2 Trends in the Telecommunications Industry Worldwide, and in Russia in Particular

The telecommunications industry is in a state of transformation and becoming ever more complex. Fast changes in the communication landscape, resulting from technological change and the development of new services, are affecting the core business of telecommunication operators. The industry is to refocus on emerging higher value-added services, which often require significant investment in new network technologies, and balancing this against shareholders' focus on shorter-term performance (OECD 2007a, p. 18).

The following main trends are evident in the telecommunications sector:

1. Convergence of traditionally different technologies and industries resulting in the blurring of market definitions: Primarily, the word "convergence" was used to describe a wide range of phenomena from the increased interaction of complementary technologies (e.g. fixed and mobile) to the use of a single network to carry a range of media such as communications and entertainment. In 2006, one distinguishes not only technological convergence but also Industrial convergence when industries with different backgrounds are competing in new markets as a result of common platforms, networks and services with similar functionalities (EC 2006). This happens both at the horizontal level, where traditionally separated industries compete with each other, e.g. cable and telecommunications operators offering VoIP, and at the vertical level, where new partnerships emerge, bringing about the need for new business models and sometimes trends towards vertical integration e.g. application providers' or end-user device producers' move to adjacent areas. As a result, it is obvious that bundling offers should be provided by a telecommunications operator to sustain in the current competitive environment. Furthermore, for a successful telecommunications operator it is not enough to offer only bundling offers. Business expansion through M&A domestically and internationally as well as gaining entry into adjacent areas, e.g. into mobile advertising, are required to ensure competitiveness.
2. Increasingly global nature of some types of technology services: Increased penetration of broadband provides a platform for services to be sold on a global basis. This phenomenon challenges the regulatory framework, especially the need to regulate at a retail level. In Europe, industry globalization stimulates the discussion about the necessity of a single European telecommunications regulator.[1]
3. Movement towards using Internet Protocol (IP) in the transmission of all services, together with all the benefits (and problems) that it provides: Telecommunications operators around the world are replacing the multiple networks

[1] "…a symbol for the single market for telecoms is the creation of the new European Telecom Market Authority which will be an integral part of the reform package" Viviane Reding, Speech, Plenary meeting of the ERG, Athens, 11 October 2007.

based on legacy technologies with a single network based on an IP core. Market demand on converged products is accelerating this trend.

4. Strong growth in bandwidth demand and challenge of serving that demand with aged infrastructure: The utility of the Internet is currently limited by access bandwidth. The limits of the existing copper access infrastructure have already been reached at some points. Operators around the world are moving to increase the bandwidth through deployment of fiber to the customer premises. These projects are usually very expensive and require a reasonable degree of confidence that the investment will be recovered.
5. Changing structure of the industry, consolidation in some areas and fragmentation in others: Consolidation is often seen as a major force in the industry. In comparison to the US, the European operators are significantly weaker based on subscribers' numbers and revenues. The continuation of the consolidation trends are to be expected in Europe.[2] Regarding the fragmentation, market liberalization and in particular local loop unbundling obligations are a driving force in Europe to increase fragmentation of the telecoms market, which is a potential threat to investment.[3]

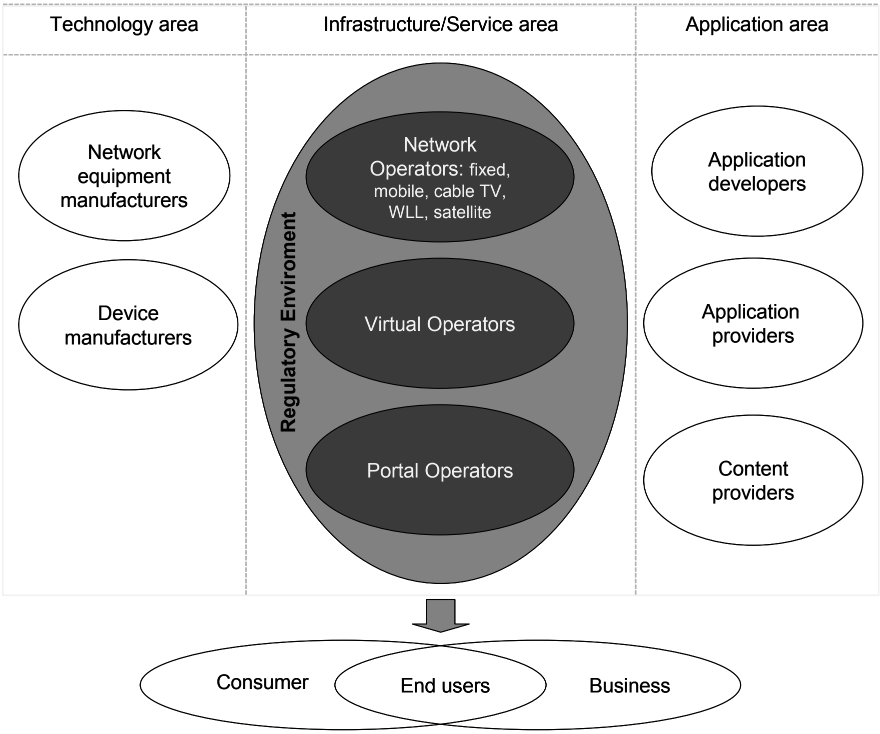
All of these trends have an enormous impact on the regulatory implications in the telecommunications industry. In this chapter, the general structure and technological developments in the telecommunications industry worldwide is presented. Then attention is directed to the current state of telecommunications around the world. The reforming processes and their reasons are presented. Furthermore, the WTO agreements on telecommunications, as the main international regulatory framework in this sector, are described. The most interesting examples of sector reforming around the world are explained. In Sect. 2.3, the historical development of telecommunications regulation in the centrally planned system is presented, giving an idea, where the liberalization processes in the transition countries were started. Then the focus is shifted to the Russian telecommunications sector, which is of special interest in this research, and an in depth analysis of the current state takes place.

2.1 Industry Structure and Technological Developments

Historically, telecommunications industry consists of the three following areas: technology, infrastructure/service and application (see Fig. 2.1). In this work, the middle segment "Infrastructure/service area" is of special interest. However, taking into account the rapid changes related to convergence processes described

[2] based on Portel.de, 10.09.2007, http://www.portel.de/nc/nachricht/artikel/15909-arndt-rautenberg-occ-mobilfunk-konsolidierung-in-europa-wird-kommen/12/.

[3] "…we still do not have an internal market for telecoms. The reason for this is mainly a regulatory one: the fragmentation of the internal market into 27 different regulatory systems". Viviane Reding, Speech, 20th Plenary Meeting of the ERG, Brussels, 15 February 2007.

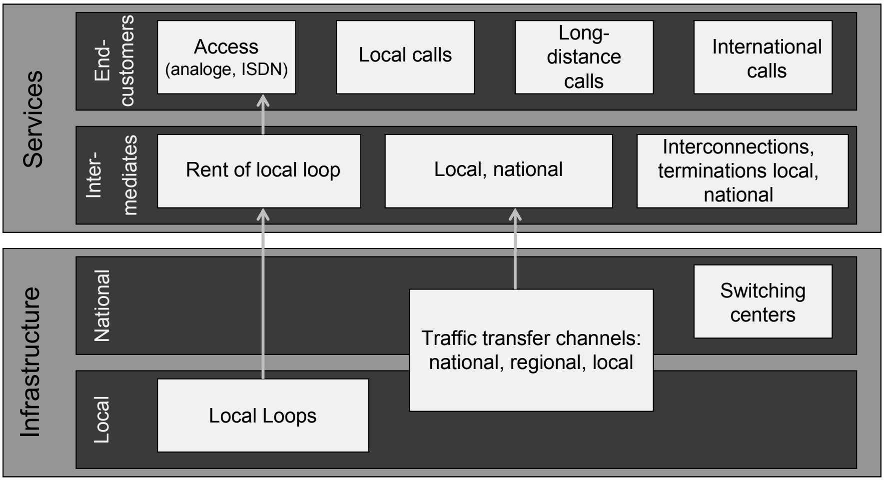


Source: Modified figure from the EITO (2002, p. 205)

Fig. 2.1. Key players of the telecommunications industry

at the beginning of this chapter and blurred boundaries of traditional telecommunications industry (e.g. Aldi, retailer chain in Germany, is at the same time MVNOs on the German market or Disney broadcasting company, which among content provider as well as a MVNO in the French market or outsourcing of mobile networks maintenance by e.g. 3 UK and 3 Italy to network equipment manufacturing Ericsson), the other areas will also be taken into consideration.

Generally, in the telecommunications sector, two levels are distinguished: infrastructure and services, which can be provided on this infrastructure. Telecommunications services differ in intermediates for the other operators and end-customers products. Intermediates are services of incumbent or other operators to operators, who offer telecommunications services to end-customers. These services are often called wholesale services. Intermediates are based on infrastructure availability. The end-customer products are e.g. local, long-distance and international calls as well as access to telecommunications services. This relationship is illustrated in Fig. 2.2 (Kruse 2001, p. 84).



Source: Kruse (2001, p. 84)

Fig. 2.2. Services and infrastructure in the telecommunications sector

The following technological changes are distinguished in the telecommunications sector (EC 2005a, b, pp. 4–5):

1. Increasing bandwidth or data transmission speed in access technologies: The next technologies, developed over the last 15 years, are becoming available: ADSL, cable modem, fiber optic networks, power line communications (PLC), wireless LAN (WiFi, WiMAX), third generation mobile communications (3G), terrestrial radio technologies, satellite, etc. This is the reason for accelerating the migration of customers from narrowband to broadband access. The availability of greater bandwidth triggers the development of new broadband services/content.
2. Development of wireless technologies: Mobile technologies have radically changed the demand structure. The number of mobile subscriptions often exceeds the number of fixed line subscriptions. Moreover, broadband wireless technologies offer broadband access at an increasing number of locations.
3. Integration of services over packet switched transmission networks: Packet-switched networks, compared to circuit switched networks, where a permanent channel or bandwidth is dedicated to enable communication, splits data into packets or cell units for an optimized transmission. This results in the provision over the same network fixed or mobile circuit switched-voice along with packet-switched Internet, video, TV broadcasting depending on the network transmission capacity. Voice transmission is already partly based on Voice over IP (VoIP). In the future, the share of packet-switched voice will significantly increase.

4. Integration of IT and telecommunications technologies: The new generation of telecommunications terminals based on the above mentioned network platforms offer an increasing range of features to the end user. These new terminals, like mobile phones, PDA, TV-set top boxes, game stations, benefit from the important progress made in the field of microprocessors, electronic memories, miniaturization, storage and display technologies.
5. Flat rate connections and bundling offers: Packet switched technologies are associated with the availability of broadband access technologies. Increased customer retention can be achieved through the development of a flat rate connection as well as offering different bundling offers.

In the following, the main current technologies are presented. With respect to telecommunications infrastructure, telephone networks are made up of two main elements: switches and transmission. Switches allow the routing of voice, video, and data signals throughout network. Transmission can be decomposed into wireline (twisted pair of copper wires, coaxial cable, fiber optic etc.) and wireless (via satellite, cellular radio, microwave, personal communications services (PCS)). The benefit of wireless technology, compared to wireline transmission, is the mobility factor; however, wireless equipment, especially for advanced services, is quite expensive. Moreover, a wireless network is more sensitive towards interference and faces bandwidth problems.

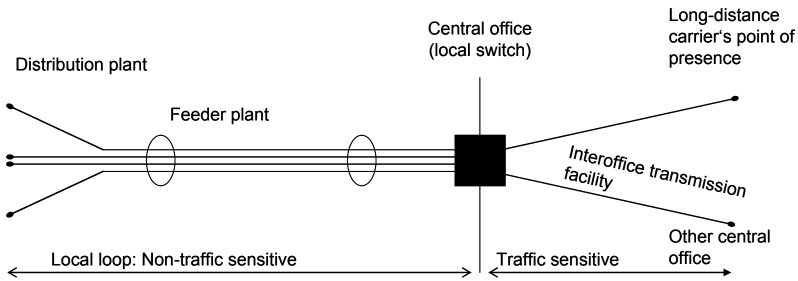
The second important characteristic of a telecommunications network is its speed (or bandwidth), measured in bits per second. Based on this characteristic, there are narrowband and broadband networks depending on the connection speed. The border between these two networks is not well defined. Many attempt to associate broadband with a particular speed or set of services, but in reality the term "broadband" is more of a moving target. However, it is generally recognized that today's dial-up Internet speeds, topping at around 56 Kbp s^{-1}, are not broadband connections. But beyond that there are quite different views. The FCC has defined broadband as starting at 200 Kbp s^{-1}, the OECD at 256 Kbp s^{-1}, the ITU considers a network whose capacity, both up and down, sums to 256 Kbp s^{-1} or above (Best and Pehrson 2005, p. 4). Due to the fact that current debates are first of all dealing with broadband deployment, we will consider broadband technologies in detail.

- *Wireline Networks*

The basic network is the public switched telephone network (PSTN). As a rule, the competitive entry first takes place in the long-distance segment. The local loop of the PSTN still quite widely perceived as a bottleneck. Some elements of the local network, such as the link close to customer premises, require essentially fixed costs. Because these elements are crucial parts of network, lawmakers and regulators have been preoccupied with the access of all telecommunications actors to these (Laffont and Tirole 2000, p. 12).

The general representation of the local loop is given in Fig. 2.3. The individual connections from the interface at the customer premises form the distribution plant. The cost of the distribution plant is by and large non-traffic sensitive.

