one of the factors that make it easier for multinationals to collaborate with Russian talents.

Another factor that is sometimes mentioned and that may have a negative influence on both the multinationals' decision to enter the country and the development of a local software industry is the wide availability of pirated software. In its Global Software Survey for 2016, BSA estimates the rate of unlicensed software installations in Russia to be 64%, lower than in China (70%) but much higher than Western Europe (28% on average)[68]. However, the BSA methodology has been criticized since as early as 2005 for relying "on sample data that may not be representative, assumptions about the average amount of software on PCs and, for some countries, guesses rather than hard data[69]" and presuming that "each piece of software pirated equals a direct loss of revenue to software firms"[70]. Since then, the BSA review methodology has not undergone any radical changes: the overall number of computers in the country is multiplied by a "software load" factor and then compared with the shipments of

[67] The ruble fell not only to one particular currency but to a basket of foreign countries (see Section 3.2 for more comments on this issue)
[68] BSA, BSA Global Software Survey: May 2016, 2016.
[69] "BSA Or Just BS?", The Economist, last modified 2005, accessed April 6, 2017, http://www.economist.com/node/3993427.
[70] Ibid

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licensed software to get the piracy rate for a country[71]. Also, as BSA is not an academic institution but an alliance of software publishers, the research is not guaranteed to be unbiased as there may exist a private interest for the BSA members to present the larger figures in order to encourage governments to adopt stronger anti-piracy laws that they may benefit from. The problem of unlicensed software in Russia as well as other BRIC countries as well as the influence it has on the industry is an interesting topic for a deeper research, however, it's challenging to develop the methodology for an unbiased measurement of software piracy rate in a country, keeping in mind the major changes in the world software market[72], so the question will be left for the future study.

3.1.2. Demand conditions

3.1.2.1. World software market

Due to the broad definition of software and its presence on various platforms, including not only computers, whether desktop or tablet, and mobile phones, but also consumer electronics, wearable devices, motor vehicles etc., its growth is influenced by many factors. In the end of 2015, CompTIA has suggested the 4.7% growth rate for the software industry in 2016 with an upside potential of 6.7%[73]. Among the four segments (hardware, software, services and telecom), the growth rate of software is second only to the services, however, the difference is a mere 0.2% (4.9% versus 4.7%) (for hardware and telecom the projections have been 3.3% and 3.4% respectively)[74]. In the report by Deloitte, such trends as machine learning, blockchain, digitization of the enterprise, cloud adoption and the increased importance of cybersecurity are said to shape the technological landscape of 2017[75], and all of them may create new demand for the software industry.

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[71] "BSA Global Software Survey: Methodology", BSA, last modified 2017, accessed April 18, 2017, http://globalstudy.bsa.org/2016/methodology.html.

[72] Such is the proliferation of open source software as well as gradual transfer to the SaaS model

[73] Computing Technology Industry Association (2015), sec. 2, pg. 9

[74] Ibid, sec. 2, page 10

[75] Deloitte, 2017 Technology Industry Outlook, 2016, pg. 4

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The traditional model of selling standardized software in individual copies (on physical media or via Internet) is entering the period of decline due to an increasing availability of open-source solutions that offer the value comparable with the standardized proprietary products. At the new, the model of software as a service (SaaS) when the payment is made on a subscription basis and the software is often accessed via web browser or a lightweight client, is on the rise: Deloitte predicts the "pay-per-use" model will account to 80% of the software market by 2020[76].

The mobile apps may also become an engine of growth for the world software market. As the infographics made by the University of Alabama at Birmingham's Online Masters in Management Information Systems in 2014 states, 46% of app downloaders report they have paid for it, resulting in projected mobile app revenue of US$ 24.5 billion by 2016[77]. As for 2017, *Entrepreneur* has a much more upbeat estimate of $77 billion in apps revenue. It is citing the abovementioned University of Alabama at Birmingham's infographics and repeats some important findings from there (including the 46% figure), however, the article does not explain how the US$ 24.5 billion projected for 2016 have turned into $77 billion for 2017 (more than a two-fold increase).

The video games market (as a part of the software market) should not be ignored too. As physical retail is dying out, game developers experiment with new business models mixing digital distribution, in-game stores and micro-transactions for downloadable content or game items[78]. In 2015, *Fortune* noted that the video game market in the US is shrinking after the peak in 2010 and the industry is waiting for the

[76] Deloitte (2016), pg. 4

[77] "The Future Of Mobile Application", UAB Online Degrees, accessed March 18, 2017, http://businessdegrees.uab.edu/resources/infographics/the-future-of-mobile-application/.

[78] Keith Stuart, "The Digital Apocalypse: How The Games Industry Is Rising Again", The Guardian, last modified 2016, accessed March 11, 2017, https://www.theguardian.com/technology/2016/may/17/video-game-industry-changing-virtual-studios.

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new driving forces[79]. However, the proliferation of small game development studios that operate much more flexible than the large companies, the hardware innovations including VR as well as the variety of gaming platforms (and the possibilities to create cross-platform solutions) are transforming the industry landscape right now. Also, the markets of developing nations such as China should not be ignored: due to relatively high and increasing PC, broadband internet and smartphone penetration as well as the lifting of the ban on game consoles in 2015 the video game market in the country has a huge growth potential.

As it was said in the beginning of this section, the definition of "software" is hard to express in a single sentence. We have already given notes on computer software, mobile applications and video games, however, these three segments do not represent the whole software industry. Currently, almost every piece of electronic equipment, from kitchen appliances to the cars' driver assistance systems starts to have at least some integral circuits inside, and that's the software (can be called firmware in this case) that allows these circuits to work and form a system that can do what it's designed to do. Such trends as IoT, smart homes as well as the introduction of advanced driver assistance systems (ADAS) for passenger cars also create a significant demand for software and software engineers and may be among the new driving forces for the software industry. At the same time, the quickly changing nature of software (regardless of if we speak about global or local market) can work the same way as "sophisticated buyers" in the Porter's model, putting a pressure on firms to innovate and making them stronger.

3.1.2.2. The software market in Russia

In March 2016, Russian IT news website CNews published an article titled "Russian IT market has shrunk 40% in a year"[80], citing a research firm IDC as the

[79] "The Video Game Industry Is Growing Old, Lazy, And Boring", Fortune, last modified 2017, accessed March 12, 2017, http://fortune.com/2015/06/15/video-game-industry-innovation/.
[80] "Russian IT Market Shrank 40% In A Year", CNews, last modified 2016, accessed March 30, 2017,

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source of data. However, one important note is that the market size has been measured in US dollars and in 2015 Russian national currency has significantly plunged to almost all the major currencies including the dollar. The report by a Russian software industry association RUSSOFT notes that, even as the impact of a shrink in US$ terms is felt among the foreign firms that export software to the Russian market (and their entities in Russia) as well as the domestic firms that need a US$ administrative and marketing budget to promote their products overseas, the domestic expenses of the software firms are incurred in rubles, so that the evaluation of the Russian IT and software market only in dollar terms can't show us the whole picture[81].

In the report, RUSSOFT gives two alternative approaches to estimate the software market dynamics in 2015. The first one is the IDC US dollar figures converted in rubles with an account for inflation. The decline here is 19%, more than two times less than the IDC figures but still notable. Another approach is to separately measure the markets for foreign and domestic goods in US dollars and rubles respectively and then use the weighted average method to get the overall dynamics. Here the figures vary from -7% (only the ready-made products) to +3% (ready-made products plus custom software development). RUSSOFT calls the first index "from the position of Russian firms" and the second "from the position of the consumers"[82]. It's hard to tell which one is the better representation of Russian software market in 2015. However, some important notes are:

a. Even though the market is shrinking, Russian software companies may actually increase their sales and market share by driving out the foreign competitors (due to price pressure on later as well as political risks);
b. Previously it was told that the world software market comprises numerous segments at different stages of their life cycle. The same is true for Russia – so that weak growth or decline in some segments may be accompanied by growth in others. Sergey Shilov, the founder of IT service company AT Consulting, has mentioned the

http://www.cnews.ru/news/top/2016-03-31_rossijskij_itrynok_sokratilsya_na_40_za_god.

[81] Russoft (2016), pg. 15

[82] Ibid, pg. 25

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custom-made software development as the fastest developing segment in Russian software market[83];

c. RUSSOFT notes that the IDC estimates of the size of Russian software market (US$2.3 billion) are too low and the overall size of the market should be at least US$4-4.5 billion even without the segment of custom-made software development[84].

The economic recession has had its impact on the market. Sergey Shilov notes that due to the deteriorating macroeconomic environment both households and businesses search the way to cut their costs[85]. The companies won't stop spending money on IT solutions, however, the IT-related projects will be evaluated with more caution and only those that can create value with high enough certainty will be accepted. The decrease in household income may also have an impact on the market, including both physical retail and cloud-based paid services, as there will be more demand for open source or unlicensed software.

The economic sanctions implemented by major Western powers after the Ukrainian crisis in early 2014 and modified many times since to expand their range also have an impact on Russian software market. The sanctions include the strict limits or restrictions on export of technologies to certain Russian companies including those who have government or military ties or those who are involved in particular industries including oil and gas. As the future of sanctions is unpredictable, more government institutions and large companies in key industries may consider swapping the imported software used previously for the software produced domestically to avoid the possible discontinuation of product support if the company gets included into the sanctions list. For smaller companies that don't bear any notable sanctions-related risks, the increased price of imported software solutions may also become an important consideration. Since

[83] "IT Market Growth Points", Expert.Ru, last modified 2016, accessed March 18, 2017, http://expert.ru/2016/02/15/tochki-rosta-it-ryinka/.
[84] Russoft (2016), pg. 24
[85] IT Market Growth Points (2016)

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2014 the calls for “import substitution” (including the software area) have been heard quite often; however, the actual measures taken are still quite ambiguous. This question will be discussed in more detail in subsequent chapters. Moreover, the devaluation of the national currency generally has a potential to boost exports, and software is not an exception, however, the recent hacker attacks and quite negative image of Russia in Western media (including, for example, the allegations of Russian leading cyber-security software firm Kaspersky Lab in working for Russian secret service[86]) may have a negative impact on the exports to United States or Western Europe (the actual size of this impact is unclear).

3.2. Russia’s software industry and cross-industry ties

3.2.1. Firm strategy, structure and rivalry

3.2.1.1. An introduction into Russia’s software industry.

According to the estimates of a software industry association RUSSOFT, there are between 3200 and 3500 software companies currently operating in Russia, among which at least 2000 have export revenues[87]. In 2015, the total revenue of them has been estimated at US$10.34 billion (a 10% decrease compared with 2014) or RUB 630 billion (a 23% increase in 2014 prices)[88]. Among 130 companies interviewed by RUSSOFT, the top four specializations are the customized software development, business process management software (incl. ERP, document automation etc.), basic software (operating systems, word processors, databases etc.) and mobile applications. In its survey of 130 companies, RUSSOFT has gathered statistics on fields of specialization for Russia’s software firms. Figure 3 below presents the results when only

[86] Carol Matlack, Michael Riley and Jordan Robertson, "The Company Securing Your Internet Has Close Ties To Russian Spies", Bloomberg, last modified 2015, accessed May 18, 2017, https://www.bloomberg.com/news/articles/2015-03-19/cybersecurity-kaspersky-has-close-ties-to-russian-spies.
[87] Russoft (2016), pg. 50
[88] Ibid

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one answer was accepted (so key specializations were recorded), while Appendix G presents the results when multiple answers were allowed.

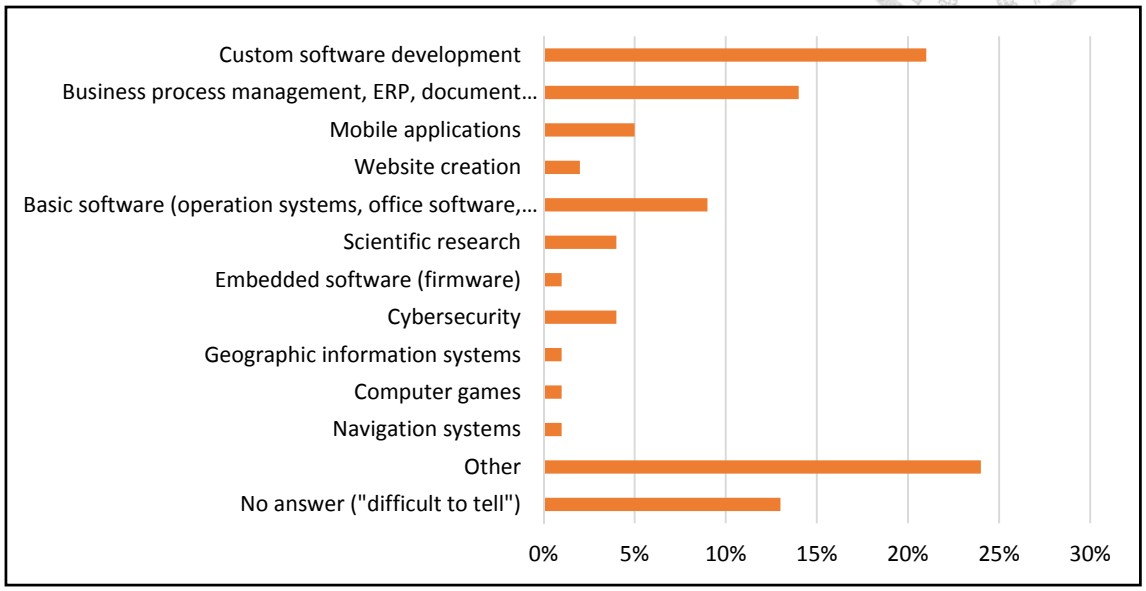

Figure 4. Key specializations for 130 Russian software firms interviewed by Russoft (only one answer allowed)

Source: RUSSOFT, 2016

Most of the companies interviewed combine both selling of their own products and development of customized software for their clients. For 20% of firms interviewed, the revenue from both sources is almost identical[89].

3.2.1.2. Russia's major software companies: a brief description

For the convenience of readers not familiar with Russia's software industry, below we will give a short description for some major companies from the top of the RUSSOFT rating of 2016.

RUSSOFT has divided the companies participating in the rating into four tiers, namely A, B, C and D. For the top tier, firm value/market cap reaching or exceeding

[89] Ibid. pg. 63

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US$ 1 billion has been used as selection criteria, when firms on lower tiers have been chosen based on turnover (US$100 to 500 million for Tier B, US$50-100 million for Tier C and US$20-50 million for Tier D). Below we will introduce the three companies that has made it to the top tier of the rating.

1C. Founded in 1991 in Moscow, this company is most famous for its ERP and business management software, including its 1C Enterprise, which, as claimed on the company website, is been officially used by more than 1 million companies[90]. Educational software for schools and video games (including distribution of other studios' titles as well as in-house development) are among other areas where 1C has established significant presence.

Kaspersky Lab. Rated fourth among the biggest private-owned cybersecurity companies in the world (IDC 'Worldwide Endpoint Security Market Shares, 2015: Currency Volatility Headwind Vendors' report quoted as a source by the company website[91]), the company, which has been founded in 1997, is renowned for its cybersecurity products for individual and corporate users. The company operates in 200 countries and was reporting an unaudited IFRS revenue of US$644 million for 2016 on its website when this paper was being written.

Luxoft. Unlike 1C and Kaspersky Lab, this company, founded in 1995 initially as an affiliate of a Russia-based IT holding company IBS, is operating in the custom software development segment. In 2013, Luxoft has been spun off by IBS as the company performed an IPO on New York Stock Exchange (market cap US$ 2.14 billion as on Jun. 27, 2017). In 2014 when diplomatic tensions between Russia and Western countries started to arise, the company has moved its operation office from Russia to Switzerland and stated in the interview that "We are not a Russian company. We are a global company with operating quarters in Zug, Switzerland"[92]. However, in its 2016

[90] "About Us (English)". 1C, accessed June 27, 2017. http://1c.ru/eng/title.htm.
[91] "About Us". Kaspersky.Com, accessed June 27, 2017. https://www.kaspersky.com/about/company.
[92] "Luxoft CEO: We're Not A Russian Company", Cnews, last modified 2014, accessed June 27, 2017,

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rankings, RUSSOFT decided to keep the company on its list due to its Russian roots and the fact that during the 2013 IPO Luxoft was positioning itself as Russian software firm. Also, this move by Luxoft might also be interpreted as a temporary one until the political situation improves so that the company is not planning to break all the ties with its country of origin.

Among companies from lower tiers, such names as ABBYY (OCR and language software), Acronis (backup solutions), Parallels (virtualization technology; headquartered in US but originates from Russia), Dr. Web (cybersecurity) etc. may be relatively familiar to people outside of Russia. Moreover, Russia's internet companies such as VK (social network) or Yandex may also be mentioned even though they're not software companies in the literal meaning of this term.

3.2.1.3. Introduction to the five forces analysis

As it was stated earlier in Chapter 2, besides the diamond model, Michael Porter is also known for the "five forces" model that provides a framework to study the competition within a particular industry. Currently, there has been no attempt to evaluate Russian or global software industry using the abovementioned model, with except of several works that deal with the IT industry in a certain country (or analyze a particular IT company), such as the research by Saji and Harikumar (2014) that tries to assess the profit potential of Indian IT industry using the five forces methodology. In the next paragraphs, we will try to apply similar model to the Russian software industry.

3.2.1.4. The five competitive forces for the Russian software industry

i. New entrants:

Two different approaches may be used to measure the activity of new entrants in

http://www.cnews.ru/news/top/gendirektor_luxoft_my__ne_rossijskaya.

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Russia's software industry. The first one is to estimate the change in the number of firms in the last 3-4 years. However, this way is quite difficult. If we look at previous reports by RUSSOFT, the number of **stable** software companies has been "at least 3200" in 2015, "at least 3000" in 2014 and "at least 2300" in 2013. We can also use the Russian Venture Capital Association data to estimate the number of VC investments that might give us some insight into the number of startups. For nine months of 2016 (at the moment when this research was done no data for the whole year was available) the number of venture capital deals was 141, compared with 183 for the (whole) 2015, 213 for 2014 and 176 for 2013[93]. However, these data are still of limited use. The estimates of RUSSOFT are very approximate (indicated by the words "at least") and include mostly mature companies (so an increase in this number may imply that more companies are entering the mature stage of their development). At the same time, the number of VC investments alone is unable to represent the situation on the complex startup "scene".

The second approach is to analyze some important factors that can influence the new entrants' decisions. Earlier in Section 1 we have had a look on Russia's VC market and have noticed that, even though there has been a decline, its magnitude is limited. Later in Section 3 we will indicate the fiscal support that is available for IT companies in Russia: here we will note that even though there's a lack of support in export-related areas, the available social tax incentives can offer quite sizeable incentives for software firms. Adding the fact that such incentives have recently been prolonged up to 2023, it may encourage new firms to enter. At the same time, the software industry itself has two important features that make it attractive. First, unlike manufacturing, it does not require a large initial investment. Due to absence of production facilities, warehouses, machinery etc. the setup costs are quite low. Second, the broad definition of software allows firms to explore new segments and compete by innovating instead of lowering the price, so that the margin can remain quite high.

[93] Russian Venture Capital Association, A Review Of Russian PE And VC Market: 9 Months Of 2016, 2016, pg. 36

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To sum up, we will consider the **activity** of new entrants to be **medium**, with a probability of it increasing in the medium term. However, due to the large size of the market, the **threat** faced by the existing participants is **low to medium**.

ii. Substitute products:

The definition of "substitute products" here is quite challenging to develop. On the one hand, if we consider, for example, the substitution of proprietary basic software with an open source solution, here the threat for the industry is quite low as a. the firms are usually focused on several segments of the market, not one (for example, a company may both sell operating systems and provide customized development services to outside customers) and b. as the software industry does not require large capital investments, the company can leave those segments where it can't efficiently compete with open source alternatives and start developing new product lines.

On the other hand, the threat of software products or services from Russia be substituted by products or services from other countries (for example, China and India) both on domestic and foreign market is quite significant. As the computer architecture is quite unified across the countries, so are development tools and basic concepts, the "country of origin" of particular software is often not important for a user. A Russian user may easily choose the antivirus software produced, for example, in China, if he considers it to be more functional, more reasonably priced etc. than the one produced by Russian developers. Moreover, virtual products can be moved across countries' borders much easier than the physical goods. It means that two software solutions from this example are very likely to be substitutes.

