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MARKET POTENTIAL OF NORTHWEST RUSSIA FOR TELEMEDICINE APPLICATIONS

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Abbreviations

BRIC = Brazil, Russia, India, China

CA = Current account

CVD = Cardiovascular disease

CPI = Corruption Perceptions Index

DLS = Clause on additional medical provision

ECG (EKG) = Electrocardiogram

EPR/EMR = Electronic patient/medical record

ERDI = Exchange rate deviation index

ETLA = Elinkeinoelämän tutkimuslaitos, the Research Institute of the Finnish Economy

GCI = Global Competitiveness Index

GDP = Gross domestic product

GRP = Gross regional product

GP = General practitioner/family doctor

NWD = North West Federal District

NST = Norwegian Centre for Telemedicine

MTU = Mobile telemedicine unit

OMS = Mandatory medical insurance

RAMS = Russian Academy of Medical Sciences

RTF = Russian Telemedicine Foundation

SBC = Space Biomedical Center for Training and Research (Moscow State University)

Foreword

The Northern Dimension Research Centre (NORDI) is a research institute run by Lappeenranta University of Technology. Nordi was established in 2003 in order to coordinate research into Russia.

NORDI's mission is to conduct research into Russia and issues related to Russia's relations with the EU with the aim of providing up-to-date information on different fields of technology and economics. NORDI's core research areas are Russian business and economy, energy and environment, the forest cluster, the ICT sector, as well as logistics and transport infrastructure

The purpose of this study is to conduct the first evaluation of the Russian health care sector and the utilization of different telemedicine applications. The results of this study will be used as a basis for focusing further research in this field, ultimately aiming at technology implementation.

I would like to thank the staff members of medical clinic Delor and International Hospital & Clinic MEDEM for giving me important input and insights for conducting this research. Thanks to Professor Kari Mäkelä from Tampere University of Technology for proposing this interesting research topic. All my colleagues in NORDI deserve my sincere thanks for their help and guidance.

Lappeenranta, December 2008

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1 Introduction

This study was written in the fall of 2008 at The Northern Dimension Research Centre of LUT. The study is a part of a preparation research project called "Development and Utilization Possibilities of Telemedicine Applications in Russia". The project is funded by Finnish Funding Agency for Technology and Innovation (TEKES) and its aim is to organize and start a larger scale international research and development project in Russia, especially in the St. Petersburg region, for commercialization and further development of Finnish telemedicine applications. The Telemedicine Laboratory of the Tampere University of Technology (Department of Biomedical Engineering) has been our co-partner in this project.

The demand for health care services and the expenses of these services are constantly growing due to the ageing of populations. Current health care processes and applications need to be developed further to be able to provide health care services efficiently to those in need. Finland has been quite active in this sense – many new solutions and technologies have been developed in Finland. The Finnish health care application market is very small, but the issues and problems in health care global. Given the financial input needed for successful health care technology R&D projects and the size of the domestic market, these types of projects must rely on international co-operation to be able to gain the critical mass and be financially successful. New incentives and methods are needed to encourage wider international commercialization and co-operation between health care service providers and technology developers.

Information and communications technologies provide many new solutions which could improve the existing health care processes and even change the whole way of providing health care. Utilizing as many IT applications as possible shouldn't be the ultimate aim - these solutions don't necessarily and automatically bring benefits, but as an integral part of the health care system, they support and make the processes more efficient.

In its broadest definition eHealth refers to all the technology involved in medical applications, where electronic health care related information flows across local or other wider information networks. In a modern hospital environment, these networks connect all hospital departments, from surgeons and physicians to nurses and administrative personnel. The true nature of eHealth is to improve the performance of patient care using modern technology, making the treatment more efficient and available precisely where it's needed. The European Union originally created the term eHealth. In many contexts the same group of services and

technologies is referred as telemedicine. Some sources make a distinction between telehealth and telemedicine; telehealth covers all aspects of healthcare while telemedicine only covers the so called curative services. In this work all these three terms are considered equal.

MedTerms (2004) medical dictionary defines telemedicine as "the use of medical information exchanged from one site to another via electronic communications for the health and education of the patient or healthcare provider and for the purpose of improving patient care. Telemedicine includes consultative, diagnostic, and treatment services."

In terms of traditional health care, the most important characteristic of telemedicine is that the doctor and the patient are separated from each other. The range of telemedicine applications is very large and varies from simple phone consultations to high-tech surgical robotics and comprehensive EPR systems.

Russia is a very potential market area for many industries and sectors, mainly due to its recent macroeconomic development and market size. In terms of health care, the processes and level of treatment in Russia are still far behind the western standards, but some changes can be expected in the future. Russia has gone through some very drastic changes in the last 20 years. The collapse of Soviet Union and communist regime was followed by market liberalization and privatization, which created the basis for free market economy. Economically, Russia was faced with a very deep slump and its first post-communist years seemed very difficult indeed. The monetary crisis in Asia and Russia in 1998 was the turning point for Russia as it started a new era of strong economic growth. Russia's vast natural resources and especially the global demand for oil and gas are the main reasons behind the fast growth of living standard. The economic slump affected Russian health care severely; lack of resources caused a sudden drop in the quality of treatment, which had very fast impacts on the overall well-being of the population. Due to the positive economic development, Russia's health care sector has also started showing some signs of recovery. Rapidly increasing living standard has created new demand for high quality medical services which are currently only available through private institutions. Leapfrog effects can be expected in Russian health care, which also means that many hospital processes must be totally reformed. Implementing and developing new, efficient processes with the help of modern ICT technology provides numerous market opportunities for Finnish and Russian companies.

Demographically, Russia is also very unique; the largest country in the world with a relatively small population density, covering 11 time zones on two continents. The population consists of different races and multiple nationalities and living conditions vary from modern

metropolises to rural villages. Considering the basic characteristics of Russia, it seems like there might be potential for a very wide spectrum of telemedicine applications.

1.1 Objectives and restrictions

The purpose of this study is to evaluate the attractiveness and potential of Russia from telemedicine sector's point of view. As this study is the first evaluation of the market, the main research problem is to draw a conclusion whether the first impression of the market's attractiveness is justified. The conclusion will be supported by an outlook of the Russian health care sector and other related industries. The outcome of the study can potentially be used as a basis for starting a larger scale research and co-operation project.

Research question:

1) Is the market in a phase where both Russia and Finland could benefit from co-operation in the field of telemedicine? Should research be carried further?
- What kind of telemedicine applications are used in Russia presently?
- Which areas of health care could benefit from the utilization of telemedicine?
- What are the main reasons hindering telemedicine utilization?

Output:
- ➔ Description of the present state of telemedicine in Russia
- ➔ Outlook on the Russian health care sector

Considering the role of this paper as a pre-evaluation, the paper doesn't aim to be a dedicated market research nor a competitiveness analysis. Elements of these two research types are combined to provide a general and wide outlook of the market. More detailed and focused reports will be conducted in the later phases of the project.

The theoretical framework used in this study can be used at many different levels. Studies about the competitiveness of countries, geographical areas, clusters and industries have been widely conducted using the same framework (see chapter 2.2.3). In this study the factors examined within this framework are factors especially decisive for the health care sector in North-West Russia. General competitiveness factors and rankings of Russia's competitiveness have been studied by many researchers in the past. These factors are introduced briefly, but the focus is on the health care specific factors.

1.2   Research method and structure of the paper

The main theoretical framework for this study is presented in the second chapter of the paper. The general layers of business environment and methods of analyzing them are discussed. ICT in health care concerns a few different sectors and the concept of clusters seems to fit best for analyzing eHealth. Therefore, Porter's cluster theory and framework of national competitiveness (the Diamond Model) was chosen as the main theoretical framework for this study. The model is described in greater detail in the chapter in question.

Chapter three examines how Russia's competitiveness, as a country, has been evaluated by multiple different rankings done by other research groups. Chapters four, five, six and seven present the elements of the Diamond Model in the Russian context. Data for these chapters was collected from secondary sources, mainly from internet, news articles and other publications. Chapters four and five concentrate on describing the Russian health care sector, including the historical aspects of telemedicine in Russia. Chapter six deals with crucial supporting industries, namely information and communications technologies. Chapter seven explains the present and future demand trends for health care applications and the reasons behind the development.

Chapter eight is based on primary data and it supplements the information presented in the earlier chapters. Two medical institutions were chosen as examples of health care providers in Russia. Interviews were conducted in these institutions to find out the actual level of telemedicine utilization, experts' opinions about Russian health care and the possibilities of telemedicine in Russia.

The last chapter of the study concludes the information gathered during the study. The most important findings of the study are summarized in the framework presented in the second chapter. Conclusions chapter also includes observations of the telemedicine applications with most market potential.
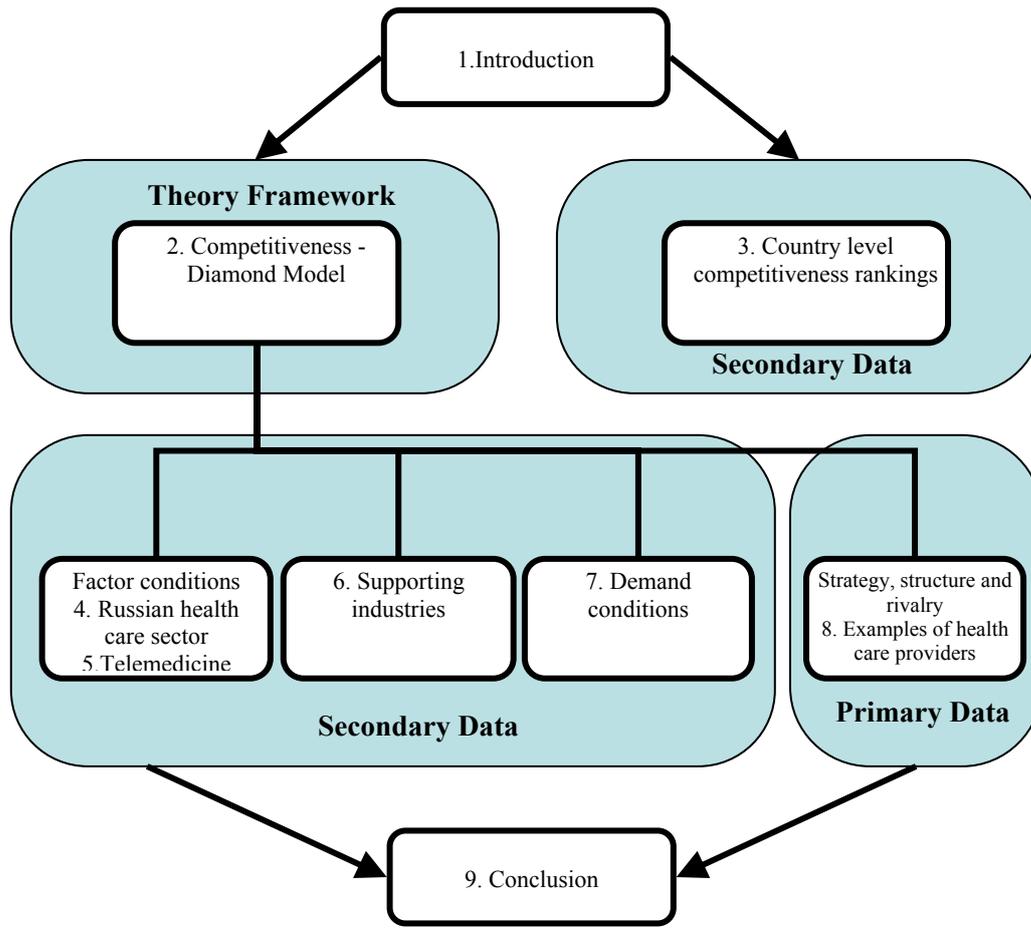
Figure 1. Structure of the paper

2 Competitiveness – Porter's Diamond

"Ability of a firm or a nation to offer products and services that meet the quality standards of the local and world markets at prices that are competitive and provide adequate returns on the resources employed or consumed in producing them." (Business Dictionary 2008)

Competitiveness is one of the most important properties both for single companies as well as for industries and nations, even though the term itself is very difficult to define. The ultimate purpose and strategy of a company is formed by its mission, vision and values. It has also been stated, that the ultimate goal of any company is to maximize its performance in the given business environment (Roberts 2004, p.19). Even if this generalization doesn't necessarily apply to all possible cases, it's obvious that a company must always strive for being profitable since it's one of the conditions that the company must meet to be able to operate in the long run without constant external financing. Global competition is present in all industries these days. Organizational competitiveness is not the only factor affecting company's performance, but also the competitiveness of the business environment is of great importance.

2.1 Analyzing the business environment

Business environment can be divided into micro- and macro-environments. Micro-environment refers to the organizational environment, in other words, conditions inside the company, while the term macro-environment is used to describe the surrounding environment.

This division can be examined more carefully by adding two more layers between micro and macro-environments; industry environment and competitor and market environment (Figure 2). The competitiveness and structure of these four layers also affects the competitiveness of a single company.
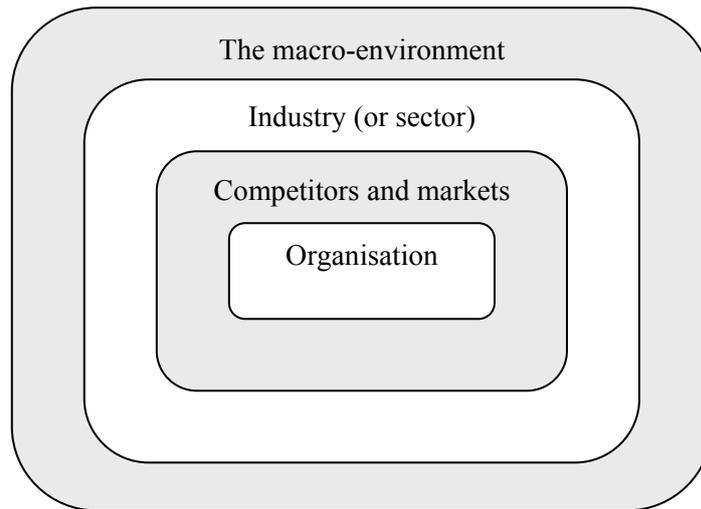
Figure 2. Layers of the business environment (Johansson et al 2006, p. 64)

Macro-environment is the most general layer of the business environment. It consists of factors that characterize the whole country, and therefore affect almost all organizations regardless of the industry. (Johansson et al 2006, p. 65-68) *PESTEL analysis* with its many variations is often used for analyzing the macro-environmental conditions. The letters stand for political, economical, social, technological, environmental and legal factors. It's obvious that the relevant contents of these groups vary between industries and when the analysis is taken into a deeper level the key factors must be identified. PESTEL analysis can also be extended to not only cover the current factors, but also the possible future development. (Kamensky 2003, p. 115-116)

The second environment layer deals with the dynamisms of an industry or a sector. The term industry or sector refers to a group of companies offering the same products or services. Competition is the key characteristic of this layer and it can be analyzed, for example, by using Michael Porter's *framework of five forces*. (Johansson et al 2006, p. 77-81) These forces include the bargaining power of suppliers and buyers, possible substitute products, barriers to entry, and the degree of current rivalry. (Kotler 1998, p. 229)

The closest layer is called competitor and market environment. This layer differs from the industry layer by the focus of the analysis. The industry layer covers the whole industry regardless of the actual target market segmentation. It's important to analyze the companies, which provide direct competition in the same segments, in more detail. Analysis can be done by dividing the industry into *strategic groups*, i.e. companies with similar strategies and characteristics competing with each other in the same industry. (Johansson et al 2006, p. 89-91)

Conducting the research described above provides very detailed results about the business environment, but it's also very time consuming and requires detailed information about the existing business positions. It also doesn't really provide any insight on how different industries interact with each other, which is essential in terms of competitiveness. That's where the concept of clusters and Michael Porter's diamond model come in handy. The next chapter deals with this model and its utilization.