This means that at current usage level it does not vary much with the customer's telecommunications usage. The feeder plant gathers the lines of the distribution plant and consists of concentrated bundles of cables that terminate at the central office. The feeder plant exhibits "economies of shared plant" and it too is rather traffic insensitive. As a result, the cost of the transmission from the customer to the switch (the local loop) is non-traffic sensitive. It involves (large) fixed costs and no marginal costs.



Source: Laffont and Tirole 2000, p. 13

Fig. 2.3. The old-fashioned local loop

Then the first switch follows. Part of the costs of the central office is non-traffic sensitive (e.g. existence of office, design of software); part depends on the number of connecting lines; and the third part (the switches themselves) varies with volume and is thus traffic sensitive. Then further transmission facilities take the call from the central office to a long-distance carrier or to another switch in the local area. There is a trade-off between the number of central offices and the costs of the distribution and feeder plants.

Cable, Hybrid Fiber Coaxial, and Fiber networks also present wireline networks and are considered below.

a. Upgrades to PSTN: *Dial-up and ISDN*

Since the 1920s, traditional wireline transmission technology has meant the twisted pair of copper wires, which still connect the customer premises to a remote terminal or a central office (first switch). Copper wire pairs are well suited to carry voice, but they have rather limited capacity. However, due to high teledensity in developed countries, PSTN has long served as a primary access network to the Internet, through dialup modems or leased telephone lines. Data rates vary between 2.4 and 56 Kbps per connection depending on the quality of the analogue copper telephone line, whether or not the network operator's central office switch is digital, whether the switches are clock synchronized, and whether the switches are connected via modern media like fiber or microwave.

Another possibility to increase capacity of PSTN network was upgrade to ISDN. This requires a digital network to the user premises, and thus investment in equipment both at the central office and at the user end. According to the cost assessment, if already installed, ISDN is still an alternative for Internet access in areas where more advanced services such as DSL, cable networks or fiber networks cannot be used. However, if ISDN is not already installed, DSL appears to be a better investment since it facilitates cheaper and higher quality broadband service. ISDN and some DSL systems are not designed to be used over the same infrastructure. Users that have upgraded from PSTN to ISDN may have to downgrade again, before upgrading to DSL. The ISDN equipment supports automatic opening of new channels as needed when the traffic increases, thereby providing from 64 to 1.5/2 Mbps connections.

Even in the best of circumstances with 56/64 Kbps maximum bandwidth per connection at voice tariffs, dialup systems or ISDN systems are not able to offer competitive broadband services.

b. Digital Subscriber Line (DSL)

DSL includes a family of technologies which provide a digital connection in an unused part of the frequency spectrum of the copper wire subscriber line in the telephone network. This technology provides a significant enhancement of the installed PSTN base and protects the value of the copper network. Usually, this is accomplished by installing a simple remote DSL unit at the subscriber's site and a DSL rack at the central office building. In this basic configuration, the system is rather simple and economical, as it is not necessary to deploy new access lines (EITO 2004, p. 100).

The bandwidth that DSL systems can provide has been increasing and there are now systems installed that can provide 256 Kbps–1.2 Mbps upstream and 512 Kbps–28 Mbps downstream. The limits are set by the attenuation of signals at higher frequencies, which depends on the quality of the copper lines and their installation. The distance between the subscriber and the exchange usually has to be in range 0.3–5 km, depending on data rates.

ADSL (Asymmetric Digital Subscriber Line) is the most widely deployed DSL technology, where the data channels use one frequency band for a low speed upstream channel (25–138 KHz) and another for a high-speed downstream channel (139 KHz–1.1 MHz). Data transmission speeds vary mainly based on the distance between the subscriber and the central office. Some users cannot be reached by ADSL due to their distance from the central office. In Denmark in 2004, for example, about 5% of households could not be reached by any ADSL services and only 70% of the population could access a 2 Mbps connection. More recent ADSL standards, such as ADSL2 and ADSL2+ promise improved capacity and coverage.

VDSL (Very high-rate Digital Subscriber Line) is similar to ADSL but optimized for shorter distances, 300–1,500 m. Existing systems offer capacities up to 52 Mbps by including more high frequency bandwidth in the copper cables and by deploying more efficient modulation. To extend the range, VDSL requires deployment of a fiber optical backbone network to the curb, block or neighborhood (street cabinet), and a power supply for the street cabinet, which is not required by PSTN. This increases deployment costs significantly. It has also other limitations, including interference from ADSL and AM radio services. VDSL2, a standard under development, promises to achieve bit rates of up to 100 Mbps.[4]

c. Cable TV Networks

Cable TV (CATV) networks use coaxial cable, initially only for distribution of TV-channels in a tree-structured network created by using passive splitters, to reach all users in a point-to-multipoint topology. Broadband communication over cable TV networks is accomplished by transferring data full duplex via unused bandwidth in the cable, similar to what DSL does over PSTN. The standard is “Data over Cable Service Interface Specification” (DOCSIS). The basic data rates are 54 Mbps downstream and 3 Mbps upstream. An Internet Service Provider (ISP) connects to the cable company central office (known as the head end by CATV operators) and uses the cable network to connect to users.

Like in the DSL case, equipment has to be installed both on the operator side and at the customer premises. On the operator side a cable modem termination system (CMTS) is installed that separates the digital communication channel from the CATV circuits, aggregates connections from different users and feeds them into the ISP network. On the user side, a splitter and a cable modem (CM) must be installed. The splitter divides the incoming signal between the TV set and the cable modem. On the other side of the modem, the user can connect a computer or a residential gateway via an Ethernet port and a USB telephone connecting to a Voice over IP service, if provided by the ISP.

From an economic point of view, broadband over cable is favorable in areas where there is already an existing cable network. The tree-structured point to multi-point technique has, however, several severe disadvantages compared to point-to-point solutions:

- For the regulator, it is less attractive since it has a lock-in effect by preventing local loop unbundling on the physical and link levels.
- For the operator, it is more complex to plan, manage and upgrade.
- For the user, the performance depends on traffic from other users due to sharing without traffic control of individual connections. Users in a neighborhood (typically, 100–2,000 homes) share the available bandwidth provided by a single coaxial cable line. Therefore, connection speed can vary between 10 Mbps and a few Kbps depending on the traffic from other users. While most networks share a fixed amount of bandwidth between users, cable networks generally spread over larger areas and require more attention to such performance issues.
- The broadcasting technique also raises concerns regarding security and privacy. To address these concerns, the DOCSIS standard includes encryption and other privacy features that are supported by most cable modems.

[4] VDSL projects are introduced by many telecom operators around the world. The driving force for implementation of this innovation is relatively long distances between customers and the first switch.

d. Hybrid Fiber Coaxial Networks

Hybrid Fiber Coaxial (HFC) is a network integrating a conventional coaxial cable network, and fiber optic cables between the head end and the curb, block or neighborhood interfaced by converters. An HFC network may carry a variety of signal types, including analogue TV, digital TV, telephone, and data. It increases the competitiveness of the cable operators industry in a similar way as the PON (Passive Optical Network) reinforces the wireline operator industry.

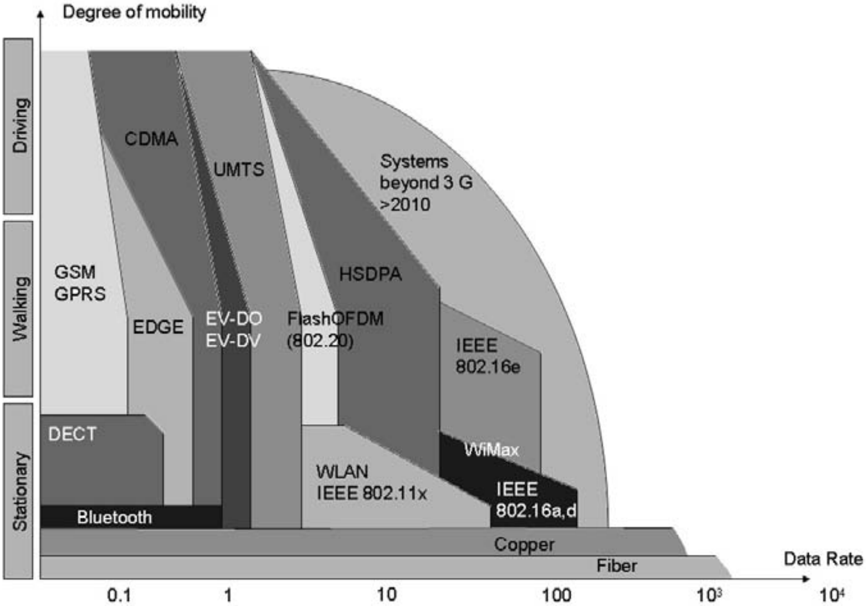
e. Fiber Networks

The technologies described thus far are primarily dedicated to other services and have to be modified to provide broadband Internet access. In this section, a closer look is taken at fiber technology, which is deployed primarily for broadband access. In the developed countries, where the legacy infrastructure is well developed, current debates are going about whether optical fiber should be deployed from carrier directly into the home (Fiber To The Premises also called as Fiber To The Home) or to within several hundred feet of the home or office. Here the optics are converted into electronics for delivery into the premises, typically using DSL (Fiber To The Curb or also called Fiber To The Neighborhood and Fiber To The Node). Due to the cost advantages, many developed countries decided to deploy the second group of fiber technologies.

The countries, where there is the lack of legacy infrastructure, can clearly turn this aspect into strength in the form of leapfrogging by coordinating fiber deployment with other infrastructure programmes, especially extensions of the power grid (as power and ICTs mutually boost each other's market), as well as along railways, pipelines and roads. Many developing countries have in recent years developed such strengths, including political awareness manifested in national ICT policies and National Information and Communication Infrastructure (NICI) plans. The availability of infrastructure creates new opportunities, where the regulatory environment allows those who recognize these opportunities to act.

An optical fiber is a hair-thin thread of glass that transports light waves with very low diminution over long distances. Fiber is deployed in cables. Standard cables contain 24, 40 or 96 fibers. Cables can be deployed under ground in conduits, under water as submarine cables or hanging in poles or pylons. The cost of deploying fiber is mainly associated with the extent of the civil engineering work involved. The marginal cost of adding more fiber cores in a cable is generally very low compared to the costs associated with deploying other infrastructure.

Power utility companies deploy fiber, primarily for supervision, control and data acquisition (SCADA) of the power grid, but are increasingly adding more fiber at a very low marginal cost to lease to others. These companies normally use a special ground wire with a fiber cable in the core (optical power ground wire, OPGW) in green field installations or wrap fiber around the transmission lines in brown field installations (known as SkyWrap). Thus, every power grid substation, including in rural and underserved areas, becomes a point of presence for access to fiber.



Source: Best and Pehrson (2005, p. 42)

Fig. 2.4. Degree of mobility vs. user data rates for the broadband wireless access

- *Wireless Access Networks*

Wireless access networks can be divided in two main areas: mobile networks, focusing mostly on mobility moving towards high capacity and the data networking sector, offering fixed wireless solutions moving towards mobility. Fig. 2.4 provides a picture of this current development.

a. Mobile Networks

Cellular telephone technology was a major improvement in mobile communications because it introduced the concept of reuse of the same frequencies in multiple geographical areas, called cells. The principle of frequency reuse realized through low powered mobiles and radio equipment at each cell site, permits the same radio frequencies to be reused in different cells, multiplying calling capacity without creating interference. This method is more spectrum efficient than earlier mobile systems which used a high powered, centrally located transmitter, to communicate on a small number of frequencies. As a result, channels were monopolized and not re-used over a wide area.

Complex signaling routines handle call placements, call requests, handovers, or call transfers from one cell to another as well as roaming, moving from one carrier's area to another. There are three common technologies used by the cellular radio systems for transmitting information: frequency division multiple access (FDMA), time division multiple access (TDMA), and code division multiple access (CDMA). The FDMA separates the spectrum into distinct voice channels by splitting it into uniform chunks of bandwidth and used mainly for the analogue transmission. The TDMA and the CDMA are used for the digital transmission. The former segments a single channel into time slots, carrying specific information. Rather than using a unique channel for a call, as does TDMA/GSM, CDMA instead uses all the available frequencies for a given call. This technology is somewhat similar to packet switching in which a voice call (or data) is divided into individual packets, sent over available frequencies, and then reassembled for transmission to the other party. CDMA has greater capacity potential than TDMA/GSM with an increase of about three times that over GSM. CDMA also has superior handoff capability when a user transits from one cell to the adjacent cell. When a GSM customer changes cells, the customer typically receives a new frequency channel. CDMA uses a 'soft' handoff when for a period of time the customer uses both the previous and future cells. This feature has increased importance in data transmission where file transfers can become corrupted more easily with TDMA (Hausman 2002, p. 566).

The original radio technology used in cellular was analogue technologies. There were many different mobile network systems such as NMT, AMPS, ETACS.[5] The former were used primarily in Scandinavia, some European countries, including Russia and Poland, the Middle East and Asia, in the 450 MHz frequency rage. The AMPS was used in the USA, Latin America, Australia, New Zealand and partly used in Russia, in the 800 MHz frequency rage. ETACS were used in Europe and Asia-Pacific.