Of course, there are exceptions. Firstly, it's the government who may limit the ability of its institutions and state owned enterprises to purchase foreign-made solutions. Secondly, due to the plunge of national currency, Russian software may be more

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attractive for Russian user as it's priced in rubles. Even though foreign software firms are able to keep the price of their software in Russia artificially lower than, for example, in the U.S., they can't let the difference be too big in order to avoid customers employing various tactics of price arbitrage. However, software functionality may be as important as price (the elasticity of demand to price is limited), also, the two examples above are applicable only to domestic, not to the global market. As this research deals with **global** competitive advantages of Russia's software industry, we will estimate the **threat of substitutes** to be **medium to high**.

iii. Bargaining power of suppliers

In Section 1 we have given some remarks on the supply of graduates in the field of IT and software engineering. We have found that it's probably not as low as the government thinks, however, the lack of practical skills and the need for additional education for the engineers recruited on campus definitely increases the costs that the employer has to bear.

In the annual questionnaire made by RUSSOFT, among other parameters, satisfaction of firms with the current education system and talent support is measured. On a 5-points scale, this parameter has increased to 2.91 in 2016 (from 2.88 in 2015 and 2.58 in 2013 when the abovementioned "Strategy" was developed)[94]. The number of CV per one opening in the field of software development on the top Russian job searching website HeadHunter (hh.ru) has increased from 1,7 in Jan., 2015 to 4.6 in Aug., 2016 (HeadHunter estimates that the level of it that is comfortable for the employers is 5 to 6 CVs per opening)[95]. At the same time, this situation may have been caused partially by the facts that there have been staff reductions in other segments, such as telecom or system integration, that are regarded a part of IT industry and share some common skills with software engineering. The Ministry of Education has been

[94] Russoft (2016), pg. 114
[95] Ibid, pg. 175

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publishing statistical data on the number of graduates and their employment before, however, the latest available results are for 2014.

As the “Strategy” suggests, the HR costs constitute the main category of expenses for most IT firms. First, for the software industry there are no such costs as raw materials, storage, production equipment maintenance etc. that manufacturing plants face. Second, the average salary levels for a software engineer in Russia can be considered relatively high. Third, as it will be described in more details later, according to Russian laws, an employer has to pay not only the salary (withholding the income tax on behalf of employees), but also to transfer approximately 30% of it to pension, medical insurance and social security funds.

Generally, we will consider the **bargaining power of suppliers** for the Russian software industry to be **low to medium**. On the one hand, it still requires efforts to find a skilled programmer, also, human resource costs are probably the most important for a software firm in Russia. On the other hand, we should not understate the supply of graduates on the market, moreover, there are some incentives by the government to help the software firms decrease their expenditures on employees’ social security.

iv. Bargaining power of buyers

For software industry in general (not in a specific country) we can divide the buyers into two categories: end consumers and businesses. For the former, the switching costs are relatively low, and, while being not so sensitive to the differences in functionality, end consumers are quite sensitive to the changes in price, especially the share of software-related costs in their income, and, besides switching to software products from other companies, they may also choose free (as their requirements towards functionality are lower) or pirated software as an option. Switching between software from different suppliers is becoming much easier to do as the subscription-based model is taking the place of the license-purchase-based one, as in this case the customer will not be required

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to pay the full license price if he decides to switch to another proprietary solution. However, each single customer in the end consumers market does represent only a small part of the companies' revenues (the number of consumers is much bigger than the number of suppliers). That limits the bargaining power of each individual consumer.

In the **business software** segments, the buyers, represented by IT departments of companies, are much more demanding to the functionality of the solution. Also, businesses that are big enough have much more power to bargain with software suppliers than single individual customers as each of big businesses represent a sizeable part of a software producer's licenses, support and other revenue. However, business customers are less sensitive to price (software licensing and support usually don't constitute a significant part of the firm's expenses so it is not going to struggle fiercely for the best deal), also, the switching costs[96] are higher as it's more difficult and costly to upgrade the computer system of the whole enterprise. The bigger is the enterprise, the higher the costs are. The alternative supplier should provide a solution that can offer much better functionality and sizeable benefits (such as cost reduction) compared with original one to persuade the company to switch to his product.

The situation in Russia is quite similar to the one described above. The only difference is the limitations on purchases of imported software for state institutions that came into effect in 2016 (see Section 3), that may decrease the bargaining power of government buyers as they can't easily switch to foreign-made solutions if they are unsatisfied with the ones made by Russian companies, however, here's still a clause that allows government buyers to purchase imported software if there are no solutions by national developers that can satisfy their needs. Moreover, in many segments, there's a competition not only between Russian and foreign vendors, but between different

[96] In his 1979 and 2008 articles, Porter considers the switching costs to influence the "threat of new entrants" (as they may influence the probability of firms switching to the newcomer's solution), however, at least in context of current industry, we consider switching costs to exert more influence on buyers' bargaining power (the higher are the costs, the lower is the desire to switch, so the price sensitivity is lower too)

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Russian vendors too. Also, as it was described before, the costs of switching from one software to another for big buyers, including corporations and government departments, may be quite high due to the complexity of their computer systems.

We should also keep in mind that the buyers for Russian software are not limited to individuals and institutions within the country, but may as well be located in any other part of the world, so that measures implemented in one particular country will have a very limited impact on the situation worldwide. We will consider the **bargaining power of buyers** (both individual, corporate and government) for Russian software to be **medium**.

v. Industry rivalry

One of the most important notes about the current situation within Russia's software industry made by RUSSOFT is that the rivalry for the global market occurs mostly between big players. It states that, among the companies that have been founded in the last 10-15 years, only a few have reached a turnover of at least US$ 10 million, and, among these few companies who have succeeded, some are actually spin-offs of other big businesses related or not related to IT[97]. This is especially true for those companies that are producing and exporting ready-made software. As suggested by RUSSOFT, the big "product" firms have already exhausted the potential for growth in their segments[98]. For example, Kaspersky Lab (the producer of information security software) in its best years has accounted for up to 20-30 percent of export growth for Russian IT industry, however, as it has already reached the 4th place in its own segment, such a fast growth is no more possible. At the same time, the attempts made by medium-sized "product" companies to enter the foreign markets and make a stable presence here so far are mostly unsuccessful. Even though the situation has been slightly better for the service firms (partially due to a plunge of national currency that

[97] Russoft (2016), pg. 55
[98] Russoft (2016), pg. 69

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made their services cheaper), developing only this particular segment will seriously limit the competitive potential of Russia's software industry (partially due to a large number of competitors in other countries such as India).

We should keep in mind that for a Russian software firm the rivals are represented not only by other Russian companies that are present in a particular segment, but also by the companies from all over the world. This is true both for products and services. As it was suggested earlier, the similar computer architecture all over the world allows a user (except some specific cases such as if user is an institution related to national security) to pick software from any vendor from any country on the world provided he or she is satisfied with the functionality and the price of a particular solutions. Moreover, software is a virtual good and can be moved freely between countries' borders without a need for shipping or customs procedures. This makes the software market highly competitive, however, it's its broadness that keeps it attractive. Also, there's a lot of room for innovation which means that firms can compete in functionality instead of price, lowering the probability of price wars that can have a negative impact on the industry attractiveness and on the firms' profit margins.

3.2.1.5. A note on industry associations.

In our description of current situation in the Russian software industry, we can't but mention the existence of several major associations and partnerships of IT industry firms and the role that they play in communicating the problems and issues in the industry to the government decision-makers. Currently, besides RUSSOFT that has been mentioned many times earlier, another entity is the Information & Computer Technologies Industry Association founded in 2001 and known by Russian abbreviation APKIT. The latter includes a broader variety of firms than the former as it's focused on IT in general, not only on software. Among APKIT members there are both domestic and foreign firms, including 1C, ABBYY, Acronis, Cisco, Google, HP Enterprise, Kaspersky Lab, Siemens and many others. It's interesting to notice that RUSSOFT and

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APKIT are closely interconnected as the former represents the Software Development and Export Committee of the latter.

In our opinion, one of the most important roles for the industry associations is to communicate with the policy makers in order to make latter better understand the existing problems and challenges faced by Russian IT firms that can be addressed with the support from the government. There have been some successful examples: the lobbying efforts by APKIT and RUSSOFT made the government extend the current tax incentives for IT firms (to be described later in Section 3.1.) up to 2023. We will return to the role of industry associations several times later.

3.2.2. Related and supporting industries

3.2.2.1. Introduction

An industry, no matter whether it produces goods or services, can't develop only on its own. Instead, it is usually closely connected to at least a few other industries. Sometimes this is an input-output relationship, where outputs of one industry are inputs for another. Sometimes, it is less direct, where a development in one industry speeds up the development of another due to the creation of new demand, innovations and technology transfer and some other factors. For a software industry where the classical definitions of "inputs" and "outputs" are inapplicable, the second kind of relationship is more important.

In this part, we will take a look on two important issues. First, we will study the relationships between computer development, fundamental science and military industry back in Soviet Union (from the early projects of 1950s to the collapse of Soviet Union in 1991), Second, we will look at clustering in modern Russia and try to find its impact on software industry development.

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3.2.2.2. Computer industry in Soviet Union

Among the researches that deal with the development of information technology in Russia, a lot will mention the Soviet era heritage, where the development primarily in military sphere (as well as space program) had led to the fast development of computing. However, it's usually mentioned quite briefly and is limited to presenting some facts without performing a deeper research of the subject. Moreover, there is also a lack of materials that can tell us the story of "computing in Russia". In the preface of the book with the same title, the authors do admit this problem, stating that, for some topics even personal archives and recollections of those who had been working in Soviet computer industry had to be used in absence of other sources[99]. The book "Computing in Russia" consisting of essays written by various authors (including those who have worked in this industry) on various topics, edited by Trogemann, Nitussov and Ernst and published in Germany in 2001 has been an extremely valuable source of data that has helped us in this work.

As Bardhan and Kroll state, quoting works by Loren Graham and Bardhan, "It used to be said that Soviet science and technology follow the ''blackboard rule'', that is, any discipline which required just a blackboard and a chalk for its study, development and dissemination, reached great heights of accomplishment. However, any subject requiring continuous investment in innovative, cutting edge equipment, complex supply ties, flexible and dynamic management techniques, multilateral manufacturing and hardware coordination was destined for failure."[100] Here we consider this statement to be disputable. The development of fundamental science, military and space program did require a lot of computational power, and their development would have been impossible without a progress in computer industry. However, there have also been significant obstacles, often originating from outside of the industry, for its development.

[99] Georg Trogemann, Alexander Nitussov and Wolfgang Ernst, Computing In Russia, 1st ed. (Braunschweig: Vieweg, 2001), pg. 2

[100] Bardhan, Kroll (2011), pg. 73

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Before starting, we should make two important notes. First, on the early stage of computer industry development it's **difficult to separate "hardware" and "software"** as innovations in both were happening simultaneously, so that we will use the term "computer industry" in this chapter. Second, as USSR had an administrative-command economy with central planning of all economic activities, it's sometimes **impossible to separate the "industry" from the "state" for the purpose of this chapter**.

First, it's a mistake to limit the development of Soviet computer industry to the military-related R&D. As Khetagurov suggests, "the development of computers in the USSR was always represented by two rather independent streams"[101], namely the "general" (civil) and "special" (military) devices that were sharing quite common architecture but were having significantly different requirements to reliability. Moreover, the tasks for which the two types of machines were designed were not the same. It was not only the needs of military, but the needs of scientific research and production administration on various levels (remember that Soviet Union had a "classical" planned economy) that were driving the development of Soviet computer industry and served as "related and supporting industries" of the Porter model.

Second, the Soviet Union state system has had a significant influence on the computing industry development. The central planning was acceptable for military and some other programs such as space exploration (as both usually require significant efforts by the state even under a market economy), however, as stated by Nitussov and Malinovskiy, "in conditions of centralized planning and the directive style of government control, an improper decision could cause serious consequences"[102]. It was especially evident in the "civil" computing. On the one hand, various branches of industry, primarily manufacturing, did require the computing power; moreover, it was also required in the scientific research. Both of them were creating demand for computer hardware and software, driving the computing industry forward. At the same

[101] Trogemann et. al. (2001), pg. 196
[102] Trogemann et. al. (2001), pg. 163

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time, the insufficient qualification of some decision makers (that have finished their education in the "pre-computer" era and had a mindset that did not allow them to realize all the potential the new industry had) resulted in numerous wrong decisions. In early 1960s, a project of the State Global Automatic System was presented to the government. The system's purpose was to establish communication between numerous institutions that were coordinating economic development of the country. However, "the project literally "drowned" in endless bureaucratic collisions"[103] and was actually abandoned (even though some findings were used later in designing more "local" networks).

Third, one of the most discussed issues regarding the history of computer industry in Russia was the decision made in 1970s to switch to IBM 360 model instead of continuing the development of original computer architectures. Some authors such as Apokin, consider this decision to be an erroneous one that "led to an increasing lag behind leading computer companies"[104] as "the repetition of a well-trodden path was never the best method of outstripping the competitor"[105]. Others state that "the foreign standards implementation was in fact very relative and by no means interrupted the original development, just slightly moved it into another direction"[106].

In this research we consider the second opinion to be closer to reality. We should keep in mind that numerous computer devices with original Soviet architecture existing before moving to IBM 360 standard were incompatible with each other in terms of both hardware and software as different series were designed by different research teams. Some of them were quite exotic, such as a ternary (using ternary instead of binary logic) computer Setun', the first model of which was designed in late 1950s in Moscow State University. However, as Apokin suggests, "although scientific level of the USSR was high, its [computer] industry was soon no longer able to back necessary pace of its

[103] Ibid, page 171
[104] Ibid, page 98
[105] Ibid, page 99
[106] Ibid, pg. 165

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development”[107]. The existence of a common hardware platform gave impetus to the development of software – previously its progress has been significantly hampered (and limited mostly to research institutions) by the lack of standardization both in computer architecture and in programming techniques (as each original platform had different requirements that made it difficult to create software for mass use). Of course, there was an option of creating a “national” equivalent for IBM-360, for example, on the URAL platform, however, it was an expensive one (the original IBM project did cost US$ 5 billion as Apokin suggests[108]), also, the question about the timeframes required for the realization of such plan is open.

Our conclusion is that, even though some Soviet original computer designs did have a certain potential for future development, here we consider the decision made by the government as acceptable under those circumstances that existed at the time. It did not stop the development of Soviet computer industry but only shifted its focus to make it able to satisfy the needs of the growing number of users. However, it was unable to remedy the problems and major deficiencies of the central planning system. They were one of the factors that led to the collapse of Soviet Union in 1991.

3.2.2.3. Clustering in modern Russia

The Porter’s definition of the cluster is “a geographically proximate group of interconnected companies and associated institutions in a particular field that are linked by commonalities and complementarities”[109]. The role of clustering in the development of software industry is quite special. Its products can’t serve as classical production inputs; however, they are necessary “indirect” inputs for almost every industry. Currently, it’s hard to imagine an enterprise that is doing its business without using computer-based information and/or control systems. This means that the range of

[107] Trogemann et. al. (2001), page 98
[108] Ibid, pg. 97
[109] Michael Porter, "Location, Competition, And Economic Development: Local Clusters In A Global Economy", Economic Development Quarterly 14, no. 1 (2000): pg. 16

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industries that can form a cluster with software firms is extremely broad. Usually, there are no clusters that specialize only on computer software; however, below we will have a look at the clustering in Russia in general and try to find its implications for software industry development.

According to the list maintained by the National Research University – Higher School of Economics, there are currently 105 establishments classified as “clusters”, among them, 9 have listed “information and communication technology” as their main specialization[110] (the breakdown on specialization of all the clusters is provided in **Appendix H**). The word “cluster” was officially mentioned for the first time in 2012, when 25 territorial establishments have been granted such status (and financial support) by the government. However, there are other establishments, such as technology parks or innovation centers, that also have at least some features of industrial clusters (even though their names are different) and were founded earlier than 2012.

Currently, the clusters are not required to provide detailed and standardized reports on the results of their functioning. Basically, each cluster decided which documentation to upload. The cluster in Saint-Petersburg, for example, has uploaded only a few presentations on some single projects as well as the abovementioned RUSSOFT yearly report (this organization is the coordinator of the cluster) and the “Strategy for the development of IT industry in Russian Federation in 2014-2020 and up to 2025” (the latter two do not provide any information on the functioning of this particular cluster). A few other clusters provided only a brief description of their work. However, after studying the materials available, we have found out some important features of Russian IT clusters.

First, clusters are involved in a wide variety of activities. Some are focused on the development of software as a ready product, while others are more focused on applied

[110] "The Cluster Map Of Russia", Higher School Of Economics, accessed April 13, 2017, http://map.cluster.hse.ru/list.

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software. The examples of latter are a cluster in Oryol that is coordinating the efforts of both hardware, software and telecommunication companies to develop new uses for the navigation system GLONASS[111] and a cluster in Vologda that has automatization in public utilities (such as energy or water supply) among its scope of activities. Some clusters are more focused on educational projects – such as the one in Saint-Petersburg that has opened the Academy of Postgraduate IT Education aimed at raising and maintaining the qualification of IT specialists.

Second, some clusters may serve as an example of public-private partnership between various levels. Even though the most important of them are backed by central government, it will be a mistake to limit all the cluster activity only to governmental projects. The regional administrations and private sector are two other important players in this area. For example, as the presentation for the cluster in Vologda suggests, among the total financing of RUB 638.71 million (up to 2020), the shares of three players were as following: 59 percent for the central government, 17% for the regional budget and 24% for non-budgetary (private) sources[112].

Third, the goals for some clusters include the development not only of IT industry, but of the regional economy in general. For Russia, disproportion in development between various regions, especially those located in the West and in the East, has been an important issue. The fact that the clusters exist not only in Moscow, Saint-Petersburg and few other major cities but also in more distant regions can have a certain positive effect on mitigating this disparity.

Fourth, it's not only the IT clusters mentioned above that are supporting the development of software industry. Software solutions are also needed in a variety of other industries, including manufacturing, scientific and medical research, military etc. Software developers can form cross-industry ties not only with other ICT firms, but also

[111] Positioned as a Russian alternative to GPS, GLONASS has been in development since 1976, but has been completed only in 2010 (full coverage of Russian territory) and 2011 (full global coverage)
[112] Calculated from the presentation available at http://map.cluster.hse.ru/list.

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with companies working in a wide variety of other industries. This may be a topic for a separate research too.

3.3. The activity of government and multinationals

A mistake that is sometimes made is perceiving the Porter's diamond as a model that consists only of four nodes that have been studied in this and preceding chapters. However, the "diamond" here is a three-dimensional figure. Porter himself has added two other nodes that can influence the four aspects described above. The first one is "chance" that can't be studied objectively due to its stochastic nature (as it represents various changes that are out of control of the firms and can't be predicted), but the second one called "government" is instead very important. Moreover, in Chapter 2 we have examined the augmented diamond made by Dunning where another important variable called "multinational business activity" (MBA) has been added. This section is the last in current chapter and will deal with these two variables.

3.3.1. The current government policy.

In the Porter's diamond model, government plays an important role as it can exert its influence on all four elements of the diamond, shaping the competitive advantage of a country in a certain industry.

It's hard to disagree with the opinion of Pankaj Ghemawat (an economist and global strategist) that currently the function of the government is not only the taxation and regulation, it can also become both a buyer and an investor[113]. If government recognizes the strategic importance of an industry (software in this case), it can use a lot of different options to boost its growth and help the industry and its participants to become competitive on the global market.

[113] Pankaj Ghemawat, "Finding Your Strategy In The New Landscape", Harvard Business Review 88, no. 3 (2010): 54-60.

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3.3.1.1. The evolution of state policy towards IT in Russia

Before 1991, Russia (then a part of the Soviet Union) had a centralized planned economy, so that the role of the government was even bigger than described above. The notes on the development of computing industry in Soviet Union have been given in the previous chapter. The government then has made a sizeable contribution to the development of information technology, however, the process was hampered by the centralized planning system when a lot depends on the qualification of the decision makers as "in conditions of centralized planning and the directive style of government control, an improper decision could cause serious consequences"[114]. Also, due to the political factors, the task of making the country competitive on the global market was not considered by the government at the time.