2.2   Porter's diamond

A legendary Economist Michael Porter introduced the concept of clusters and the diamond model in his book the Competitive Advantage of Nations (1990, p. 71-72). The key concept in Porter's diamond is the presence of clusters. Clusters are geographically proximate interconnected companies and institutions in a particular field, which are linked by commonalities and complementarities. Clusters break the boundaries between industries and sectors. Industries are dependent on each other and it's important to consider this factor while analyzing the business environment. As an example, a manufacturing industry can lose its competitiveness if its suppliers cannot meet the material demand. When related industries are closely linked with each other, they all benefit and gain economies of scale. Geographically clusters can be very different, from small technoparks to town or regions, or even a whole country. (Porter 1998, p. 199-200)

2.2.1   The factors

According to Porter's model, the competitive advantage of a country or a cluster is dependent on four different factors, which interact and are closely linked to each other in the present business environment and networks. It can be said that these elements together form the business system where firms are born and compete with each others. These factors include: factor conditions, demand conditions, related and supporting industries and firm's strategy, structure and rivalry (Figure 3). One single factor alone cannot create a competitive advantage, but the factors together can. In addition to these four main factors also government actions and a chance can have an effect on competitiveness.
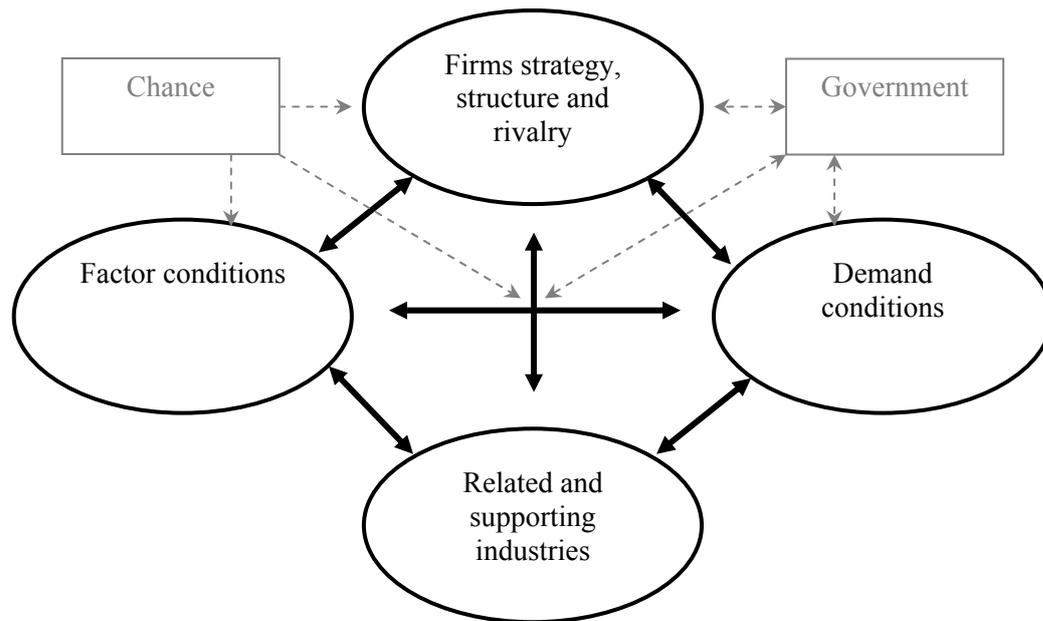
Figure 3. Diamond model by Porter (Porter 1990, p. 127)

Factor conditions

Factors of production are the inputs that a company needs to be able to operate its business. In traditional competitiveness models, it's normally assumed that certain conditions typical of a location are the ones which have the biggest impact on the competitiveness of an industry. These models might apply, for example, in cases where an industry is heavily dependent on one irreplaceable production material, which is not widely available. Porter, however, argues that the most important factor conditions are created, not inherited. Therefore, competitive advantage is not very heavily dependent on the current availability of factors of production, rather than on the rate that they can be created and implemented. (Porter 1990, p. 73-76)

Factors of production can be divided into multiple groups. These groups are described in the Table 1. The factors relevant to certain businesses vary greatly between industries.

Table 1. Division of factor conditions

Human Resources	*Physical Resources*
Availability and skills of personnel, taking into account standard working hours and work ethics. Human resources can be divided into groups based on the professions occupied by the industry.	Availability, accessibility, quality and cost of resources, such as water, wood and power.
Knowledge Resources	*Capital Resources*
The Nations stock of technical, scientific and market knowledge. These resources can be found for example from universities, government research facilities, private research units, local literature, statistics bureaus etc.	Availability and cost of capital in a country. Capital can come in many forms - the county's rate of savings and the structure of capital markets are very decisive.
Infrastructure	
Infrastructure can include, for example, transportation, communications, mail, health care, fund transfer etc. Things like housing stock and cultural institutions, which have an effect on the quality of life and attractiveness of a nation, can also be considered as infrastructure.	

Source: Porter 1990, p. 74-75

Related and supporting industries

The competitiveness of an industry is often closely related to the competitiveness of other supporting industries. For example, machine tool producers are more likely to be competitive globally if their home country's specialty steel production, the most important material for tools, is considered world class. Another good example of the importance of supporting industries could be a producer of high quality leather shoes. Even if in terms of quality the shoes are very competitive, it's difficult to compete if their design is not following the latest trends globally. Producers of other type of footwear in the same country can be seen as supporting industries for a leather shoe manufacturer. Related industries are normally complementing each others' products, for example computer manufacturer and software firms. (Porter 1990, p. 100-101)

The advantages of having competitive supporting industries are quite obvious. Working in co-operation with top quality companies leads to knowledge transfer and development of new innovations and solutions which one company hardly could develop alone. Of course, high demand of one industry also easily affects the demand of other supporting industries. It's impossible to estimate how much, for example the success of Nokia, has boosted the demand

for many other Finnish high tech companies. Close co-operation also often results in cost savings. (Porter 1990, p. 105-107)

Demand conditions

Home markets are very important even for multi-national corporations. The way that demand changes in the home markets over time often shapes the way the companies react to market signals and make many strategic choices. The size of the home market is not necessarily decisive, although small home market often leads the companies to have more global perspective in their activities. However, if the home market is very large, the company will more likely operate longer in the domestic markets and when internationalizing, prefers to export to sustain economies of scale. (Porter 1990, p. 86-88)

In terms of competitiveness, the most demanding customers are the most beneficial ones for the industry, since they are constantly expecting the companies to improve their products and to be open to innovations. (Porter 1990, p. 89-90)

Analyzing the segment structure of demand is of great importance. Normally, a firm is most likely to have competitive advantage globally in the segment which has the largest relative share in its home markets, even if the segment is not very large in absolute terms in other countries. It should be also noted that the largest segments of a market receive the greatest and earliest attention by local firms and, therefore, smaller segments are often neglected and considered lower priority. This easily results in foreign companies entering the markets through these segments. (Porter 1990, p. 87-88)

Firm's strategy, structure and rivalry

Hard rivalry is the key to competitiveness, as it drives the companies into being more efficient and innovative. Companies normally co-operate and compete with each other at the same time. It's beneficial for all the players in a cluster to develop the cluster through co-operation, since it increases everyone's competitiveness globally. In a new, developing industry, there are always one or two companies that grow very rapidly. While the big companies concentrate on the biggest and most attractive segments, they leave room for smaller companies which only concentrate on some smaller niche segments. (Porter 1990, p. 107-110)

Porter has also developed a special framework of five forces for analyzing competition in an industry. Since analyzing the competition is not the main focus of this work, this model will not be presented in greater detail.

Government

The role of government differs slightly from the role of the main four determinants. In many ways, government can be seen as a vital element of competitiveness, since it can affect the competition environment very dramatically. Government can influence all the four elements positively and negatively. It can, for example, grant subsidies, form new policies, regulate markets and so forth. The four determinants can also influence the government; an establishment of an important industrial sector can cause the government to grant more funding to the education in this field, to mention one example. However, from the diamond's point of view, the role of government is still external and it doesn't actively take part in the diamond dynamism in the same sense as the main determinants. It can work as a catalyst or challenge the industry. It is of the government's best interest to simulate the industries to work as effectively as possible and produce the maximum output. (Porter 1990, p. 126-128)

Besides the external role, government can also have a more active role in the diamond. In many industries, government is, in fact, one of the most important clients, either selling or buying products or services. Defense and infrastructure related industries are good examples in this field. In these cases, the government can be seen as part of a cluster and it acts more actively in the diamond. Government procurement can improve or lower the national competitiveness. If government is the main client in an industry, the supplier might take government's purchases for granted, which in turn might result in slowdown of innovations. Government owned companies also often prefer domestic partners to improve national output and sometimes even tight "buy domestic" policies are implemented for certain type of procurement. If government procurements are satisfactory in volume for creating a steady profit, and a company focuses only on supplying the government needs, it's very likely to lose its competitiveness internationally. Sometimes local companies might even lobby the government to implement abnormal product standards or other restrictions to hinder rivalry from foreign companies. For government procurement to have a positive effect on competitiveness, it must demand new products and innovations, follow the international trends in the industry, use multiple suppliers to catalyst competition or provide some other catalysts for innovations in return. (Porter 1990, p. 644-646)

Since government owned companies often place national interest over the company's interest, governmental companies are normally not very profitable. In terms of revenues, the same instances would very likely work more effectively when privatized. Therefore, government as a company owner doesn't affect the dynamism of the diamond very dramatically.

2.2.2 Model critique

Porter's model was a hot topic of debate and it received a lot of criticism and improvement suggestions right after it was published. Before the Research Institute of the Finnish Economy conducted its research about the Finnish industrial clusters, it studied the earlier feedback carefully, in order to use the model as efficiently as possible. Risto Penttinen (1994) conducted a summary of the critique in 1994. Some of the most important disagreements are discussed below.

Porter puts a lot of emphasis on the location of the cluster. He agrees that the most important competitiveness factors are created and they are not location specific inherited factors. Nevertheless, he still sees that all the elements of the diamond need to be present in the same business environment, e.g. in a country. It's crucial for the cluster to have a steady home market which is used for innovating, product testing and central coordination. Many critics see that this assumption is based on Porter's own home market, the USA, and this kind of situation is simply not possible in a smaller country. In reality, many companies are heavily dependent on their international networks and sometimes the local market is very small, if nonexistent. A cluster is not restricted into any special geographical location; it can reach over borders and still be equally effective. Basically, this means that the national diamonds don't work separately, but are very closely linked to each other. Therefore, on a wider scale, it's possible to comprehend a whole continent, or even the whole world, as one big diamond, which consists of the networked national diamonds. (Penttinen 1994, p. 1-4) In his later book, On Competition (1998), Porter discusses the critique described above. He still sees that uniform business environment and geographically close distance are the key factors in creating a successful cluster, but he doesn't totally rule out the possibility of a cross-national cluster.

Porter neglects the role of macroeconomic factors; exchange rates, interests or low wages are not sources of sustainable competitiveness. Even if these factors may not form a granted competitive advantage for the years to come, they can be very important competitiveness factors depending on the industry. As an example, a large export company in a small country with heavily undervalued currency gains considerable competitiveness advantage, since majority of the deals is done in foreign currency, but the expenses are paid in local "cheap" currency. In many cases, other companies simply cannot overcome this competitiveness benefit in any way. (Penttinen 1994, p. 14-15)

The model generally has been criticized as too indefinite and broad; it provides a rough framework, but no actual tools for measuring competitiveness. The four determinants are too general and their contents vary greatly depending on the case. There are no clear guidelines how the model should be utilized and the results are not really comparable. (Penttinen 1994, p. 17-19)

Since Porters original model has already reached the modest age of almost 20 years, the times have also changed quite a bit. Whereas the development of Japan 20 years ago was very closely linked with governmental decision making - heavy savings, investing and subsiding local companies - the modern western market force ideology leaves a lot less room for this kind of actions. As one example, the public procurement activities in the European Union are heavily regulated by the European Community directives on public procurement. These rules make sure that public sector procurement follows transparent, open procedures and ensures fair and non-discriminatory conditions of competition for suppliers. (Economist 2007; Procurement Advisory Services 2008)

2.2.3   Diamond model and services

The role of services in modern societies has grown significantly in the last few decades. The main difference between services and other traditional industries is that normally services are intangible and the service is tailored individually for each customer based on their preferences (Porter 1999, p. 433). A service can also be closely linked to a manufactured product, or the other way around. Sometimes a service or a product can be a complementary addition to the main offering. The distinction between service and manufacturing companies is difficult, since most large companies have activities in both fields. International competition is often associated with pure manufacturing industries and most theories are also based on it. However, international competition is also present in service sector and the theoretical framework must be adjusted to match with the special nature of services. (Chen et al. 2008, p. 38-39)

There is a direct analogue between services and manufacturing based on how the service is provided (Porter 1990, p. 248-249):
1. A buyer travels to a foreign country to have services performed by the locals
2. A service firm provides services in a foreign country using domestic personnel and other resources
3. A firm provides services in a foreign country via foreign locations and foreign personnel.

The first two types can be seen as international trade, export and import, and the last one as foreign direct investment. It's common that the same firm can provide services of all three forms, depending on the case. In the context of international competition, firms normally perform only very sophisticated services internationally. Economies of scale are difficult to achieve in pure service industries and know-how is the key element in services. Local companies can normally provide basic services, where no special know-how is needed, more efficiently than their international rivals. (Porter 1990, p. 248-250)

Porter's diamond applies to services the same way as it does to manufacturing. However, the special characteristics of services must be taken into account while considering the four determinants from service sector's point of view. The most important factors are described below.

The importance of factor conditions depends on the type of the service industry. Factor conditions are important in types 1 and 2 (see above), since the service creation process starts from the home base. If the service is provided outside the home market using foreign resources (type 3), the conditions in the home markets are not of great importance. Success abroad depends more on the existing technology, techniques and service features, which have been developed in the home markets. (Porter 1990, p. 256-258)

Home demand is probably the most important element of creating competitiveness in service industries. When demand is versatile and sophisticated in the home market, companies are pushed to create and provide the best possible solutions for the buyers. The share of services in western countries is very large and services originating from these countries are normally also the most widespread globally. It's often necessary to stay geographically close to the customer. If the demand in the home market is widespread, the company gains important experience in supplying the demand using local offices; the same way as it's often done internationally. (Porter 1990, p. 258-262)

The role of related and supporting industries and firms strategy, structure and rivalry are just about the same as in manufacturing. Some service providers might benefit from the success of traditional industries, i.e. cell phone manufacturing in a country can accelerate demand for software solutions. Service industries rarely form their own clusters, but are rather blended into manufacturing clusters. From the point of view of a pure service provider, information technology is probably the most important supporting industry. Competition in the home market is essential innovation incubator also in services; companies are more likely to succeed internationally if the home market is free and many companies are present in the

same segments. Heavy government presence in service sector normally indicates poorer performance internationally. (Porter 1990, op. 263-265)

2.2.4   Model in practice

When Porter was forming the diamond model, he studied ten different countries and multiple industries in order to find out the sources of their competitiveness. Many countries, which weren't included in Porter's research, conducted similar analysis of their diamonds after the book was published. In Finland, the analysis was done by the Research Institute of the Finnish Economy (ETLA) and it was finished in 1995 (Hernesniemi et al. 1995). In the beginning of the project, the most competitive industries (export-wise) were identified. The study found 9 different important industries, where one or multiple clusters were present, and these industries were analyzed individually. The outcome of the study provided many useful results. Clusters were categorized based on their size and development potential. The forestry cluster stood out of the group, both in terms of size and international competitiveness - however, many other clusters had better development prospects. Analysis of the four determinants in each cluster provided valuable data about the strengths and weaknesses of each cluster, and this data was used as a basis for future development.

ETLA was also the organizing party of another competitiveness study conducted on the Northwest region of Russia (Dudarev et al 2002). The research methodology remained the same as in the earlier ETLA project; the five most important industries in Northwest Russia were identified and then analyzed individually. These industries included forest, metallurgy, energy, food and ICT industries. The research provided important information about the industry structure in Northwest Russia; the data was used for analyzing possibilities for more extensive co-operation and developing cross-border clusters.

3   Country level competitiveness rankings

In this study, the Russian health care sector is examined using Porter's competitiveness theory. In order to study this one specific sector, it's also very useful to form a general understanding of how Russia's competitiveness, as a country, has been rated in other researches. The country level competitiveness factors also affect the dynamism of a single sector. The general competitiveness factors are of course included in the health care sector review if they are very decisive for this sector's operation. Measuring competitiveness can be done in multiple ways and in the end it all depends on how the term is exactly defined. Four main indices are considered in this context since they all represent slightly different aspects of competitiveness.

The "Global Competitiveness Index" (GCI) by the World Economic Forum includes both quantitative and qualitative elements in twelve different areas and as a whole it provides a very comprehensive outlook on competitiveness. The "Ease of Doing Business" ranking by the World Bank concentrates on the actual operation of companies in the studied countries; the regulations and policies and their efficiency. "Services Location Index" by A.T. Kearney rates the most attractive locations for service offshoring. This ranking is interesting in this context since software programming is one very important area for telemedicine. The last of the indicators is "The Corruption Perception Index," which describes the role of grey economy and corruption in the selected countries; these are factors which can have major effects on competitiveness especially in the developing markets. A recent study conducted by IRBD in the East European transitional economies showed that health care was regarded as the most common field where corruption and bribes are still common, mainly due to low salaries (Tiusanen 2008, p. 9).

In the comparisons presented here Russia is compared to three very similar fast-growing economies: China, India and Brazil. Together, these four economies are expected to overtake the economies of the six richest countries in the world by 2050. The similarities in these economies and their common goals have earned them the name of BRIC countries. (O'neill 2008) Also, the former Soviet states Estonia, Latvia and Lithuania are included to demonstrate the difference between relatively young EU countries and Russia.