In Europe, a patchwork of analogue systems ETACS (and TACS) was hitting the capacity and interoperability wall (Belk 2004, p. 5). The European wireless network operators agreed to implement the GSM, first digital technology, operating in the 900 MHz and were preparing for full commercial deployment of GSM. This cellular technology is still the most implemented in Europe. In opposite to this decision the USA did not adopt a common standard of the second generation technologies. One group of the companies adopted the TDMA standard, the other group adopted CDMA. The lack of standardization influenced the diffusion process ranking the USA in terms of penetration rates behind Europe. The last two standards were also used in Latin America, New Zealand, parts of Russia and Asia-Pacific. In Japan the PDC digital standard was implemented. All digital networks standards mentioned in this section usually belong to the second generation (2G) mobile systems technology.

The third generation (3G) mobile systems technology offers an increase in data transfer speed that it is very important considering the constantly increasing volume of data in mobile services. The ITU developed the concept for the IMT 2000 as a global standard for 3G wireless communications. IMT 2000 gives the capability of providing value added services and applications on the basis of a single standard. IMT 2000 is characterized by, first, flexibility through the supporting of a wide range of services and applications accommodating five possible radio interfaces (W-CDMA, CDMA 2000, TD-SDMA/UTRA TDD, UWC 136/EDGE, DECT) based on three

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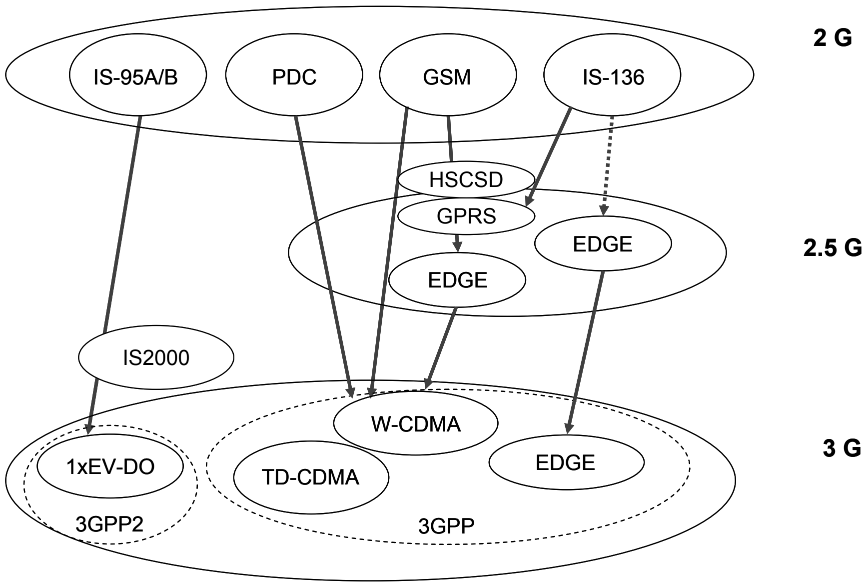
[5] Traditionally, all analogue mobile standards are called the first generation network (1G).

different access technologies, second, affordability for the consumers and operators, and third, compatibility with the existing system and modular design system for easy expansion (ITU 2003, p. 15). Figure 2.5 shows the ways of transferring the mobile system of second generation (2G) technology to the third generation (3G).

The CDMA 2000 technology can be considered to be an upgrade to the existing IS-95 (CDMAone) systems. IS-95 network operators will be able to convert existing systems from IS-95 to CDMA 2000 by installing new cards in their current base stations. They do not have to invest in totally new equipment (MASSON 2000, p. 8). The new coding format for packet data 1xDO requires one IS-95 channel and is allowed to increase data capacity even up to ten times compared to CDMA 2000 and six to ten times compared to IS-95. Future versions of this will be capable of data and voice (1xEV-DV).

The W-CDMA (or UMTS) is a system designed for use in a new spectrum, typically the new IMT-2000 band. It will require major new equipment installation by the network operators. TD-SCDMA is an alternative candidate for using unpaired spectrum allocations, which was proposed in China due to its large population.

On the evolutionary path between W-CDMA and GMS lie the mobile technologies standards of the 2.5 generation. GPRS, based on the GSM, allows information to be sent and received across a mobile telephone network standard, by using the packet switching which enhances the spectrum efficiency. GPRS allows achievement of the theoretical maximum speeds of data transfer, up to 171.2 kbps.



Source: Masson 2000, p. 15

Fig. 2.5. Second to third generation migration

EDGE can be deployed as well on mobile networks that are based on the TDMA access standard. EDGE is a mobile technology system that is faster than the standard GSM and GPRS, and uses a new modulation scheme to enable data transfer at speeds up to 384 kbps and uses GSM infrastructure.

At the beginning of 2006, 3G, which most notably UMTS, are the most widely deployed mobile broadband technology with a huge established presence in terms of operators, customer base, brand, deployed based station sites, and backhaul capacity. Standardized by 3 GPP in its Release 5, HSDPA[6] is a tremendous performance upgrade for UMTS packet data, enabling peak data rates up to 14.4 Mbit s^{-1}, although the initial limit is 1.8 Mbit s^{-1}. Latency is also reduced, and spectral efficiency is improved as well.

The progress of wireless communications technology is fast and there is already talk about fourth (4G) and fifth (5G) generations in mobile technology networks, which are entirely packet-switched networks with higher bandwidths to provide multimedia services and lower costs. The speeds of 4G can theoretically be promised up to 1 Gbps. In addition, the 4G networks are characterized by tight network security. There are plans are to implement the 4G network by 2010. 5G is expected to be a more intelligent technology that interconnects the entire world without limits through incredible transmission speed with no restriction for access and zone size.

b. Data Networks

Fixed broadband access has already become an urban commodity in the developed counties, but so far there have been few means of delivering these bandwidth-consuming services effectively and affordably to the significant number of rural and mobile users. Recent advances in e.g. signal processing, radio protocols, and mobile network infrastructure and now enabling the concept of mobile broadband for consumers around the world (Aarnikoivu and Winter 2006).

1b. WiMAX

The WiMAX is a range of technologies including those that comport to the emerging set of IEEE 802.16 standards. WiMAX systems promise to be very high capacity (up to 134.4 Mbp s^{-1} in a 28 MHz channel), travel long distances (50 Km or more), not require line of site, work at vehicular speeds (under the 802.16e extension), enjoy high spectral efficiency (by using OFDM, under the 802.16a/d extension), and be inexpensive (with base stations in the $10,000 range). Many experts talk about WiMAX like a broadband wireless dream-come-true but for the fact that not all of these extensions have worked yet in the real world and all of these desirable qualities cannot be enjoyed at the same time under the same network (e.g. there is not at present a cheap, efficient, high-capacity system that works at vehicular speeds). Nonetheless, WiMAX systems show great promise for

[6] An evolution of the W-CDMA standard, HSDPA achieves the increase in data transfer speeds by defining a new W-CDMA channel: a high-speed downlink shared channel (HS-DSCH) that operates in a different way from existing W-CDMA channels and is used for downlink communications to the mobile.

the provision of broadband Internet services especially in remote areas and especially when fully ubiquitous access and vehicular speeds with seamless handoff is not a high priority.

2b. IEEE 802.20

In comparison to WiMAX, which started as a fixed wireless technology, and which has since been evolving towards the support of mobility (under the .16e extension), the IEEE 802.20 standard originated explicitly as a mobile broadband technology. According to the technology experts, the original mobility design should prove beneficial to the standard (as opposed to trying to add support for mobility onto an existing fixed wireless standard). On the other hand, one significant advantage of the 802.16 family of systems is a first mover advantage and at present receives stronger industry support from major players. Through its recent acquisition of Flarion Technologies and their Flash-OFDM technology, Qualcomm, has just demonstrated its support of the emerging 802.20 standard. This system plans to comport to the 802.20 standard as it is finalized.

Orthogonal frequency-division multiplexing (OFDM) is emerging as a leading technology for providing very high bandwidth wireless connectivity. With increasing wireless service speed, more and more radio spectrum is required. This spectrum is an expensive resource, thus spectral efficiency, the number of bits that can be encoded into a single radio cycle becomes more and more important. OFDM based technologies, including WiMAX, enjoy spectral efficiencies of around 4 bps Hz^{-1} as compared to 802.11d, for instance, which is under 2 bps Hz^{-1}. OFDM works by segmenting available spectrum by frequency and carrying a portion of user data on each of these frequencies. Each of these frequencies is unique and non-overlapping, and thus orthogonal one to the next. This ensures that there is no interference between the various tones. This technique, along with other sophisticated improvements in digital signal processing, has produced an efficient and speedy network technology. Flash-OFDM can deliver to users a capacity of around 1 Mbps downstream and 0.5 Mbps upstream while motionless. While moving at vehicular speeds, available bandwidth is diminished. One significant strength of the Flash-OFDM system is its spectral efficiency at about 4 bps per Hz (similar efficiency is planned for the 802.16a OFDM extension). When spectrum is scarce and/or expensive, this is a great advantage. In some rural and underserved areas where the microwave radio bands are relatively underutilized, this advantage need not be so compelling.

To sum up, it is clear that there are a number of complementary and often-competing standards, standard setting institutions, proprietary offerings, and vendors. While considerable effort is being put into interoperability and merging of these various systems, it is still likely that many areas will have installed a heterogeneous collection of wireless networks. Ongoing research work has been studying ways to integrate across these various network technologies. For instance, the Third Generation Partnership Project (3GPP) has been studying systems to inter-network 3G systems with WiMAX or Wi-Fi networks. Issues have included handoff; authentication, authorization and accounting (AAA); and other considerations.

2.2 Current Worldwide Trends

2.2.1 Sector Reforms and their Driving Forces

In general, sector reform in telecommunications can be measured according to three variables: privatization, deregulation and liberalization. Privatization refers to the degree of state ownership, deregulation to the degree of state supervision of the sector and liberalization to the openness to and actual amount of competition (Vogelsang 2003, p. 313).

Sector reforms can be described by a variety of factors, not all of which need to be sector-specific. If reforms occur in the same sector throughout the world, then the sector-specific circumstances have to be strongly and/or closely interrelated with the non sector-specific factors. The sector-specific factors include the following prime candidates (Vogelsang 2003, p. 314):

- Technical changes in the sector, which are described above, in particular, through digitization (implying convergence of media), cellular technology, fiber optics, and progress in computer technology.
- Demand changes, such as expansion and diversification of demand, an increase in dependence of the rest of the economy on the telecommunications sector and, in particular, the globalization of telecommunications.
- Changes in governance technologies, such as new organizational setups, property rights and incentives. Some of these have been developed in the course of telecommunication reforms and may therefore not have been causes but rather facilitating factors. They include price-caps, interconnection regulation, spectrum auctions, and proxy cost models.

Against this background, the traditional monopoly became increasingly doubtful. The combination of all these developments called for competition as the preferred mode of market organization, because it presumably knows best how to adapt to technical and demand changes and because those changes themselves destroyed natural monopoly properties. The importance of economies of scale and of sunk costs was reduced by the technical and demand changes in all parts of the telecommunication network, at the moment maybe with some exception in the local loop. In the course of globalization of telecommunications, restrictive telecommunications regimes can be bypassed by channeling communication through other countries. All these changes and emerging competition further disadvantaged public enterprises over private telecommunications carriers due to their poor adaptation to competition and changing market conditions. In terms of media and technologies convergence, harmonization of conflicting regulation, liberalization and privatization policies in different parts of the telecommunications sector is required (Vogelsang 2003, p. 315).

Telecommunication reforms took place at different times and in different forms in different countries. Vogelsang (2003, p. 315) insists that the simple explanation for this is that the strength of the underlying reasons for reform differed between countries. However, the other country specific explanations related to the telecommunications sector are also important for telecommunications reforms:

1. The original state of sector governance, in particular, whether the dominant supplier was a private enterprise or public enterprise and the type of regulatory tradition that came with it
2. The state of the country's telecommunications sector reform relative to its peers; in particular, successful reforms in a comparable country (cross-country learning and herding)
3. Sector crisis
4. Change in the composition of potential winners and losers.

The original sector governance is particularly important, because certain types of governance are more conductive to change than others and any sector reforms have to overcome resistance against change from existing institutions. The forces of change have to be sufficiently powerful. This holds, in particular, for public administrations, based on constitutional privileges, public ownership, civil servant status of employees and monopoly provision of services. In competitive markets, many changes occur automatically because market forces put resisters aside. Regulated private enterprises are somewhere in between.

Furthermore, country specific but non sector-specific explanations play a significant role in the reforming process. These may include the following issues:

1. The country's institutional endowment, which includes legislative and executive institutions, judicial institutions, custom and informal norms, ruling interests and ideologies in a country and its administrative capabilities;
2. Wealth, population density, metropolitan centres, country size;
3. Economic or governmental crisis (inflation, unemployment, budget deficits);
4. Change in government with or without a change in ruling ideology.

Another important issue, which certainly has an impact on the reforming processes and was not mentioned above, are international organizations and countries unions, such as WTO, ITU, World Bank, ERBD or European Union. They influence the reforming developments with their agreements, documents, and directives. On the level of the European Union, the European Commission develops the policies on the European level. The EU members have to implement these directives. This has a significant impact on the sector development in these countries. As one historical example serves, the Greenbook on Telecommunications 1987, constituted policy input in the direction of liberalization and contained a series of proposals aimed at the gradual introduction of liberalization. This document gave a strong impulse for the reforming processes in the EU countries. ITU is a pre-eminent intergovernmental organization, where member states, sector members and associates work together to enable the growth and sustained development of telecommunications and information networks. ITU also works to facilitate universal access so that people everywhere can participate in, and benefit from, the global information economy and society – thus advancing the "right to communicat". As an example serve ITU documents in the fields of telecommunications standardization. World

Bank (worldwide) and ERBD (in transition economies) help among many sectors in the telecommunications sector as well to define the right policy objectives and in some cases to finance these plans. The WTO's regulation of telecommunications services has an especially high impact on the telecommunications reforms worldwide and is considered in the next chapter.