As Dm. Zhamenskiy suggests, "a clear conception of state policy in the sphere of science and technology [in Russia] did not exist before 2002"[115]. In 2002, the "Key aspects of Russian Federation' policy in the field of science and technology development for the period up to 2010 and further"[116] have been published. Even though this document was not dealing with the development of IT industry in particular, it can be considered an early example of a policy document[117] that has had an impact on the information technology development in Russia. In the same year, a federal program of e-government development has been launched. The process of its implementation was not so smooth and it has been corrected several times during that eight-year period. In 2008 it was claimed that only 38% of the financing dedicated to that program has been used by the date[118], also, it was realized by the government that

[114] Trogemann et. al. (2001), pg. 163
[115] Dmitriy Znamenskiy, "The State Scientific And Technical Policy Of Russia", Vlast', no. 10 (2009): 38-40.
[116] Key Aspects Of Russian Federation' Policy In The Field Of Science And Technology Development For The Period Up To 2010 And Further (Пр-576, 30.03.2002), 2002.
[117] The "Key aspects", as noted by Znamenskiy, didn't have a force of law
[118] Oleg Krasilnikov, "Problems Of E-Government Introduction In Russia", Saratov University Bulletin: Sociology and Politic Science 12, no. 2 (2012), pg. 36

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the previous implementation was focused mostly on some highly-specialized tasks and there was a lack of an infrastructural base for the electronic workflow between different government agencies. In 2009 both targets, measures and financing of the program have been corrected significantly, and currently the Ministry of Telecom and Mass Communications reports that by 2010 41 out of 42 targets have been accomplished[119]. The program has had an impact both on IT industry by creating a sizeable demand for both hardware and software tools and on the business climate by increasing the government efficiency in some routine procedures as the paper-based workflow has been phased out by electronic communication.

Currently, the state policy towards information technology industry is stated in “The strategy for the development of IT industry in Russian Federation in 2014-2020 and up to 2025” approved by the government in 2013. It puts an emphasis on software and services grouped in the following four categories: a. production of ready-made software; b. IT services including customized software development, design and deployment of information systems, testing and consulting, especially with high degree of complexity; c. development of complex hardware-software solutions with a high value added by the software; d. remote information processing through websites (excluding e-commerce and entertainment) It is quite a controversial document. On the one hand, the important advantage is that it does acknowledge the existing problems such as the undersupply of graduates, a sizeable gap between Russia and the top economies of the world in some areas such as hardware etc. and offers the development of those particular segments where Russia can still have a strong competitive advantage. The officials have invited numerous research firms and industry associations to compensate for a lack of official statistical data available for IT industry. In some way, a broader scope and a clearer focus of the new strategy can be credited to their influence. On the other hand, when the final document was published, a lot of inaccuracies related to statistical data has been discovered by experts and media. Some data had been misrepresented and based on

[119] "The "Electronic Russia" (2002-2010) Federal Target Program", Ministry Of Telecom And Mass Communications, Russian Federation, accessed April 25, 2017, http://minsvyaz.ru/ru/activity/programs/6/.

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incorrect assumptions[120], other have been not listed at all in spite of their importance, also, the forecasts for the growth of Russian IT industry and the particular segments within it also raise a lot of questions as the growth there turns out to be extremely uneven with no clear reasoning behind it[121]. Some media suspect that these errors, often leading to the underestimation of starting conditions, may be beneficial to the government officials in charge of new strategy, as it will be easier for them to achieve the lowered targets[122]. \

Below, we will try to analyze how the Russian government currently influences each of the four nodes of the "diamond" in order to make Russia's software industry more competitive.

3.3.1.2. Supply (factor) conditions

i. Education and language proficiency:

Some of the figures and conclusions presented in the "Strategy" and describing the situation with the education system have been criticized by industry experts. One of the examples was the incorrect estimation of the number of IT graduates that has been mentioned earlier in Section 1. The industry experts as well as private companies consider the education quality to be even bigger issue that the number of graduates. The figure of 15% graduates "that can get employed immediately" does not necessary imply the low quality of education (however, there should be a room for improvement); the real problem may be the lack of practical skills among the graduates except those who

[120] For example, when the document authors were estimating the size of Russia's IT market compared with the global one, for unknown reasons the size of the market in national currency turned to be significantly smaller than the estimate made by the Russian Information & Computer Technologies Industry Association (the organization was one of the consultants for the "Strategy"), moreover, while trying to convert this figures into US dollars, the authors used the exchange rate significantly lower than the average for 2012 (26.5 versus 31 rubles per U.S. dollar) when the document was prepared

[121] "Playing With Numbers", Lenta.Ru, last modified 2013, accessed March 16, 2017, https://lenta.ru/articles/2013/11/15/strategy/.

[122] Ibid

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has participated in an IT-related part-time job or internship. Dmitriy Voloshin from Mail.Ru Group notes that the government needs to partner with private businesses and establish common targets for both sides to pursue in order to improve the quality of IT education[123]. Currently, both the business and the government are trying to partner with educational institutions; however, there is a lack of coordination. The "Strategy" emphasizes that the education programs in IT should become more tailored to the employers' needs through cooperation with industry leaders in both human resources and scientific research areas[124], but implementation is what matters the most. Financing may become an obstacle, as government expenditures in education have been decreasing since 2013 (RUB 482.1 billion in 2016 versus 661.2 billion in 2013 for tertiary education in constant prices[125]) and it's quite unlikely that the IT education escapes the overall cost cutting.

An advantage of the "Strategy" is the realization of the fact that not only the technical knowledge, but also the English proficiency, as well as entrepreneurial and marketing skills are necessary for the development of Russian IT industry[126]. However, there's currently no information about specific measures implemented.

ii. Internet penetration

In 2012 the Ministry of Telecom and Mass Communications has developed a program for telecom, mail, media, IT and e-government services development for the period of 2012-2018, stating that by 2018 80% of households should have access to wired or wireless broadband access, also, all the communities with the population of more than 8 thousand residents should be connected to the high-speed broadband

123 "The Government Wishes To Increase The Number Of IT Specialists And Deliberately Sacrifices The Quality Aspect", Vedomosti, last modified 2014, accessed March 8, 2017, https://www.vedomosti.ru/management/articles/2014/11/24/professionaly-idut-lesom.
124 Strategy (2013), pg. 24
125 "The National Defense Expenses Of National Budget Have Exceeded The Ones On Education", RBC, last modified 2016, accessed February 21, 2017, http://www.rbc.ru/politics/12/12/2016/584996939a79476ef58c6cb3.
126 Strategy (2013), pg. 22-23

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Internet lines[127].

The report in Rossiyskaya Gazeta (the official daily newspaper of the country's government) dated June 22, 2015 cites the official statistics for 2014: by then, high-speed Internet access was available to 64 percent of the country's population, growing 7.5 percent compared with the previous year. The head of the Ministry of Telecom and Mass Communications Nikolay Nikiforov has noticed that, while for some major cities the penetration of high-speed Internet access had reached 90%, lots of smaller communities are lagging behind. He also predicted a slower growth in the following years as making broadband available in remote areas is a much more complex assignment, so "each new milestone will be harder and harder to reach"[128]. The other concern voiced were the "unstable foreign exchange rates" and the "increased costs of borrowing" (attributable to an economic recession that started in the end of 2014) that could lead to an extension of the project' time frames.

The recent years have seen a stable increase in Internet penetration among the residents of Russia. Both official statistics and research by private firms confirm this (see Chapter 3 for more details). However, there's still a number of policy concerns that may hamper the progress of the Ministry of Telecom' project mentioned above.

To start with, the program has been designed in 2012. Thanks to stable and high oil prices, the recession of 2008-2009 (caused by the world financial crisis) seemed to have passed away, so the government was eager to develop bold and long-term modernization plans aimed at narrowing the gap in technological development between Russia and developed world. Besides the Ministry of Telecom' six-years strategy, another notable example was a project to introduce an electronic "universal ID card" replacing a large number of documents including national ID, health insurance, social

[127] Ministry of Telecom and Mass Communications, Work Plan For 2013-2018, 2015.
[128] "Fast Internet Will Be Available To Most Of Russia' Population By 2018", Rossiiskaya Gazeta, last modified 2015, accessed May 18, 2017, http://rg.ru/2015/06/23/internet.html.

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insurance etc. and having debit card capabilities at the same time[129]. Now, in contrast, because of low oil prices and the financial sanctions imposed by major Western powers (and the existing flaws in the country's economics and political system) the country is experiencing a new recession. The government is taking measures to cut the expenses of the country's budget and it's quite likely that the implementation of the "Internet access" program will be hampered too.

Another concern voiced by Internet and mobile service providers is a series of laws implemented in the last few years aimed at increasing the control over the Internet and telecommunications industry for the sake of national security. Among them, the most controversial was the new "anti-terrorist" law passed on summer 2016 and scheduled to come into force in June 2018 that requires telecom providers to store all the voice, text and other (including images, videos etc.) content sent by its users for up to 6 months (previously only the metadata[130] but not the content had to be stored) and the metadata of this content for up to three years. The reason of concerns was the enormous capital expenses required to create an infrastructure able to store huge amounts of data (the expert group expects it to be 59 million Tb[131]). While the state corporation and hi-tech wealth fund "Rostec" predicts that the costs will not exceed RUB 10.3 billion[132] (currently US$ 165.62 million), Internet and mobile data providers estimate the overall costs for the whole industry to be at RUB 5 trillion (currently US$ 80.4 billion) against the aggregate income for the industry of RUB 1.7 trillion. As the law is scheduled to become effective in June, 2018, the experts do not rule out the possibility of it being amended in order to decrease the implementation costs and to fix the flaws of the original bill (the current version raise a lot of question both from the technical and the

[129] The project was first time introduced in 2010, but the pilot program including a number of regions started in 2012. However, due to a lack of infrastructure development and underfinancing the project was not successful and the issue of such cards has been finally stopped in 2016

[130] Including such information as sender ID, receiver ID, time of calling/sending etc. but not including the content of the call/message.

[131] "The New Anti-Terrorist Law May Bring Profits To "Rostec"", Vedomosti, last modified 2016, accessed May 7, 2017, http://www.vedomosti.ru/technology/articles/2016/08/22/653913-million-nadezhnie-ruki.

[132] "Megafon Estimated The Costs Of Anti-Terrorist Law Implementation To Be 0.5 Trillion Rubles", Kommersant, last modified 2016, accessed April 1, 2017, https://kommersant.ru/doc/3143331.

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legal points of view)[133]. Otherwise, the huge capital expenditures will lead to an increase of the Internet or mobile service prices; also the companies will have to sharply decrease or even stop their investments in communication infrastructure (increasing penetration and quality of service) and redirect them towards implementing the new law. It will likely cause zero or even negative growth in Internet penetration for the country for quite a long period, which will undermine the competitive advantages of Russia in this area.

iii. Other areas under "Factors"

In Chapter 3, business climate was described as one of the factors; however, improvement of business climate is not the task that can be executed according to a carefully written plan but rather a combination of efforts of various structures at various levels. Some of the factors that influence the business climate (such as macroeconomic cycles) are outside of the government's control. In some other areas years and even decades are required for results to become visible. The broad meaning of term "business climate" means that making a comprehensive list of all the steps that have been done and must be done in this area will be a hard and time-consuming task. We will return to this question later in Chapter 4 and outline some possible implications for the government in this area.

In the sphere of intellectual property protection (that may be regarded as a part of the business climate) RUSSOFT quotes Federal Institute for Industrial Property, stating that the laws that protect intellectual property in "ordinary" and high-tech industry in Russia do meet the global standards in the area, however, there are problems with the law enforcement[134]. Speaking about the pirated software, we can note that, even though the new series of anti-piracy laws that allow government agencies to block websites

[133] "They Haven't Planned It Well", Kommersant, last modified 2016, accessed May 18, 2017, http://kommersant.ru/doc/3150175.
[134] Russoft (2016), pg. 136

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with unlicensed content[135], permanently under certain circumstances, have come into force in 2015[136], the level of software piracy in Russia as measured by BSA is still higher than in the developed world. It's hard to make conclusion if the government should pursue pirates more aggressively by putting more efforts into finding unlicensed content and increasing the possible punishment for the copyright violations, or if such actions are unlikely to change the situation. We should also remember the limitations and deficiencies in the BSA methodology that have been mentioned in Section 1 of this chapter.

3.3.1.3. Demand conditions

In modern world, the government is not only the regulator, but also a powerful buyer. The "Strategy" states that in 2011 in Russia the government has accounted for 13% of total IT expenditures, against almost 20% for the global market (no source quoted in the final document, but in the draft version the data are credited to McKinsey)[137]. The government was planning to stimulate the government demand for information technology mainly by encouraging its own departments and agencies as well as major companies (probably meaning state-owned enterprises) to outsource IT solutions to the market (instead of using affiliated structures to develop them).

The economic sanctions imposed by the major Western countries in 2014 created a threat for the state agencies and SOEs that the support of the foreign software they were using may get discontinued if they were added into the sanctions list. The reaction was the proclaimed "import substitution" policy in the field of software. In 2015, the Registry of National Software has been created, and since Jan. 1, 2016, state and

[135] The "unlicensed content" here is not limited to pirated software and includes unlicensed music, movies, e-books etc.
[136] "Russia Beefs Up Anti-Piracy Laws", BBC News, last modified 2015, accessed February 18, 2017, http://www.bbc.com/news/technology-32531275.
[137] "Strategy For The Development Of IT Industry In Russian Federation In 2014-2020 And Up To 2025 (draft version)", CNews File Archive, accessed May 20, 2017, http://filearchive.cnews.ru/doc/2013/09/strategy.pdf.

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municipal agencies are required to purchase the software from national developers included in the Registry unless there's objectively no solutions that can meet their needs[138]. In Dec., 2016 the Ministry of Telecom and Mass Communications said it will develop the table that will allow the purchasers to find the alternatives for specific examples of foreign-made software more easily[139].

Currently, as the federal law suggests, software may be defined as "national" a. if the sole rights for it belong to the state or to a company with a share of Russian investors more than 50% or to a Russian citizen, b. if it is legally sold on the whole territory of the country, c. if the licensing, royalty and other similar payments to foreign entities constitute less than 30% of the producer's revenue and d. if the software itself or its elements do not belong to the sphere of state secrets[140].

At the same time, the process of import substitution raises a lot of questions. There are both flaws in the legal framework as well as questionable practicability of the policy itself. These questions will be addressed later in Chapter 4.

3.3.1.4. Related and supporting industries

i. Military research and development

Even though the authors of "Computing in Russia" note that the military field was not the only one that required computers (there was a separation between "civilian" and "special" devices), it was still an important driver for development of the information technology industry[141] in Soviet Union. Now the government of Russia still attaches a

[138] "The Registry Of National Software", Ministry Of Telecom And Mass Communications, accessed May 14, 2017, http://minsvyaz.ru/ru/activity/directions/772/.
[139] Sergey Karasiov, "Government Purchases Of National Software To Be Simplified", 3Dnews, last modified 2016, accessed May 3, 2017, https://3dnews.ru/943670.
[140] Federal Law No. 188 "Amendments To Federal Law "On Information, Information Technologies And Information Security" And To Article 14 Of Federal Law "On Contract System In Purchasing Goods And Services For Needs Of Central And Local Governments"", 2015.
[141] Even though this term wasn't in use back in USSR

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lot of importance to military development and modernization, and so this industry can remain among the "related and supporting industries" for IT and software in particular. Even though for an ordinary person military research is associated mainly with new weapons, armored vehicles or fighter jets, the importance of software should not be diminished, as the modern examples of such "hardware" require complex programming algorithms to make them work. Also, unlike civilian industry, the use of foreign-made software (programming code) is restricted or strictly limited in military for sake of national security.

The "Strategy" proposes a creation of a mechanism of engaging private contractors to develop technologies for the military (like the U.S. DARPA program) and creating a system that allows the subsequent civilian use of the inventions. In 2012, a DARPA-like Future Research Fund has been established in Russia. However, the rigid rules governing the partnership between private contractors and the Fund may discourage former from entering, which will be described later in Chapter 4.

ii. Clusters, technology parks, special economic zones etc.

From Chapter 5 one can see that the development of clusters, technology parks and similar special zones is currently driven both by public and private efforts. Even though a large number of them are dedicated to other industries, the nature of software that allows it to be used in a lot of different areas allows wide cooperation between software developers and hardware engineers or scientific researchers.

The federal program for technology parks creation was functioning from 2007 to 2014. According to Ministry of Telecom and Mass Communications, 12 such objects have been built[142]. Due to the fact that software is often not the final product but an instrument widely used by technology park residents, it's hard to assess the contribution

[142] "The Results Of The Technology Parks Creation Program Have Been Presented To The President", Ministry Of Telecom And Mass Communications, last modified 2016, accessed April 8, 2017, http://minsvyaz.ru/ru/events/34679/.

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that technology parks have made particularly to the software industry. The report by RUSSOFT has a positive view on their development, stating that they facilitate the formation of an environment and ecosystem that supports innovation, and also states relatively high level of satisfaction among the high tech companies regarding the technology parks' operation (even though there are still some shortcomings to address).

Besides technology parks, there are other objects that serve the same or almost the same purpose. There are two innovation centers "Skolkovo" and "Innopolis", however, they seem to be more focused on the incubation of high-tech businesses instead of clustering, so they will be reviewed in the subsequent sections. There are also special technology and innovation economic zones, however, as suggested by RUSSOFT, their impact will be more evident in high-tech and high value added manufacturing instead of IT[143].

iii. Other related and supporting industries

Besides military R&D, the "Strategy" lists several fields as priority ones for applied **civilian** research in information technology: new solutions for search and recognition (voice recognition, advanced software for machine translation, new machine learning algorithms), big data analysis, new methods of storing, processing and transmitting information, high-performance computation and data storage systems, solutions for cybersecurity and identification, cloud computing, human-machine interfaces, telecommunication and navigation, and new tools for development and testing.

3.3.1.5. Firm strategy, structure and rivalry

Among the five forces discussed in Chapter 4, industry rivalry, threat of substitutes as well as bargaining power of consumers are quite unlikely to be strongly influenced by the government. It may have some limited impact on bargaining power of suppliers (as earlier in Chapter 4 we decided the employees to be the suppliers in our analysis) by

[143] Russoft (2016), pg. 134

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changing the supply of graduates through grants and enrollment at public institutions. However, measures taken by the government can have a strong influence on the attractiveness of the industry for new entrants. It can make the industry less attractive for newcomers by establishing licensing or other control measures; at the same time, it can attract more firms to enter an industry by providing tax or non-tax incentives. Due to the huge size and scope of the market for software and wide use of differentiation instead of price competition, a flow of new entrants is quite unlikely to make the situation worse for existing firms by driving profit margins down as they may in traditional manufacturing industries. At the same time, as IT industry is widely regarded as strategically important in the new world, the governments of many countries try to take measures both to support the existing IT firms and to attract the new businesses. Below we will analyze tax and non-tax measures taken by Russian government in this field.

i. Tax incentives

The “Strategy” notes that “For most companies in IT industry, employee compensation constitutes the major expenditure”. And, due to specific features of Russian tax and social security system, employee compensation costs are not limited to salary. Besides paying the employee his or her wage (and withholding the 13% flat-rate personal income tax), the employer must also transfer in total 30% (20% for small businesses that use special taxation regime) of the wage to three funds: the pension fund (22%), national health insurance (5.1%) and social insurance (2.9%). Unlike personal income tax, these payments are not included in the employee’s wage that is stated on his or her contract, but they constitute a significant expense for a firm, especially in the industry where the salary can be relatively high. So, incentives that can reduce these expenses will be beneficial for the firms currently operating on IT market; also, they can be helpful for the new entrants.

The government has recognized this back in 2011 where a lower rate of social

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security payments was implemented for the firms working in information technology industry. Currently the rate is 14% versus 30 or 20 percent mentioned above, also, the required minimum number of employees has been lowered from 50 to 7 so that it become available for a larger number of businesses of different size. In 2016 there have been concerns regarding the possible discontinuation of the program or a limitation of its scope to the companies that have products included in the Registry of National Software (mentioned earlier in this chapter). The RUSSOFT report for 2016 had more than four pages dedicated to the possible negative consequences both for employees, firms, industry and national budget. However, in December 2016 a new law that extends the duration of social payments incentives up to 2023 has finally been approved[144].