3.1 Ease of doing business

The "Doing Business" project was launched seven years ago by the World Bank and International Finance Corporation. The project aims to publish annual reports on countries' competitiveness in terms of dealing with some common regulations applying to companies throughout their whole life cycle. Surveys are carried out in small and medium sized companies in 181 countries and measurable questions asked in ten different subcategories (Table 2). Countries are then ranked in these ten subcategories and given an overall rank. The country ranking the highest in 2009 is Singapore, which also ranked number one the previous year. Denmark is the number one country in Europe ranking 5th worldwide. (World Bank 2008)

Table 2. Ease of doing business rank by the World Bank

	Estonia	Lithuania	Latvia	China	Russia	India	Brazil
Ease of...							
Doing Business	22	28	29	83	120	122	125
Starting a Business	23	74	35	151	65	121	127
Dealing with Construction Permits	19	63	78	176	180	136	108
Employing Workers	163	131	103	111	101	89	121
Registering Property	24	4	77	30	49	105	111
Getting Credit	43	43	12	59	109	28	84
Protecting Investors	53	88	53	88	88	38	70
Paying Taxes	34	57	36	132	134	169	145
Trading Across Borders	5	26	25	48	161	90	92
Enforcing Contracts	30	16	4	18	18	180	100
Closing a Business	58	34	86	62	89	140	127

Source: World Bank 2008

Considering that the ranking consists of 181 countries, the positions of the BRIC countries are generally still quite low. Russia performs well in the ease of starting a new business, registering property and enforcing contracts, but performs rather poorly in credit issues, investment protection and cross-border trading practices. Generally speaking, Eastern Europe performs quite well; the Baltic States, as an example, outperform many western countries. Employing workers is the only area which is relatively easier in Russia than in the Baltic States.

Despite the relatively poor rank of Russia in this comparison, it must be noted that its development goes well in hand with other BRIC countries. Market size and macroeconomic development, among others, are not directly measured in the Ease of Doing Business Index. The index shows, without a doubt, that the business regulations and policies in these countries

are not as straightforward as in most other countries, but in the end, the profitability of new businesses is not really dependent on these issues if the background work is done properly.

3.2 Global competitiveness index

Global Competitiveness Index (GCI) has been composed since 1979 by the World Economic Forum (2008) and it currently includes 134 countries. The reports examine the factors which enable economies to achieve sustained economic growth and long term prosperity.

The World Economic Forum (2008) defines competitiveness as the set of factors that determines the level of productivity in a nation. Return of investments is one of the main factors explaining an economy's growth potential. High return of investments is made possible by high productivity, which results in high income level of the country's citizens.

CGI consists of twelve different pillars which all try to describe one aspect of achieving high competitiveness. The twelve pillars are categorized under three main subcategories (World Economic Forum 2008):

Basic requirements	Efficiency enhancers	Innovation and sophistication factors
• Institutions • Infrastructure • Macroeconomic stability • Health and primary Education	• Higher education and training • Goods market efficiency • Financial market sophistication • Technological readiness • Market size	• Business sophistication • Innovation

The overall index is calculated based on these twelve components, which all include both quantitative and qualitative elements. A scale from one to seven is used when the countries are rated.

The United States has achieved the highest rating (5,74) in this index for the last few years. The USA is closely followed by three European countries: Switzerland, Denmark and Sweden. The highest ranking country in the Ease of Doing Business Index, Singapore, scores highly in this index as well and is positioned 5th. (World Economic Forum 2008)

The BRIC countries are ranked similarly compared to the Ease of Doing Business rating (Table 3). China is the leading country ranked as 30th, follow by India and Russia (50th and 51st respectively). Brazil remains as the last of these four, but its position is still above the

average (64th). The gap between Baltic States and BRIC countries is considerably smaller in this rating; China is already able to outperform the leading Baltic State, Estonia.

Table 3. Global Competitiveness Index (CGI) 2008-2009

Country	2008-2009 rank	Change since 2007	2008-2009 score
China	30	+4	4,70
Estonia	32	-5	4,67
Lithuania	44	-6	4,45
India	50	-2	4,33
Russian Federation	51	+7	4,31
Latvia	54	-9	4,26
Brazil	64	+8	4,13

Source: World Economic Forum 2008

As mentioned in the earlier chapter, the Ease of Doing Business Index didn't directly measure factors like market size and macroeconomic development, which are included in CGI. This is one reason favoring the fast-growing BRIC economies. It's also noticeable that three of the four BRIC countries have considerably improved their position in the ranking, while the tendency for Baltic Countries has been the opposite. It's not unjustified to say that the competitiveness of BRIC countries is improving very rapidly.

While looking deeper behind Russia's pillars, some observations can be made. The most obvious advantages that Russia has are the large market size and very favorable macroeconomic development. However, it has some structural weaknesses which hinder its competitive performance. Government inefficiency (ranked 116th), lack of independence of judiciary (109th) and general concerns about governmental favoritism are factors which considerably lower Russia's total score. Goods and financial markets, along with corporate ethics, are also weaker areas for Russia. (World Economic Forum 2008) In this sense, the results support the results in the Ease of Doing Business ranking. Russia's competitiveness is closely related to its market potential and macroeconomics while the actual business practices and regulations are still a burden.

3.3 Services location index

One of the main trends in the last two decades has been offshoring of services to foreign countries. Especially software programming, call centers and other support services are very commonly operated remotely. Companies in mature markets gain considerable savings by offshoring their functions to cheaper emerging countries where high skill base is often

available at a relatively low price. Eastern Europe and the BRIC countries are examples of such markets.

A consultancy company called A.T Kearney (2008) has published annual reports since 2004 about the attractiveness of different countries for offshoring operations. The 50 most attractive offshoring locations are included in the review and thus it doesn't include countries which don't have any special cost advantages in terms of offshoring. According to the methodology of the study, each country's score is composed of a weighted combination of relative scores on 43 measurements, which are grouped into three categories: financial attractiveness, people and skills availability, and business environment. Financial factors constitute 40% of the overall score and the two other 30% each. Financial attractiveness is rated on a scale from zero to four and the remaining two categories on a scale from zero to three.

Table 4. Services Location Index 2007

Rank	Country	Financial attractiveness	People and skills availability	Business environment	Total score
1	India	3,22	2,34	1,44	7
2	China	2,93	2,25	1,38	6,56
5	Brazil	2,64	1,78	1,47	5,89
15	Estonia	2,44	0,96	2,2	5,6
17	Latvia	2,64	0,91	2	5,56
28	Lithuania	2,6	0,83	1,98	5,42
37	Russia	2,61	1,38	1,16	5,14

Source: A.T. Kearney 2008

Three of the four BRIC countries are among the top five locations for offshoring (Table 4). India is the leading country; it has a very attractive cost structure combined with good availability of qualified personnel. China is the second country and Brazil 5th. Russia is the worst of these four countries and is positioned 37th. Its financial attractiveness is still pretty good, but it suffers from very poor business environment. In addition to the problems mentioned earlier in doing business in Russia, the difficult Russian language is also one additional problem. The cost level in Russia has increased very significantly in the last few years, which doesn't ease its competitiveness problems. However, in general, A.T Kearney believes that these current cheap labor countries will maintain their cost benefit still for fifteen to twenty years. Ireland is an example of a country which has lost its competitiveness due to high level of offshoring, mainly due to increasing costs. It's still included in the list, but it's the last country in the ranking with a financial attractiveness score of 0,40. In the latest report,

A.T Kearney suggests that Estonia is currently a very similar country to Ireland fifteen years ago (A.T Keanrey 2008). This is a very good example of how fast the cost structure can change.

3.4   Corruption and grey economy

Corruption and grey economic activities are ultimately aiming at increasing personal income by breaking the commonly accepted legislative regulations in a society. There is plenty of evidence that democracy is a better system in terms of gaining wealth. Democratic societies are also said to have more transparency in their economies than autocracies. Therefore, corruption is generally a bigger problem in emerging markets than in mature market economies. (Tiusanen 2008, p. 5)

The main idea of communism was the presence of central planning. All productive assets were under the control of the public sector. The small communist elite was responsible for all economic policy making, which was aiming at creating total economic equality between the citizens in a society. The elite used functional agencies as tools for maintaining this equality. The price office was responsible for fixing all retail prices and controlling that the regulations were followed. Gossnab was the bureau concentrating on linking supply and demand administratively, in other words, replacing the free market. Already in the very beginning it became obvious that the communist elite themselves didn't follow the system they created, special favors and compensations became a part of their everyday life. (Tiusanen & Malinen 2006b, p. 4)

Since the prices of all basic commodities were fixed on an artificially low level and supply was very limited, the demand soon permanently exceeded supply. This resulted in new black markets where commodities were traded with truly free market prices. Supply and demand were brought to equilibrium. (Tiusanen 2008, p. 5-6) The role of this parallel black market was essential for communism; without it the curtain wouldn't have stayed up for 70 years in Russia.

Shortages in supply also affected the industries very heavily. Horizontal links between companies were formed: networks of personal relationships where corruption played a major role. In many cases, these activities were based on stealing supplies from the state or smuggling them into the country and then trading them with fair market prices. After a while, these actions were very commonly accepted and even the communist elite, the central force

behind the whole communist ideology, actively took part in black market trading. (Tiusanen & Malinen 2006b, p. 5)

Communist countries, in theory, also provided a big bulk of services for their citizens free of charge. These services included areas like education and health care. The same phenomenon that happened with goods market also happened to services: demand exceeded supply. The services were allocated unevenly based on corruption. Special favors were given often in non-monetary form, e.g. service against counter-service. (Tiusanen 2008, p. 5)

The Corruption Perceptions Index (CPI) is conducted yearly by Transparency International. The index is based on thirteen different data sources originating from eleven different institutions. These thirteen different rankings all measure the overall extent of corruption (frequency and the size of bribes) in the public and political sectors and, as a result, they all provide rankings for individual countries. Then these individual rankings are converted using relevant mathematical methods to make them comparable and finally combined together in the form of CPI. The number of data sources available for individual countries varies slightly, but in practice this has very little effect on the confidence intervals of the combined indexes. The included countries (total 180) are rated on scale from zero to ten. An overall score of five or less indicates that the country has a serious corruption problem. (Transparency International 2008)

In 2008, five countries were able to achieve an average score of nine or higher. The best performing country was Denmark (9,3), followed by New Zealand, Sweden, Signapore and Finland. (Transparency International 2008)

Table 5. Corruption Perceptions Index 2006-2008

CPI	Score	Rank		
Country	2008	2008	2007	2006
Estonia	6,6	27	28	24
Latvia	5	52	51	49
Lithuania	4,6	58	51	46
China	3,6	72	72	70
India	3,4	85	72	70
Brazil	3,5	80	72	70
Russia	2,1	147	143	121

Source: Transparency International 2006-2008

From our observation group, the Baltic States outperformed the BRIC countries (Table 5). The most noticeable thing in this comparison is how far behind Russia is compared to other BRIC countries. In the last three years all of the chosen countries have had somewhat negative development, but Russia's decline has been the worst; it has lost 26 positions in three years. It's not totally clear whether the situation in Russia has actually gotten worse in absolute terms in the last few years, or if the downfall is a result of other countries developing and fighting against corruption more efficiently. Nevertheless, shadow economy and corruption still have a major role in Russia and the country must seek to fight more actively against corruption in order to improve its competitiveness. The legacy of the Soviet way of doing business lies deep in the structures of the nation, but the task is not by any means impossible - many of the former Soviet states are already on the right track.

4 Russian health care sector

The current Russian health care sector has been greatly influenced by its history. The basis for the system was created during Soviet times. After the Soviet regime, the system has been trying to adjust to the present environment. This chapter describes the Soviet history of Russian health care and the connections between present and history. Current organizational structure is presented along with the problems and prospects that the system currently has to cope with. The information in this chapter is gained from secondary sources. In chapter eight these same issues are partially discussed from the point of view of a doctor working in the public health care.

4.1 Soviet legacy

During soviet times, a lot of effort and capital was invested in health care in order to create a centralized, hierarchically organized and wholly government-financed health care system. The head of the system was the Ministry of Health of USSR, which regulated the resource and management allocation through the Ministries of Health in all fifteen Soviet Socialist Republics. The emphasis in health care was put on epidemic diseases and infection control, which led to a creation of massive hospital bed capacity. Primary health care was overlooked, which eventually led the system into troubles. The country was crowded with different kinds of medical specialists and hospital capacity, but as the preventive primary health care was lacking, chronic diseases started to increase. Despite the flaws in the system and corruption in the economy, USSR was still relatively successful in creating an effective health care system which was available to most of the population. (Tragakes 2003, p. 22-25)

After the collapse of Soviet Union, most industries faced reforms and health care was no exception. The biggest change was a transition from a wholly government-financed centralized system to an insurance-based system, which consists of a compulsory social security insurance (OMS) and a supplementary comprehensive insurance (DMS), which everyone can choose and pay independently. However, as the country had no experience in organizing this kind of a system change, the insurance system turned out to be very complex and inefficient and it actually has very little to do with the original model visualized by the reformers. The largest portion of the OMS insurance funding comes from income tax revenues. For unemployed people, the tax fees are compensated from the regional government budgets. However, two major problems exists; insufficient tax revenues and incomplete financing by regional authorities. Considerable portions of the salaries are still paid under the

table, which also means that in practice, the tax revenue income for health care is not high enough. There have also been considerable problems with regional authorities not covering the missing tax revenues for unemployed people; false statistics are used to determine the missing portion. Currently only some 43% of the total government health care expenditure comes through the OMS system; additional channels still have a major role in health care financing (WHO 2007). The differences between regions are substantial. Generally speaking, it can be said that the reforms were left unfinished and, besides the transition to insurances, the flaws that existed in Soviet times still exist today. (Tereshenkov 2008, p. 20-23; Thompson 2006)

4.2   Current structure

To be able to understand the organizational structure of Russian health care, it's first necessary to understand Russian regional division. As of March 2008, the Russian Federation consists of 83 federal subjects. The subjects are equal in federal rights, as they all have two delegates in the Federation Council[1], but their degree of autonomy varies. Federal districts are called with different names depending on their history and autonomy level. There are 21 republics, 47 oblasts, eight krais, one autonomous oblast, five autonomous okrugs and two federal cities (Moscow and St. Petersburg). (Russian Embassy 2008) Since administration of 83 different subjects is relatively difficult, the Russian government has divided the subjects into seven federal districts, which are lead by and envoy appointed by the president. It's important to remember that this is only an administrative measure; federal districts are not constituent units of the Russian Federation.

4.2.1   Public system by the Ministry of Health

Administratively, Russia's health care is divided into three different levels: federal (Ministry of Health and Social Development), regional (federal subjects) and municipal. "Fundamentals of the Russian Federation legislation on citizens' health protection" is part of the Russian constitution and it defines the responsibilities of these three levels. Generally it can be said that "the state is responsible for the regulation and protection of human and citizen rights and freedoms, and the federal and regional levels are to be jointly responsible for the coordination of health care issues." However, the legislation is not able to draw a very clear line how some functions should be administered. (Tragakes et al. 2003, p. 28-30)

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[1] Federation Council is the upper house of the Federal Assembly of Russia (parliament of the Russian Federation)

Federal level consists of the Ministry of Health and Social Development, which is lead by a minister[1] appointed by the prime minister. The main responsibility of this Ministry is to formulate policies and law drafts related to health care and nominally overlook how health care is organized in subjects. However, at present state, the power of a single subject has grown to a state where the Ministry of Health really has very little to say, e.g. in budget planning. The Ministry of Heath receives funding from the Ministry of Finance, which it uses to support different research institutions, the clinical activity of the Russian Academy of Medical Science, medical schools and many other scientific centers. Federal medical facilities form about 4% of the total bed capacity in Russia and the Federal system controls about 5% of the total resources available for health care. Therefore, the role of different subjects is very important. (Tragakes et al. 2003, p. 31-35)

In the regional level, the governments of subjects have considerable powers. Before the transition from government-based financing to partially insurance-based financing, the regional governments were solely responsible for allocating money in regions. As mentioned earlier, currently some 57% of the public financing still comes from government sources other than the local OMS funds. Regional governments must follow the federal programs, but they don't need to report to the Ministry of Health. Some regions are very active in reforming, developing their systems and monitoring the quality of health care while others are not very active at all; big differences in practices exist. Regionally organized health facilities are normally large and aim at serving the whole region. Therefore even 1000 bed hospitals are not uncommon. Besides large hospitals, a regional level also administers many specialized medical institutions for infectious diseases, mental illness etc. (Tragakes et al. 2003, p. 35)

Municipal authorities work independently from the regional and federal level. They have to follow the federal policies, but they don't need to comply with oblast level reforms. Some towns work in close co-operation with regional level while others don't report their activities at all. Municipals arrange many kinds of medical treatment, normally only on smaller scale than regions. There might be only one medical unit or hospital in small towns, while larger towns have more specialized centers. (Tragakes et al. 2003, p. 35) The basic structure of the system can be seen in Figure 4.