2.2.2 WTO Regulation of Telecommunications Services

A special impact on reforming the sector, in developing countries in particular, has been the liberalization agreement of the World Trade Organization's Group on Basic Telecommunications. The WTO Basic Telecommunications Agreement commits the signatories to liberalize basic telecommunications. Originally, 69 countries signed the agreement, but by early 1999, the number was up to 80 of the 132 WTO members. Twenty of these countries, including not only the advanced, industrialized nations but also some developing economies, e.g. Chile, Dominican Republic, El Salvador, and Guatemala, committed to completely open their markets for competition and foreign direct investment (FDI). The other developing and transition countries have embarked on less ambitious reforms. Although, there are many differences in the goals and reform processes, the main direction is unmistakable.

The background for trade in telecommunications services between the WTO member countries are the multilateral trade rules provided in the General Agreement on Trade in Services (GATS). The GATS includes the Annex on telecommunications, which focuses on the specific points pertaining to trade in telecom services, such as access to public networks. After the Uruguay Round, the members agreed to continue negotiations on basic telecommunications with a view to progressive liberalization of trade in telecommunications. Adopted in 1996 and entering into force in 1998, the Fourth Protocol of the GATS (or Agreements on Basic Telecommunications Services (ABT)) provides the legal basis for the annexation of new basic telecommunications schedules to the Uruguay Round services schedules. Signatories to the ABT, as well as countries wishing to join the WTO, must bring their regulatory and licensing practices into compliance with WTO trade rules. One of the main results of the recent negotiations is the Reference Paper, a compilation of regulatory principles considered binding in their basic telecommunications commitments.

The trade rules applicable to telecommunications primarily include the following issues: licensing process, interconnections, fair competition, universal services and the establishment of independent regulation.

Concerning the licensing process, all WTO member states are bound by the "general obligations and disciplines" of the GATS. Three of these are directly relevant to the licensing process:

- Most-Favored-Nation (MFN) Treatment (GATS Article II): a licensing regime must grant market access to operators from a WTO member country on terms "no less favorable" than terms applicable to operators from "any other country";

- Transparency (GATS Article III): all laws and rules affecting trade in services must be published. The Telecommunications Annex specially requires, among other things, publication of all notification, registration or licensing requirements, as well as any other forms of recognition and approval needed before foreign service suppliers can lawfully do business in a member country;
- Barriers to trade (GATS Article VI): licensing requirements must not "constitute unnecessary barriers to trade".

The WTO Regulation Reference Paper, which was annexed to many countries' commitments in the context of the Fourth Protocol of the GATS, binds them to adopt the following two main points, which are directly relevant to licensing:

1. Public availability of licensing criteria. Where a license is required, the following will be made publicly available:
   - All licensing criteria and the period of time normally required to reach a decision concerning an application for a license and
   - The terms and conditions of individual licenses. The reasons for the denial of a license will be made known to the applicant upon request.
2. Allocation and use of scarce resources. Any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely, transparent and non-discriminatory manner. The current state of allocated frequency bands will be made publicly available, but detailed identification of frequencies allocated for specific government purposes is not required.

Concerning interconnection rules, introduced in ABT, there is the informal Reference Paper focusing on this issue in detail. The paper's central principles are non-discrimination, transparency, and the availability of reasonable interconnection terms, including cost-oriented rates and unbundled access from "major suppliers". According to the Reference Paper, a major supplier is a supplier which has the ability to materially affect the terms of participation in the relevant market for basic telecommunications services as a result of (a) control over essential facilities or (b) use of its position in the market. Under the term "essential facilities", one can understand this to mean those facilities of a public telecommunications transport network or service that (a) are exclusively or predominantly provided by a single or limited number or suppliers; and (b) cannot feasibly be economically or technically substituted in order to provide a service. The Reference Paper requires the public availability of the procedures for interconnection negotiations and the transparency of interconnections arrangements.

With respect to fair competition, the WTO Agreement on Basic Telecommunications establishes prohibitions against anti-competitive practices. The WTO Reference Paper requires signatory countries to maintain appropriate measures to prevent anti-competitive practices. These should include in particular:

- Engaging in anti-competitive cross-subsidization;
- Using information obtained from competitors with anti-competitive results; and

- Not making technical information available to other services suppliers on a timely basis about essential facilities and commercially relevant information which are necessary for them to provide services.

Regarding universal services, member countries have the right to define the type of universal service obligation. Such obligations will not be regarded as anti-competitive per se, provided they are administered in a transparent, non-discriminatory and competitively neutral manner and are not more burdensome than necessary for the kind of universal service defined by the member.

Concerning the independent regulator, the regulatory body in a member country must be separate from, and not accountable to, any supplier of basic telecommunications services. The decisions of and the procedures used by regulators shall be impartial with respect to all market participants.

After the general overview of the sector reform and its driving forces including agreements on the international level, the attention will be turned to selected countries and their experiences.

2.2.3 Successful Reform Examples from Selected Countries

For the purpose of this research, two country examples USA and Germany will be considered, giving some insights on the similarities and the differences in the sector reform in the US and Western Europe. Some aspects of the historical development are described. Then the attention is directed to the current regulatory aspects.

2.2.3.1 The United States

Reform of the telecommunications sector in the USA has a long history and was discussed in many research studies.[7] The provision of telecommunications services in the US was traditionally the *de facto* monopoly of the Bell operating companies (BOCs) and was known as the Bell System. AT&T was formed in 1887 and merged with Bell Laboratories, set up by the inventor of the telephone, Alexander Graham Bell, around 1876. AT&T was able to force virtually all of the independent telephone companies to sell their networks through denying access to its network. Soon it acquired all major markets for local telephone service, controlled the interconnections between these markets, and managed the research, development, and manufacture of telecommunications equipment. Only a very limited number of independent companies provided local telephone services in specific geographic regions.

From the late 1960s until early 1980s, AT&T had lost monopoly positions in such areas as production and supply of equipment and customer premises markets. In order to exempt itself from anti-trust actions, it was obligated to provide universal services. Furthermore, in the 1970s, the next step to break the monopoly position of AT&T was to allow entry in the long-distance market. MCI and Sprint entered this market segment.

[7] e.g. Welfens and Graack 1996, p. 97; De Bijl and Peitz, 2003, p. 23.

At the beginning of 1984, AT&T's 22 BOCs were divested into seven regional BOCs (RBOCs). Rulings also defined the areas in which the companies were allowed to offer services, known as local access and transport areas (LATAs). The RBOCs were limited to providing intraLATA services and were excluded from providing interLATA services, information services, or manufacturing telecommunications equipment and CPE (although they were able to sell CPE). The seven RBOCs were: Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis, Southwestern Bell Communications (SBC), and US WEST. AT&T, one-fifth its original size, offered long-distance and international services and continued to manufacture telecommunications equipment.

By the end of 2006, the US telecommunications industry has seemingly come full circle. There were just three RBOCs still operating – AT&T, Verizon and Qwest – following a series of mergers and acquisitions within the industry. SBC Communications having acquired its former parent, AT&T, kept the century-old brand name for itself. Moreover, in 2006, the FCC approved the merger of AT & T and BellSouth. Verizon Communications swallowed up MCI. Qwest's merger or acquisition deal is not planned at the moment, but one is "likely" in the long term.[8]

Back to the reforming processes, in February 1996, the Telecommunications Act was passed and superseded the 1934 Communications Act. The aim was to provide more relevant regulation to reflect market and technology changes. The 1996 act was supposed to move US telecommunications regulation away from the courts and into the hands of the state regulators.

The Telecommunications Act of 1996 primarily aimed to introduce competition in the local loop, which was still a bottleneck controlled by local operators. The idea was to establish competition not only in the long-distance segment but also in the local telephony market. To encourage this competition, the *unbundling obligations* were introduced. The RBOCs had to unbundle the local loop and to lease parts of their networks to newcomers in the markets. Any services were allowed to be bought for resale at a wholesale discount.

After many court cases and broad public discussion[9] in February 2005, the FCC released a decision on new unbundling rules. The FCC eliminated the requirement to unbundle mass market local switching on a nationwide basis, with the obligation to accept new orders ending as of the effective date of the order (FCC 2005). The FCC also established a one-year transition for existing UNE switching arrangements. For high-capacity transmission facilities, the FCC established criteria for determining whether high-capacity loops, transport, or dark fiber transport must be unbundled in individual wire centres, and stated that these standards were expected to affect only a small number of wire centres. The FCC also eliminated the obligation to provide dark fiber loops and found that there was no obligation to provide UNEs exclusively for wireless or long-distance services. This development is often considered as a course on deregulation in the US telecommunications

[8] Press article "Analyst says no deal linked to CEO's exit", Jeff Smith, Rocky Mountain News, 26 June 2007.

[9] e.g. Alleman and Rappoport (2005).

industry. After this decision, main market players announced high investments in the high speed infrastructure.[10]

The Telecommunication Act of 1996 also required that competition be present in local markets before the Baby Bells were allowed *to enter the long-distance segment*. The RBOCs have been petitioning the FCC to allow them to offer in-region long-distance services since the passage of the 1996 Telecommunications Act, although it was not until December 1999 that the first approval was granted, e.g. SBC Communications received approval to offer long-distance services in selected states from June 2000 and, as of mid-October 2003, was authorised to provide such services in all of its 13 local service areas.

In respect to *universal service obligations,* the Act of 1996 states that "consumers in all regions of the nation, including low-income consumers and those in rural, insular, and high-cost areas, should have access to telecommunications and information services". Due to the structure of the industry in the US, some local operators have to be compensated for providing universal service and a complicated mechanism for the financing of universal services was implemented. One of the universal service mechanism are interstate access charges, which are the rates long-distance carriers pay for the use and availability of local exchange carriers' (LECs) facilities for the origination and termination of interstate service. Interstate access charges were many times modified by the regulator. Another universal services mechanism is support to high-cost areas served by large local exchange carriers (LECs). This funding mechanism provides additional support for local telephone services in many states.

New Telecommunications Bill

Early in November 2005, draft telecommunications legislation was released for review. This new legislation would represent the broadest reforms in the telecommunications sector since 1996 and are designed specifically to pre-empt state regulation of broadband services and – most significantly – make it easier for the RBOCs to enter the video services market. This legislation would treat broadband video as an interstate service under the FCC's authority and require municipal authorities to grant video franchises to telephone companies.

However, this controversial telecommunications bill, opening the way for phone and cable companies to compete on video services, was highly debated, especially on the net neutrality issue (some experts called this debate a civil war) and was not adopted until 2007. Net neutrality backers oppose a plan by high-speed Internet providers to create online speed lanes and give faster service to preferred content providers. They argue that innovations like Internet telephony or instant-messaging would have developed without the freedom people now have. On the other hand is net neutrality opponents' need to prioritize data in order to be profitable. Some experts believe that the potential problems of discrimination among content providers would be eliminated through more competition among broadband providers.

[10] for more details on this see Baumgarten and Markova (2006)

2.2.3.2 Germany

The roots of the German telecommunications reforms go back in the 1960s.[11] Due to some deficits in the early 1960s, the federal government established an expert commission for the German Bundespost to look for the solution. The recommendations of the commission included the following: increasing the independence of the Bundespost and separating its sovereign tasks from its commercial tasks. Only minor organizational recommendations were implemented from these recommendations. The same happened with the recommendations of the second commission report in 1970.

A first official major telecommunications reform proposal came from the German Monopoly Commission in 1981 and focused on liberalization of the telecommunications equipment market. However, little happened in this respect between the time of this proposal and the publishing of the EC Greenbook in 1987. The Postreform 1 in 1989 was implemented based on the suggestions of the Witte Commission. The infrastructure responsibility remained with the state. The universal service policy was based on a network monopoly, which provided financing and cross-subsidization. The Postreform 1 differentiated between monopoly services (telephony), mandatory services (those that Deutsche Telekom had to offer on a universal basis) and free services (that Deutsche Telekom had the freedom to discontinue). A significant reformation was the organizational separation of the post office, bank and telecom as well as the separation of entrepreneurial and regulatory functions. The legal status of the enterprises, however, was not changed. The reform in Germany in this time is in line with, but did not go beyond, the EC policy. Shortly after the Postreform 1, the mobile competition was introduced through the private new entrant, which had begun operations at the same time as Deutsche Telekom.

In 1994, the Postreform 2 followed. It allowed the privatization of the Deutsche Telekom, which was an important step in the reforming process. A special fond was created with the aim to allow the firm usage of public servants as regular employees. From this point in time, the state no longer had to provide telecommunications itself but only had to assure that it is provided adequately. The universal services were now obligated by law. Postreform 1 and Postreform 2 are the basis for the further liberalization and regulatory reforms. The reforming of institutional framework in Germany is characterized by the three following aspects: (1) the relative broad privatization of an ex-monopolist company; (2) the liberalization of the market entry; (3) the deregulation in form of decreasing state interventions.