At the same time, the same report states that there should be tighter control for the firms that use the incentives illegally. The conclusion about their existence has been made by RUSSOFT after comparing the government statistics with their own data on the approximate number of software firms in the country, number of their employees and the percentage of firms that participate in the abovementioned program and finding out that there are 2172 companies using the incentives as the Federal Tax Service statistics shows, however, in the model by RUSSOFT there should be only 1575 of them[145]. Even though RUSSOFT is a highly competent organization, it's hard to tell whether such conclusion is justified or not without knowing the exact way of how the number of software companies has been compiled; moreover, as there have been a limited number of firms participating in the surveys, is the extrapolation of the sample data (40 to 45% of firms participating in the social security incentives program) to the whole pool of software companies in the country correct from the scientific point of view? There's no raw data available in the report.

Tax incentives are also available for the residents of "Skolkovo" innovation center established in 2010. They include the business income, property and value added tax

[144] "Tax Incentives For IT Firms Have Been Prolonged Till 2023", Russoft.Ru, last modified 2016, accessed May 2, 2017, http://www.russoft.ru/news/3623.
[145] Russoft (2016), pg. 83

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exemption as well as lower rate of social security payments (the same 14% mentioned above), also, import duties for the equipment used for R&D purposes are compensated. In early 2016 a proposal was made to make the same incentives available for companies registered in technology parks and similar establishments[146], however, currently no decision has been made.

In January 2017, a new legislation has come to force that obliges foreign firms offering electronic services through Internet to pay the VAT just like the domestic firms do. The definition of “electronic services” includes the transactions that occur on the Internet and do not include the transfer of physical goods, such as selling of software, computer games, music, e-books (or providing an access to them through Internet)[147], providing hosting services and platforms for the functioning of websites etc.[148]. Previously, the value-added tax in this field of business was imposed only on domestic companies (and, according to Forbes, some Russian firms used this loophole too by registering entities abroad[149]), providing a not-stated tax incentive for foreign providers. Currently, it’s too early to make conclusions about the impact that the new legislation may have on Russian IT market and software industry. We can note that the foreign service providers (including, for example, the firms that distribute software through digital distribution or via SaaS model) will probably have no other choice but to increase their prices (some providers such as Google have already done this) to compensate for the increased tax burden, which may reduce their sales and market share. However, we can’t be sure whether it will be beneficial or not for Russian software and IT services firms. Even though they can win back some market share of their overseas competitors, there are concerns that the new tax legislation might lead to the overall shrinking of Russian IT market that will have quite a negative impact on all

146 "Tax Incentives Available For Skolkovo Residents May Be Extended To Other Technology Parks", Vedomosti, last modified 2016, accessed January 18, 2017, http://www.vedomosti.ru/technology/articles/2016/02/10/628290-lgoti-skolkovo.

147 Excluding those transactions where the product is transferred on physical media (such as CD)

148 Federal Law No. 244 "On Amending The 1st And 2nd Section Of The Tax Code", 2016.

149 Olga Sorokina, "The "Google Tax" - How Will It Influence Foreign Internet Companies In 2017", Forbes, last modified 2016, accessed May 15, 2017, http://www.forbes.ru/kompanii/336337-nalog-na-google-chto-zhdet-inostrannye-internet-kompanii-v-2017-godu.

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players (whether Russian or foreign). Moreover, as *Forbes* suggests, the current version of the law creates a threat of double taxation, when the price of the final product may include both the tax that the Russian firm paid when selling it to a distributor registered overseas and the tax paid by the foreign distributor as it sells the product in Russia[150] – which can make the product developed domestically even less competitive than the foreign one due to higher price.

ii. Non-tax incentives

However, tax reductions and exemptions are not the only instrument the government can use to stimulate the companies in software industry. Not less important are the export and marketing support that allows companies to create notable presence on overseas market. According to the RUSSOFT estimates, the availability of such support is quite low and limited to some particular cases. There are such measures as export credits (however, RUSSOFT suggest that in its current form they are suitable mostly for manufacturing firms[151]) or the compensation for overseas localization and intellectual property registration expenses announced by the Ministry of Telecom and Mass Communications, however, most of them are currently in the planning stage. Among the measures that are already in the process of implementations is the new program for subsidizing the overseas patenting expenses of Russian companies (approved in the summer of 2016)[152] that may be useful for smaller companies (including software) possessing some promising technologies but lacking the budget to go through the patenting procedures abroad, however, it's too early to make conclusions about the results of it as not enough time has passed. The inadequacy of non-tax incentives currently available for IT and software companies, as well as possible implications to address the issue, will be discussed in more detail in Chapter 4.

[150] Sorokina (2016)
[151] Russoft (2011), pg. 51
[152] Russoft (2011), pg. 137

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iii. Support available to small businesses and startups

Besides creating an environment that can help current industry participants grow and expand their share of both domestic and overseas markets, the government should also be paying attention to those small and micro-enterprises that have a good concept of a product or service but don't possess enough resources to grow on their own. If the idea that the startup is trying to develop is promising, the government can provide some direct or indirect help. However, instead of providing grants directly through its own institutions, the government should create a mechanism of cooperation with private investors, funds and accelerators to let the "qualified specialists on the market" to do the financing and selection, as the Strategy suggests[153].

Strategy states that "the government can provide additional financial leverage for successful companies and funds"[154]. As it was discussed before in Chapter 4, venture capital funds that are fully or partially financed from the state or regional budget are powerful players on Russian VC market. As the RVCA statistics for Q3 2016 suggests, government-backed funds have accounted for almost all the amount of venture investments in such areas as "computers" (hardware, software and related services), "industrial equipment" and 3/4 of the investments in "Medicine", but only 2.35% of the VC investments into "Telecommunications" (including Internet portals, telecom services, media industry etc.)[155]. The situation in 2015 was not much different. The large share of government investments in medicine[156] and industrial equipment is easily understandable as there is a need for significant capital and/or R&D expenditures there. At the same time, it's more difficult to explain why the government dominates in the "Computers" sector as, firstly, it includes both hardware and software that have quite different cost structure as well as capital intensity, and, secondly, there are some points where the "Telecommunications" and "Computers" intersect. Should cloud services or

[153] Strategy (2013), pg. 38
[154] Ibid
[155] Russian Venture Capital Association (2016 b), pg. 34, 59
[156] The "Medicine" sector in RVCA methodology includes such industries as medical services, medical equipment and pharmaceuticals

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SaaS solutions be considered “software” or “Internet services”? The report does not give a clear distinction.

It’s interesting to notice that, according to RVCA, in 2015 the main driver in VC segment have been the government-related structures (as the yearly report suggests), but in the first 9 months of 2016 the main contributors have been the private structures. It’s difficult to give the exact reasons behind it, however, it gives us an impression that the venture capital market in Russia is driven by both public and private institutions.

The government role in startup ecosystem isn’t limited only to financing. In 2010, Dmitry Medvedev, then the President of Russian Federation, approved the project of Skolkovo Innovation Center (mentioned previously in connection with tax incentives). The government had quite ambitious plans of turning Skolkovo into a Russian version of Silicon Valley, combining office space, research facilities and a university and serving both as a cluster for related industries and an incubator for small enterprises. However, the implementation of the strategy has turned to be quite difficult. While the grants and tax incentives look attractive for small enterprises in various fields including IT, there is still a huge gap in physical infrastructure. The RUSSOFT report states that in 2015 60% of the facilities were still under construction (even though some key objects had been originally planned to be completed by 2015)[157]. Also, moving offices and personnel to the innovation center may be a feasible option for such industries as medicine or electronics (due to an availability of laboratory space and research equipment), but won’t be so feasible for software companies that don’t require special R&D facilities. While previously it was possible to be a resident of Skolkovo without having an office there, in Jan. 1, 2016 the clause that forbids such practice has come into force[158]. Deciding whether to move to Skolkovo that is located outside Moscow or to set up a branch there (and incur additional rental expenses) in exchange for grants and preferences will be quite a difficult choice for software company. Currently, the

[157] Russoft (2011), pg. 133
[158] Federal Law No. 244 "On Skolkovo Innovation Center", 2010.

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possible impact of Skolkovo on software industry is unclear, however, it seems to be rather indirect if compared with some other high-tech industries.

3.3.2. Multinational business activities

The original Porter's diamond does not include the activity and investments of MNEs as a variable. As it was described earlier in Chapter 2, Porter himself had quite a skeptical attitude towards inward FDI and preferred to focus on activities of domestic firms as, in his opinion, they did matter the most in determining the competitive advantage of a nation. However, as proved by later researches on the subject, such views are outdated and can't reflect the situation that exists in modern economy. Currently, MNEs play a very important role (whether positive or negative) in shaping the competitive advantage of nations, and so they deserve to be viewed as the third (along with chance and government) variable in the augmented diamond model.

Returning to the industry in question and leaving aside the buyer-seller relationships[159] (as they have already been covered in previous sections), the **current** activity of multinationals in Russia can be divided into two parts:

- MNEs establishing R&D centers in Russia and organizing various activities (including education programs) that can improve the competitive advantage of the country;
- Foreign offices of MNEs recruiting IT professionals and graduates from Russia to work for them.

It's tempting to call the first one "positive" and the second "negative" influence of MNEs, however, in this chapter we will refrain ourselves from giving any subjective assessment of whether they are "good" or "bad". Instead, we'll describe the current situation for both and then perform an analysis of their desirability in Chapter 4.

[159] Such as MNEs selling their products or services to Russia or purchasing other products or services from Russian firms

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3.3.2.1. R&D centers of MNEs in Russia

As counted by RUSSOFT, by 2015 there have been 40 major MNEs having and maintaining R&D activities in Russia. Except Chrysler, the logic of which being included into the list is questionable as there's no information on it (unless not the automobile manufacturer but another firm with a same name is mentioned[160]) performing any IT-related activities in Russia, other firms usually fall into one of categories[161]: **software development**: Oracle (R&D center opened as early as 2004), SAP, Columbus IT; **telecommunications**: Alcatel-Lucent, Nokia Networks (listed under old name Nokia Siemens); **hardware and networking equipment**: Dell, Cisco, Intel (opened in 2001); **highly diversified companies**: Microsoft, IBM and **other:** Deutsche Bank (opened in 2001).

A note should be made that some of the companies included to the list do actually originate from Russia (such as Nival Interactive or Design Systems) and have HQ there. We consider that it is more correct to call them domestic MNEs rather than foreign companies, regardless of whether they have a significant presence overseas. However, there are only a few such cases as most of the companies in the list are indeed MNEs originating from abroad.

The activities performed by multinationals in Russia are not limited to R&D work. In 2013, Cisco has launched an education center offering programs in business administration (including the use of modern technologies in developing business strategy) based in the innovation center of Skolkovo that has been already mentioned earlier in this section[162], along with a Cisco Technology Center based at the same place.

[160] Unless many other firms, Chrysler is not mentioned in RUSSOFT' companies list so it's currently impossible to determine whether it's Fiat Chrysler or an IT firm with a same name

[161] Russoft (2016), pg. 76

[162] "An Education Center Of Cisco Entrepreneur Institute At Skolkovo Has Been Opened", Cisco, last modified 2013, accessed December 17, 2016, http://web.archive.org/web/20161007150808/http://www.cisco.com/c/ru_ru/about/press/press-

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The Skolkovo Fund plays a notable role in attracting multinationals' investments. In a 2017 interview, Igor Drozdov, the board chairman of the fund, has noted the agreements with Microsoft and IBM (that do not require these companies to move their representative offices to Skolkovo but create this opportunity), as well as an educational partnership with latter among the recent achievements of the fund in international R&D cooperation[163]. However, the lack of physical infrastructure mentioned earlier is likely to slow down the process.

An interesting move has been made by a networking devices manufacturer D-Link who has opened an R&D center (focused on software solutions development) not in major cities like Moscow or St. Petersburg but rather in a smaller city of Ryazan'[164].

The report by RUSSOFT has mentioned that, though the devaluation of national currency has made moving R&D to Russia an attractive option (as the salaries are denominated in rubles), the worsened diplomatic relations between Russia and major Western countries over the events in Ukraine are likely to influence the MNEs decisions and stop them from expanding their investments due to the risks being perceived higher than they actually are[165]. However, we consider this negative impact to be limited. As discussed earlier in Section 1, the Global Competitiveness Index (that is to a great extent based on executives' opinion and is also used by businesses as an important source of data) noted the stable performance of Russia (and even some improvement) in 2015 despite the economic recession.

At the same time, as the monthly data published by Bank for International Settlements (BIS) suggest, the real effective exchange rate (REER) for ruble[166] has

releases/2013/03-032613a.html.

[163] "An Interview With Skolkovo Fund Chairman", Rambler, last modified 2017, accessed May 19, 2017, https://rns.online/interviews/Predpravleniya-fonda-Skolkovo-o-prizemlenii-novih-rezidentov-2017-03-03/.

[164] "Ryazan - A Capital City For D-Link", CRN, last modified 2016, accessed February 19, 2017, https://www.crn.ru/news/detail.php?ID=111362.

[165] Russoft (2016), pg. 73

[166] Real effective exchange rate is an index that shows the dynamics of exchange rate between a unit of

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increased over 2016 from 66.3 in January to 86.86 in December compared to a benchmark value of 100 for year 2010[167]. Even though the REER of late 2016 – early 2017 is still attractive for multinationals if compared with an average value of 105.78 (standard deviation 2.21) for the period of 2012-2013[168], the exchange rate considerations may have less important role in the eyes of MNE decision makers in the future. However, more observations are needed to prove this statement. It may be a subject of a separate study that will take into account such factors as trends in Russian labor market (as the salary in such industry as IT may be pegged to a foreign currency)[169], tradability of IT services (as exchange rate movements tend to have different impact on "tradable" and "non-tradable" sectors) etc. The monthly REER for ruble to a broad basket of currencies computed by BIS is presented in **Appendix I**.

There's no single statistical indicator that can measure the intensity of R&D cooperation in software industry or IT in general. The closest one is the total volume of cross-border trade in R&D services measured by the Central Bank in Russia. If we analyze the data from 2012 to 2016 (see **Appendix J** for the graphs), we can see quite a significant rebound in 2016 after a plunge in 2015. However, an important note is that the data are measured in current US$, which makes the comparison difficult from the methodological point of view. It's difficult to prove whether the changes in trade volume are caused by the actual changes in trade or by the exchange rate volatility (or by a combination of both). A longer observation under a relatively stable exchange rate (Central Bank of Russia does not provide the trade volume in constant prices) is necessary. Also, the data may get biased due to various transfer pricing schemes employed by multinationals (as R&D centers are usually a part of their corporate

national currency and a basket of foreign currencies and computed using a weighted average formula with weights being assigned to every currency in the basket based on the composition of bilateral trade or some other indicators.

[167] Compiled from BIS monthly data, http://www.bis.org/statistics/eer.htm

[168] We can use the period of 2012-2014 as well, and the average in this case will be slightly lower (102.60) but still above the 2010 level, however, due to a notable decrease in ruble value in the last quarter of 2014 (REER index has decreased from 93.07 in October to 72.23 in December against 100 for year 2010) standard deviation increases to 7.03 which is much higher

[169] See paragraph g. of Section 1 for some additional notes on salary level of IT specialists in Russia

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structure) for tax or other reasons.

Still, an interesting fact is that Russia has been maintaining a positive trade balance in R&D services for all the five years studied (2012~2016); at the same time, there's a slight trade deficit with CIS countries in this item (with a few exceptions for some particular quarters) which implies a probability of outsourcing done by Russian firms in these countries (however, R&D services in this classification are not limited to IT).

3.3.2.2. MNEs recruiting IT specialists

However, establishing R&D centers in Russia is not the only option for MNEs that want to make use of the talent pool of the country. Sometimes, multinationals can use another approach, recruiting graduates as well as experienced IT specialists to work for their offices abroad whether by moving to a specific country or by collaborating over the internet.

The term "brain drain" is often coined by experts and media while speaking about highly qualified professionals in various industries emigrating from Russia. The opinions on its scale and importance vary greatly. In March 2017, Atlantic Council (a U.S. based think tank) organized a conference with quite a pretentious name "The Putin Exodus" – as one of the speakers noted, emigration from Russia has surged since 2012 when Vladimir Putin began his third term as a president[170]. At the same time, Leonid Bershidsky in his column for Bloomberg titled "Russia is not suffering from a brain drain" notes that such opinion can be easily challenged if we have a closer look on official statistics. Even though there has actually been a surge in number of people leaving the country, the geographical distribution of emigration shows that most of them are likely to be migrant workers returning home after an economic recession started (as most of outward emigration flows go to CIS/ex-USSR nations), while emigration flows

[170] "The Putin Exodus: The New Russian Brain Drain", Atlantic Council, last modified 2017, accessed April 10, 2017, http://www.atlanticcouncil.org/events/upcoming-events/detail/the-putin-exodus-the-new-russian-brain-drain.

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into Western countries haven't changed significantly[171].

However, we consider both opinions to be incorrect (or, at least, not absolutely correct) if we focus on software industry. First, even Bershidsky himself notes that only those people who have completed the necessary paperwork associated with the change of place for permanent residence have been included into the official statistics, and not everyone is supposed to actually complete this time-consuming process (also, not every emigrant is planning to leave Russia forever)[172]. Second, for a software engineering specialist, actual emigration is not always the best available option. Due to the nature of IT industry, it's not always necessary for an employee to be present in a company's office to do the work efficiently, so that remote work[173] and flexible work schedule are quite widespread. Unlike actual emigration that requires significant efforts and may be quite costly, working remotely from Russia allows an employee to get a salary that may be pegged to a foreign currency but pay all the costs in rubles that can be quite a lucrative option. Under these circumstances, it's extremely difficult, if not impossible, to count the number of software specialists working for multinationals not in their Russian offices or R&D centers.

3.3.2.3. Government and MNEs

An important feature of augmented Porter's diamond is the two-way relationship between government and MNEs. The latter are trying to get better treatment for their investments, when the former is trying to amplify the positive and minimize the negative influence of MNEs on national economy.

There have been several laws that came into force recently and have had an impact on multinationals. The examples are a law that imposes value-added tax on services

[171] Leonid Bershidsky, "Russia Is Not Dying From A Brain Drain", Bloomberg, last modified 2016, accessed May 7, 2017, https://www.bloomberg.com/view/articles/2016-07-06/russia-is-not-dying-from-a-brain-drain.

[172] Bershidsky (2016)

[173] Not to be confused with freelance work – even though both imply working from home, a freelancer does not have a stable job and earns money through numerous contracts with various clients.

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provided online by foreign firms as well as a controversial “personal data” law that requires firms to store the personal data of Russian users on servers inside Russia. However, we consider that they are more likely to influence the multinationals’ sales but not the investment decisions, unless indirectly due to decrease in MNEs revenue (still it’s questionable if the decrease will be sharp enough to make them abandon their investment plans). The possible implications for the government in connection with MNEs activity will be described in Chapter 4.

Above we have given the description (quite a long one as there’s a lot of factors that need to be taken into account) of the current situation in the Russian software industry by the moment this paper was written. However, it is not the single and not the main objective of this research. Much more important is the in-depth analysis of the problems that exist right now and the ways of how they can be addressed whether by firms, government, MNEs or a combination of efforts. This question will be discussed in the next chapter.

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Chapter 4. New possibilities for Russia's software industry

4.1. Introduction

In this chapter, we will use the data acquired previously to detect the problems and shortcomings in current development of the Russian software industry. We will try to divide them into five categories based on who should make the most efforts to address them: individual firm level, industry level, cross-industry level[174], country (government) level and multinational (MNEs) level. However, some will be mentioned several times as only combined efforts on various levels are sufficient for making a change. Not only the problems will be described, but also possible actions and policy implications will be suggested. Then, we will summarize all the findings in a single table for a more convenient use.

4.2. Individual firm level

4.2.1. New segments and geographical markets

Corresponding element (s) of the diamond: Industry structure and rivalry

As it has been noted before, software industry remains an attractive destination to enter, however, the competition is strong too. In order to maintain and improve their position on global market, Russian software firms should choose whether to provide better customer value in the "hot" **segments** and **markets** where many countries compete ("red ocean") or to develop those new **segments** and **markets** that have been neglected or not yet entered by competitors from other countries but have a strong demand ("blue ocean").