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[1] Tatyana Golikova since 24.9.2007 (U.S.-Russia Business Council 2007)
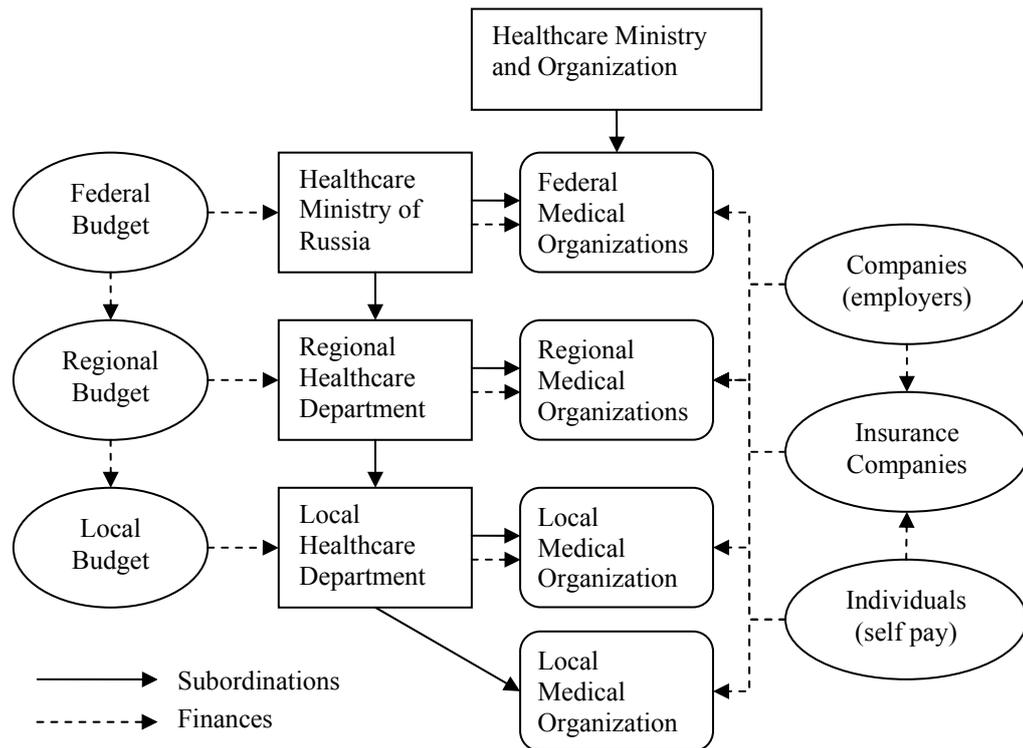
Figure 4. Flow of decision-making responsibilities and finances (Khasanshina 2006)

4.2.2 Parallel public system

The Ministry of health is not the only authority in health care. Other ministries and public companies, which only provide health services for their employees and their families, are also important players in public health care. Ministries like Defense, Railways, Transportation and Interior (in total, twenty ministries) have their own polyclinic networks. Normally these networks are superior in quality compared to standard public health care. The financing comes directly from the Ministry of Finance. Military sector receives financing also from external sources, but the amounts are kept confidential. Fifteen percent of all outpatient facilities and about 6% of inpatient facilities are organized by parallel public system. Even though the access to these services is limited to small groups of people, it's often possible to use these services using "out of the pocket payment" or some additional health insurance, just like with any private institution. (Tragakes et al. 2003, p. 36-37)

4.2.3 Private sector

The first private medical units were established already during Soviet times when President Gorbachev allowed private dentistry clinics in the late 1980's (Wines 2000). Existing medical facilities were excluded from privatization after the collapse of the Soviet Union, but on the

other hand the market was also opened for new players. The share of private medical facilities increased through the 90's, but the real boom didn't start until the beginning of the 21st century. Public units often have two separate roles. They provide treatment for patients covered by the mandatory health insurance, but they also provide excessive services, which are paid directly or through some private health insurance. Even a few years ago, most totally private units were small in size and concentrating on treatment of patients needing specialty care like dentistry, rehabilitation, maternity, etc. In the last few years, more comprehensive medical units have also been established, which offer a full range of services. (Tragakes et al. 2003, p. 41-42)

Fast economic growth is one reason behind the growing demand for private care, but also dissatisfaction with public services. The mandatory health insurance covers treatment only in the patient's home hospital, so people working or living temporary in another city often get an additional health insurance. Private health care institutions and health care insurances, therefore, often go hand in hand. It's not very uncommon that an insurance company owns their own chain of clinics. Since the private sector normally functions totally without the financial help of government, the costs of additional health insurances are quite considerable. This makes sure that only wealthy customers and corporate clients can regularly use private services. There has been a lot of debate going on whether the government should step up and support the private sector more, for example in the form of giving tax reductions to companies who offer social programs for their employees and also for private consumers who don't use any services covered by OMS. (Tereshenkov 2008, p. 23; Tragakes et al. 2003, p. 41-42)

4.3   Problems

The Russian health care sector has clear problems with its organization and resources as well as with the treatment of some special diseases. Of course, these issues are also somewhat related. While looking at the numbers in Table 6, we can see that Russia has a great amount of specialised medical personnel and hospital beds, but the share of general practitioners (primary care) is surprisingly low. The average length of hospital stay indicates the same problems as during Soviet times, primary health care is lacking and co-operation between different specialists and between primary and secondary care is poor. Patients seek specialist care when they can identify the problems already themselves and normally at this point the diseases have gotten to a very difficult state.

Table 6. Indicators of resource use in 2004.

	Russia	EU
Physicians per 100 000 people	484	347
of which general practitioners	23	99
Nurses per 100 000 people	799	731
Hospital beds per 100 000 people	1125	592
Average length of stay in hospitals	14,2	9,5

Source: Thompson 2006

The list of resource related problems is very long. The waiting lines for public care are long, the professional level of medical staff varies greatly, the equipment and supplies are still in many places in poor condition and there are considerable shortages in medicine supply. The salaries paid to doctors in public care are below the levels of private institutions and, therefore, the most talented group of specialists work for private institutions. Efforts have been made to correct this issue, but given the number of doctors that public sector employs, it's very difficult to narrow the gap down on all areas of health care. (Tereshenkov 2008, p. 21)

The most alarming indicator of new problems in current health care in Russia is the average life expectancy, which actually decreased in the 1990's. Life expectancy of a Russian male was 59 years in 2005 while the average number in the European region was 69 years (WHO 2007). While the total life expectancy hasn't really increased much from the lowest numbers in 1990's, life expectancy of patients suffering form chronic diseases has improved (Thompson 2006). Compared to Soviet times the system lost a lot of its subsidy and was forced to become over-effective. This has resulted in deficiency of modern equipment and shortages in many basic supplies, even medicines.

Cardiovascular diseases (CVD) cause more than half of the deaths in Russia (Table 7). Compared to the equivalent per capita figure in Finland, the share of deaths caused by CVDs is threefold, even though Finland's rank in this sense compared to other western countries is fairly moderate. The lifestyle changes in Russian culture are a major reason for the CVD problems and the health care system cannot be held solely responsible. The value indicating the total number of deaths per 100 000 population in Russia is alarmingly high, over double to those of Germany and Finland.

Table 7. Causes of death per 100 000 population by ICD-10 in 2006

	Russia	Estonia	Germany	Finland
Total deaths by all causes	1521	1288,3	776,7	725,1
Deaths by...				
Diseases of circulatory system	860,0	683,8	322,0	291,1
Malignant neoplasm (cancer)	200,0	263,0	217,0	164,4
Diseases of raspiratory system	58,0	36,9	50,7	31,4
Diseases of digestive system	62,0	49,7	41,7	19,2
Infectious and parasitic diseases	27,0	11,1	12,0	5,1
External causes of death	191,0	121,1	34,4	63,7

Sources: Goskomstat 2007, Statistics Finland 2007, Statistics Estonia 2007, Statistisches Bundesamt 2007

HIV infection rates have increased in Russia. Along with HIV, some forms of tuberculosis and hepatitis are common. Lifestyle factors, smoking and especially drinking cause many chronic illnesses as well as sudden accidental deaths. In the beginning of the 21st century, death rates from injuries and poisonings were over 4 times higher in Russia than in Finland, which had at the time the worst rate in EU. (Eberstadt 2005) Since then, the gap has slightly narrowed down and in 2006 the rate of deaths by external causes in Russia was threefold compared to Finland (Table 7).

4.4   Recent reforms and future prospects

The problems with health care have been noticed by the Russian government. The first attempt to make things better took place during Vladimir Putin's first term as an acting president in 2005, but the outcome was a little less than expected. The first change was the possibility to receive social benefits granted for certain groups of people (mainly elderly and disabled) in direct monetary compensation. These benefits are not limited to only medical expenses, but also cover areas like public transportation. By replacing the social benefits with a monetary compensation, the government was seeking to control the social benefit expenditure better. Another important change was an additional 380 billion ruble budget for increasing pensions. The third and the last change was the one which caused a lot of discussion in Russia: clause on additional medical provision (DLO). This clause guaranteed the possibility to receive free medication within an acceptable timeframe. Ironically for benefit receivers, this possibility is already granted through the basic OMS insurance, only in practice the drugstores were continuously short on medicines covered by OMS and patients were forced to buy more expensive brands with their own money. Therefore, the DLO clause received very heavy criticism and in the beginning nothing was changed; the shortages in drug supply remained and the promise of acceptable timeframe was more of a joke. To win back the trust of citizens, the government was forced to review the list of brand names

covered by DLS. New, more expensive foreign brands were included and DLO became a standard part of the social benefit package. (Tereshenkov 2008, p. 20-24)

However, the situation was about to change soon. By the end of the year 2005, already 46% of the benefit receivers had chosen to receive their benefits in direct monetary compensation. The budget for social benefits for the year 2006 was based on these statistics. The total number of benefit receivers increased by 1,5 million people in 2006 and the Russian government was expecting a majority of these people to accept monetary compensation, which was not the case. Furthermore, the doctors and drugstores were very unhappy about the situation; they were forced to buy expensive medicines, give them out to patients, and only hope that the government budget holds and they will receive compensation from government to pay their debts to drug suppliers. The doctors prescribing medicines started their own protest and only prescribed very expensive medicines, which were not covered by DLO or OMS. The list of covered medicines needed to be reviewed again. At the end of 2004, the list of covered medicines included 1861 drug names, in 2005 after the reform the list included 2347 names and at the end of 2006 only 1623 names. In this sense the whole DLO reform can be seen as a big failure; however, compared to the previous OMS coverage, the actual availability of covered drugs has greatly increased and the reform has been successful in this sense. (Tereshenkov 2008, p. 20-24)

In the beginning of 2006, Russia launched a program called "National Priority Program 'Health'". Through this program, the government planned to channel an additional 210 billion rubles to health care between 2006 and 2007. The program had several goals and one very important one was to increase primary physicians' salaries. Two other major investments were building eleven high tech medical units in Russian rural areas and updating diagnostics equipment of polyclinics and outpatient facilities. One concrete example of the effects of the program is the fact that about 70% of the ambulance fleet was revamped with the money granted through this program (Tereshenkov 2008, p. 22). A considerable amount was also given to diagnosis and treatment of HIV, aids and hepatitis. (McAdams 2006, Thompson 2007)

The government also confirmed its healthcare reform priorities until the year 2010. Firstly, it once again aims to re-evaluate the social benefits package. The problems with the DLO clause showed them that more precise planning is needed. The public sector has been lacking resources and hasn't been able to live up to its promises. Since health care expenditure is increasing constantly in absolute terms and also relatively (as percentage of GDP), increasing government financing alone is not enough; systematic analysis should be conducted to see

what the public sector actually can afford. Secondly, transition to insurance based system should be finished. Thirdly, the main focus of health care should be changed from specialist and hospital care to preventive primary care. This could mean that over 80 000 general practitioners (GP) need to be trained. (Thompson 2007)

There have been concerns that the reforms will also have very negative outcomes. It's possible that many specialists and doctors will be laid off and some hospitals will be closed. If primary care starts functioning effectively, the current hospital capacity is far too much for the decreasing population of Russia. Ideally, the government wishes these specialists to get additional training and start working as general practitioners. (McAdams 2006)

5 Telemedicine in Russia

Russia is seen as a potential country for telemedicine for multiple reasons (Khasanshina 2006, p. 753):

1. The availability of diagnostic and treatment options vary greatly between regions and institutions (federal/regional). Most specialist services are only available in larger cities.

2. Russia is by far the largest country in the world and yet its population is only 143 million. Distances between larger cities are very long. Seventy-three percent of the population lives in the urban areas and the rest are scattered into small rural villages all across the country (Goskomstat 2007). Lack of affordable transportation makes traveling difficult.

3. Fast development of broadband connections makes telemedicine applications possible.

Because of the reasons mentioned above, telemedicine utilization in Russia is strongly oriented towards basic video-consultations and remote diagnostics. However, as telemedicine consultations have become more and more common in the last few years and telemedicine has proven to be quite effective, the spread of different telemedicine applications has started to become wider.

5.1 History

History of telemedicine in Russia is very closely linked with space medicine and development of biotelemetric systems. When the Laika dog was sent to space in November 1957, her physiological parameters were closely monitored by scientists on earth. During the era of manned space programs, monitoring the health conditions of cosmonauts was crucial. Therefore, many data collection, transmission and analysis techniques were created. At that time it was all about competition, but later on at the end of the cold war era, the Soviet Union and the US started many space related co-operation programs, which led to encouraging results. Armenians have not yet forgotten the year 1988 when over 50 000 people got killed in a massive earthquake. Back then Armenia was still one of the Soviet Republics. The USSR and the US used their satellites to establish a telemedicine bridge across the ocean, which proved to be very useful in helping the victims in shattered Armenian towns. The same bridge was used a year later when a pipeline exploded in Ufa killing almost 600 people. (Orlov 2005)

The co-operation program was implemented by the Space Biomedical Centre for Training and Research[1] (SBC) and it proved to be the initiative for telemedicine popularization. The SBC, State Scientific Centre and Russian Academy of Medical Sciences (RAMS) decided to start a co-operation program which was aiming to create a federal telemedicine network. For this purpose, a governmental body called Russian Telemedicine Foundation (RTF) was established. Seven Russian ministries were also involved in the RTF along with some large medical, educational and scientific centers. RAMS took interest in RTF and sponsored several telemedicine projects. The best known one is the so called "Moscow to the regions of Russia" network, which is currently the largest network in Russia. However, attempts to create a single federal network under one administrative body failed. Many hospitals started their own telemedicine programs without RTF's supervision. Russian Telemedicine Association was established in 2000. Surprisingly, RAMS, led by Bakulev Research Centre for Cardiovascular Surgery, was the founder of this organization, despite their previous role also behind RTF. That year the Ministry of Health also appointed a Telemedicine Coordinative Board, which was planned to work in co-operation with the Telemedicine Association. It started to look obvious that centrally coordinated network wouldn't be possible and, if a federal network is introduced some day, it will most likely consist of multiple networks run by different organizations, at least if the existing networks are utilized. (Orlov 2005)

5.2 "Moscow to the regions" network

"Moscow to the regions" was one of the very first attempts to create a national telmemedicine network. Of all the networks in Russia these days, it has gotten closest to the goal. The network reaches over 120 remote units in all Russian eleven time zones. The centre of the network is Bakulev Research Centre for Cardiovascular Surgery in Moscow. The idea of the network is to connect medical institutions in Moscow to the large regional hospitals, which serve as hubs for connections to small remote units in each region's municipal units. The Russian Telemedicine Association is the administrator of the network. The role of telemedicine has changed over the years as more and more advanced systems have been implemented. (Orlov 2005; Selkov 2007)

The network started its operation in 1997. For the first five years, it was mainly used for teleconsultations and tele-education between Moscow and some regional hospitals. At the same time, the network was expanding quite rapidly. In 2002, mobile emergency systems were implemented. The dependency of telecommunications was lost in 2005 when the second

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[1] Unit in the Medical Faculty of Moscow State University

generation mobile emergency systems were utilized. These systems use satellite technology and they make mobile diagnostics and data transfer possible basically everywhere. The technology can be brought temporarily even to the smallest villages. Mobile emergency systems were implemented in ambulances and helicopters in 2005. The sizes of mobile telemedical units (MTUs) vary from suitcase sized video-systems to hospital trains and trucks[1]. The development of mobile telemedical units is inherited from space medicine. SBC conducted the clinical tests of a MTU developed by NASA, and an "earthly" version of the innovation was launched soon after. The Telemedicine Association was also actively involved in a multi-national research program called TEMOS[2], which focused on telemedical emergency management in international space stations. (Orlov 2002; Selkov 2007)

Development of home care systems started in 2003 (Selkov 2007). Aging of populations increases the number of people who need constant monitoring. Thanks to modern technology, many people can live at their homes longer before being hospitalized, which greatly improves their quality of life.

5.3   Telemedicine network in Arkhangelsk oblast

Arkhangelsk oblast is located in the Northwest part of Russia. Its land size is about 1,7 times the size of Finland and the population is less than 1,5 million people. The capital of the oblast is Arkhangelsk, which has about 350 000 people living there. Total of 390 000 people live outside the urban areas. (Kudrisjova et al. 2000) Arkhangelsk oblast is one of the rural areas in Russia where basic health care services are not available to everyone due to long distances.