In 1996, the partial liberalization and privatization of the Deutsche Telekom followed. However, the major further liberalization and regulatory reforms, in the form of the TKG, passed in 1996, was based on the EC liberalization package. The main goal of this EU package is an establishment of national regulators and the opening of voice markets by the beginning of 1998. On the January 1, 1998,

[11] Historical developments of reform in the telecommunications sector are presented extensively by Vogelsang (2003), Dewenter and Haucap (2004) and are summarized in this section based on these sources.

the Regulatory Authority for Telecommunications and Posts, known as Reg TP, came under the Federal Ministry of Economics and Labor (BMWA), which undertakes basic policy tasks. Reg TP had various powers, such as the authority to grant and revoke licenses, assign and supervise frequencies, impose universal service obligations, control network access and interconnection, and approve or review the tariffs and tariff-related general business terms and conditions of market-dominant operators.

The TKG 1996 had to be brought into line with the substantially revised European standards due to the European Union reform package of 2002, which covered all forms of electronic communications services. This process took longer than expected to complete, but the revised legislation, the Telecommunications Act of 2004, finally entered into force on July 1, 2004. In 2005, the Reg TP was renamed the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway (Bundesnetzagentur für Elektrizität, Gas, Telekommunikations, Post und Eisenbahnen, known as BNetzA for short). BNetzA took on immediate responsibility for the energy sectors; responsibility for the railway infrastructure market was transferred to BNetzA on January 1, 2006.

In 2007, the TKG 2004 is still in place. It focused on such issues as abolishment of licensing requirements, market analysis and notifications of SMP operators, requirements for SMP operators to offer access to their networks as well as rate regulation for SMP operators especially in respect to access services and facilities. In the following, the main aspects of this legislation and its practical implementations are presented:

Licensing

To follow the EC's Authorisation Directive 2002, RegTP abandoned most of the license requirements of the TKG 1996. However, rights of way for the installation of telecommunications lines still must be transferred by the regulator. Commercial providers are only subject to a notification requirement. BNetzA is able to impose ex post measures in cases of breaches of duty. Such measures range from requiring a company to state its views, issuing orders, imposing financial penalties and, as a last resort, prohibiting a company from providing services.

According to the BNetzA,[12] 2,045 registered operators and providers of telecommunications services were on the German market by the end of 2005, around 2,304 at the end of 2004 and 2,184 at the end of 2003.

Market Analysis and Notifications

Based on the TKG 2004, market regulation must be preceded by market definition (to identify the relevant markets) and market analysis (to define operators with SMP in these markets). BNetzA must give interested parties, the regulatory bodies of other EU countries, and the European Commission (EC) the opportunity to comment on the markets defined and analyzed by BNetzA. The EC has a veto right in respect to identifying relevant markets and determining the presence or absence of SMP. In respect to market regulation decisions or market remedies,

[12] http://www.bundesnetzagentur.de/media/archive/1522.pdf.

the EC does not have a veto right. Market regulation decisions are made by the BNetzA's Ruling Chambers. Applicable remedies, resulting from the presence or absence of SMP, are determined by regulatory order rather than deriving directly from legislation.

Until February 2007, BNetzA did not submit two market notifications from the eighteen required.[13] Only in two markets, effective competition was found and in one market, partial competition was established. In other cases, SMP positions were identified and market remedies are adopted. The famous German case in respect to market analysis is the new VDSL network of the Deutsche Telekom, where the German government allowed the BNetzA's exemption of the Deutsche Telekom from unbundling obligations for VDSL fiber network. Due to the fact that the European Union does not have veto power on the national decision, the European Commission is to take the German government to the European Court of Justice (EC 2007, p. 107 in Annex 1).[14]

Rate Regulations

The TKG 1996 postulated that tariffs for the telecommunications services of market-dominant providers and their affiliates were subject to special regulatory oversight and control. The tariff rates of all service providers were subject to European and German laws.

Based on the TKG 2004, rates are primarily regulated for access services and facilities, where access and rates orders are issued together. The cost of efficient service provision must not be exceeded in such cases. The approval of the BNetzA is required to give prior (ex ante) approval to rates for access services that an SMP operator is mandated to provide. Ex post price controls are made, when the operator in question does not also have an SMP in the retail, but which control access to end users (such as alternative access providers).

Concerning retail services, ex ante approval is limited to markets in which sustainable competition is not expected to develop in the foreseeable future. If an SMP company intends to introduce or change the price for a retail service, at the same time it must submit a corresponding wholesale offer to its competitors which satisfies the requirements of anti-competitive pricing controls, to ensure that competitors are able to offer comparable services in the retail market without delay.

Any cases of anti-competitive behavior by a company in levying and agreeing rates are investigated by BNetzA for all non-regulated rates.

Access and Interconnection Rules

According to the TKG 1996, specific obligations concerning access to networks and interconnections are imposed. For example, every operator of a public telecommunications network, irrespective of the operator's market position, is obliged upon request to offer to other network operators interconnection to its networks.

[13] for more details see http://ec.europa.eu/information_society/policy/ecomm/article_7/index_en.htm.

[14] Meanwhile, the BNetzA has already issued legislation, obligating DTAG to provide access to cable tubes.

If an agreement on interconnection cannot be reached, the BNetzA orders the interconnection on other terms.

A market-dominant provider, offering telecommunications services to the public in a particular market, must allow every user access to its network or parts thereof. It must also grant to its competitors access to essential services it uses internally upon the same conditions it applies to itself, unless different conditions can be objectively justified. Agreements on special network access (including interconnection) must be immediately reported to the BNetzA for execution. The regulator publishes the terms and conditions for interconnection agreements. This publication with terms and conditions will constitute a basic offer that must be included in the general business terms and conditions of a market-dominant provider.

In 2001, Reg TP established a new interconnection tariff regime. The main difference here is that operators are charged on the basis of the network elements used (element-based charging), thus replacing the former regime of distance-based charging. In 2003, the Deutsche Telekom was explicitly obliged to allow call-by-call and pre-selection for local calls.

Based on the TKG 2004, obligations concerning access to networks are dependent on market analysis. The BNetzA must explicitly require SMP operators to offer unbundled broadband access such as bitstream access. Until June, 2008, SMP operators are obliged to provide bundled resale (i.e. wholesale line rental only in conjunction with calls). Beginning on July 1, 2008, the regulator can also order unbundled resale.

At the European level, the current Telecommunications Review is ongoing. The new legislation should be published in 2007 and after that, the EU member states have to implement the new EU legislations in their national laws. The discussions during the consultation process are very lively, especially on such issues as regulation and investment incentives, spectrum authorization and trading, market analysis and notifications and possible deregulation in this respect. At the same time, the European Commission is finishing the Audiovisual Service Directive, which will be the new legislation in respect to traditional broadcasting as well as non-linear audiovisual services such as IPTV, Video on Demand. Considering the state of increasing convergence processes, it is expected that this directive will have a strong impact on the industry. The German telecommunications sector, as a part of the European market, has taken an active part in the discussions on the European level to ensure the beneficial implementation of the legislation later on the national level.

To summarize, two country examples were considered in detail: the USA and Germany. The US telecommunications industry has a long tradition in regulation, went through vertical separation in the middle of 1980s, and experienced strong M&A developments after that. The industry consisted of three major companies at the end of 2006 and is still on the deregulation course presented through such actions as abolishment of unbundling obligations or spectrum trading. The German telecommunications industry had to be developed under the EU legislation and experienced both advantages and challenges of this approach. It did not have to follow the vertical separation approach like in the US and due to this fact had intensively dealt with asymmetric regulation. There are many other countries, which experiences are worth attention, e.g. the UK, as the country with the longest liberalization traditions in Europe and its long beliefs in duopoly as the way to industry restructuring. France as a country, which has very successfully implemented the EU unbundling policy; in the Netherlands, where the telcos are strongly challenged by cable operators, an advanced level of competition is present in the market, which keeps the level of regulatory intervention relatively low; Asian countries such as Japan and Korea show very successful developments in broadband. The broadband penetration there is the highest in the world, which success was mostly achieved through state politics and aid (see e.g. Point Topic 2007; OECD 2007a).

2.3 Telecommunications Infrastructure Policy in the Socialist Command Economy

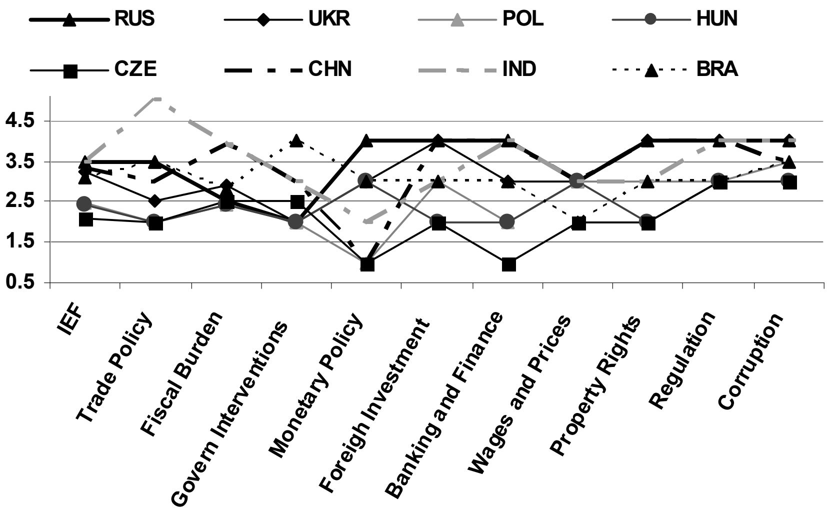
In the socialist system, the definition and the development of infrastructure is very different than in the countries with market economies. The infrastructure development was not subordinated to the requirements of the (profit-oriented) production process for the sake of producing value-added. Its objective was to improve the functionality of the socio-economic superstructures (VNIICI 1982; Tjulpanow 1969, 303ff). The main objective of infrastructure was the reproduction of the labor force. In the Soviet-type system, the notion of infrastructure was very broad and included categories that would not belong to infrastructure in a market economy, such as rolling stock of the transportation system, trade, IT and new technology, storing services and "everyday infrastructure", e.g. shoe repair shops, hairdressers, tailors, photographers.

Generally, the Soviet-type of economy is characterized by the following main principles (von Hirschhausen 2002, p. 31): (1) abandonment of the money-commodity relationship and the "capitalist" principles of "value added"; (2) dominance of the Communist Party in important questions regarding the production of goods (plan) and their distribution (through pricing policies, direct distribution, etc.); (3) absence of a separation between the Party and economic activity; (4) absence of money as a universal equivalent of value. These principles were fully reflected in the Soviet infrastructure policy.

As a result, a telecommunications sector was built, where ownership, operation, finances and control was concentrated in the public hands like in many EU market economies but with a completely different background. The owner of telecommunications infrastructure was the state; other forms of ownership did not exist. The state introduced in the telecommunications sector the plans for the next five years on the local, regional and national levels and controlled these. The planning process was strongly politicized. The communist party used the telecommunications system for controlling and restraining information flows. The telecommunications was not oriented on profits and the cost-profit analysis was not realized in the command economy (Campbell 1995). The telecommunications infrastructure was financed by the state, because private finance activity was not allowed. The biggest part of clients of the socialist telecommunications system consisted of corporations und not of private clients. The quality of the connections was neglected; the telecommunications network used analogue equipment with an average yearly fault rate of about 40 per 100 lines in the first half of the 1990s (ITU 2006a). The average fixed line telecommunications penetration rate was about 15%, making the private ownership of a phone a luxury. According to the ITU Database (2006), at the beginning of 1990s, around 10 million people in Russia were on the waiting list to receive a phone connection. Due to these facts, the Russian telecommunications sector was a public monopoly with lower penetration rates and quite poor performance. However, one must consider the fact that it was under other circumstances as in the market economy. In the organized hierarchically socialist system, vertical communications lines in industry were provided by state telecommunications operators, but the individual horizontal communication links, which are vital for competing firms in the market economies, were quite neglected (Welfens 1996, p. 90).

2.4 Current Developments in the Russian Telecommunications Sector

Before proceeding with the details on the current developments in the Russian telecommunications sector, the attention will be directed to the performance of the Russian economy, the Russian ICT sector, and in particular the Russian telecommunications sector in international comparison. In the author's view, the international ranking studies are the best instrument to assess the Russian performance. Although there may be a certain degree of subjectivity in each ranking method, representations of results from a couple of different ranking studies will provide an adequate overview on the development trends. Investigation is started by considering the Russian performance in terms of macroeconomic developments and the political situation (based on the Index of Economic Freedom as well as partly on the Growth Competitiveness Index), and then the focus shifts to the performance of the Russian ICT and particularly the telecommunications sector (based on the Growth Competitiveness Index, Digital Opportunities Index, Network Readiness Index as well as E-Readiness Ranking of Economist Intelligence Unit). To gain an objective picture, the Russian performance rankings are compared to the performance rankings of the biggest Eastern-European EU countries such as Hungary, Czech Republic, and Poland, other big world economies such as China, India, and Brazil as well as the Ukraine as one of the CIS countries showing a relatively high GDP per capita. According to the Index of Economic Freedom 2006 (IEF 2006), which measures economic freedom worldwide, Russia is ranked 122nd out of 161 countries and categorized as "mostly unfree". Figure 2.6 presents the total score of the index and its sub-indexes in comparison between Russia and other countries.