New segments. There's a breakdown on the most popular fields of activity between

[174] "Cross-industry" means that efforts from multiple related and supporting industries is required to address the issue

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Russian software companies provided in **Appendix G**, however, it's questionable if we can make any conclusions from it here as:

a. The sample size is limited: only 130 among more than three thousand companies have been interviewed which can't give us a complete picture;
b. Most of the firms don't limit themselves to only one segment or model, combining them to avoid the risks;
c. There have been in total 37% firms that have answered "Other" or "Difficult to say" when asked about the segment that is a top priority for them. It's unclear whether it has been caused by the wide definition and complex nature of software industry or merely by an incorrect design of the questionnaire.

Our vision on the development of the Russian software industry includes more firms exploring new segments such as big data analysis, cloud technologies, software for IoT and wearable devices etc. The large and medium firms should be able to assess their product and service portfolio, limiting their investment into the areas where the potential for growth is becoming low due to maturity of the market, large presence of competitors or both. The firms that get most revenue from the selling of ready-made products should also consider new trends in software distribution. As physical retail gets abandoned in more and more segments, buyers' switching costs are reducing dramatically, so that new ways to create customer value and retain users should be developed (which also implies changes in marketing strategy that will be noted later).

Among the segments which, in our opinion, may be a good option for the Russian firms to enter, we can name enterprise and B2B solutions (including ready-made ones as well as individual solutions tailored to clients' information systems) as well as built-in software (firmware) for complex hardware-software solutions (including IoT devices) in cooperation with other countries' electronic device manufacturers. However, a firm should not blindly follow these recommendations but rather perform a thorough assessment of its own strengths and weaknesses, trends in the markets and competitors' behavior in order to identify the sectors which are the best match for the firm's core

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competences.

New markets: Focusing on the overseas markets that have limited potential for growth (such as U.S. or Western Europe) is another mistake made by Russian "product" firms, as suggested by RUSSOFT (however, expanding to emerging markets may be considered by service firms too)[175]. It notices that there have been cases with Russian companies trying to enter such markets as Asia or Middle East, though currently it's rather an exception than a trend. The data on a presence of Russian software firms on overseas markets is presented in **Appendix K**.

The worsening relations between Russia and major Western countries in theory can encourage more Russian firms to search for new clients in Asian markets. However, in practice such option is limited mostly to big companies as only they can afford it. Due to large cultural distance, Asian markets have always been quite difficult for Western firms to enter, and even more difficult to form a significant presence there. Entering these markets requires a significant expertise and a large marketing budget, also, there's no guarantees that the first attempt will be successful. Looking at the current situation in the Russian software industry, we should conclude that refocusing to new markets will be gradual and will start mostly from big companies that possess enough funds to use a trial and error approach for entering Asia. We will return to the question of financing for international marketing later.

4.2.2. Giving more attention to the business and marketing strategy

Corresponding element(s) of the diamond: Firm strategy, structure and rivalry

Another common pitfall for IT firms, especially those who are in early stage of their development, is focusing only on the technical part of the project, completely ignoring the "business" one, lacking a clear development and marketing strategy. As report by Vimpelcom suggests, "recent graduates with strong IT skills but little

[175] Russoft (2016), pg. 59

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understanding of market dynamics [and] limited focus on implementation…"[176] represent quite a large group of startup founders in Russia. This situation results in many startups whether develop a product that is wrong initially (for example, one that is outstanding from technical point of view but lacks market demand) or develop a good product but market it incorrectly (for example, focusing only on domestic market that is "easier" without thinking about expanding globally and thus limiting their future growth opportunities). On the one hand, this problem is closely related to the education system (this will be discussed later), but, on the other hand, companies can also address this problem by not forming a team only from technical specialists, but also adding someone who has enough knowledge in business administration and market dynamics. Hiring advisors may also be an option. The Global Startup Ecosystem Report suggests that "[Russian] startups count the lowest number of advisors in the world and give 49% less equity to their employees compared to startups in the rest of Europe."[177] – however, it requires costs so that a careful process of selection based not on how renowned is the candidate but on his or her real skills and achievements is necessary.

4.2.3. Exploring talent pools in nearby countries and establish R&D centers abroad

Corresponding element(s) of the diamond: Supply conditions

Another consideration for individual software firms is to pay more attention to attracting and hiring talents from nearby ex-USSR countries. An example of the latter may be Belarus. Though being much smaller than Russia, it has a large pool of skilled IT labor, also, due to historical reasons, there is little or no language (Russian is widespread in Belarus and is native for large part of the population) and cultural barriers, which makes hiring developers from there quite attractive. The situation is quite similar for Ukraine, however, due to the political conflict that has started in 2014, it may be more complicated for Russian firms to use the talent pool of this country.

[176] Vimpelcom, AT Kearney, Digital Entrepreneurship In Russia, 2016, accessed May 20, 2017, https://www.vimpelcom.com/Global/Files/Responsibility/Digital-Entrepreneurship-in-Russia.pdf
[177] Compass Co. (2015)

doi:10.6342/NTU201701175

Besides hiring developers, Russian firms may also consider establishing R&D centers in the neighboring countries and moving one step closer towards becoming multinational enterprises.

Summary for individual firms: Pay more attention to business and marketing strategy (or hire professionals); choose correct product/service segments and geographical markets and make use of talent pools in neighboring countries.

4.3. Industry level

4.3.1. Private initiatives in education and the case of Yandex

Corresponding element(s) of the diamond: Supply conditions

Earlier in Chapter 3 we have described the current situation with Russian education system and found out that, even though the quality of engineering and computer science education is quite high in most important "elite" institutions, graduates usually lack practical skills to start working right after finishing the university program. The employer should spend a certain amount of time and money to train the new employee before assigning him or her to work on a real project. Somehow it is related to a certain degree of obsoleteness of university programs (we will return to this in the "government" section), however, sitting through a university course is not a sufficient condition for becoming a specialist in such field as information technology. It's not only the government, but also the industry who is responsible for changing this situation. Below is the case of Yandex, a Russian Internet service provider and search engine.

Yandex (an acronym for Yet ANother InDEXer) started as a search engine back in 1997 in Moscow and by now has evolved into a comprehensive web portal that can be comparable to Google. The US$1.3 billion IPO of the company on NASDAQ in 2011 has become the biggest one for a dotcom company since the US$ 1.7bn offering by

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Google back in 2004 as The New York Times have suggested[178]. However, here we'd like to focus neither of the Yandex web services nor on the company performance but on its educational initiatives that may contribute significantly to making Russian students majoring in IT disciplines more ready for real work after graduation.

The main feature of the programs provided by Yandex is their broad range. The "earliest" of them are targeted for 8-9-year school students (the school education in Russia usually consists of 11 years), the "latest" are open for senior year university students, graduates and postgraduates. The "Moscow Programming School" offers high school students advanced courses in programming, mathematics, cybernetics and algorithmic science that go beyond the school curriculum. The "Data School Analysis" (offering a choice of full-time or distance education, but requiring entrance exams to get enrolled) is focused not only on the programming itself, but has a goal of familiarizing students with such popular trends in IT as big data, machine learning, computer vision etc. Several online educational programs are available; also, Yandex supports and organizes a number of competitions in traditional programming, as well as "hackathons" for 8-11-year students where they develop their projects on designated topics. The company is also trying to partner with some leading technology universities in Russia, opening its own programs or incorporating its courses into existing ones. Courses in related disciplines such as web-marketing are available too.

Moreover, in its education programs for university students and graduates Yandex tries to put emphasis on those courses that are not taught within the "classical" university programs. Also, as the curriculum includes not only lectures (taught by the specialists that are aware of the newest developments in their areas of study) but also individual or group projects, the students are able to get practical experience they will need in their future career.

[178] Evelyn Rusli, "Yandex Shares Soar 55% In Market Debut", Dealbook, last modified 2011, accessed May 1, 2017, https://dealbook.nytimes.com/2011/05/24/yandex-shares-surge-on-debut/?_r=0.

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We have chosen Yandex education programs as a small "case study" to be presented in this chapter as we consider it to be a very good example of industry participants (private companies) trying to influence certain elements of the "diamond", eliminating obstacles for the development of the Russian software industry. In the Yandex case, it's influencing the "factors" part (education system) to eliminate the problem of the deficit of practical skills among recent graduates due to outdated and more theory-focused university programs. Moreover, the partnership between Yandex and certain public universities may, in our opinion, be a role model for future public-private partnership in various areas related to information technology (we will get to this question again later).

The education programs of Yandex are mostly focused on increasing students' and graduates' engineering skills. However, as we noted above, they are not the only skills that matter. Industry efforts are also needed in the field of business education, where IT firms can partner with companies from other industries (including managerial or marketing consulting) to teach new entrepreneurs the most important laws of enterprise management and market dynamics and their application in IT industry. Government and MNEs can also play their role in this process, which will be discussed in subsequent paragraphs.

Summary for industry: Use participants' top-level knowledge to improve education quality in public institutions, partner with government and MNEs in the process.

4.4. Cross-industry level

4.4.1. Rigorous selection of candidates in venture financing

Corresponding element(s) of the diamond: Supply conditions, Firm strategy, structure and rivalry

In this research, we agree that "the government can provide additional financial

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leverage for successful companies and funds"[179] but should not participate too actively in fund management, letting industry specialists and cross-industry teams develop selection criteria and carry out the selection process. The quality of investment should be more important that the overall amount of financing. After studying various factors that influence Russian venture capital market, we consider that quality of entrepreneurship (even though it's increasing) can still be a more important issue than the amount of financing available. This implies a need for a more rigorous selection in order to avoid choosing startups with no clear market strategy as even the most sophisticated and functional product may fail due to a poor marketing.

A good selection system may comprise several steps. Candidates that have passed the initial screening (and possess some basic qualifications) can start from the "accelerator" where experts and mentors help them to develop their strategy and fill the blanks through lectures and one-to-one meetings (offline or online) before the project becomes a candidate for obtaining venture financing. A notable example is the system implemented by Internet Initiatives Development Fund (IIDF) that has been founded by government initiative but is getting financed strictly from non-budgetary sources (even though it's speculated that the real source of funding were the money of state-owned enterprises such as Gazprom or Rosneft'[180]):

The candidates start from "Pre-accelerator" which includes lectures on some important topics related to business strategy, marketing, team selection etc., as well as online consulting by fund' experts (the candidate should provide a progress report each week during the two months of the program). A team that successfully complete this step can enter a part-time accelerator or skip this step and enter a full-time one if it passes the screening. After successfully completing these steps, a company may get selected for full-scale investment by the fund. Each step has its minimum requirements

[179] Strategy (2011), pg. 38

[180] "An "Oil-And-Gas" Venture Fund: How Does The Internet Initiatives Development Fund Work", RBC, last modified 2016, accessed May 19, 2017, http://www.rbc.ru/magazine/2016/05/570fa16e9a794781cb616fa0.

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and a process of selection, so that the "final" financing is obtained by companies that possess both a strong product and a clear strategy of business development, marketing etc. and are more likely to survive and transform to a mature company (which will bring benefits both to the fund and to the industry in general). At the same time, such system helps the startups which are promising but have encountered some difficulties that they can't overcome by themselves to get external help and not die out during early stage.

As the report by Vimpelcom and AT Kearney suggests, Russia has a ratio of start-ups to accelerators comparable with United Kingdom or Germany.[181] However, rigorous and multi-level selection system, as well as the ties between accelerators and venture capital funds (that allows a smooth transition from acceleration to obtaining financing) are the key elements for a success of Russian startup ecosystem. We consider that private efforts should play key role here. The government can provide additional financing especially in the areas with a long payback period and can request a reasonable compensation for the funds, but it should leave the tasks of investment management and participants' selection to industry professionals.

4.4.2. International competitiveness and international cooperation as one of the key priorities of industry clusters

Corresponding element(s) of the diamond: Related and supporting industries

While studying the situation with clustering in Russian IT and software industry, we have noticed that most clusters in this sphere lack a clear plan of making the participants' products and solutions able to enter new markets of other countries. A lot of projects currently have an explicit focus on home market that has its limits despite the relatively high population. Even though some clusters do state "international cooperation" among their development tasks, a single definition is not enough to make it work. It's very important for clusters' coordinators and partners to realize the export potential of Russian software (including the hardware-software combinations) and start developing it through various channels instead of limiting themselves to products for

[181] Vimpelcom, AT Kearney (2016)

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Russian market. In this respect, navigation solutions including GLONASS may be an interesting option to develop, however, it's a task for a separate research to assess their potential on global market that is dominated by GPS.

Another dimension that is often being overlooked by cluster participants and management is international cooperation. This aspect will be described in more detail later (from government and multinational firms' point of view), however, cluster management and participating companies should also spend more efforts searching for possible international connections. The latter may take different forms. The most obvious one is partnering with foreign and/or multinational companies (whether mature firms or promising startups) in developing complex solutions which can include both hardware and software (Russian firms may use their competitive strengths in latter); however, the possibility of cooperating with clusters in neighboring European and CIS countries (Belarus, Ukraine etc.) should be taken into consideration as well, even though the significantly worsened relations between Russia and some of these countries (such as Ukraine or Baltic states[182]) make this more challenging.

4.4.3. Digital entrepreneurship courses by startup accelerators

Corresponding element(s) of the diamond: Supply conditions

The courses in digital entrepreneurship may be provided by startup accelerators, aimed at IT graduates with an interest in creating their own product or service and starting their own business. This category of entrepreneurs may have outstanding technical knowledge and a good idea to develop, however, they don't know so much about business administration (including strategic, financial and marketing management) and market dynamics. It leads to many startup teams developing a good product which turns out to be not successful in the market, or running out of resources (such as cash) even before creating one. Both audio-visual and "classical" courses (with a lecturer) can be used. At the same time, such courses can be implemented in the

[182] Estonia, Latvia and Lithuania

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curriculum of technical universities if both sides have willingness to cooperate.

Summary for cross-industry: For venture capital industry, more attention should be paid not to the amount of capital available but to the quality of startup ecosystem, especially the selection, acceleration and mentorship. VC industry may also contribute some efforts to education, offering digital entrepreneurship courses, whether independent or included in university curriculum. For clusters and similar establishments, global competitiveness and international cooperation should become a very important consideration.

4.5. Government level

4.5.1. Introduction: Pay more attention to the opinions of industry firms and associations

Before outlining the most important policy considerations and implications for the government, we would like to put an emphasis on the process of decision making itself. When the government is planning a measure or a set of measures that are going to significantly influence the IT industry, whether directly or not, it should not rely only on its own experience, but also listen to the opinion of the IT firms voiced by industry associations such as Russoft. Even though the latter have had certain success in shaping the government decisions in the way which is beneficial for the industry (for example, the efforts of several associations including RUSSOFT have contributed to the decision to prolong the social tax incentives for IT firms in their current state), there have also been examples, such as the counter-terrorism law mentioned in Chapter 3, when the opinions of corresponding industry (telecommunications in this case) have been largely ignored, so that serious concerns has been raised about the consequences of its implementation. Even though the government officials in charge of IT industry policy may have some knowledge about the firms' needs, it's often biased or at least incomplete. Without actually asking the industry about their problems and requesting

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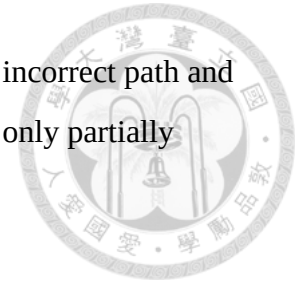

their opinions, there's a high probability of government choosing an incorrect path and implementing the measures which are whether completely wrong or only partially correct.

4.5.2. Providing more incentives for overseas expansion of domestic software firms

Corresponding element(s) of the diamond: Firm strategy, structure and rivalry

Earlier in Chapter 3, we have had a look on tax incentives available for Russian IT (including software) companies. We consider the government support in this area to be adequate. The government is trying to help IT firms in reducing their human resources costs that are extremely important for such an industry as software development (for them a reduction in social security payments may be even more beneficial than a reduction in corporate income tax). However, there are other areas where there is a significant lack of support measures.

Besides providing IT companies with some degree of tax relief, government should realize the much unrealized export potential of the industry. Currently, many small and medium-sized firms may have a product that has its demand on the world software market; however, can't afford the high costs of overseas marketing and promotion that are crucial for the success of the product launch. As most of the related costs are incurred in foreign currency (whether U.S. dollar or other), the plunge of national currency since the end of 2014 has made it even harder for smaller companies to gather enough resources for expanding overseas[183]. This implies a need for government support for export-related activities in IT. The existing measures aimed at supporting export activities (such as export credits) are often not suitable for an industry that produces "virtual" products or services and not "physical" goods. Currently, the government is trying to implement certain measures to address this issue, however, most of them are still in the planning or early implementation stage so a significant amount of time is required until results can be seen.

[183] Russoft (2016), pg. 51

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Creating a comprehensive and stable export promotion policy for software, including both financial and non-financial support for marketing, promotion, IP registration activities, should become an important objective in the government information technology policy if it wants to make more software companies, not only the biggest ones, to be able to compete on the global market.

4.5.3. Rethink the import substitution policy

Corresponding element(s) of the diamond: Demand conditions, Firm strategy, structure and rivalry

Earlier in Chapter 3 we have had a look on the policy of import substitution in software that has been being implemented by the country's government in last few years. As stated by RUSSOFT, creating the definition of "national software" was already a difficult task on its own[184]. In the end, such definition has been developed (see Chapter 3), and in 2015 the Registry of National software was created.

However, there exists a much deeper problem that puts into question the correctness of the policy in general. For example, if a Russian software company takes an open-source software that does not require licensing payments (otherwise it may conflict with part c. of the definition) and allows modifications, then modifies it slightly without changing the main features (without adding too much value and technical "know-how") and registers it as a software made domestically under their own name, will they qualify for being included to the registry? Currently, when browsing, for example, the section "Operating systems" in the Registry, one can see that there's a lot of items that are actually modified versions of the open-source Linux operating system and probably do not include a lot of value created by the developer company. While such software may solve the "sanctions" problem faced by the government agencies and SOEs, it's unlikely to become competitive on the world market. Such solution may

[184] Russoft (2016), pg. 104

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bring short-term revenue for its creator (keeping in mind that no royalties are required for an open-source product), however, it can't bring a broad and long-term positive effect for the industry in general as no significant value created. We agree with the RUSSOFT opinion that "the target of the "import substitution" campaign should be not squeezing out foreign suppliers partially through non-market measures but stimulating the development of Russian companies that can create solutions able to compete **on the foreign markets as well as domestically**"[185]. Not the "import substitution" but rather the "export promotion" (mentioned in previous paragraphs) is beneficial for the Russian software industry.

4.5.4. Changes in educations system are necessary

Related element(s) of the diamond: Supply conditions

Due to the high role of public sector in Russian education system, government can implement measures to increase both the popularity (availability) and quality of IT-related education. On the one hand, it can increase the availability of the university programs in this area and sponsor activities that can increase the popularity of them among the university entrants. On the other hand, it can strive to improve the quality of education among the major league of institutions, collaborating with both education establishments, experts and future employers (private IT enterprises), and encourage more universities to join it. Earlier in Chapter 3 we have noticed that, even though it will be impossible for Russia to surpass such countries as United States and India or even approach them in the number of software engineering specialists, the overall supply of graduates in this area is not as low as believed by the government. We consider that the quality, not the quantity, should be the most important policy concern for the government. The problem of graduates lacking practical skills or having outdated knowledge should be addressed. A number of measures may be implemented by the government to help solving this problem.

[185] Russoft (2016), pg. 106

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First, government agencies should establish more flexible and less bureaucratized procedures to allow timely changes in education plans for IT disciplines in public education institutions with a fast and efficient approval procedure. In IT, technology, instruments as well as the set of disciplines are constantly changing. New areas, such as big data analysis and computer vision, emerge, and some of those that used to be popular in the past are getting obsolete. At the same time, the education plans for various specializations in Russia tend to lack flexibility as government agencies' approval is required for an update, which may require quite a large amount of time before the change finally comes into effect. Without creating a faster and more efficient approval procedure without excessive bureaucracy, it will be difficult to make state educational institutions able to follow the latest developments in information technology, so that latter will produce more graduates with outdated knowledge, unable to work on real projects without participating in additional training programs.