Local hospitals and the Norwegian Centre for Telemedicine[3] (NST) started a telemedicine project, which aimed to utilize information technology for transferring data between medical units in Arkhangelsk. The project received government funding from both countries, mainly from a program called Barents Health Program. The project was started in 1996 and ended in 2001, but the telemedicine network is still active in Russia. The project started from the premise that they would try to create a low cost network using the existing infrastructure, even if it's not totally adequate everywhere. Basically, this meant that consultation would be limited to transferring still images and text data. Internet wasn't available in the region until the beginning of the year 2000 - during the first years data was sent directly between hospitals

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[1] See the webpage of a company called TANA for further details:
http://www.tana.ru/ENG/mtu/index.htm
[2] Project's final report can be found at http://www.egms.de/de/reports/temos2004/TEMOS.pdf
[3] Located at University Hospital of Northern Norway, Tromsø. Most project reports are available at:
http://www.telemed.no/index.php?cat=43156&basecat=43156&find=russia

using terminal dial up connections. After the year 2000, using internet became the norm. Norwegian telemedicine software was utilized. Russian hospitals didn't have any electronic medical records (EMR) at that time, so the applications used were stand alone programs only meant for the purposes of creating, sending and receiving medical data based on demand. (Bye et al. 2007, p. 335-348)

The first telemedicine stations were located in medium sized medical units, which served the populations of 70 0000-110 000 people. These units were connected to the central regional hospital in Arkhangelsk. In 2001, there were total of thirteen stations, three of which were located in medium hospitals, six in central district hospitals and four in very small primary care units in Arkhangelsk. Data transferred includes X-rays, fibrogastroscopy, ultrasound, ECG and, for example, images of wounds, cross sections and blood smears. During the first two years, only a total of 56 consultations were performed, but by the year 2004, the yearly number already reached 250. Teleconsultations had a very positive effect on the local health care. Fifty-one percent of the cases were acute. Correction of treatment was recommended in 70% of the consulted cases and in 97% of the cases no evacuation or transfer was needed. These days, the regional hospital in Arkhangelsk is also connected to the "Moscow to the regions network", so the best possible care in Russia is available even in Arkhangelsk, should it be needed. (Bye et al. 2007, p. 335-348)

5.4   Telemedicine network for tackling child cancer

The St. Petersburg area was considered to be among the highest in Russia in terms of child cancer at the end of 90's. Hospitals were lacking screening systems and most of the cancer cases weren't diagnosed until the disease had advanced to a very serious level. While the survival rate of Leukemia and lymphoma in the USA was over 80%, most patients in Russia didn't survive. A Russian originated non-profit organization called Vishnevskay-Rostropovich Foundation is aiming at improving children's health care all around the world. In 1999 it started a project at the First Municipal Hospital of St. Petersburg to create a telemedicine network with US specialists to tackle the problem with child cancer. (infoDev 2003)

The project started as a high tech project, but eventually the set goals proved to be a little too high. The original plan was to create a browser based EMR, which could be accessed by the Russian doctors as well as their American colleagues. At that time, all patient records in Russia were still on paper and local medical staff wasn't eager to use two separate unsynchronized systems. Creating a new EMR system is a tough enough challenge alone, so

the parties involved decided to abandon the idea and use more traditional means for sending medical data. Most of the MRI scans and other patient data were transferred through email. Co-operation seemed to work very well and, most importantly, the connection turned out to be very cheap to maintain. In the very beginning, it was still difficult to find a reliable internet connection. In the beginning of the decade, the government decided to connect the hospital with a high speed fibre connection and it also decided to create a consultative diagnostic centre in First Municipal Hospital to serve the whole northwest region of Russia. The role of the centre is no longer only restricted to cancer cases, but it covers the whole pediatric care. (infoDev 2003)

5.5   Electronic medical records

Even small and medium sized companies in Russia have started to realize the benefits that different types of IT systems can provide, for example in accounting, billing and enterprise resource planning (ERP). Different types of computer software is also used in health care, but the basic infrastructure, central ERP systems are not yet present.

Some estimates suggest that there are even up to 800 different programs utilized in Russian health care, all created for one special purpose . The age, purpose and standards vary greatly, so literally there is no possibility to integrate these software products together and information exchange between them is normally impossible. The situation is a result of the times when there were no state regulated standards on handling medical information in Russia. Still there is no comprehensive set of standards, but steps have been taken to the right direction and individual standards for example for patient data storing have already been implemented. Before the standards for data protection, transmission and information exchange are created, it's pointless to start creating integrated systems. (CNews Analytics 2007c)

The diversification of systems is slowly disappearing and the health care IT development sector is becoming more and more civilized. The number of companies engaged in development of medical information technologies, has reduced and the market is getting consolidated. In 2002 there were 406 development firms registered in Russia while in 2006 the same number was already only 295. (CNews Analytics 2007c)

The main reasons hindering the implementation of new IT systems in public health care include lack of financial resources, shortage on qualified IT experts in this field (implementation and maintenance), lack of knowledge and skills of medical personnel to use the new systems and uncertainty of the actual economic benefits of implementing new

solutions. Another important aspect is the diversity of different systems available and the lack of comprehensive standards. (CNews Analytics 2007c)

5.6 Future development

The Russian Minister of Communications, Leonid Reiman, told at the InfoCom 2007 exhibition in November about Russia's plans to start a project in 2008 to create a federal communications network between all major hospitals and connect them to internet using high speed lines. Reiman stated that telemedical systems have been actively developed by single hospital networks and different remote units and now as the demand for these systems is higher than ever, it's time to start acting. As an example of successful telemedicine application development hospital trucks were mentioned; there are currently eight trucks in use in Russia, which can be used both in emergencies and also to provide health care to the most inaccessible villages. (CNews 2007a)

Telemedicine in Russia has become one of the main priorities in health care. A large range of telemedicine programs are to be launched in 2008-2009. Through the program "Health" (see p. 37), additional resources were made available for telemedicine development, but more importantly, telemedicine has attracted a considerable amount of private investment. Mikhail Natenzon, the director of TANA, says that the most efficient telemedicine system development is based on a public-private partnership model, where "private business acts as a provider and undertakes all the operations related to the infrastructure creation and telemedicine services provision". Natenzon sees that the main priorities in telemedicine for the year 2008 are 1) establishing a federal communications network, 2) creating telemedicine services for disaster situations, and 3) developing more advanced multi-functional mobile complexes. (CNews 2007b)

Besides the national communications network, Russian Telemedicine Association sees remote e-diagnostic centers as an important development field for the years 2007-2012 (Selkov 2007). These clinics can run considerably more cost-efficiently, when specialist diagnostics is done in larger units based on the data sent from the remote units. This trend follows the general development in Russian health care; specialist services are getting more centralized and the role of general practitioners becomes more important. More focus is placed on the needs of GPs. Home care systems are an important field in this context as they ease the workload of GPs and also work as a preventive measure. (Orlov 2005)

6   Supporting industries

eHealth solutions are made possible using information and communications technologies; they are actually one niche segment of ICT applications. The ICT industry is heavily dependent on intangible know-how; tangible resources of production play a smaller role especially in software engineering. In this section, the ICT sector in Russia is introduced briefly. In terms of eHealth, the most important aspects are to find out the current level of ICT infrastructure in Russia and also the extent of ICT solutions developed in Russia currently.

According to one estimate, the combined revenues of Russia's telecommunication and information technology companies were about 1,1 trillion roubles (some 32 bln euro) in 2006. There was a 20% growth compared to the previous year. Russia's telecommunications market is twice the size of the country's IT market. In 2006, the IT market was worth 386 million roubles (11,1 billion euro) and telecommunications the remaining 21 billion euro. (Cnews Analytics 2007). (ICTRussia 2007)

6.1   Information technology

Cnews Analytics (2008) compose a yearly list of the biggest Russian IT companies in terms of their revenues. The development can be seen in Figure 5. The growth of these companies has been astonishing in the last few years; the total revenues have become almost fourfold, reaching over 14 billion euro (over 500 bln rubles). During the 2001-2007 period, the annual growth rates have been between 30-45% excluding the year 2004, when growth temporary slowed down to only 15%.
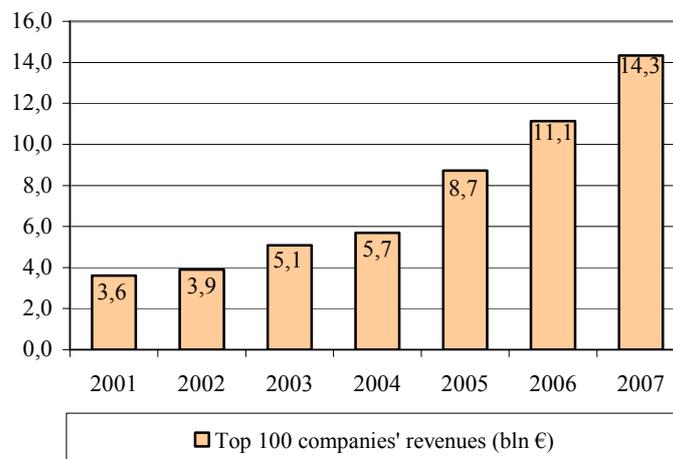
Figure 5. Revenues of top100 companies (CNews Analytics 2006, 2007a, 2008)

Nineteen of the top twenty companies are located in Moscow, which is without a doubt the IT capital of Russia. There are eight companies from St. Petersburg on the top 100 list. If Moscow is excluded from the list, the turnover of companies from St. Petersburg forms about 45% of the total turnover. The biggest ICT companies in the Northwest part of Russia are listed in Table 8.

Table 8. Largest ICT companies in North-West Russia in 2007

Rank in 2007	Company	Field of activity	Turnover in 2007, M EUR	Growth from 2006, %	Number of staff (end of 2007)
1	BCC	Integration	216,6	112 %	811
2	Superwave	Distribution	207,0	164 %	141
3	Nienschanz	Group of companies	204,8	68 %	403
4	Tranzas	Group of companies	136,4	75 %	1124
5	Ramek VS	Hardware	98,1	17 %	412
6	Paladin Invent	Group of companies	70,1	7 %	100
7	GMCS (SPb)	Integration	57,3	242 %	484
8	Exigen Services (former Starsoft)	Software development	45,7	13 %	510
9	Svega-Computer	Distribution	36,0	40 %	117
10	Bercut	Software development	31,0	24 %	387
11	Olly	Integration	27,8	25 %	60
12	Korus Consulting	IT-services	24,8	35 %	576
13	Arctica	Group of companies	22,2	N/A	140
14	Ascon	Software development	19,1	78 %	584
15	Croc (SPb)	Integration	17,3	40 %	N/A

Source: Cnews Analytics 2008a

The development of Russian IT sector is closely linked with the favourable macroeconomic conditions in Russia; the positive development is likely to continue in the next few years. The balance of different IT segments in Russia differs from the western countries. The share of services is still relatively low and there are a lot of IT companies concentrating on hardware. This situation is mainly due to the fact that IT utilization started quite late in Russia and in the last few years many companies have caught up and invested heavily in computers and other IT equipment. However, this phase is coming to its end and the balance is shifting towards creating competitiveness through services. Roughly 80% of the total IT spending in Russia in the year 2000 was generated by hardware sales, while the same number in 2007 was about 55%. The share of services increased from 9,5% to 28% during the same time period.

Software business makes up about 17% of services, while the same figure in 2000 was 10%. However, it should be noted that it's very difficult to divide the market into smaller segments and methodologies differ depending on the source. (Olszynka 2008; Stack 2008)

Table 9. Growth of top 100 companies by business activity

	Growth % 2004-05	Growth % 2005-06	Turnover, 2006 (mln rbl)
Semipublic (multiple)	59,5	60,4	178131
Integration	38,6	15	121341
Software development	21,7	33,2	17801
IT-consulting	12,2	175,6	6113

Source: Cnews Analytics 2007

Software outsourcing activities in Russia have grown rapidly in the last few years. The share of outsourcing of the total IT sector is not higher than 2,5%, but the annual growth between 2006 and 2007 was over 50% (Cnews 2007c). There are multiple reasons why Russia seems like an attractive outsourcing location for foreign companies. Russian workforce is highly educated; about 50% of the total student pool study science, technology or engineering. These fields were ranked very high in the Soviet Union and the education system was developed to produce high quality scientists; the legacy of those times is still present. Moscow and St. Petersburg are geographically only a few hours away from other European metropolises and culture-wise they are also at least as favorable as their Indian or Chinese rivals. Pricing is an important factor in outsourcing; fast economic growth in Russia has increased wage costs dramatically and India and China are generally cheaper. That's why Russia is concentrating on more high-tech outsourcing; it needs to be able to take advantage of its unique talent pool and grab the jobs that Indian or Chinese workers simply can't do as effectively. (Outsourcing-Russia 2007)

Software business in North-West Russia is concentrated on St. Petersburg, just like most other IT activities. The biggest software developing companies in St. Petersburg are listed in Table 10. While looking at the list, it's very visible that many of these companies are concentrating on small market niches. Some of the companies sell the same products to multiple clients, some only perform custom programming based on orders. It's quite obvious that the range of products in Russian software business is very large. In the table below, a company called Starsoft also lists healthcare, pharmaceutical and telecommunication industry members as their customers. The company has recently been merged with a US company called Exigen.

Table 10. Biggest software developers in St. Petersburg

The Company	Specialization
Ascon	Systems SAPR, CAD/CAM/CAE/PDM
Bercut	Solutions for telecommunication operators (billing, Value added services)
Compas	ERP-system " Compas "
LANIT-Terkom	SW for telecommunication, development of the digital equipment and system SW, communication systems, specialized computing and built-in systems.
LETI Engineering center	AIS for gathering and processing of measurement data, systems and program packages of Committee on Energetic and Engineering Support of Saint Petersburg, information system " Thermal power station of Leningrad region", ERP, maintenance of operation and service GAS "Elections"
Monolit-Info	ERP-system "Monolit"
Promt	Translation programs
Spetstek	SW for management of a fixed capital of enterprises in transport, energy, metallurgy, and in other capital-intensive sectors
Tranzas	Electronic cartographical systems, systems of collision prevention, flight and shipping simulators
Expert-Systems	SW for brokers
Arcadia	HRM, business-applications, low level SW, SW for training
Astrosoft	Decisions for work with data of SAP R/3, "mobile office" (the solution organizing and supporting an activity of employees outside the office), authentication tools, etc.
BCC	Custom-made program solutions
DataArt	Custom-made SW for investment funds and technology companies working in the field of the finance, telecommunications, biotechnologies and Internet.
Digital Design	Control systems of businesses, development and integration of applications
Docsvision	Systems of document circulation
Reksoft	The basic technological expertise: NET, J2EE, EMC, Documentum, Microsoft Office SharePoint, BMC Remedy ARS, SAP R/3.
Speech Technology Center	Speech synthesis technologies
Starsoft (now the part of Exigen Group)	Specialized business-applications and corporate portals for public health services, telecommunications, financial sector. Low level and system programming.

Source: Cnews Analystics 2007b

In March 2006, the Russian government started a program to create multiple IT technoparks in Russia. A technopark is an area of residential and industrial buildings, built near a large educational or scientific institution. The idea of technoparks is to create small IT clusters, where companies can work more efficiently in close co-operation with other related companies. The Russian government has announced that it aims to finish eight parks by 2012.

In February 2008, two technoparks were being built in Russia, one in Novosibirsk (West-Siberia) and in the Republic of Tatarstan (Volga region). Later this year, four other construction projects will be started. Plans for 2009 include a park in St. Petersburg and Moscow areas. Government is expecting to spend around 800-900 million euros on these projects, which is around 15% of the total construction costs. Private investments are expected to exceed 4 billion euros. (RIA Novosti 2008)

Considering that the size of the whole IT sector in Russia in 2007 was around 12 billion euro, the investments are quite impressive. When the project was launched in 2006, it was estimated that the parks would employ around 75 000 people and the production and services of the parks would reach over 3 billion euro by 2011 (Silicon Taiga 2007). However, it must be noted that this estimate was made in the beginning of 2007 when the actual building schedule wasn't yet finished.