1 = the best, 5 = the worst score

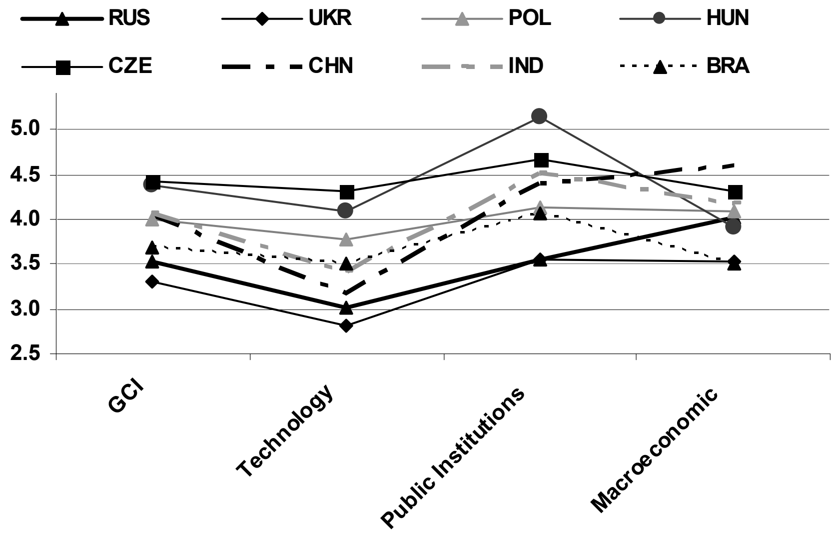
Source: Index of Economic Freedom (2006)

Fig. 2.6. Index of Economic Freedom and its subindexes

In the category "Freedom from Government Interventions," measuring all government expenditures and state-owned enterprises, Russia performs better compared to 2005 and other investigated countries. However, in relation to other sub-indexes, this positive performance cannot be found very often. The most critical index components for Russia are "Monetary Freedom," "Freedom in Foreign Investment," "Freedom in Banking and Financing," "Freedom in Property Rights" as well as "Freedom from Regulation" (or "Business Freedom"), and "Freedom from Corruption" where the Russian scores are weak in relation to the peer group's.

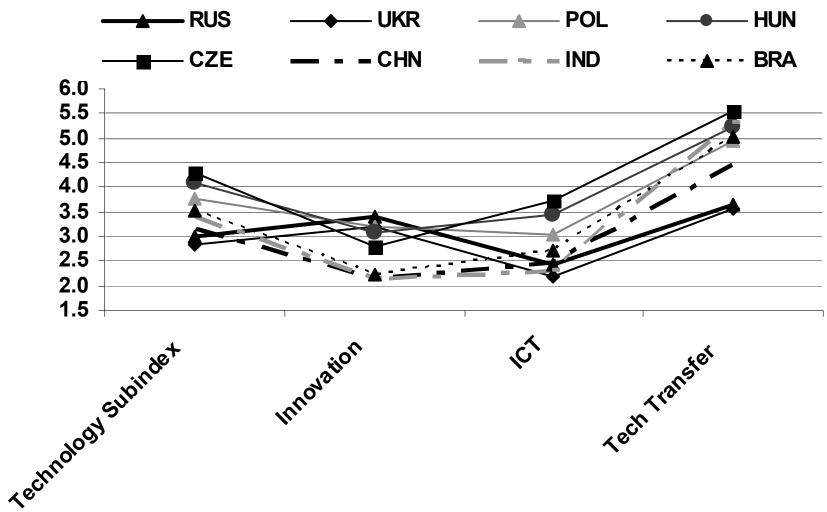
The Growth Competitiveness Index 2005–2006 is a study conducted by the World Economic Forum, comparing 117 economies. The Russian total score and subindex scores are presented in Fig. 2.7. On the background of the relatively high "Macroeconomic" subindex score, Russia has a low score in "Technology" and "Public-institutions" subindexes. Russia ranks 90th in the "Public-institutions" subindex. Figure 2.8 presents the components of the "Technology" subindex. This indicates, on the one hand, the big potential of the Russian science, resulting in the high score of subindex component "Innovations", and on the other hand, the Russian weaknesses in terms of "ICT development" and "Technology Transfer" subindex components. Especially in the "Technology Transfer" category, Russia is lagging behind the investigated countries.

The Digital Opportunities Index from ITU measures the magnitude of the digital divide and has been applied on 40 economies. The structure and the Russian ranks are illustrated in Fig. 2.9. Russia's overall rank is 30. The scores of this index are presented in Fig. 2.10. All Russian score values are under median in



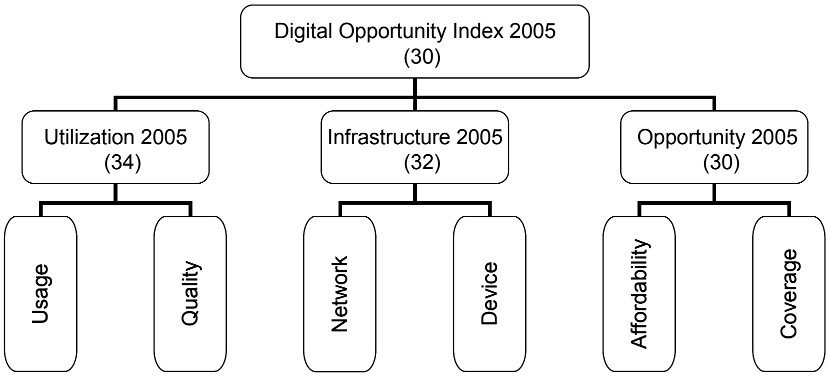
Source: The Global Competitiveness Report (2005)

Fig. 2.7. Growth Competitiveness Index and its subindexes



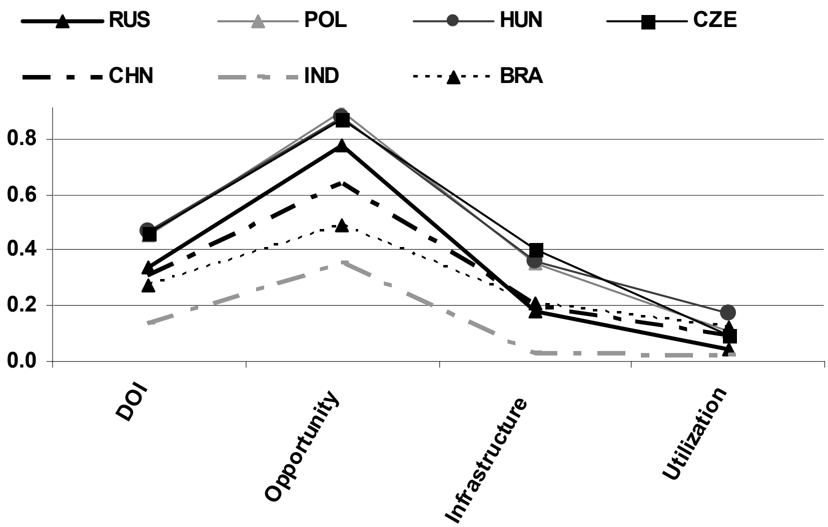
Source: The Global Competitiveness Report (2005)

Fig. 2.8. Technology subindex of the Growth Competitiveness Index and its components



Source: ITU (2006b)

Fig. 2.9. Digital Opportunities Index 2005: structure and the Russian ranks

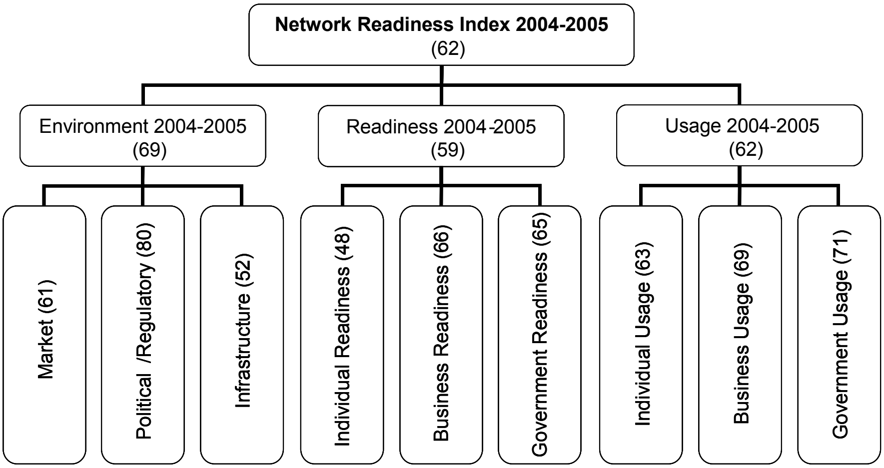


Source: ITU (2006b)

Fig. 2.10. Digital Opportunities Index 2005 and its subindexes

respect to all subcategories. In the subcategory "Opportunity", which measures basic access (reflected by mobile coverage) and affordability of networks, Russia is ranked 30th. The next subcategory "Utilization" shows the extent of ICT "Usage" and "Quality". "Quality" means a level of access, which enables higher degrees of functionality, supporting services such as video streaming. As a result, the number of desirable applications for information society such as telemedicine, e-government, and e-learning enhances, increasing their "Usage." In the subcategory "Utilization", Russia is ranked 34th. Finally, the subcategory "Infrastructure", which includes network indicators and device's availability, providing the interface between users and networks, is ranked 23rd.

The NRI index, covering a total of 104 economies in 2004–2005, measures "the degree of preparation of a nation or community to participate in and benefit from ICT developments." Based on the NRI index, the success of a country participating in and benefiting from ICT can be very well benchmarked. As illustrated in Fig. 2.11, this index is composed of three subindexes, which measure (1) the environment for ICT offered by a given country or community, (2) the readiness of the community's key stakeholders – individuals, business, and governments – as well as (3) usage of ICT among these stakeholders.



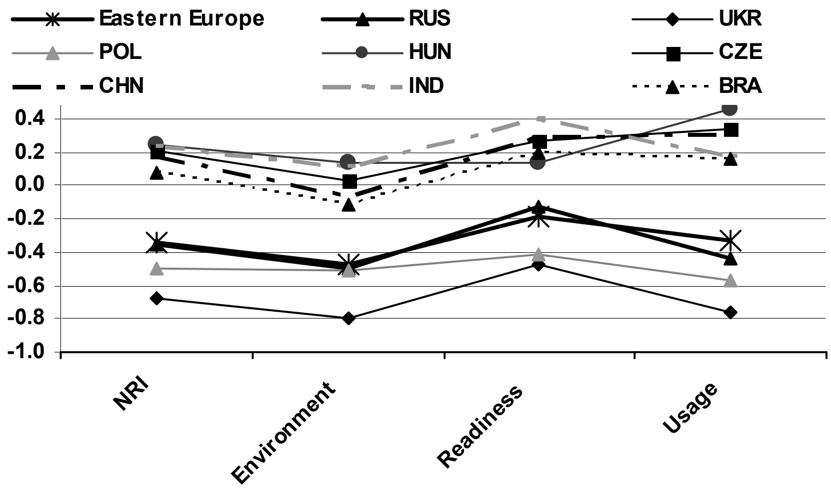
Source: The Global Information Technology Report (2005)

Fig. 2.11. Network Readiness Index (NRI) 2004–2005: structure and the Russian ranks

In order to compare the Russian performance with the performance of other countries, the regional benchmark of the NRI index is considered. As illustrated in Fig. 2.12, Russia's has the scores of the overall index as well as its components are close to the weighted average for Central and Eastern Europe. This is far below the scores of many Central- and Eastern-European countries like Hungary and the Czech Republic but higher than the score of Poland. The low Polish ranking is a controversial issue due to the fact that the other rankings do not prove this fact. The Polish NRI ranking will be presented in this analysis for information only. The most interesting finding from this index is that large countries such as, China, India, and Brazil ranked quite above Russia.

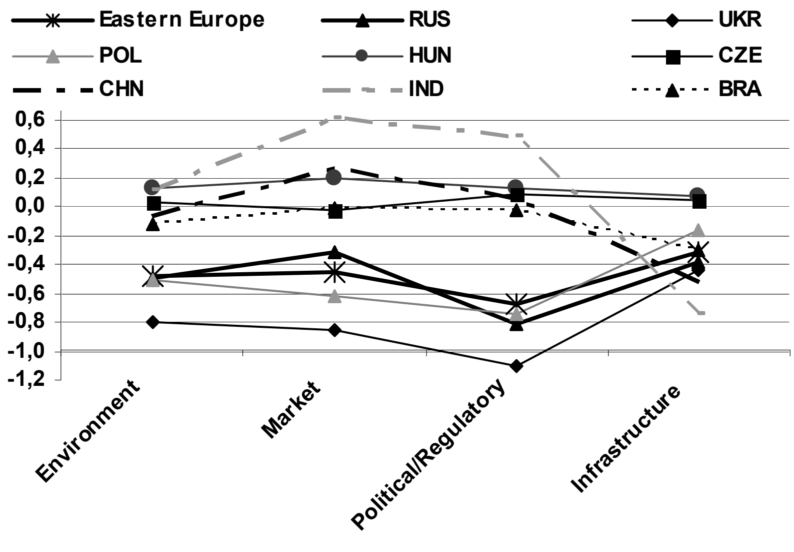
In the following, a closer look is taken at the subindex components of this NRI index. In the first subindex "Environment" (see Fig. 2.13), which measures the environment for ICT offered by a given country or community, the trend that Russia ranks lower compared to Hungary and the Czech Republic can be noticed.

A similar trend is valid in respect to the large economies China, India, and Brazil, with the exception of the component “Infrastructure”, wherein these economies are relatively weak.