Second, government should partner with local **and global** (latter will be discussed in more detail in following sections) industry leaders and allow wider implementation of their programs as a part of curriculum in leading technical universities. A public-private partnership can be a useful tool in those areas which can't be significantly improved with only private or only public efforts, and education system is a good example of such an area. Higher capability of private firms in applied innovation and a solid research and teaching base present at top-level public universities can complement each other in making information technology education able to meet modern market demand. At the same time, incentives should be created for private firms to make such partnership desirable for both sides.

Third, attention should be paid not only to engineering, but also to foreign language and business education. Even though latter are not so important if we limit ourselves only on offshore software development, they are crucial for success of domestic software industry. A reasonable amount of business and entrepreneurship-related courses added to the curriculum of technical universities can help to solve the problem

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of startup founders (that often have an IT education background) focusing only on technical features and benefits of their solution (the supply side) and ignoring the demand side, such as existence and dynamics of market demand in their segment. A new specialization of "information management" combining both technical and management courses can be introduced, aiming at those who plan to start their own business in IT in the future. At the same time, higher foreign language proficiency (that should be improved by raising the education standards both at schools and universities) among industry specialists and entrepreneurs will create more self-learning and self-development options for former and facilitate international marketing activities of latter.

4.5.5. Encouraging public-private partnership in military and civilian research

Related element(s) of the diamond: Related and supporting industries, Demand conditions

Earlier in Chapter 3 we have mentioned that Russia has created a fund similar to U.S. DARPA program in order to encourage public-private partnership in military research. However, a very important difference of Russian fund compared to the U.S. one is stated in the Article 9 of the law that regulates the new organization, which states that all the intellectual property that has been created or purchased through contracts belong to Russian Federation[186]. In such case, the private contractor that enters the partnership with the fund is to retain nothing (except the remaining part of funding) after the contract ends, which can discourage many firms from entering the program. For a comparison, DARPA states on its website that it "normally does not acquire IP rights that will impede commercialization of technology"[187] leaving the exact conditions to be negotiated between the parties.

Such rule may discourage a number of private participants from partnering with the

[186] "Federal Law "On Future Research Fund"", Rossiyskaya Gazeta, last modified 2012, accessed March 3, 2017, https://rg.ru/2012/10/19/fond-dok.html.

[187] "How To Participate In DARPA'S SBIR And STTR Programs", DARPA, accessed May 19, 2017, http://www.darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program.

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fund. Even though the part 2 of Article 9 allows the fund to transfer the IP a. to the state for improving national security or b. to any other organization to stimulate the innovation-driven economic development, however, in this case the "organization" from the part b. plays a role of a licensee, getting an ordinary nonexclusive license and bearing liabilities to introduce the new technology, achieve necessary efficiency targets and present the necessary reports to the fund[188]. A compromise between the state and private interests should be found, so that all the "sensitive" findings will belong to the state (and be classified), but the private firms will be able to sell a "lighter" version of the product to ordinary consumers.

Moreover, public-private partnership should not be limited only to the military R&D. There's also a lot of opportunities for the state and private contractors to work together in the field of civilian research, especially the applied one.

Summary for government: Making public education in IT more up-to-date by partnering with domestic and foreign industry leaders, departing from import substitution and protectionism to better methods of creating domestic demand for products of Russian software firms, providing more incentives for overseas expansion of domestic software firms (including export and overseas marketing co-funding etc.), intensifying private-public partnership in military and civilian R&D as well as paying more attention to industry professionals' opinions should be on the agenda of the government.

4.6. Multinational level

The important feature of Dunning's augmented diamond which is neglected in original model are complicated and versatile relationships between government and multinationals. Earlier in Chapter 3 we have noticed that currently there are not many

[188] The Regulations On Transfer Of Results Of Research Ordered Or Purchased (Through A Contract) By The Future Research Fund For Practical Use, 2014.

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examples of Russian government actively interacting with multinationals in order to speed up the development of IT and software industry. This chapter will outline some possible actions that may be taken by both sides and ways to solve the conflicts that arise in the process as both sides may have different targets.

4.6.1. Government: Stimulating MNEs to open R&D centers instead of directly hiring Russian specialists to work overseas

Related element(s) of the diamond: Industry strategy, structure and rivalry

Due to popularity and availability of remote work options, arbitrage in software industry is much cheaper that in manufacturing as no investments in machinery, plants and equipment are required; also, due to virtual nature of the product no transportation, export or import-related costs and risks are born. Such flexibility also allows MNEs to easily switch between different countries and regions in search for better value. However, the interests of MNE may contradict with the interests of the national software industry. Even though it's quite difficult (and hardly justified) to restrict MNEs from hiring developers in Russia, however, another approach can be taken to let talented Russian software engineers contribute to development of national software and IT industry instead of simply helping a multinational enterprise to reduce costs.

Making Russia more important than simply a destination for price arbitrage in the eyes of MNEs should be an important policy consideration for the government. The latter should stimulate MNEs not just to use national talent pool for their own purposes, but rather partner with the local industry by establishing R&D centers in Russia. Cross-industry partnerships may be extremely beneficial too, when the hardware part is developed by an overseas partner (thus overcoming the problem with relatively undeveloped IT hardware industry in Russia) but the software is designed and created by a Russian team – so that a complex hardware-software solution with significant value added by both partners is produced.

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To achieve such goal, the government can use following policy instruments:

- Offer tax (or other applicable) **incentives** for foreign companies that have established R&D centers, have made contribution into education system (by offering joint programs or through other ways) or have entered an R&D alliance or partnership with Russian companies. The biggest difficulty is to develop the sufficient criteria for determining whether an MNE qualifies for such support. If the criteria are too loose, multinationals can abuse these incentives by creating only nominal presence within the country without treating Russia as a significant part of their value chain. However, if the criteria are set too high, it may discourage many MNEs from entering as costs will be too high to justify the benefits.
- Take further measures to improve **business climate**. This will be explained in more details in subsequent paragraphs

4.6.2. MNEs: consider establishing even more significant presence in Russia

Related element(s) of the diamond: Firm strategy, structure and rivalry

It's always risky and costly to establish "physical" presence in a foreign country, however, if managed properly, it can bring benefits that can't be achieved if the MNE uses the country only as a target for labor price arbitrage without "deepening" its investment by opening offices or even regional headquarters in the area. In his 2010 article, Pankaj Ghemawat has noticed the trend of multinational enterprises (with IBM or General Motors as an example) actively establishing their second headquarters outside their home country (China is often a choice) and delegate significant function to them[189]. Even though we don't consider Russia to play such an important role in the MNE strategy in the nearest future, as "local knowledge has become critical"[190], Russia may become a destination for multinationals to establish their lower-tier regional headquarters. The geographical location of the country between Europe and Asia can offer sizeable benefits for MNEs which wants to efficiently coordinate their operations

[189] Ghemawat (2010)
[190] Ibid

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in these two important parts of the world. However, what is holding foreign and multinational companies back from establishing significant presence in Russia is the country's business climate. So there's a room for the government to take actions.

4.6.3. Government: Non-tax options to make Russia a more attractive destination for investment

Related element(s) of the diamond: Supply conditions, Firm strategy, structure and rivalry

Even though business climate is a complex notion comprising factors some of which can't be directly influenced by the government, neither is it free from stereotypes and prejudices (the diplomatic conflict between Russia and many Western nations has had a huge negative impact on MNEs decisions to invest as the perceived risks have increased), it can still be improved step-by-step.

The government of Russia can consider an example of its small north-western neighbor Estonia. With a small population of 1.317 million, this country has become a popular destination for both large enterprises and startups to establish both R&D centers and offices. Besides some obvious reasons such as low corporate taxes, one of the reasons behind this is a very modern and efficient e-government system. As said by Minkel Tikk, one of the government officials in charge of the electronic government portal, "it takes just five minutes to register a firm in Estonia"[191], with the necessary procedures being done online with an electronic national ID card. Besides that, even bolder innovation was implementing the system of e-residency. While not being a substitute for a visa, residence permit or ordinary citizenship, it allows an individual to use some of the e-government systems to establish and manage business in the country, including paying taxes and signing documents[192]. Even though there may be some difficulties (for example, to open a bank account personal meeting is still required as

[191] "Estonia's Technology Cluster: Not Only Skype", Economist, last modified 2013, accessed May 20, 2017, http://www.economist.com/blogs/schumpeter/2013/07/estonias-technology-cluster.
[192] "E-Residency", E-Estonia, accessed May 3, 2017, https://e-estonia.com/component/e-residency/.

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banks want to escape too much risk[193]), this is indeed an example worth learning.

Is the example of Estonia applicable to Russia? It is partially. We don't think that Russia should directly copy the Estonian example. Directly introducing an option similar to e-residency creates a threat of potential abuse of the system such as using it for money laundering, tax evasion or any other illegal or undesirable activities. What works perfectly in a small country like Estonia may not be absolutely suitable for a big country like Russia. However, it teaches us some important lessons:

- Simplifying administrative procedures is one of the efficient ways for improving business climate. Besides providing tax incentives for MNEs in IT that we have mentioned in earlier paragraphs, the government can invest resources in making procedures for setting up and managing small, medium and large businesses in the country transparent and smooth. Electronic document circulation and digital signatures should be used where it's possible. The procedures may require not five minutes but a few days, however, clear requirements, well-explained procedures and predictable outcome (meaning no groundless denials or endless requirements to submit additional documents) will make the operations of both domestic companies and multinationals of any size much easier and will encourage the investment by latter;
- A broader notion of MNEs may be implemented which includes not only "giants" like IBM or Microsoft but also smaller technological startups. Even though the latter have quite a modest size right now, Russia can consider attracting the best of them to set a presence in a country's numerous clusters, science parks and innovation centers. Partnership possibilities also exist between local and international startups.

At the same time, by expanding its investments into building e-government and electronic document flow systems for various departments, the government can create

[193] Ibid

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significant demand for software solutions in this area. Due to better local knowledge, as well as easier communication (it will be much easier for government buyers to deal with a domestic provider), the domestic firms will probably have a competitive edge over multinationals in this area, so it's the former who will benefit the most from such decision – so no administrative and non-market barriers such as registry of suppliers will be required.

Besides state agencies, another driver for the government-related demand for software may be the state-owned enterprises, including but not limited to oil and gas companies, infrastructure operators, banks etc. Such big businesses may create and are creating a significant demand for business-oriented software such as ERP and document automation systems or the software that is dedicated to control and monitor production equipment etc. Local suppliers may also have a competitive advantage due to easier communication and bargaining in this case

4.6.4. MNEs: don't focus only on major cities but explore the potential of regions

Related element(s) of the diamond: Related and supporting industries

A mistake that can be made by MNEs that consider having stronger presence in Russian IT industry by opening R&D centers is focusing on a small number of major cities such as Moscow, St. Petersburg etc. Russia has a vast territory and there's a number of lower-tier cities that can offer similar benefits (an access to local IT talents) on much lower cost (including space rental etc.). Earlier in Chapter 3 we have mentioned the example of D-Link who opened an R&D center in a smaller city of Ryazan'.

At the same time, MNEs can make good use of government strategy of speeding up the development of clusters and technology parks in various parts of the country to partner with highly qualified local firms in creating complex hardware-software solutions for different industries.

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4.6.5. Government: promote international cooperation in clusters and encourage MNEs to partner with firms all around the country

Related element(s) of the diamond: Related and supporting industries

However, the government (also including regional authorities) should give more attention to international cooperation as an essential element of cluster development. Making participants able to compete internationally should be among the primary targets for cluster development. Sets of key performance indicators as well as incentives for achieving the projected goals should be created for all the aspects of the development of a cluster, including the cooperation between cluster participants and tech companies from all around the world.

At the same time, measures should be implemented by both central and regional governments to attract more MNEs to cooperate with regional clusters. Besides direct measures such as tax incentives, even more important are the promotional ones. The first step is making all the necessary materials (translated into English), including cluster presentations, investment guidelines etc., easily available online. Currently, such information is widely scattered and often is offered only in Russian. Road-shows, exhibitions and other promotional activities may be organized by both government authorities and cluster participants.

4.6.6. MNEs: use own expertise to improve Russian talent pool

Related element(s) of the diamond: Supply conditions

In the area of education, it's not only domestic industry leaders and government that can make a change. MNEs can also provide education programs of various kind, independently or in partnership with local firms and institutions. Remote education programs (for example, through providing presentations and related teaching aids for

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the course instructor) are the most feasible option for MNEs as they don't require significant investments and can be used in different settings, whether at home (self-learning), university (being a part of a course) etc. We consider this variant to be the optimum one not only to the MNEs but also to the industry in general. The constant technological development in the field of education makes possible a wide use of audio-visual materials as an essential part of a course, allowing greater teaching efficiency. In this situation, requiring MNEs to set up "physical" education centers in Russia may be not rational. It may be quite costly, which decreases the probability of such decision being adopted by multinationals. The fact that there are broad talent pools in other countries too, not only in Russia, may discourage MNEs from spending too much money on improving IT labor force in one particular country. The exception may be the case when such investments are highly subsidized by target country's government, however, this scenario requires large amount of funds that, in our opinion, can be used more efficiently in other areas.

4.6.7. Government: encourage MNEs to enter the education system

Related element(s) of the diamond: Supply conditions

At the same time, the government should establish the connection between MNEs on the one side and major public education institutions on the other. It should encourage both to form partnerships when MNE (the one which is recognized as industry leader with high R&D potential) provides teaching materials that can be included in university's courses. In this case, the students can get more practical and actual knowledge, which will benefit the university in a broad variety of ways – such as higher ratings and prestige, higher enrollment etc.; while MNEs can use such courses to encourage more outstanding students to enter them after graduation (and as a publicity tool as well).

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4.6.8. Closing remarks: A change in government' attitude is required

Since the Ukrainian crisis in 2014 and the economic sanctions following it, the protectionist rhetoric by Russian politicians at various levels has seen an increase. However, the government should understand that efforts made only by domestic firms are not enough to make an industry competitive globally. Here we return to the discussion on the Porter's model performed in Chapter 2. The role of foreign direct investment in the development of an industry should not be underestimated, neither should it be viewed as negative in general. It's true that MNEs have their own goals which may contradict with the interests of the country and/or domestic industry. However, this problem is solvable if a comprehensive government policy towards MNE activity exists which supports and incentivizes positive effects of FDI while minimizing the negative impact. The most important is the change of government attitude. MNEs should not be viewed as an enemy or an imminent threat to national competitiveness, but rather as a potential partner which may bring sizeable benefits in case the relationships are managed properly.

Moreover, as we discussed before, the government should change its focus from supporting domestic companies by the means of squeezing out foreign competitors to stimulating the creation of products and solutions that can become competitive on the global market. Following the latter approach will render all or most protectionist measures (excluding some "sensible" areas such as national defense where it's justified) useless. The presence of MNEs' products on Russian market does indeed put a pressure on local firms, however, such pressure should give the latter an impetus to innovate in those areas and segments that has been neglected by multinationals. If the government can create a scheme for subsidizing the overseas activities (including marketing, promotion, patenting etc.) of domestic firms (many of which lack the resources to conduct such activities on their own), it may give a boost to the development of the Russian software industry and will increase the competitiveness of the latter on the global market.

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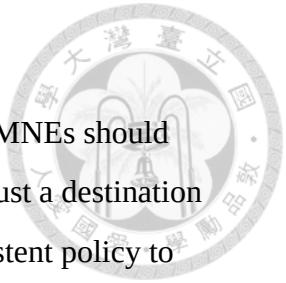

Summary for MNE policies and government-MNE interactions: MNEs should consider making Russia a more important part of their strategy than just a destination for price arbitrage on relatively cheap skilled labor; however, a consistent policy to attract MNEs and even promising international startups should be implemented by the government.

4.7. Summary table

In the sections and paragraphs above we have grouped the existing problems and opportunities into five levels and presented policy implications for each of the related parties from individual firm to government and multinational companies. The main conclusion that must be made is that most of the problems and shortcomings of the Russian software industry in its current state require coordinated efforts from different levels to be addressed. There may be a question of who should be responsible for doing the organizational work of bringing these efforts together. It's obviously can't be done by individual firms as even the biggest of them still have limited power. The industry represented by associations and partnerships can exert some influence, however, it's still not enough. Here we consider the government to be the most important player in shaping the competitive advantage of the Russian software industry as only it has enough power to bring all the pieces of the complex puzzle together. At the same time, we should not make the same mistake that Porter did in his original work on the role of MNEs. If the government creates an efficient system of rules and incentives, the multinationals can provide the resources that can't be provided by all other players. The table below summarizes the current issues in the Russian software industry and provides the implications for various levels.

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Corresponding Element(s) of the Diamond	Issues / Gaps to Improve	Firm / Industry Implications	Government Policy Implications	MBA Implications
Supply Conditions	a. Even though theoretical education is good in top universities, students often don't get enough practical and actual knowledge that are required at the labor market; b. Not enough attention is paid to the foreign language proficiency of engineering faculties' graduates c. Business education has a lot of room for improvement d. Business climate has a number of problematic areas	**Individual firm:** - Explore talent pools in neighboring countries, also consider opening R&D centers **Industry**: - Provide full-time and part-time courses for senior year students, postgraduates and recent graduates whether independently or together with education institutions **Cross-industry:** - Digital entrepreneurship courses can be provided by startup accelerators, teaching IT graduates the principles of business administration and marketing, as well as the laws of market dynamics	**General**: - Establish more flexible and less bureaucratized procedures to allow timely changes in education plans for IT disciplines in public institutions; - Partner with local and global industry leaders and allow wide implementation of their programs in universities; - Attention should be also paid to foreign language and business education. - Continuously improve business climate **Towards MNEs:** - Explore the possibilities of partnering with MNEs in revising academic programs in public educational institutions	- Use own experience to improve Russian talent pool (whether technical or business skills)

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Demand Conditions	a. The import substitution program that is being implemented by the government has major flaws as the priorities have been set incorrectly;		- Rethink the import substitution policy. The goal should be not squeezing out foreign competitors but encouraging domestic firms to create products that can be competitive not only domestically but internationally; - The presence of MNEs' products on Russian market may give domestic firms an impetus to innovate; - Create demand by investing more into building e-government and electronic document flow systems. - SOEs may also create demand for national software	
Related and Supporting Industries	a. International competitiveness often neglected b. Importance of international cooperation in cluster development is understated c. Low level of MNE activity is limiting future development d. Largely unrealized opportunities for public-private partnership in military and civilian R&D	**Cross-industry:** - Focus on international, not domestic competitiveness - Set international cooperation as strategic priority and search for areas where it can be efficient - Consider cooperation with clusters in neighboring countries even though it may be challenging due to political factors	- Central and local government institutions responsible for cluster development should develop a set of key performance indicators (including international cooperation) for clusters - Conduct marketing and promotion activities to make foreign companies and MNEs understand the advantages of partnering with Russian clusters. - Review the public-private partnership in military R&D and extend it to civilian research	- Make use of industry clusters in different parts of Russia and create complex products and solutions using Russian firms' experience in particular areas

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Industry Structure, Rivalry, and Firm Strategy	a. Firms over-focused on stagnating or shrinking product segments and geographical markets; b. Smaller firms giving not enough attention to business and marketing strategy, concentrating primarily on technical aspects; c. Medium-sized companies lacking resources for international marketing. d. Low involvement of MNEs. e. Largely unrealized opportunities of R&D alliances between domestic firms and MNEs	**Individual firm:** - Explore new segments and markets; - Include business strategy and marketing professionals in your team (or hire advisors)	**Towards domestic firms:** - Implement a series of measures to support export and overseas marketing activity by domestic software firms	- Consider deepening the investments into Russia: it may be a suitable place for R&D and even for regional headquarters due to its location; - Consider entering R&D agreements or alliances with strong and/or prospective local firms
		Cross-industry: - Promote acceleration and mentorship programs for startups; - Employ more rigorous criteria to select candidates for VC investments	**Towards MNEs:** - Provide tax and other incentives for MNEs to establish R&D facilities in Russia; - Improve business climate and administrative procedures to encourage MNEs to open offices and regional HQs; - Think about attracting international startups too	

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Chapter 5. Conclusion

In this research, an attempt has been made to evaluate the global competitive position of the Russian software industry and, more important, to provide policy implications for each party concerned (from individual firm to government and multinational enterprises) to address the existing problems and shortcomings. The first stage of this research was gathering the data about the current situation in the Russian software industry and arranging it according to the diamond model of national competitive advantage. The results of it can be found in Chapter 3. The second stage was the search for existing problems and shortcomings. Some of them have been explicitly mentioned in the sources (research papers, industry reports etc.) used on the previous stage, others did require a deeper analysis to be uncovered. The problems have been divided into five levels depending on whose efforts are necessary to address them: individual firm, industry, cross-industry (related and supporting industries), government and multinationals. Some of the problems have been mentioned several times as they can be only solved with combined efforts of various parties (for example, industry and government, government and MNEs etc.). Then, the policy implications have been developed for each problem at each level. Finally, both the problems and solutions have been combined in the table that can be found in the end of Chapter 4 to provide guidance for decision makers.