6.2   Telecommunications

Telecommunications market in Russia is still relatively young, but it offers great potential. It's the biggest market in Central and Eastern Europe both in value and in terms of users in mobile, fixed-line and internet segments. In absolute terms the telecommunications segment was the third largest in the world in 2006, right after USA and China. (ICTRussia 2007) The top fifteen telecommunications providers in Russia are listed in Table 11. Largest telecommunications companies in Russia in 2007. The turnover figures of the top five companies, reaching billions of euros, are quite impressive; however, it must be noted that for example Svyazinvest is a holding company, which consists of many other smaller companies.
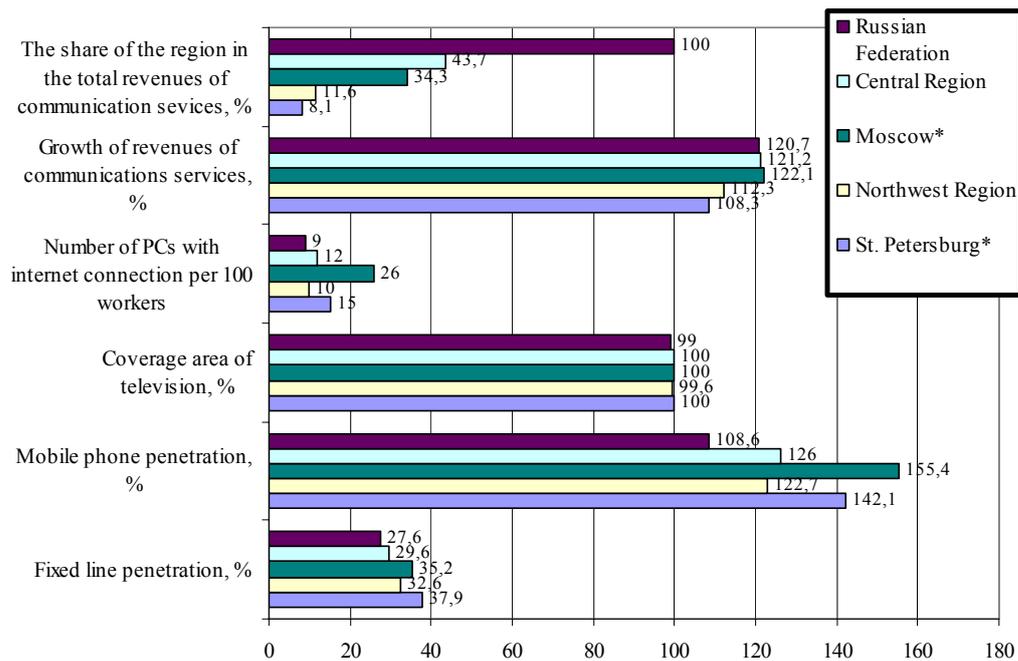
Table 11. Largest telecommunications companies in Russia in 2007

Rank in 2007	Company	Primary business	Turnover in 2007, M EUR	Growth 2007/2006
1	Svyazinvest	Fixed-line communication	6 789,8	12,00 %
2	MTS	Mobile communication	5 859,3	21,70 %
3	VimpelCom	Mobile communication	5 091,8	37,70 %
4	Megaphone *	Mobile communication	4 061,4	44,30 %
5	Comstar OTS *	Fixed-line communication	1 109,4	31,30 %
6	Golden Telecom *	Fixed-line communication	916,0	42,10 %
7	Inter-regional Tranzittelekom Company	Fixed-line communication	767,6	119,20 %
8	TransTeleKom	Fixed-line communication	389,0	10,20 %
9	Sinterra	Fixed-line communication	359,3	129,60 %
10	GK "Renova-media" **	Internet connection, cable TV	220,1	46 %
11	Sky Link *	Mobile communication	213,0	22,40 %
12	GK SMARTS *	Mobile communication	211,5	21,10 %
13	National telecommunications *	Internet connections, cable TV	153,3	63,80 %
14	Bashinformsvyaz *	Fixed-line communication	138,9	15,10 %
15	Tattelekom *	Fixed-line communication	138,5	30,60 %

* Preliminary   **Cnews estimate
Source: Cnews Analytics 2008b

Fixed-line networks in Russia are in good condition in widely populated areas; the regional capitals have modern digital infrastructures. However, since the country is very large and small villages exist all around the rural areas, fixed line networks don't reach the whole population or the systems are very outdated. (CIA World Factbook 2008) Estimates still suggest that the fixed line density is about to slowly grow in the coming years (ITC Market Overview 2007). Obviously, mobile communications cannot yet substitute fixed-lines in many places. In comparison, the fixed line density in Finland was around 55 per 100 people throughout the 1990's, but had decreased to 36 connections by 2006 (Statistics Finland 2007). The fixed line penetration rate in Russia was about 28 per 100 people in 2007, while Moscow and St. Petersburg exceeded this number by almost 10 connections (Figure 6). The largest telecommunication company, Svyazinvest, is an important player in fixed-line market. It has majority shares in multiple service providers; the providers make up about 70% of the all fixed line connections provided for their customers. The largest company owned by Svyazinvest is Rostelecom, which had the turnover of about 1,74 billion euros in 2007 (some 25% of the turnover of Svyazinvest). Other important fast growing companies belonging to Svyazinvest are VolgaTelecom, SibirTelecom and SZT. SZT is the largest fixed line provider in St. Petersburg area. The Russian State owns about 75% of Svyazinvest. (Cnews Analytics 2008b; Svyazinvest 2007)
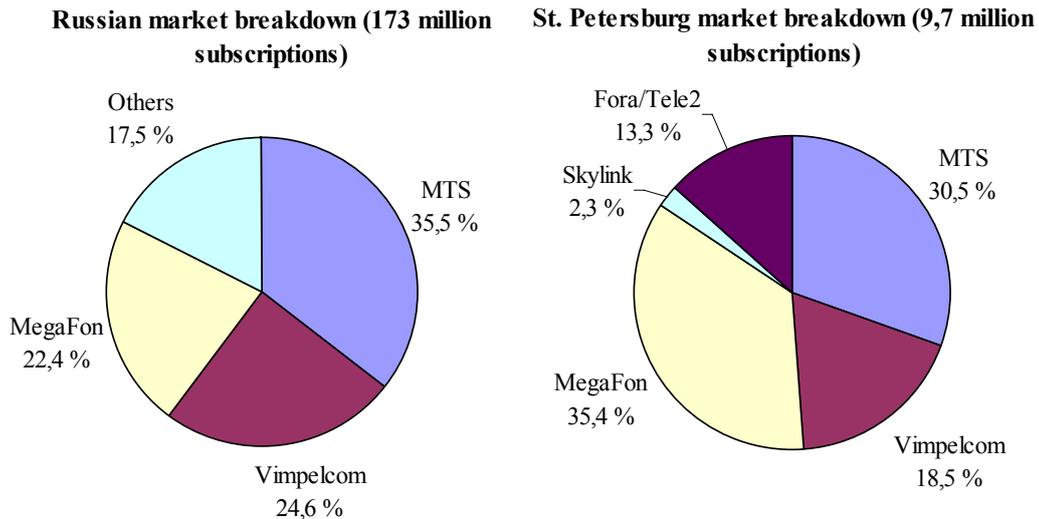
The share of the region in the total revenues of communication sevices, %
Growth of revenues of communications services, %
Number of PCs with internet connection per 100 workers
Coverage area of television, %
Mobile phone penetration, %
Fixed line penetration, %

Legend: Russian Federation · Central Region · Moscow* · Northwest Region · St. Petersburg*

*Moscow belongs to Central region and St. Petersburg to Northwest region

Figure 6. Some infrastructure indicators in Russia in 2007 (Cnews Analytics 2008b)

Mobile phone penetration in Russia is currently over 100 (Figure 6), which theoretically means that everyone in Russia has a mobile phone. In reality, the situation is not that clear, since statistics often make no difference between active and inactive subscriptions. In practice, there are still plenty of people who don't actually own a cell phone. (ICTRussia 2007) Nevertheless, cell phone penetration in Russia is quite high; in comparison, the mobile phone penetration in Finland broke the 100 level in 2005 for the first time (Reiss 2006). The situation is very much different between large cities and other regions. The latest reports suggest, as if since July 2008 the mobile phone penetration rate in Moscow has already reached the level of 170 and St. Petersburg has already broken the level of 150 subscriptions per 100 people, which partially also proves that in the rural areas the penetration rate is still under 100 (AC&M 2008).

There are three large mobile phone operators present in Russia; MTS, Vimpelcom and Megafon. Competition between the operators has always been fierce. Currently, MTS is the largest company in the market, followed by Vimpelcom. In the St. Petersburg area, however, Megafon has the largest customer base (Figure 7).

Russian market breakdown (173 million subscriptions)

St. Petersburg market breakdown (9,7 million subscriptions)

Others
17,5 %

MTS
35,5 %

MegaFon
22,4 %

Vimpelcom
24,6 %

Fora/Tele2
13,3 %

Skylink
2,3 %

MTS
30,5 %

MegaFon
35,4 %

Vimpelcom
18,5 %

**Figure 7. Mobile operator market breakdown in July 2008 (AC&M 2008)**

The focus in mobile communications is shifting towards creating new mobile services. Even though the mobile penetration will eventually show signs of slowing down, there is a whole new service market waiting, which is still relatively young. The launch of 3G networks in Russia was delayed multiple times due to license disputes and bureaucracy, but finally in October 2007, Megafon launched Russia's first 3G network in St. Petersburg (MegaFon 2007). MTS and Vimpelcom rolled out their networks in mid-2008 (Mobile Content Russia 2008).

The number of broadband internet connections is still relatively modest, but there has been very fast growth in the last few years. Fixed broadband connections grew 42% in 2006 and wireless ones 61%. Growth of broadband connections was faster in the regions than in Moscow and St. Petersburg, which probably just illustrates that broadband penetration in Moscow and St. Petersburg is already very high. Estimates suggest that currently about 35 million people (25 %) use internet regularly and about 5 million households (10%) have a broadband access at their homes (Solonin 2008). There are many service providers for broadband connections depending on the area. Fixed broadband technologies available include xDSL, Ethernet and cable TV. In addition to fixed connections, 3 different types of wireless connections are available: 3G, WiFi and WiMax. WiMax is an interesting technology, as it's more adequate for large distances than traditional WiFI. In many areas where poor fixed phone lines can barely support the strain from voice services, WiMax technology provides an alternative approach for data services. (Mäntyranta 2007)

In the beginning of 2007, the Russian Deputy Prime Minister Sergei Ivanov promised that 50% of Russians will have a PC and internet access by 2010. *"The government will make*

efforts to provide the necessary infrastructure for Internet connections. After the implementation of a state program, there will not be a single town or village left in Russia by 2015 where it will be impossible to install fixed phones, use mobile phones and access the Internet." (Khmelev 2007)

However, experts didn't really take Ivanov's words too seriously. This kind of a project would require investments, which cannot be estimated even roughly at this point. Government would have to spend billions of dollars just to be able to provide basic communications to schools and hospitals in all rural villages. It was also questioned whether these actions are even necessary. Government maintains and finances most of the fixed line infrastructure. However, in mobile communications, the country almost has nationwide network coverage, which has been funded mostly by private companies. Therefore, it could be possible that private companies could create similar or better communications infrastructure than the government. It must also be noted that internet connections are already available basically everywhere in Russia (through satellite), it's just a matter of need and affordability. (Khmelev 2007) Federal and regional government spending on ICT can be seen in Figure 8. Government spending on ICT has increased very fast in the last few years. However, it must be noted that this figure only includes the public investments and the actual implemented budget could differ from the planned one.
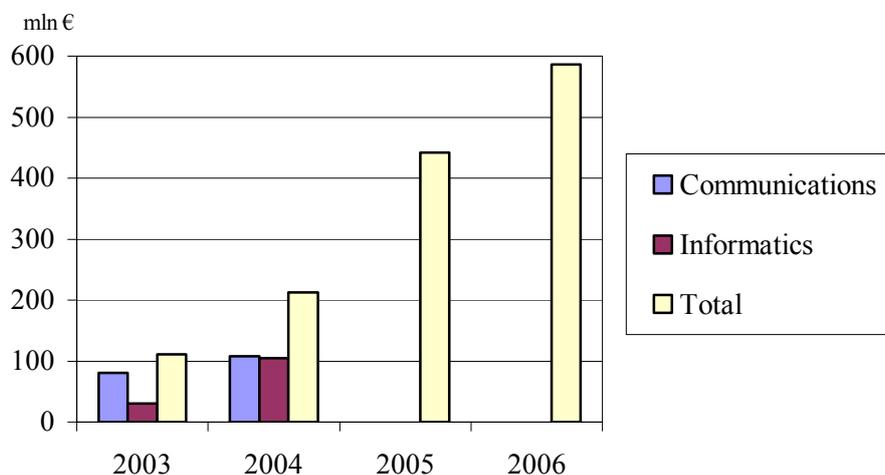

Figure 8. Total planned budget (federal and regional) on ICT (Federal Treasury 2004-2007)

7 Demand conditions

In this chapter, the demand conditions in Russia are analyzed on a general level, from the point of view of the total expenditure on health care. Some opinions about telemedicine specific application utilization possibilities will be presented in the eighth chapter of the study based on interviews held in St. Petersburg. However, given the role of this study in the research project, analyzing the general development of the demand of health care services is seen as more important at this stage.

7.1 Health care expenditure

As mentioned in earlier chapters, health care suffered from the collapse of the Soviet Union and financing addressed to health care decreased dramatically. However, in the last few years the recovery process has been very fast and likely to remain positive in the coming years. The development of health care expenditure in the last ten years can be seen in Figure 9. Besides the years after the monetary crisis in Russia in 1998, the growth rate of health care expenditure has been quite impressive. However, health care expenditure per capita reflects a big difference between the role and quality of health care in Russia and Finland. These figures respectively were 638 dollars and 2472 dollars per capita.
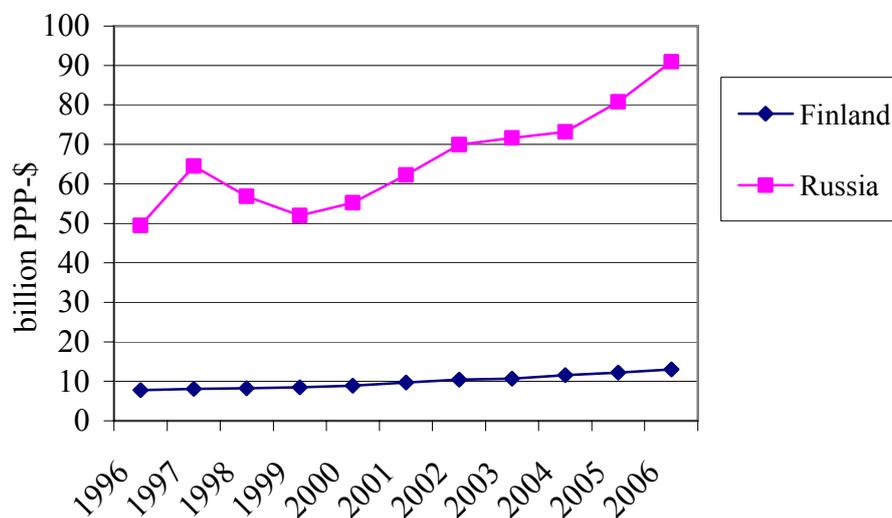
Figure 9. Total Expenditure on Health (THE) in Russia and Finland 1996-2006. (WHO 2008)

Table 12. Health expenditure division in Russia in 2006

	1996	2002	2003	2004	2005	2006
Private sector expenditure on health (PvtHE) as % of the total expenditure	31,8	41,0	41,2	40,4	38,0	36,8
Private households' out-of-pocket payment as % of PvtHE	*(54)*	*(75)*	*(79)*	*(82)*	*(82)*	*(81)*
Prepaid and risk-pooling plans as % of PvtHE	*(6)*	*(10)*	*(10)*	*(9)*	*(8)*	*(10)*
Others as % of PvtHE	*(40)*	*(15)*	*(11)*	*(9)*	*(10)*	*(9)*
Government expenditure on health (GGHE) as % of the total expenditure	68,2	59,0	58,8	59,6	62,0	63,2
Social security funds as % of GGHE	*(35)*	*(40)*	*(39)*	*(39)*	*(42)*	*(42)*
Others as % of GGHE	*(65)*	*(60)*	*(61)*	*(61)*	*(58)*	*(58)*

Source: WHO 2008

The share of government expenditure of the total health care expenditure was 63% in 2006 (Table 12). In contrast, the same figure in Finland was 79%. (WHO 2007) The quality gap between public and private sector is wider in Russia than in Finland, which is one reason behind the difference. Whereas the public sector is often lacking financing and struggling to provide even the most basic services, private sector spends more since their competitiveness is very closely dependent on the quality of care that they can provide for their wealthy customers. Considering the different patients volumes of public and private institutions, it's quite obvious that the total spending per patient is considerably higher in private institutions.

A competitiveness analysis of the Finnish health care cluster conducted by the Research Institute of the Finnish Economy (Rouvinen et al. 1995, p. 94) found four basic and universal reasons why the total health care expenditure is likely to grow in the future, a) technology development makes more advanced health care solutions possible, b) commonly accepted principle of every person's equal right to health care, c) demand caused by the growing living standard, d) change in the population's age structure.

7.1.1 Insurances

Estimating the role of insurance companies is somewhat difficult due to the commonly used division to life and non-life insurances. These two groups are often used in insurance market analysis and together they form the whole insurance market – health insurances constitute only a very small portion. The private expenditure in 2006 constituted about 37% of the whole expenditure on health. To be able to estimate the importance of insurance companies, it's necessary to look how the private expenditure is divided (Table 12). In 2006 prepaid insurance policies made up about 10% of the whole private expenditure, while out-of-the-pocket expenditure was 81%. This shows that the role of non-governmental health insurance

companies is not very important in Russia; people mainly use public services under the mandatory OMS health insurance policy or pay the costs not covered by the mandatory insurance directly. Even though the relative share of insurances in private expenditure hasn't really changed much during the years, the absolute monetary contribution of insurance companies has become over fourfold, mainly due to the growth of the total expenditure on health.

7.1.2   Macro-economic perspective

The growth of the living standard is very closely linked with the growth of health expenditure. Private health care systems benefit most when the general living standard increases. The relative share of basic necessities (e.g. food) of the total consumer spending decreases while the total income of a single consumer increases. Public sector normally reacts slower to changes in national economy. If public sector adopts some new innovation or service, it's very difficult - due to public pressure - to give up this service if economy suffers a slump. Private sector can adjust more easily to changes in economic situation. (Rouvinen et al. 1995, p. 95)

The most common way to measure living standard is to examine changes in gross domestic product (GDP). However, some things need to be taken into account before any comparisons can be made (Tiusanen 2006, p. 26)

1. All GDPs must be converted into single currency, normally USD or euro.
2. Conversion must be made using the purchasing power parity (PPP) fixed exchange rates.