Source: The Global Information Technology Report (2005)

Fig. 2.12. Comparison of NRI 2004–2005 between Russia and other countries



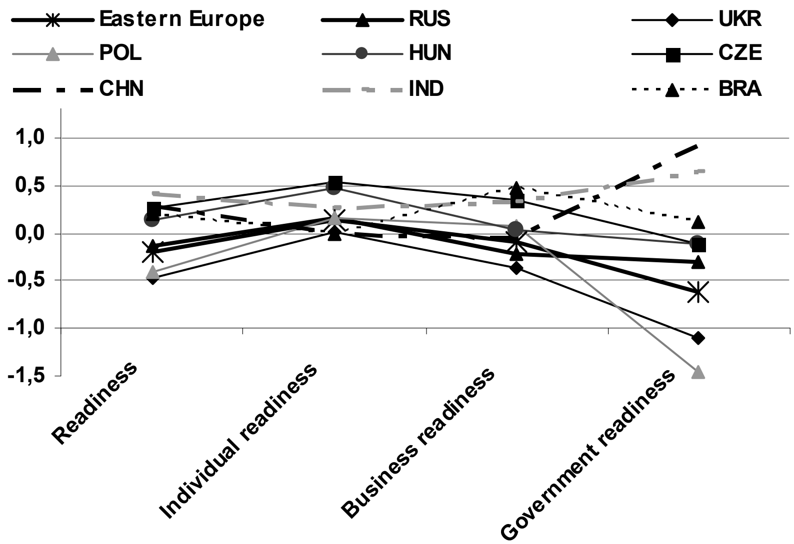
Source: The Global Information Technology Report (2005)

Fig. 2.13. Comparison of subindex “Environment” in NRI 2004–2005 between Russia and other countries

In terms of readiness of the community's key stakeholders – individuals, business, and governments – Russia performs well regarding individuals but shows disappointing results in business and governments (see Fig. 2.14). In respect to readiness and usage of the business and governments, Russia underperforms compared to Hungary and Czech Republic as well as China, India, and Brazil (see Fig. 2.14 and Fig. 2.15).

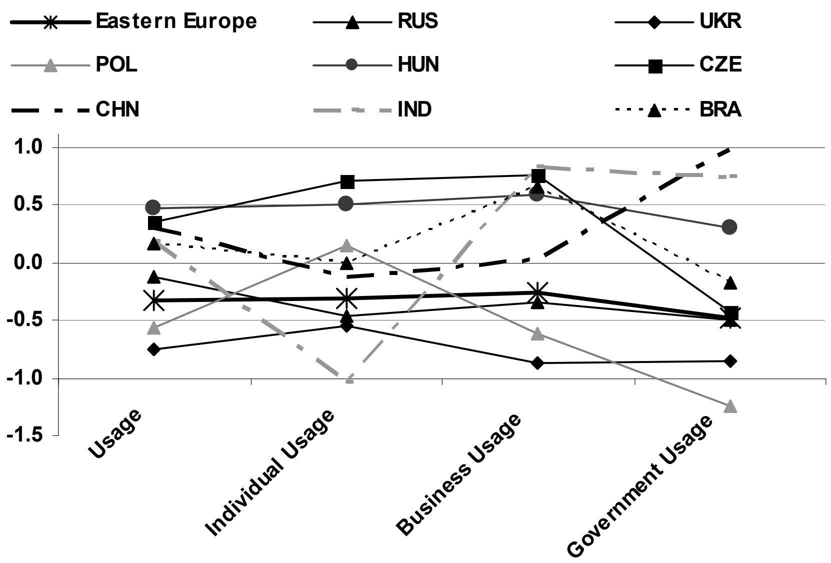
According to the 2005 e-readiness rankings from Economist Intelligence Unit, which rank the ability of 65 countries to promote and support digital business and ICT technologies, Russia ranks 52nd. This is a higher rank than in 2004, but it still shows the relatively low level of the Russian e-readiness compared to that of other world nations. In "Connectivity" as well as in "Social and Cultural Environment", Russia ranks relatively high, whereas in "Legal Policy Environment" as well as in "Consumer and Business Adoptions", it ranks particularly low (see Fig. 2.16).

To sum up, according to the ranking studies, Russia enjoins high economic growth and relatively stable macroeconomics indicators, however, it has a low quality of political institutions. In the field of ICTs, Russia has a quite developed infrastructure and a higher quality of human capital, which is often reflected by the individual readiness and usage. This is certainly the strength of Russia. On the other hand, policy issues and readiness/usage of the government are insufficient. Based on the fact that Russia is very often lagging behind large world economies like China, India, and Brazil regarding IKT policy issues, special attention should be directed to this weakness to avoid Russia further falling behind in these issues.



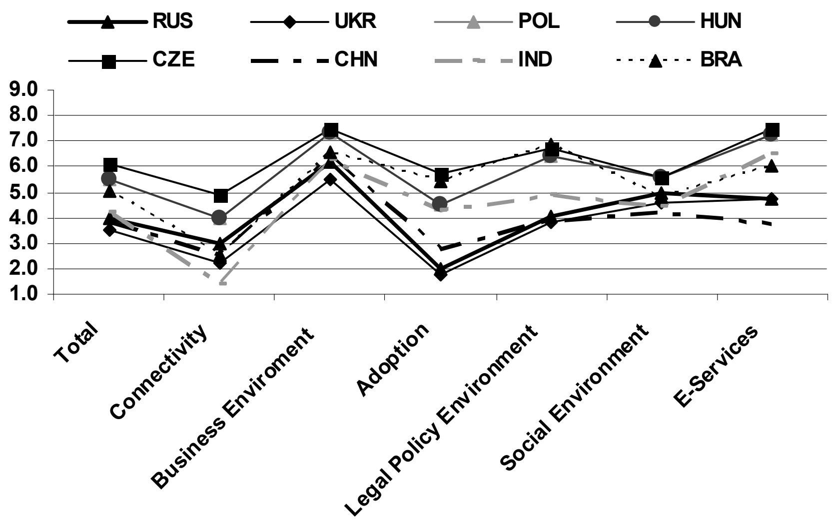
Source: The Global Information Technology Report (2005)

Fig. 2.14. Comparison of subindex "Readiness" in NRI 2004–2005 between Russia and other countries



Source: The Global Information Technology Report (2005)

Fig. 2.15. Comparison of subindex "Usage" in NRI 2004–2005 between Russia and other countries



Source: Economist Intelligence Unit (2005)

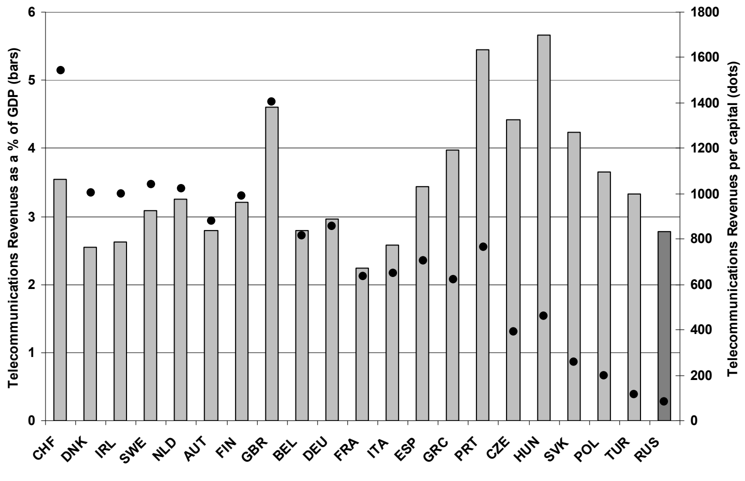
Fig. 2.16. The 2005 E-Readiness Ranking

2.4.1 General Sector Trends

From 2000 to 2005, the Russian telecommunications market has demonstrated strong growth and in 2005, its overall revenues volume exceeded $21.9 billion. This accounts for 2.86% of GDP and is considerably higher compared to $4.7 billion in 2000. The CAGRs from 2000 to 2005 account 36% per year. For comparison, the CAGRs from 1994 to 1999 account only 10% per year, showing the impact of the Russian crises in 1998–1999. The telecommunications revenues as a percentage of GDP and telecommunications revenues per capita in comparison to other countries are illustrated in Fig. 2.17. This percentage of GDP is close to the average level of developed countries and is lower than in most transition countries. The reasons may lie in the fact that in the developed countries, low prices and high access rates ensure a revenue level which is comparable with the revenue level in the Russian monopoly situation with the access deficit of telecommunications services and high monopoly prices. Moreover, another reason explaining this phenomenon may be some distortions when calculating a ratio to the Russian GDP, which has a high share of oil production. As presented in Fig. 2.17, the Russian population spends less than average on telecommunications. Based on the fact that Russia has a low population density geographically and often harsh climate conditions, it is more logical to suggest high usage and willingness to pay for telecommunications services.

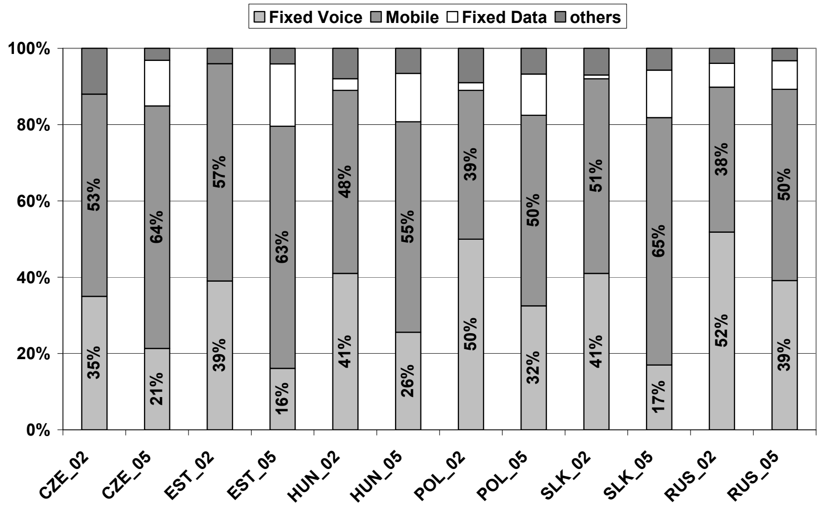
As illustrated in Fig. 2.18, the Russian revenues of mobile telecommunications and Internet services account for more than half of the telecommunications revenues. This trend is similar to the trends in other transition countries and is accelerating over time.

The quality of telecommunications networks in Russia is improving; however, it is still lagging behind especially in rural areas. Figure 2.19 presents the share of



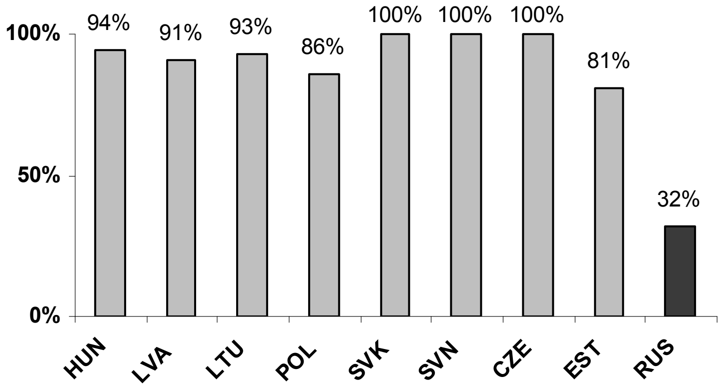
Source: OECD (2005a), Minsvyaz (2006) and own calculations

Fig. 2.17. Telecommunications revenues 2003



Source: IBM (2003), EITO (2006), Minsvyaz (2006) and own calculations

Fig. 2.18. Components of telecommunications revenues in 2002 and 2005

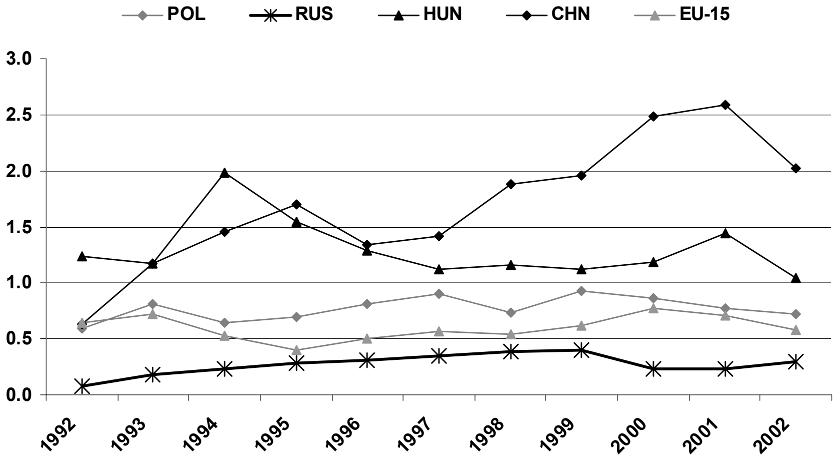


Note: for POL and RUS the data are available only in 2002

Source: ITU (2006a)

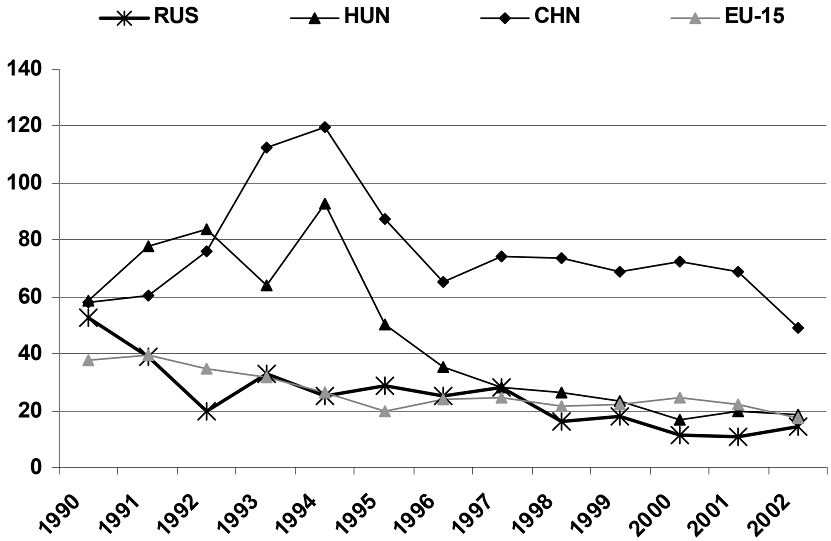
Fig. 2.19. Digitalization level of telecommunications networks 2004

digital main lines in comparison to other advanced transition economies. According to Minsvyaz, in 2004 the share of digital lines as a percentage of automatic lines (up to 2003 all lines are automatic according to ITU) in Russia in rural areas accounts for only 28% and in residential areas 59.1%. The Russian telecommunications sector shows a significantly low quality of telecommunications services for users. The level of telephone faults per 100 main lines was 35 in 1999. This is relatively high in comparison to other countries in the same time period, for example Czech Republic with 20 and Finland with 8 (ITU 2006a).