Even though it's not the first research trying to analyze Russia's software industry using Michael Porter's methodology, some important improvements have been made compared to previous works mentioned in Chapter 1. First, an augmented version of the diamond which takes into account the activity of MNEs (developed by John H. Dunning) have been used in order to address the underestimation of FDI importance present in the original Porter's work. Second, besides studying the attractiveness of Russia as a destination for IT outsourcing, this research has also discussed the competitiveness of products and services of Russian software firms on the global market. Third, besides describing the current situation in the industry, this research has also developed a comprehensive set of policy implications for decision makers at various levels, which increases its practical value.

Of course, there have been certain aspects that may require further study. For example, the

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question of business climate and entrepreneurial culture, including startup ecosystem, is so big that it requires an independent research to be studied comprehensively. Another topic for future research may be the possibilities of combining the relevant competitive advantages of Russia and neighboring countries and creating a bigger regional diamond – even though this topic has been partially touched in this research, there are still a lot of aspects that can be studied in more detail.

We hope that the practical findings made in this paper will be useful for both the researchers and policy makers at all levels. At the **firm level**, it calls for changes in strategy which will stimulate the firms' growth (so more small and medium firms will be able to grow into big ones) and help them to become competitive internationally. At the **industry level**, it highlights the possibility for industry leaders and associations to improve the supply of highly qualified IT specialists by cooperating with government and MNEs in creating new education programs. At the **cross-industry level**, it emphasizes the need for more complete startup ecosystem (including acceleration programs and digital entrepreneurship courses), as well as for more rigorous choice of candidates for obtaining venture financing at all stages, which will make Russian startup scene more competitive internationally. Moreover, it also offers some important changes in cluster development strategy to promote international cooperation in this area. At **government level**, it provides policy consideration aimed both at addressing some internal problems and deepening the cooperation with multinational enterprises, creating incentives for latter to make their contribution into the “national” diamond, especially those areas where efforts by domestic firms and government alone may be not enough. At **multinational level**, it offers MNEs to change their view towards Russia, and make it a more important part of their strategy than just a destination for price arbitrage in skilled labor.

It may be argued by readers that some of the policy implications derived in Chapter 4 are relatively general. Yet we consider that the goals of this research have been adequately achieved. As the problems and major implications have been discovered, it’s the policy makers’ task to develop concrete measures and plans for their gradual implementation. For some issues, multiple solutions may be available. Even though we’ve included some practical recommendations based on our own vision, we want the final decisions to be made by professionals after a thorough

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assessment of the situation. Moreover, a general nature of some implications may be considered an advantage too, as it makes them suitable not exclusively for Russia, but for some other countries that want to develop software industry too. For example, Taiwan (where this paper was written) is also trying to diversify its economy and rely less on the semiconductor industry that used to shape its development in the past, and software industry is listed among the possible "engines" for future growth. Even though the "diamonds" or Russia and Taiwan are very different (some notable features of Taiwan include its experience in hardware manufacturing, as well as smaller domestic market size which should make Taiwanese firms more active in promoting their products and services overseas), this paper might serve as one of the reference materials in preparing a plan of actions. Due to broad nature of software industry as well as different initial conditions in every country, simultaneous development of software industry both in Russia and other emerging economies will not be such a significant threat for the former: as in the end every country's firms are going to find a specific section of the market where their core competencies can be used, which may in turn allow cooperation between countries.

We hope that the practical findings made in this paper will be useful for both the researchers and policy makers. We also hope that this research will make its contribution in making Russia's software industry highly competitive on the world market, which, in turn, will stimulate the economic growth in the country.

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Appendix A. Exports of major goods from Russia in 2016

(as calculated by Federal Customs Service)

Category	Total trade volume (US$ thousands)	Percentage in total trade volume
Mineral products	$168,947,153.60	37.42%
Fuel and power	$165,983,584.50	36.76%
Metals	$29,076,197.00	6.44%
Machines, equipment and automotive	$24,293,376.50	5.38%
Chemicals, incl. raw rubber	$20,778,671.40	4.60%
Food and raw agricultural products (excl. raw textile)	$17,044,501.00	3.78%
Wood, pulp and paper	$9,792,309.90	2.17%
Precious stones, metals and products made of them	$8,905,706.40	1.97%
Other goods	$5,492,225.10	1.22%
Raw textile, textile apparel and footwear	$899,263.10	0.20%
Leather, fur and products made of them	$261,648.00	0.06%
Total	$451,474,636.50	

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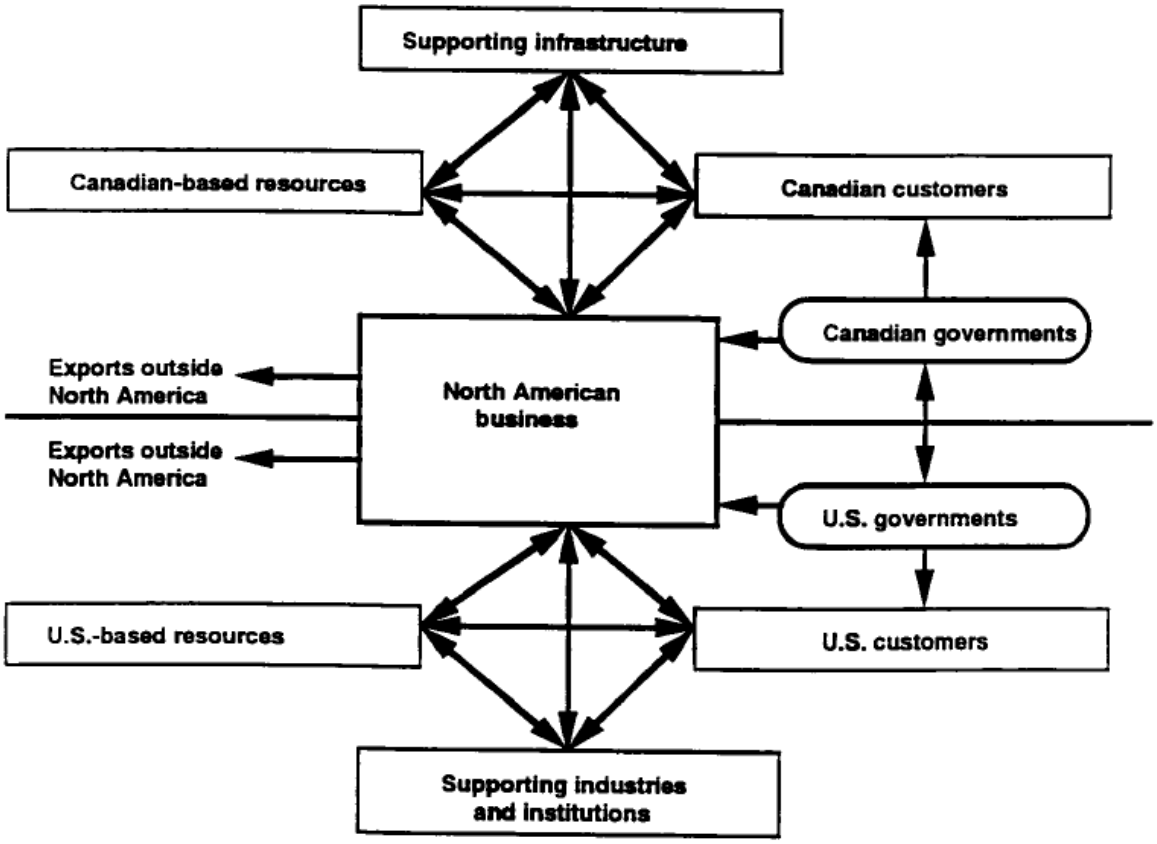
Appendix B. The "double diamond model" for US and Canada

(as presented in Rugman, Cruz (1993) and Rugman, Verbeke (1993))



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Appendix C. The performance of Russia in Internet Development Index

Source: ITU Measuring the Information Society Report, 2015

The final IDI score comprises three components: "access" (showing mainly availability of telecom and Internet services), "use" (the number and percentage of Internet and telecom users) and "skills" (consists of three indices such as literacy rate, secondary and tertiary education enrollment), attached weights of 40%, 40% and 20% respectively. While performing quite well in the "skills" part (19th place, higher than some European nations), Russia underperforms both in "access" and "use", scoring 48th and 44th respectively, dragging its overall score down. The comparison of scores for Russia and other BRIC nations with a more detailed explanation of them is presented below:

Country	Total score	Place in general rating	Access score	Average international bandwidth per user, 2014	Use score	Percentage of individuals using Internet, 2014	Skills score
Brazil	6.03	61	6.28	**42966**	5.16	40.7%	7.27
Russia	**6.91**	**45**	**7.24**	29860	**5.52**	**70.5%**	**9.04**
India	2.69	131	3.13	5677	0.85	18.0%	5.48
China[194]	5.05	82	5.25	4995	3.84	34.3%	7.07

In the ITU rating Russia is a leader among the BRIC countries (except the average bandwidth per user where it has lost to Brazil[195]). However, the limitations of such comparison should also be kept in mind. The extremely low score for India, for example, may be attributed to a large population as well as huge disparity in economic development of various regions and in the people's income. The problem of disparity in regional development, though not as acute as in India, is also characteristic to China. Apart from it, the relevance of the "Skills" sub-index to

[194] Excluding Hong Kong and Macau SAR as they are assessed separately in this report

[195] The Akamai State of the Internet report for Q1 2016 estimates the average Internet speed in Russia at 12.2 Mbps, 35th place in the rating (higher than other three BRIC nations); also the same report states that 92% of Russian internet users have connection speed higher than 4 Mbps.

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the overall level of telecom and Internet development in the country. Even though the literacy rate and education level should have some indirect impact on it, it can be disputed whether this impact is strong and measurable enough to be considered. However, the IDI data can still serve as one of the instruments to assess the Internet access and use in particular countries as well as across the borders. However, even more interesting indicator that is presented in the ITU report is the price availability of Internet access. An attempt has been made to measure how much (expressed in % of GNI per capita) it costs to enjoy an entry-level fixed broadband access plan (**different in every country**[196]) in more than 180 countries and territories around the world. In this ranking Russia has performed quite well, scoring 13th with a price of US$7.82 (or 17.94 if the purchasing power parity is used) per 15 Mbit/s, 100G per month broadband plan, which was 0.68 percent of the country's 2014 gross national income. The comparison table between Russia and other three BRIC countries can be viewed below:

Country	Place in ranking	Basic broadband plan		Monthly price		%GNI[197]
		Speed	Cap	US$, 2014	PPP$, 2014	
Brazil	45	1 Mbit/s	unlimited	12.66	16.62	1.30%
Russia	13	15 Mbit/s	100G/mth	7.82	17.94	0.68%
India	108	2 Mbit/s	1.5G/mth	6.90	24.04	5.28%
China[198]	90	1 Mbit/s	unlimited	19.53	31.92	3.58%

Even though in absolute terms the access in India (if we use US dollars) or Brazil (if we use the purchasing power parity) is slightly cheaper than in Russia, the connection speed that the user can get in Russia is notably higher than in other three BRIC nations. Even though Brazil, for example, offers unlimited data as a part of its entry-level broadband plan (versus 100 gigabytes per month in Russia) slightly cheaper in terms of PPP, the connection speed is much slower. ITU was ranking the countries based on the comparison of broadband price and the

[196] According to the Methodology annex of the report, "For comparability reasons, the fixed-broadband sub-basket is based on a monthly data usage of (a minimum of) 1 GB. […] Where several offers are available, preference is given to the cheapest available connection that offers a speed of at least 256 Kbit/s and 1 GB of data volume."

[197] ITU uses monthly GNI to make the results meaningful

[198] Excluding Hong Kong and Macau SAR

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country's GNI (the last column in the table, the lower it was, the higher was the position of the country in the ranking); however, this indicator may have a downward bias in case of such populous countries as China and India.

Regarding the mobile broadband prices, the ITU report only states that "most CIS countries enjoy affordable mobile-broadband prices".

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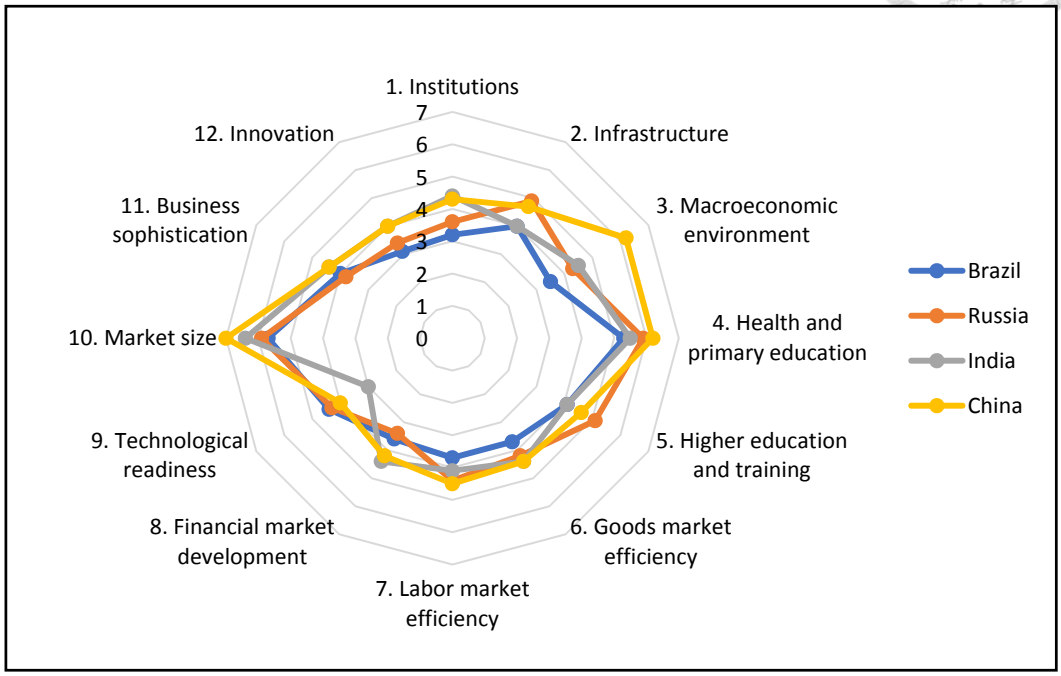
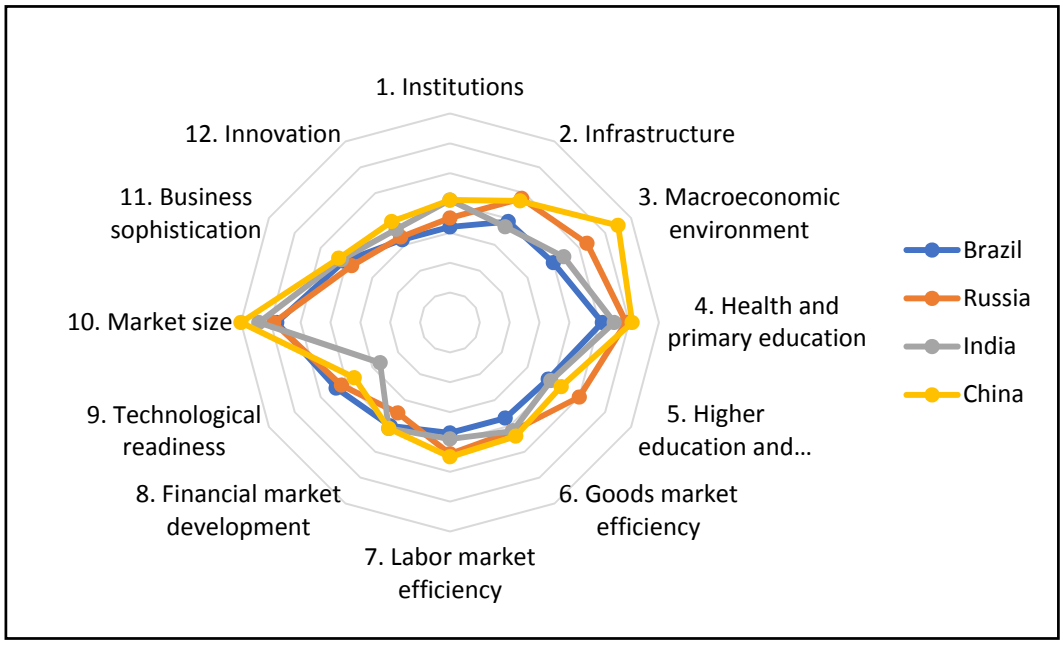
Appendix D. The performance of Russia in the Global Competitiveness Index compared with other BRIC countries

a. Global Competitiveness Index 2016-2017



b. Global Competitiveness Index 2015-2016



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Appendix E. Best and worst performance of Russia in the Global Competitiveness Index 2016-2017

Russia is a…	
leader in (performing in the top-40)	**outsider in (the bottom-40)**
Available airline seat km/week (13th)	Property rights (123rd)
Mobile telephone subscriptions (13th)	Intellectual property protection (117th)
Fixed telephone lines (39th)	Burden of government regulation (103rd)
Government debt (10th)	Business costs of terrorism (101st)
Tertiary education enrollment (18th)	Reliability of police services (109th)
Internet access in schools (33rd)	Strength of auditing/reporting standards (103rd)
Number of procedures to start a business (40th)	Protection of minority shareholders (116th)
Flexibility of wage determination (23rd)	Quality of roads (123rd)
Internet users (39th)	Inflation (132)
Mobile broadband subscriptions (40th)	HIV prevalence (106th)
Domestic market size (6th)	Effect of taxation on incentives to invest (106th)
Foreign market size (5th)	Agricultural policy costs (110th)
GDP (PPP) (6th)	Prevalence of non-tariff barriers (111th)
	Prevalence of foreign ownership (126th)
	Business impact of rules on FDI (124th)
	Imports as a percentage of GDP (128th)
	Effect of taxation on incentives to work (105th)
	Financial services meeting business needs (111th)
	Affordability of financial services (102nd)
	Ease of access to loans (115th)
	Soundness of banks (121st)
	Regulation of securities exchange (113th)
	FDI and technology transfer (111th)

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Appendix F. Most problematic factors of doing business in Russia according to World Economic Forum's Executive Opinions Survey

According to the Executive Opinion Survey performed by the World Economic Forum, some the most problematic factors for doing business in Russia are:

- **Macroeconomic instability** due to the recession started in late 2014. In 2015, "inflation" has become the biggest problem in the eyes of businessmen surveyed (for 2014 it was the "corruption"). According to the CGR, in 2015 the average annual change in CPI (consumer price index) has constituted 15.5% (citing the International Monetary Fund as a source), putting the country on the 132nd place among 140 countries surveyed. However, IMF gives much more optimistic outlook for 2016: 7.24% (annual change) and 5.95% (change by the end of the period)[199]. The end-of-2016 estimate by Rosstat is a CPI change of 4.97% (November 2016 versus December 2015, all goods and services);
- **Tax rates**. The GCR has estimated the total tax rate in Russia for 2015 as 47% of profits, citing World Bank Doing Business as a source[200]. It is a large number indeed, however, there's no uniform opinion on whether the tax burden in Russia is or isn't too high. The study by Elena Fernández-Rodríguez and Antonio Martínez-Arias that analyzed the financial statements for a sample of companies from four BRIC states (the very small sample size for Russia may raise questions) in the period between 2000 and 2009 has found that, though having the least average statutory tax rate among the four countries, Russia has the highest effective tax rate[201] of 30.03% versus 18.49% for China, 25.21% for Brazil and 24.45% for India[202]. Another opinion is voiced by Prof. I. Nikolaev in his presentation for the Russian

[199] IMF World Economic Outlook Database, the revision for October 2016

[200] According to the World Bank methodology, this indicator includes "profit or corporate income tax, social contributions and labor taxes paid by the employer, property taxes, property transfer taxes, dividend tax, capital gains tax, financial transactions tax, waste collection taxes, vehicle and road taxes, and any other small taxes or fees".