Because of the imperfections in exchange markets, many currencies are over or undervalued. In most developing countries, including Russia and other transitional economies, currencies are undervalued. This means that it's possible to buy more products in these countries with the same amount of money (e.g. EUR 100) than inside the euro zone. The difference between nominal exchange rate and real exchange rate is marked with a coefficient called ERDI. It has been noticed that while economies grow and become more developed, ERDI decreases (undervaluation disappears). ERDI value between the Euro and the Russian Rouble was about 1,79 in 2006. The undervaluation of Russian rouble has decreased quite fast in the last few years and Russia is rapidly loosing its price competitiveness. In 2002 the ERDI value of Russian rouble was still 2,78. (Tiusanen 2006a, p. 26; Tiusanen 2007, p. 22)

Table 13. GDP per capita, 2007 (Euros)

	A (at official EX)	B (PPP adj.)	ERDI (B/A)
Bulgaria	3.740	9.390	2,51
Czech R.	12.349	20.080	1,63
Hungary	10.130	15.870	1,57
Poland	8.026	13.470	1,68
Romania	5.486	10.140	1,85
Slovakia	10.147	16.740	1,65
Slovenia	16.542	22.330	1,35
Estonia	11.539	17.680	1,53
Latvia	8.816	14.540	1,65
Lithuania	8.296	15.000	1,81
Russia	6.642	12.320	1,85
EU (15)	27.738		

Source: Tiusanen 2008b, p. 25 (source data from WIIW)

In Table 13, the column A represents the nominal living standard and column B represents the actual "real" living standard. The figures in A and B ought to be identical. "In that case all official exchange rates would correctly reflect price levels in the countries involved. One to one relationship is equilibrium ER. It is also said that ER is in parity when A equals B". (Tiusanen 2008b, p. 25)

Due to undervaluation, the actual purchasing power of currencies in the countries listed in Table 13 is higher than their nominal value. The PPP adjusted GDP figures show that Russia's living standard was still quite modest in 2007; about 45% of the European Union average and about 55% of the living standard in the most developed transitional economy, Slovenia. However, the graph in Figure 10 shows that Russia's GDP has been growing very fast in the last few years. The real annual growth rate has constantly been between 6 and 7% (WIIW 2007) while the same number in EU25 has varied between 1 and 3% (Eurostat 2008).
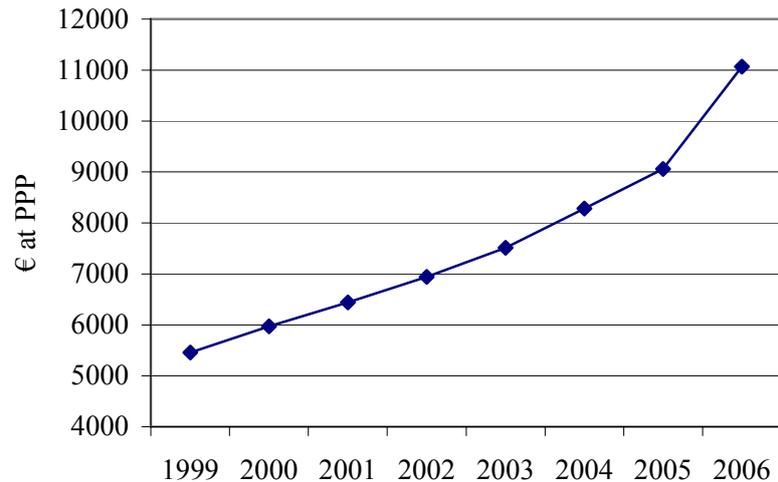
Figure 10. GDP per capita in Russia, 1999-2006 (WIIW 2007)

Russia's economy is heavily export driven. Its primary exports, oil and gas, are the driving forces behind the fast growth. As world's oil reserves are diminishing and demand is continuously growing, Russian economy will benefit greatly and the positive trend will continue. Table 14 shows Russia's current account (CA) development. The country has been able to achieve a current account surplus every year. The relative share of the surplus has stayed the same, which means that it has grown at the same rate with Russia's GDP.

Table 14. Russia's current account, 2002-2006

	2002	2003	2004	2005	2006
Current Account (EUR mn)	30788	31329	47868	67851	76463
% of GDP	8,4	8,2	10,1	11,1	9,7

Source: WIIW 2007

It's important to remember that wealth is distributed very unevenly in Russia between people and geographic regions. The richest 10% of the population controlled over 30% of the total Russia's income in 2007, while the poorest 10% accounted only for 1,9 % (CIA World Factbook 2008). Regional differences in living standard and income levels in North West District (NWD) are shown in Table 15. Average income level and gross regional product (GRP) of NWD is higher than the Russian average. It might seem a little surprising that St. Petersburg is not among the highest regions in terms of GRP. This is due to the fact that many regions in North West District are large in size and their population density is very low[1]. These regions also control considerable amounts of natural resources (minerals, wood, fuels), which attract industries. As a whole, St. Petersburg makes up about 37% of the NWD's GRP. The very small autonomous area of Nenetsky is an oddity in the NWD as it happens to sit on

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[1] In Komi 2,3 people per square km (St. Petersburg 3265 people)

a very large gas and oil bed. The poorest of the regions in NWD is Pskow, which only has the living standard of about 45% of the Russian average. It is also important to remember how considerable of an effect Moscow has on the whole Russian economy. Its GRP and income levels are threefold compared to the average. Even though all other seventeen regions in Central Federal District have GRP and income index values below the base value, the total index values of the district are 131 and 138 respectively. While looking at the situation nationwide, multiple regions only have the living standard and income levels of about 30-50% of the average. The lowest living standard indexes belong to the Republics of Ingushetia (index 12) and Chechenia (16), but these numbers are not really comparable due to the prolonged wars between Chechen separatists and Russians.

Table 15. Economic indicators of regions in North West District, 2006 (index 100 = Russia)

	Population (thousands)	GRP per capita	Income per capita
Russian Federation	**142221**	**100**	**100**
North West Federal District	**13550.0**	**106**	**107**
Nenetsky autonomous area	42.0	839	249
Republic of Komi	974.6	140	133
Murmansk region	857.0	131	124
Vologda region	1227.8	125	82
Saint-Petersburg	4571.2	115	137
Arkhangelsk region	1280.2	105	95
Leningrad region	1637.7	102	81
Republic of Karelia	693.1	87	85
Novgorod region	657.6	73	77
Kaliningrad region	937.4	68	87
Pskov region	713.4	45	64
Moscow	10442.7	303	298

Source: Goskomstat 2007

In Russia's case, it's very noticeable that health expenditure and living standard go hand in hand. The collapse of the Soviet Union caused a severe economic slump and Russia's economy declined over 40% between 1991 and 1996 (Tiusanen 2003, p. 11). Serious recovery started after the monetary crisis in 1998, the same way as it also happened to health expenditure.

7.1.3   Population demographics

Probably the most important single factor globally in the last few years for increasing health expenditure has been the aging of populations. The results of the post World War II baby boom are now visible, when this generation is reaching the retirement age. In a country like Finland, people over 65 years old consume over 50% of the total health expenditure and the national health care system must be able to take care of all its members. Life expectancy increases along with living standard, which is another important reason for the change in age structure. (Rouvinen et al. 1995, p. 95)

Russian demographics differ slightly from many other countries. Generally the population is getting older, but the reasons are slightly more complex than just a baby boom. The total population of Russia is on decline (Table 16). According to the US Census Bureau (2008), the total population of Russia was about 148 million in 1991, while in 2007 the number was about 141 million. Estimates for the next 20 years predict that decline will continue and in 2025 the total population could be down to 128 million. Annual population loss has been constantly over 500 000 people in the last ten years.

The trend of Russian men dying too young was already discussed earlier. More important reason behind population decline is the unbalance between births and deaths in Russia. Rather ironically, it can be said that the birth rate in Russia has fallen to the level of the developed countries (decreased) while death rate has remained at the level of the developing countries. The fertility rate was 1,4 births per woman in 2007 and deaths exceeded births by nearly 700 000. The worst is probably already behind; in 1999 the birth rate was only 1,17 (Eberstadt 2005). In comparison, the birth rate in Finland at the time was 1,7 births per woman and births exceeded deaths by 2000. It should also be noted that the net migration to Russia has declined since the beginning of 1990's and it cannot solve Russia's population problem. (US Census Bureau 2008)

Table 16. Russian population demographics

Per 1000 population	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Births	9	9,7	10,2	10,4	10,2	10,4
Deaths	15,6	16,2	16,4	16	16,1	15,2
Net (births - deaths)	-6,6	-6,5	-6,4	-5,6	-5,9	-4,8
In thousands						
Net (births - deaths)	-943,3	-935,3	-888,5	-792,9	-846,5	-689,5
Net migration	278,5	230,8	93,1	98,9	125,9	128,3
Population growth	-654,3	-685,7	-795,4	-694	-720,7	-561,2

Source: Statistics Finland 2007

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The average life expectancy of Russians will get higher in the future, but the change takes time. Russian women are not very far from the western levels of life expectancy. If lifestyle changes and medical practices can tackle the problems with cardiovascular diseases, Russian life expectancy will slowly catch up with the western levels (US Census Bureau 2007). The population pyramid in 1990 and an estimate for 2015 is shown in Figure 11. US Census Bureau has based the 2015 figure on the assumption that Russian population will continue to decrease at current speed. As 2015 is already relatively close, the estimate is probably quite accurate.
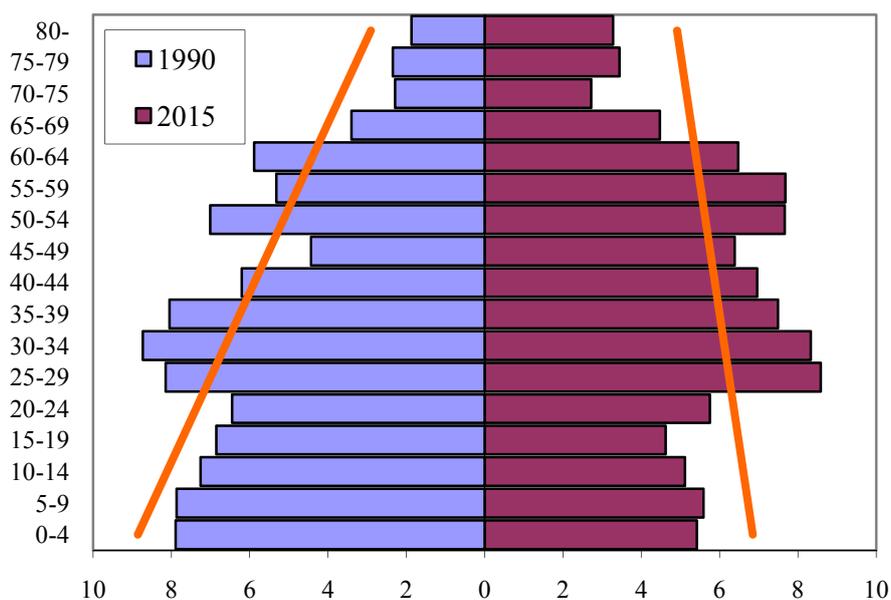
Figure 11. Population pyramid in Russia (both genders) in 1990 and 2015 (US Census Bureau 2007)

8 Examples and insights of health care providers

In order to gain more insight views on the Russian health care, two medical institutions are introduced in greater detail in this chapter. The professionals working in these institutions have been very kind and provided information about their clinic and shared their thoughts about the current state of Russian health care. MEDEM is a privately owned high class clinic in St. Petersburg. I was fortunate to be able to visit the clinic with some of my colleagues. Sales and marketing specialist Pavel Tyulkin gave us a tour of the MEDEM facilities and answered our questions. We were also able to meet the Medical Director, Professor Alexander Strelnikov, who also told us about the medical centre.

Medical Centre Delor is a chain of clinics mainly serving the State University of St. Petersburg. The General Director, Professor Larisa Kochorova, is an expert in the public health care services in Russia. I have been able to meet Prof. Kochorova twice and discuss the health care issues, both from her clinics' point of view and in Russia in general.

8.1 International Clinic & Hospital MEDEM

MEDEM is a private medical institution, which provides both in-patient and out-patient services for its customers in the heart of St. Petersburg. The clinic was established in 1999. In the beginning, it operated under the name International Clinic. The role of the clinic has changed dramatically over the years. At first, it consisted of three examination rooms and employed five people. The original mission of the clinic was to provide health care services especially for the needs of foreigners in St. Petersburg. In 2004, the clinic moved to a new location and the facilities were completely renovated almost from scratch to match the needs of a growing full range multidisciplinary medical facility. The current facilities provide 7500 square meters of space and the clinic facilities are spread over six different floors. The services offered by the clinic were naturally expanded dramatically. These days the clinic offers over 2500 different medical services in 77 licensed areas of medicine. The current number of staff is over 300, most of the professionals have received qualifications in medicine abroad.

8.1.1 Services

Marketing and Sales Specialist Pavel Tyulkin has been working in MEDEM for the last five years, the time that the institute has been operating in its current scale. The basic sphere of services covers quite thoroughly all fields of medicine from diagnostics, treatment and

surgery also to rehabilitation. Diagnostics can be conducted by general practitioners as well as specialist in multiple fields. As what has been discussed earlier about the unbalance between preventive care and specialist care, Mr Tyulkin can confirm the same fact. However, family doctor services are available at MEDEM and they are demanded probably more than in public health care.

MEDEM has a large laboratory, which operates 24/7, so there are no delays in analysis. It's possible to get almost any kind of a sample analyzed; express-HIV testing is conducted among others. Diagnostics and treatment rooms are equipped with personal computers that are connected to internet and the local patient records. Generally speaking, all the basic diagnostics and treatment equipment used in the facility is modern and up to date – the state-of-the-art dentistry equipment and the new MRI department are great examples of top-level equipment utilized in the clinic.

The clinic has three separate surgery rooms which are also available 24 hours a day and equipped with modern laminar air flow system to ensure very high sterility levels. Surgical operations are carried out from standard small operations to more challenging trauma cases; only very difficult operations such as open-heart surgeries as well as neurological brain operations are not conducted in the facility.

The in-patient department consists of 30 single patient rooms, a day treatment centre for 5 people and six intensive care rooms. Day-treatment rooms are used in cases where long hospitalization is not needed and the patient doesn't require constant monitoring. The basic in-patient wards have very much a hotel like feeling to them, which is very intentional. The rooms are equipped with private bathrooms, satellite TV, internet access, couch and also, in most cases, a small kitchen. The hospital wishes to provide their patients the best comfort available. Nevertheless, it is a hospital and not a hotel, so the rooms are also equipped with alarm buttons for nurses and centralized oxygen supply system. The intensive care chambers are equipped with the most modern technology utilized in St. Petersburg.

The emergency unit at MEDEM is naturally operating 24 hours a day. The clinic has three well equipped ambulances of its own and also contracts with other private and public ambulance services. On an average day, the hospital deals with some fifteen to twenty cases where ambulance service is required.

8.1.2 Customers

The original mission of the clinic is still visible in its operation these days. The International Clinic was specializing in foreign customers - still about 15% of customers are foreigners. As a whole, the clinic treats some 250 patients daily. The Russian customers are generally quite wealthy or famous people. Mr. Tyulkin confirms my earlier observations of the role of medical insurances in Russia. Average people cannot afford to buy individual additional health insurances and are, therefore, limited to using public facilities functioning under the OMS policy or perhaps some other lower quality private institutions. Some 10-15% of the total customers are corporate clients, a share which is becoming more and more important for MEDEM. The list of corporate clients includes many western companies such as IKEA, Philip Morris, Neste and Skanska. In addition to the corporate clients, many of the foreign consulates located in St. Petersburg are also clients of MEDEM.

The clinic has direct billing contracts with most western insurance companies - normal tourist accident cases are very common. The relatively long nine year experience in dealing with foreign customers have put the clinic into a position where their insurance processing functions are probably the most effective and also most convenient for patients. In addition to the obvious language problems, some public institutions have no experience with insurance claims and customers are personally forced to claim a refund afterwards.

8.1.3 Telemedicine

The electronic medical record utilized at MEDEM is relatively old and has been utilized in the clinic for a very long time. Originally, this French system was designed for small private clinics to control all the basic patient data. Currently, the system at MEDEM holds about 50 000 case histories and it is slightly insufficient for the scope of activities provided by MEDEM. There have been some plans to renew the whole system, but no concrete actions regarding the change have been taken. The system requires regular updates to keep it up and functional. The situation at MEDEM seems to be very similar to the general role of EPR systems in health care in Russia. Comprehensive medical resource planning systems are not yet in use, but multiple individual programs are utilized. In addition to earlier discussed lack of standardization in terms of medical data transmission and protection, Mr. Tyulkin also raises up another issue: in Russia the medical data gathered always remains as the property of the medical institution rather than the patient, and, thus, each institution can decide individually whether and how it wants to share any of the information with other competing institutions. The modern equipment utilized at MEDEM will, however, make the

implementation of more comprehensive systems easy. For example, an X-ray scanner utilized stores the images digitally on a central server; currently the server simply cannot be integrated to the existing patient data system. Separate program is used to fetch the x-ray images from the server and then these images can be included in the EPR system. Despite the fact that the EPR system used at MEDEM has its limitations, on a Russian scale the system is still very advanced.

The ambulance equipment used at MEDEM doesn't include any technologies for automatically sending patient data to the hospital in advance. In urgent cases, communications can be conducted utilizing standard phone calls. The surgery rooms include equipment for arranging video consultations between separate locations. However, the General Director, Alexander Strelnikov, states that the actual utilization rate of this system has been lower than he had expected.

Mr. Strelnikov sees that elderly care and home care are currently becoming more and more important and the market for these types of solutions exists. The customer base of MEDEM includes elderly people and also people with chronic diseases, who have come to the clinic already for years to receive treatment. Even though the clinic deals with many types of one-time accident cases, the number of long lasting customer relationships is still quite high. Since governmental institutions are constantly short on financial resources, this market can be more easily reached through the private institutions.

8.2   Medical clinic Delor

Delor was the first commercial medical clinic in St. Petersburg, it was established in 1990. It consists of four separate clinics which operate under the St. Petersburg State University and serve all the students and staff of the university. In addition to serving the academic world, it also offers services to the citizens of St. Petersburg through OMS and DMS insurance systems. Delor has a total customer base of over 70 000 people. The General Director, Professor Larisa Kochorova, has long experience in working in the public health care in Russia. Prof. Kochorova shared her opinions on the history of Russian health care and also the status of Delor in terms of telemedicine utilization.

Delor is a very interesting case because of multiple reasons. First of all, its connection to the State University distinguishes it from most other clinics; student training and the availability of the latest academic research influence the operations of the unit. Secondly, the structures of financing are somewhat unique. Like mentioned earlier, Delor is a commercial medical unit,

but it also has the basic public health care structures and it offers many services also through the mandatory OMS system. Local public polyclinics send patients to Delor to receive closer diagnostics and these services are billed from the OMS fund. According to Prof. Kochorova, only very rare private institutions in Russia offer services that fall directly under the OMS category. Delor can be categorized as a commercial public health care unit; its financing structures separate it from most public units. The third interesting aspect of Delor is that it's very heavily oriented towards providing primary care. The clinics offer out-patient services mainly by general practitioners and physicians. All basic areas of out-patient services are covered and small operations that don't require hospitalization are also possible.

The doctors of Delor use PCs in their work and the computers are equipped with internet connection. Electronic medical records are, however, not utilized. Prof. Kochorova states that the advantages of having EMR system are indisputable and new systems are likely to be implemented in the future. The biggest problem currently is the lack of governmentally accepted form of patient records (standards discussed already in the earlier chapters). Prof. Kochorova is aware of some public institutions already utilizing EMR systems, but, due to the lack of standards, the systems are all different from each other. Generally speaking, the medical equipment utilized at Delor is on a very good level. Video-connections are not utilized in medical practices of Delor, but the equipment exists and is used for training and educational purposes.

Prof. Kochorova sees that Delor could be a very potential unit for pilot testing new technologies. Given its role as a university clinic, it strongly supports developing and testing new technologies for health care. She mentions multiple reasons how telemedicine could benefit Delor and the development of Russian health care:

1. Delor has operation in four different locations in St. Petersburg and not all services are available in all four locations. Therefore, patient data transfer and remote consultations could improve the operation considerably

2. Given the high age structure of university staff and Delor's orientation towards primary care, there could be a very potential market area for different types of preventive home monitoring systems

3. Transportation in downtown St. Petersburg can be very difficult for many people especially after trauma cases, which are quite common. Remote monitoring/consultation could perhaps replace many standard check-ups at clinics.

4. References are needed in public health care. Government authorities will not push implementing new solutions or hurry with creating standards if they cannot see

working examples. For example, a successful implementation of an integrated patient data system between the four separate locations could work as an excellent reference.

8.3   Public sector in general

Like discussed in the earlier chapters, the preventive care and family doctor practice is becoming more and more important in Russia. Prof. Kochorova agrees that the term family doctor or general practitioner is very new in the Russian health care, but she also argues that the actual practice of providing preventive care has been present in the history of Russian health care throughout the Soviet times. In fact, she claims that the whole concept of preventive care was introduced globally for the first time in Soviet health care system and the roots go even deeper. Since 1860's, countryside physicians became very common. They performed health care practices in the suburb villages of the Russia, providing all basic medical practices from assisting in giving birth to conducting surgeries.

According to Prof. Kochorova, the Soviet health care system had its shortcomings, mainly because of its maintenance costs, but it was also very successful in providing preventive care for its citizens. Therapeutists were the first health care contact layer for the Soviet citizens. They provided the very same kind of general preventive care practices that GPs do these days, but of course their qualifications were different. Regular check-ups were arranged for the citizens; most workers in industrial Soviet production units were required to obtain a therapeutist's statement of their health condition on a regular basis. The first resource deficiency hit the Soviet health care system in the 70's. During that era, the scheduled appointments were limited to only children and pregnant woman. The next big deficiency hit the country after the dissolution of the USSR.

The resource deficiency after the collapse of the Soviet Union partially meant that the best characteristics of the Soviet health care were lost and preventive care was one area that suffered greatly. Now that the primary care is in focus again it's more or less a matter of taste whether you regard this phenomenon as new.

"Maybe the GPs are a new wave but maybe it's the returning to the very good therapeutists, like it was before."

The scope of services that the therapeutists were able to provide was, of course, limited and specialists were trained to deal with more difficult cases. The number of specialists increased very fast and soon the therapeutists were only dispatching patients to specialists rather than

treating them themselves. This is how the Soviet citizens learned to seek for specialist care. The lack of resources in the 90's and now the return of family medicine have raised some attitude problems among patients.

"Maybe in our country the population was very spoiled by our system. Everything was free of charge ... The patients didn't look after their own health ... That's why it was impossible for the therapeutists to seem very good ... after that it's very difficult to get patients to come to see a GP because they were used to seeing a specialist directly"

In Delor, it took some time for the patients to realize that in many cases GPs were in fact able to provide the very same level of treatment as specialists. The national project "Health" and the salary increases especially targeted towards GPs have made many specialists and old time therapeutists start acting as general practitioners. The salary increase of GPs in public health was actually so high that many private institutions have had troubles finding qualified GPs.

Medical clinic Delor, directed by Prof. Kochorova, has been participating in the OMS program since its introduction some thirteen years ago. In the beginning, the OMS funds were quite limited and only very basic services could be covered from it. Over the years, the situation has constantly been getting better and more and more services can be included in the OMS coverage. Probably the biggest problems with the OMS insurance are related to regional differences in the services covered, which makes treatment practices in a foreign city very complicated both for the patient and the health care provider.

9   Conclusion

In this chapter, the summary of the findings of the study is presented in Porter's diamond model. The status of some telemedicine applications in Russia is discussed and conclusions given to the research topics presented in the introduction chapter.

9.1   Factors of the diamond

The five determinants of Porter's diamond and the main findings of this study are presented in Table 17. Even though the main focus of the study was to examine competitiveness from the point of view of the health care sector, the determinant factor conditions is divided into country level (based on the competitiveness rankings presented in Chapter 3) and health care related factor conditions.

The country level <u>factor conditions</u> were gathered only from the observations that other research groups had made while analyzing Russia's competitiveness. It was very obvious that the availability of natural resources, market size and economic development are the most attractive characteristics of Russia. On the other hand, difficult day-to-day business practices, corruption, language and diminishing cost advantage are factors that make doing business in Russia difficult.

The public health care has been struggling with its resources. The number of doctors and hospital capacity is relatively high in Russia, but the financing is not quite adequate to maintain these resources. The shortages in funding have negatively affected the general health of Russians. Cardiovascular diseases, external trauma cases, HIV and tuberculosis are problems which have partially led to the situation where the average male life expectancy is almost ten years below the European average. Of course this is not only due to the problems in health care; the general lifestyle factors can be blamed as well. Nevertheless, it's reasonable to question how much the poor preventive care in the beginning of 90's has had effect on these statistics. It must be also noted that the poor health care in rural parts of the country lowers the average statistics and the situation in cities is a lot better. Many health care institutions have basic IT structures and computers are utilized, even if electronic medical records aren't yet widely in use.

Table 17. Summary of the findings

Factor conditions / Country Level	*Factor conditions / Health Care Sector*
Positive • Strong economic growth • Fairly strong education system • Geographic location of St. Petersburg • Large market size, different segments **Negative** • Corruption • Diminishing cost advantage • Business environment in general	**Positive** • Earlier experiences about telemedicine • Basic infrastructure (PCs, internet) is available at least in urban institutions • Number of health care professionals… **Negative** • …who lack financial resources (public health care) • Health care system is lacking co-operation and is not integrated well enough **Positive/Negative/?** • Quality of health care equipment utilized varies greatly
Related and supporting industries	*Demand conditions*
Positive • St. Petersburg is the second IT capital of Russia • Strong growth of IT sector • Experience about wide range of application programming (due to offshoring) • Experience about dealing with western customers • Communications infrastructure adequate	**Positive** • Strong growth of living standard and health expenditure • Role of private sector is stronger than for example in Scandinavia. • Ageing of population • Increased awareness of the problems in health care **Positive/Negative/?** • Purchasing power very unevenly distributed among individuals and organizations
Firm's strategy structure and rivalry	*Government*
Positive • Electronic patient records only present at some institutions. • Existing systems are not integrated • The need for new, more advanced electronic patient records has been acknowledged • Home care is coming into spotlight • Private institutions offer novelty services for very wealthy customers **Negative** • Arranging financing is difficult • Lack of standards **Positive/Negative/?** • Video consultations are possible, but actual utilization is a question mark (when, why, who) • Public sector needs references	**Positive** • Project 'Health' and other investments on health care and IT • State is an important buyer **Negative** • …which is very slow in making decisions regarding renewing the outdated equipment. **Positive/Negative/?** • State as fixed line communication's infrastructure holder

The related and supporting industries are naturally not only limited to information technology (software programming) and telecommunications, but in this case these two were considered most important. The Central region and Moscow are without a doubt the IT capitals of Russia. St Petersburg is the second most common location for companies working in this field. The focus of IT has started shifting from hardware to services, software programming and integration. The level of software programming in Russia is quite high, which has also made it a common place for offshoring. The scope of software produced varies from one end to another; some companies have their special niche focus areas and others work based on customer orders. If any programming services were needed, they should be easily found in Russia. IT is one priority area for Russia; the heavy investments for building IT clusters (technoparks) all around Russia are great examples of this.

Telecommunications market has been growing very fast in Russia in the last few years. The mobile networks are already quite comprehensive and 3G networks are also present in large cities. The theoretical mobile phone penetration has already long ago reached 100%, which is a good indicator of the market. The availability of landline or mobile connections shouldn't be a problem in large cities like St. Petersburg.

The demand of health care services is constantly growing. This development goes hand in hand with the positive economic growth, which results in higher living standard and, thus, also in the ageing of the population. The problems in public health care are undeniable, which is also one reason that promotes the private sector. The services offered by private institutions are of very high quality and also quite expensive. In Russia, the wealth is distributed very unevenly due to the history of the country, and, therefore, the market consists of many different segments. In terms of telemedicine, different segments can be found: telemedicine for providing the most basic health care to the poorest and most rural areas of Russia, telemedicine for improving the efficiency of the basic health care processes of an average Russian and additional very high-technology "novelty" services for the most wealthy clients. Russia's economic development is heavily dependent on its natural resources; despite the recent instability of the global economy ("Chance" in Porter's diamond), the positive development of Russia's economy can be expected in the long run. However, in the short term, the expected recession can have impacts on investment decisions and temporarily slow down development activities.

The two reviewed medical institutions illustrated how telemedicine and the development of health care are seen by health care providers. Different telemedicine applications and their

potential from the <u>health care provider's point of view</u> are explained in more detail in the chapter 9.2 dealing with telemedicine applications.

<u>Government's actions</u> heavily affect the operation of health care. The public sector receives most of its financing directly from government budget and the rest through governmental OMS insurance fund, mainly supported by tax revenues. Lack of resources has been a serious problem in public health, but the recent reforms have had some very positive effects. The National Project Health improved public health care by increasing salaries and renewing outdated equipment. Also, the investments on telemedicine projects - providing care to the rural areas of the country - have had significant effect. State owned companies are also the main players in fixed like communications, whereas the mobile networks in Russia are mainly in private ownership. In terms of telemedicine implementation, one important aspect is how fast the new standards regarding medical records are created as well as how heavily authorities prefer domestic companies while choosing new technology providers.

9.2   Telemedicine applications

It's obvious that the markets for ICT related health care equipment are emerging and there will be demand for many kinds of new solutions in the future. Currently, many basic health care applications utilized in hospitals and clinics are already on a very good level, but the scope of different telemedicine applications in use is still very limited. Also, the quality of the equipment in use varies greatly and the situation in the countryside is often a lot worse.

In terms of electronic patient records, it's quite clear that big changes will happen in the near future and new EMR systems will slowly become the standard at least for most of the institutions. Currently, the biggest problem with EMR systems is the lack of standards or governmentally accepted software products. The range of different types of programs utilized is very large and normally these programs are not integrated to any degree. The Medical Director, Larisa Kochorova, believes that references are very important especially for public health care. A working example of a comprehensive EMR system - integrated between multiple locations, including multiple functions currently processed with different software programs - could be the reference that government authorities are looking for. Since the co-operation between different medical institutions in Russia is still very limited, it's probably easier for private institutions to implement new EMR systems as they normally have no need to transfer any data outside their unit. Of course a very extensive background search of the existing programs and different standards is needed prior to launching any concrete actions regarding the implementation of EMR systems.

Home and elderly care are becoming more and more important in Russia. Currently these applications are still very new in Russia among private individuals and mostly limited to only some alarm systems. However, very similar technologies have been used in Russia already for years while providing health care to the rural areas of the country. The remote or mobile diagnostics units, even small scale transportable hospitals, treat patients using remote monitoring technologies and actual diagnostics are conducted elsewhere. These systems have proven to be very effective both in terms of finances and quality of treatment. It's very likely that similar, smaller scale equipment will become more common also among private individuals, especially with people who belong to certain risk groups (e.g. elderly people with chronic diseases). There are multiple possible patient segments, which could benefit from home monitoring and alarm systems. In this study, both of the health care institutions interviewed found a possible segment in their customer base:

The regular customers of private institutions are normally quite wealthy and they also care and are very aware of their health condition. These kind of new preventive methods, as well as monitoring of a recovery process, could perhaps be improved by home monitoring. Private institutions want to stand out of the crowd by offering services that are not available in other institutions.

As a university clinic, Delor also serves the staff of the State University. The age structure of the staff is relatively high and the lecturers and professors, as academic people, are of course keen on helping the development of Russian health care. Once again, home monitoring at Delor could work as a reference for many other public institutions and it could also create possibilities for academic research, e.g. how home monitoring can enhance the preventive care.

Video consultations and diagnostics have been conducted in Russia already for years. There have even been attempts to create a federal video consultation network. These plans have not worked out as well as planned, but video consultations are still utilized in Russia, especially in order to provide health care and training outside the urban areas. There have also been some projects where connections were established to foreign health care institutes. Both of the interviewed institutes were familiar with these technologies and they also had experiences in using them, either in medical practice or training. However, their effective utilization in treatment practices was still a little unclear.

9.3   Concluding comments

Russia's close location and large market size make it a favorable target market for many industries and sectors in Finland. The fast economic growth has rapidly enhanced Russia's development in many fields, including health care. eHealth applications are not yet very widely utilized in Russia, but it became very clear that ICT will be involved in health care processes to an ever greater extent in the future; the actual market potential of this sector is not only limited to patient records, home care and remote connections. Especially the public sector in Russia is constantly struggling with keeping the balance between the quality of treatment and finances. It's likely that, in order to improve its efficiency, many changes will happen in the future and the treatment and administrative processes will be examined in great detail. During this process, numerous opportunities will arise for Finnish and Russian companies, not only in terms of telemedicine applications, but for many other companies as well.

Entering new markets rarely happen fast or without extensive background research. The main research question for this thesis was to find out whether the original impression of Russia's attractiveness as a market for health care applications was justified and should the research be carried further. The answer is very clear; the business opportunities are undeniable. However, more research is needed before concrete actions can be taken.

A thorough understanding of the Russian health care sector must be formed. More detailed information is needed, for example, in areas like authoritative organizational structures, hospital information flows, treatment processes, existing technologies and legislative restrictions. After a deeper analysis of the relevant factors is conducted, the opportunities for Finnish and Russian health care actors can be identified and compared – possibilities for reforming the existing processes and integrating new technologies in them. Identification of the opportunities isn't enough by itself; the actual operational models need to be formed as well. Which actions are needed for making the most of these opportunities? Can these experiences in the Russian markets be harnessed in local health care and technology development in Finland?

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