[201] The feature of ETR is that it also includes the effect of provisions regarding tax exemption, deferral, deductions and tax credit etc.

[202] Elena Fernández-Rodríguez and Antonio Martínez-Arias, "Determinants Of The Effective Tax Rate In The BRIC

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Union of Industrialists and Entrepreneurs where he argues that the best measure is the sum of tax payments of the firm divided by the gross value added less amortization[203] and yields the tax burden of 26.2% for 2014. However, the results got by various organizations and researchers and mentioned above cannot be directly compared due to different principles of calculation. The question of tax burden in Russia remains open for future research. Moreover, in Section 3 we will have a look on tax incentives available for IT firms.

- **Corruption**. According to Transparency International Corruption Perception Index (though criticized for focusing on perceptions instead of actual corruption[204]), all the BRIC countries do have serious problems with corruption, however, the situation in Russia is significantly worse than in other three states, scoring the 119th among all the countries surveyed (the ranks for other countries is 76th place for India and Brazil[205] and 83rd place for China).
- **Low government efficiency**. Even though the "Russian bureaucracy" has already become a stereotype (some authors even claim that "At least as far back as the reign of Tsar Nicholas I, Russia's state bureaucracy has been widely considered to be top-heavy, corrupt, inefficient and tyrannical"[206]), the fact that Russia has had central-planning economy for the most of 20th century (and a lot of high-rank government officials in modern Russia have started their career in that period) as well as a strong degree of vertical integration of political system nowadays (when the lower-level agents' opinion is often ignored) may have contributed to the low efficiency of the bureaucratic machine, as well as slow progress towards building a modern system of governance (including e-government).

Countries", Emerging Markets Finance & Trade 50, no. 3 (supplementary) (2014): 214-228.

[203] Igor Nikolaev, An Analytical Estimate Of Tax Burden In Russian Economy, 2016, accessed May 7, 2017, http://www.fbk.ru/upload/docs/nalogovaya_nagruzka.pdf.

[204] Dan Hough, "Here'S This Year'S (Flawed) Corruption Perception Index. Those Flaws Are Useful.", Washington Post, last modified 2016, accessed May 20, 2017, https://www.washingtonpost.com/news/monkey-cage/wp/2016/01/27/how-do-you-measure-corruption-transparency-international-does-its-best-and-thats-useful/.

[205] The TI methodology allows several countries with the same 100-point score to tie for one place

[206] Chaim Shinar, "How Russia's Bureaucracy Hindered Its Economic Development", European Review 20, no. 3 (2012): 438.

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- **Other concerns** included policy instability (probably meaning the foreign policy), inadequately educated workforce (however, there has been a significant improvement since last year), foreign currency regulations, as well as “access to financing” (10.7%).

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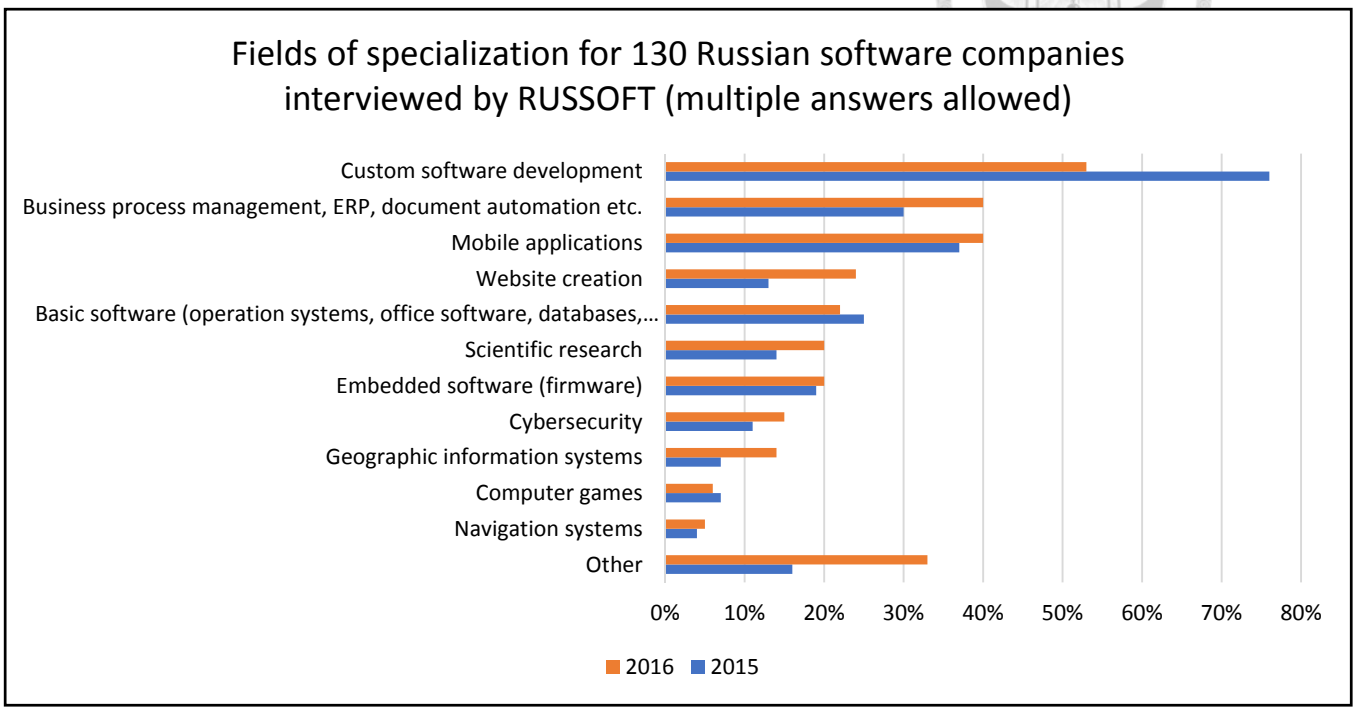
Appendix G. Specializations and priorities of Russian software firms (survey with multiple answers allowed)



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Appendix H. Fields of specialization for 105 clusters recognized by National Research University – Higher School of Economics

Field of specialization	Number of clusters
Industrial equipment manufacturing	10
ICT	9
Pharmaceuticals	8
Microelectronics	8
New materials	7
Medical equipment	7
Nuclear technologies	6
Aircraft construction	6
Forestry, wood processing, paper production	5
Military equipment	4
Environmental protection and waste recycling	4
Automotive	4
Tourism	3
Industrial biotechnologies	3
Chemical industry	3
Agriculture and fishery	3
Other	**15**

Note: "Other" includes specializations which had been represented by two or less clusters as indicated below:

Two clusters: shipbuilding, metalwork, manufacturing of food/drinks/tobacco products

One cluster: power generation and electrical equipment manufacturing; crude oil and natural gas extraction; optics and photonics; jewelry production; space industry; furniture manufacturing; public health and social services; manufacturing of construction materials and other glass, concrete, cement, plaster, clay, ceramics and porcelain products; manufacturing of textile products, apparel, footwear and leatherware.

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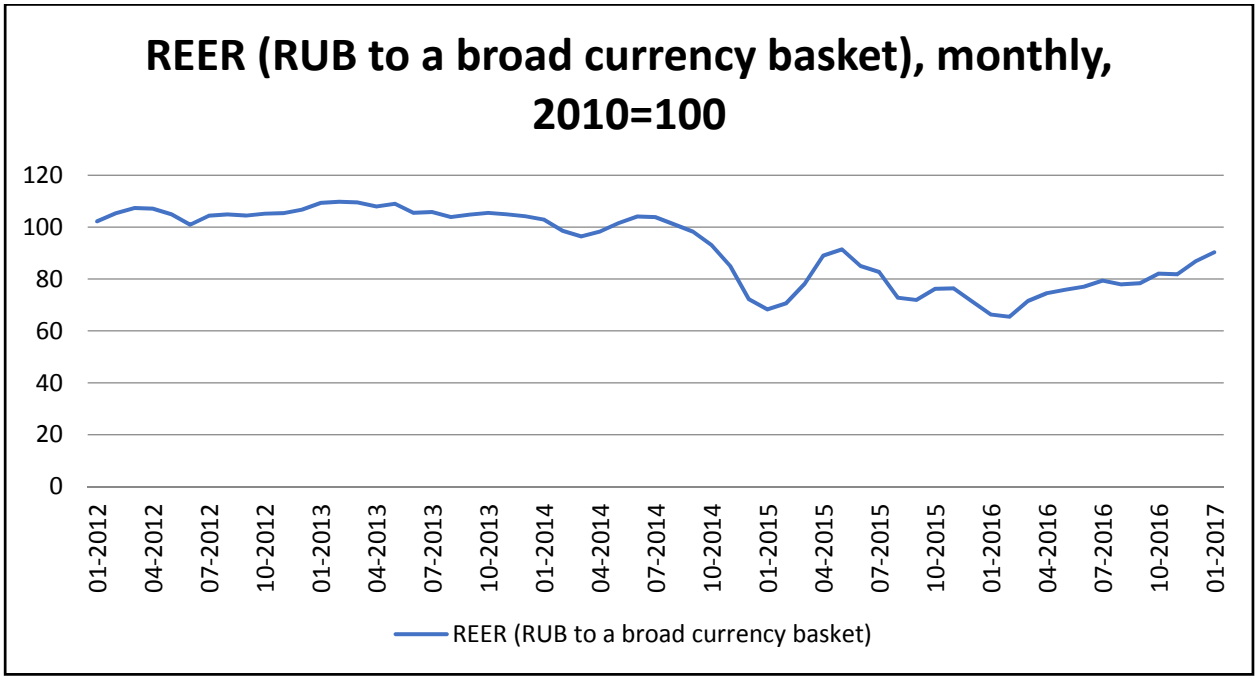
Appendix I. Real effective exchange rate (REER) of Russian ruble (RUB) against a broad basket of currencies from Jan. 2012 till Jan., 2017)

(as calculated by Bank for International Settlements)

Description: REER is an index that measures the change in real (adjusted for difference in home and foreign price levels) value of one unit of national currency against a basket of foreign currencies over time. REER takes the changes in the real exchange rate between home currency and each currency from the basket over a period and then creates the geometric weighted average of these changes with weights being assigned based on the share of each foreign country in the domestic bilateral trade. REER is an index, which means that it is only able to measure the change in the real value of the domestic currency for each period, but not the value itself. In the BIS methodology, one period is equal to one months, and the basket of currencies consists of sixty one economies (euro area countries have been listed separately due to different price levels in each one), with weights based on bilateral trade volume in 2011-2013.

This page shows the data as a graph, while the next page will present a table of numerical values of REER from Jan. 2012 till Jan. 2017. 2010 has been the base year for the index.



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Month-Year	REER index (2010 = 100)	**Month-year (cont'd)**	REER index (cont'd)
01-2012	102,23	**10-2014**	93,07
02-2012	105,32	**11-2014**	85
03-2012	107,35	**12-2014**	72,23
04-2012	107,09	**01-2015**	68,3
05-2012	104,93	**02-2015**	70,6
06-2012	100,92	**03-2015**	78,15
07-2012	104,37	**04-2015**	88,98
08-2012	104,84	**05-2015**	91,42
09-2012	104,42	**06-2015**	84,99
10-2012	105,18	**07-2015**	82,73
11-2012	105,36	**08-2015**	72,77
12-2012	106,69	**09-2015**	71,95
01-2013	109,28	**10-2015**	76,17
02-2013	109,75	**11-2015**	76,39
03-2013	109,51	**12-2015**	71,29
04-2013	107,96	**01-2016**	66,3
05-2013	108,99	**02-2016**	65,48
06-2013	105,48	**03-2016**	71,54
07-2013	105,81	**04-2016**	74,54
08-2013	103,89	**05-2016**	75,87
09-2013	104,82	**06-2016**	77,05
10-2013	105,48	**07-2016**	79,38
11-2013	104,92	**08-2016**	77,89
12-2013	104,18	**09-2016**	78,35
01-2014	102,88	**10-2016**	82,06
02-2014	98,54	**11-2016**	81,77
03-2014	96,43	**12-2016**	86,86
04-2014	98,24	**01-2017**	90,3
05-2014	101,5		
06-2014	104,05		
07-2014	103,81		
08-2014	101,04		
09-2014	98,24		

Source: Bank for International Settlements website

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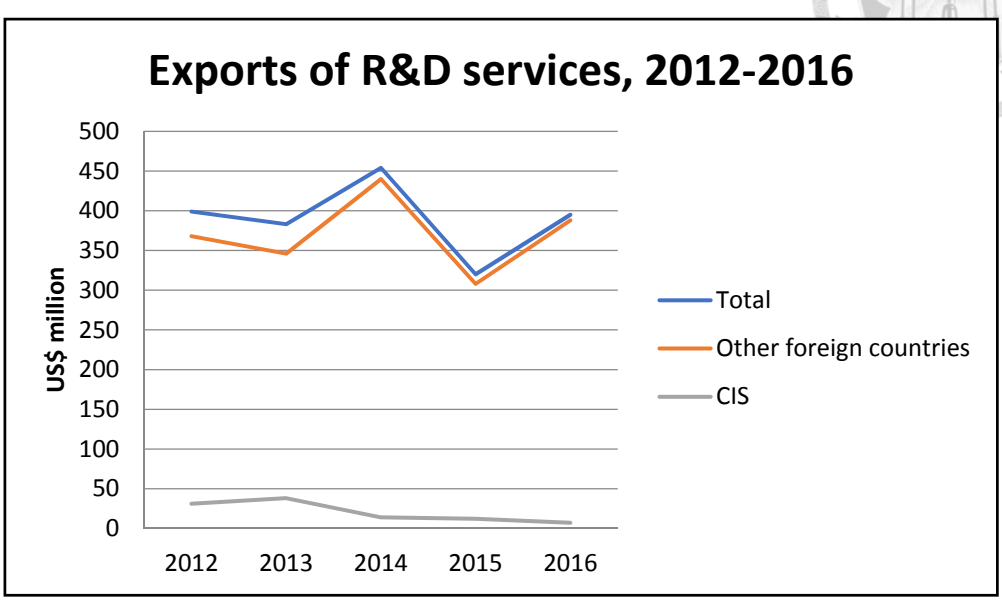
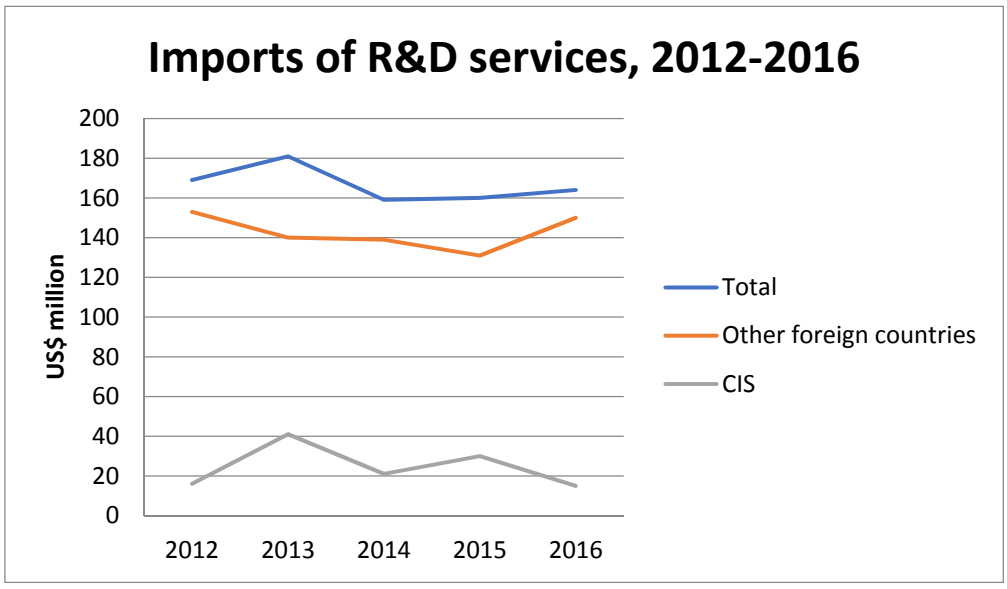
Appendix J. Exports and imports of R&D services of Russia

(as calculated by the Central Bank of Russia)





Note 1: CIS countries here include Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan, Uzbekistan and Ukraine.

Note 2: The statistics here include the trade in all R&D services, not only IT-related ones

Note 3: The classification of services used by Central Bank of Russia is based on the United Nations' Manual on Statistics of International Trade in Services (2010)

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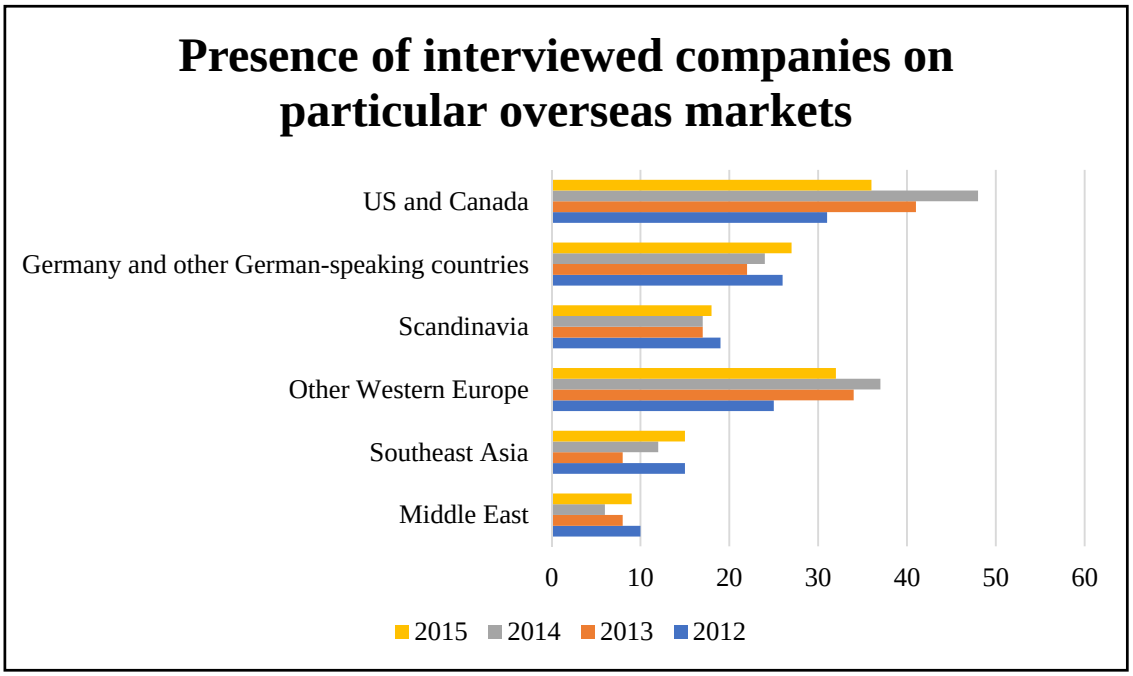
Appendix K. Presence of Russian firms on overseas software markets

(according to a RUSSOFT survey of 130 companies)



Note 1: The graph below does not include such regions (countries) as **South/Central America**, **Africa** and **Australia** even though there's a presence of Russian firms in these markets (8%, 9% and 8% respectively in 2015). The reason has been a change in design of the survey. Before 2016 (which shows the data for end of 2015, see Note 2 below), these three regions have been grouped as a single item ("South/Central America, Africa and Australia", 15%, 14% and 12% for 2012, 2013 and 2014 respectively), but since 2016, these three responses have been counted separately, which makes the comparison between 2015 and previous years impossible).

Note 2: Even though the latest survey is dated 2016, however, in this question the respondents have been asked about the markets they were present at by the end of 2015 (or the markets they have entered by the end of that year), so that the last year in the graph is 2015.

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