Source: ITU (2005) and own calculations

Fig. 2.20. Share of telecommunications investment as percentage of GDP

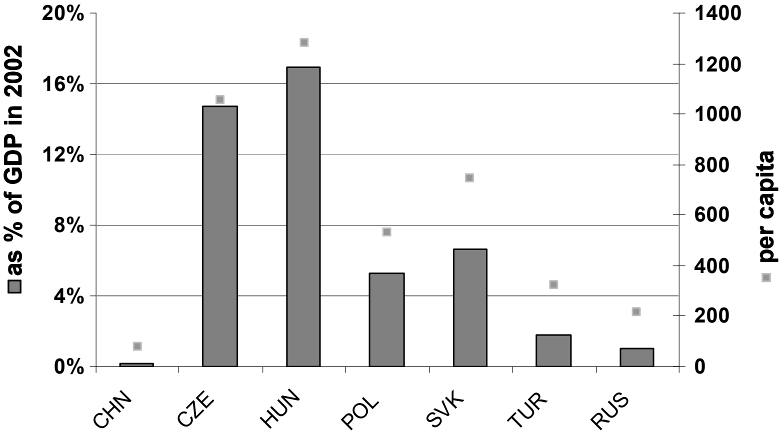


Source: ITU (2005) and own calculations

Fig. 2.21. Share of telecommunications investment as percentage of telecommunications revenues

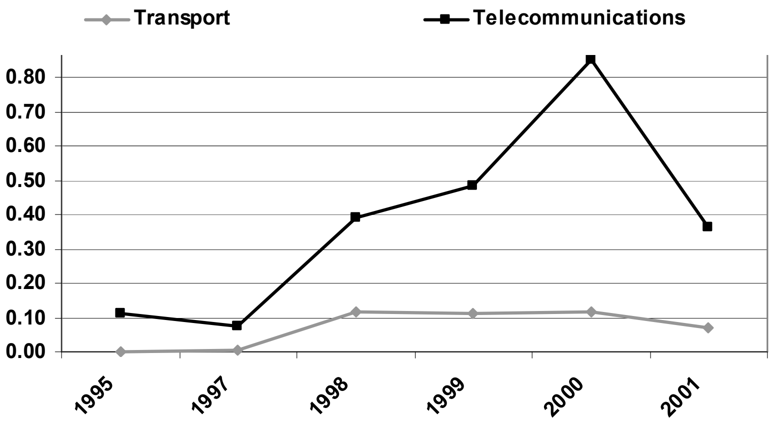
The needs of Russia with respect to telecommunications investment are huge, with rather different estimates abounding. As illustrated in Fig. 2.20, in the period from 1992 to 2002, the share of telecommunications investment as a percentage of GDP in Russia is low in comparison to the shares of other transition countries, China and the EU-15. The share of telecommunications investment as a percentage to sector revenues is presented in Fig. 2.21 and confirms the weak Russian performance. The backwardness of Russia is quite remarkable compared to advanced transition countries and China.

The share of private participation in infrastructure serves as one of the most important indicators of infrastructure development. Comparing amounts of private participation in telecommunications, it is obvious that private participation in the Russian telecommunications sector in relation to GDP or per capita is lower compared to other transition countries and is only higher than in China (see Fig. 2.22).



Source: PPI Database of The World Bank[15]

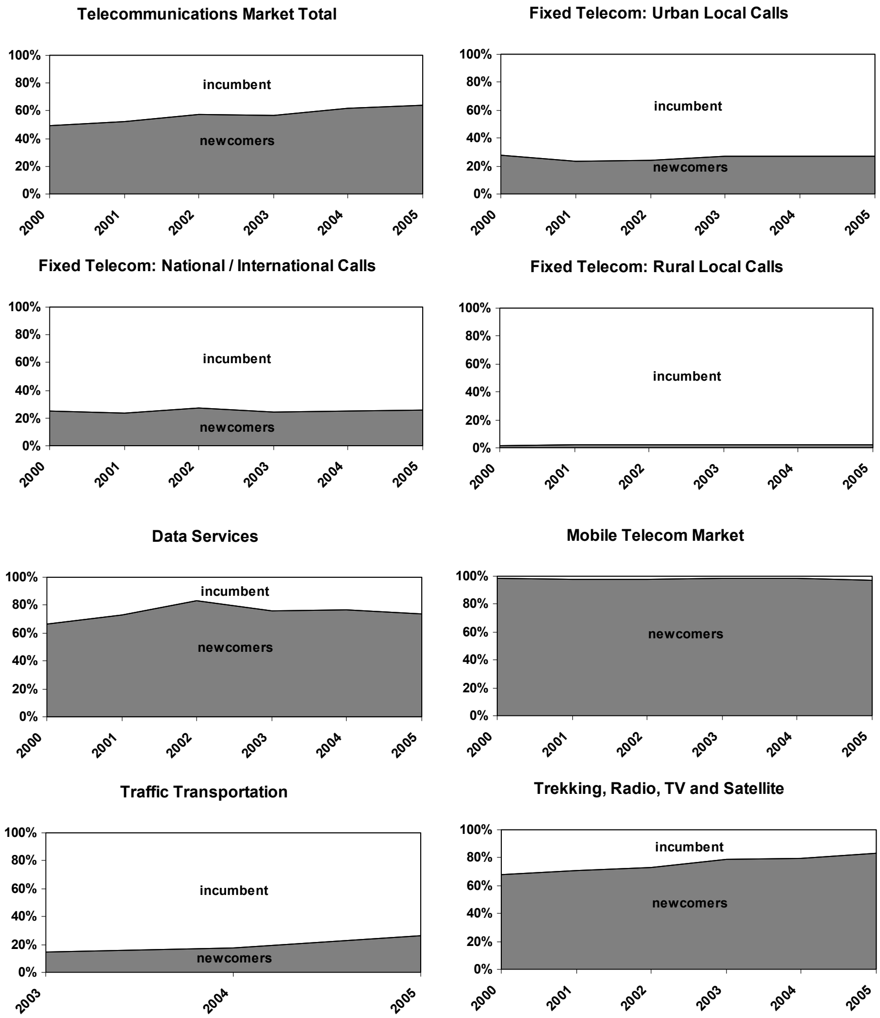
Fig. 2.22. Cumulated infrastructure investments in telecommunications projects with private participation in comparison 1990–2003



Source: Goskomstat (2004) and own calculations

Fig. 2.23. Shares of FDI in the total sectoral investments

[15] http://ppi.worldbank.org/resources/ppi_countryClassification.aspx



*Data (including telegraph services) are not identical between 2001/2002 and between 2002/2003.

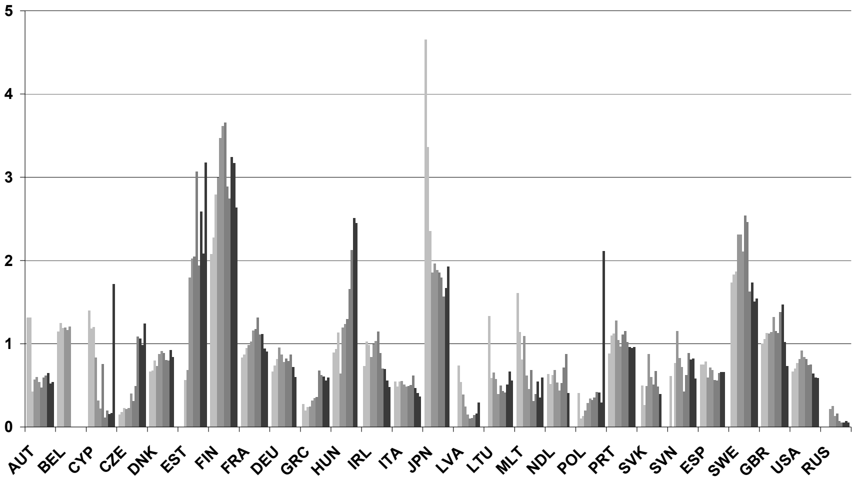
Source: Minsvyaz (2006) and own calculations

Fig. 2.24. Trends in the Russian telecommunications revenues 2000–2005

However, among the Russian infrastructure sectors, the telecommunications sector is one of the most attractive. As illustrated in Fig. 2.23, the share of FDI in all investments in this sector is quite high.

Figure 2.24 illustrates the structure of the Russian telecommunications revenues in terms of their belonging to incumbent or newcomers. As one can see, in the Russian market more than 50% of revenues are earned by newcomers. The incumbent remains very strong in rural local calls and traffic transportation. It remains quite strong as well in long-distance calls and urban local calls (corporation clients are an exception, which are mostly served by the alternative telecommunications operators).

With respect to manufacturing of telecommunications equipment as an important element of the telecommunications industry, the figures indicate that the import of telecommunications equipment makes up to over 95% of all telecommunications equipment (ITU 2005). As one can see in Fig. 2.25, revealed comparative advantage in manufacturing of telecommunications equipment of Russia is very low and decreasing over time compared to other countries. For advanced transition economies like Poland, Czech Republic and Hungary, these indicators are higher and strongly increasing over the investigated period.



Source: Based on Borbely (2005)

Fig. 2.25. Modified revealed comparative advantage in telecommunications equipment manufacturing[16]

To access WTO accession, like other candidates, Russia has to adopt the WTO commitments in the telecommunications sector. According to negotiations over the last several years, two main points in terms of the Russian telecommunications sector were primarily mentioned:

1. Abolishment of the anti-competitive cross-subsidization between long-distance and local calls: This means primarily the de-monopolization of Rostelecom and market liberalization for long distance calls. However, the tariffs are still

[16] More on the estimation method see Borbely (2005).

not fully rebalanced in Russia. The long-distance and international calls markets were liberalized in 2006.

2. Removing the limits of foreign participation in the Russian telecommunications market (as well as other infrastructure sectors in general): in 2000, Russia set the limit of the maximum share of foreign participation in the Russian telecommunications sector to 49% (by leasing of Russian lines, 25%). In addition, the Russian party stated that the foreign management share in the telecommunications companies also had to be limited to a maximum of 49%. During negotiations, some of these requirements were shelved, e.g. a 25% limit on foreign participation in a telecommunication operator which leases its lines as well as limits on foreign participation in the long-distance call market segment.

Concerning other issues, which are included in multilateral trade agreements, Russia has started to introduce appropriate laws. The Federal Law on Communications involves topics such as interconnection rules, transparency and publicity of the licensing process, spectrum allocation procedure, and the introduction of universal service obligations. Nevertheless, a lot of additional documentation providing details on these issues is still missing.

2.4.2 Regulatory Institutions

Currently, the Russian institutions are undergoing an institutional reform leading to the development of a more efficient and transparent system. The first projects of this reform merged the old Ministry for Communications with the Ministry of Transport. However, at the end of June 2004, the Russian government returned to the idea of a separate Ministry in the field of telecommunications, post and information technologies.[17] The new Ministry for Information Technologies and Communications (Mininformsvyaz[18]) combines the function of policymaker and regulator. Russia does not have an independent regulator. Mininformsvyaz's competence covers the fields of TV and radio broadcasting. The new Ministry includes the following three departments:

- The Federal Telecommunications Supervision Services (FTSS), which handles control and supervision in the communications and information technologies sectors
- The Agency on Communications, which takes responsibility for the administration of government assets in the field of telecommunications, for the realization of public infrastructure programs as well as the universal services mechanism
- The Agency on Information Technologies deals with activities in the field of information technologies, similar to the Agency on Communications

[17] The Russian language often uses the words information technologies and communications separately and not information communications technologies (ICT) in its typical form.

[18] The old name Minsvyaz is often used.

The Russian State Radio Frequency Commission closed during the process of reformation, but was restarted again as an inter-ministerial collegial commission, and took the functions of allocation and assignment of radio spectrums. Price regulation in the telecommunications sector was taken over by the Federal Tariff Services. The latter was reformed from the Federal Energy Commission, which already regulated prices in the fields of energy and transport.

The Russian institutional framework demonstrates some imperfections and can be characterized by weak regulatory policy. Particularly in fast growing markets like mobile telecommunications, the regulatory mechanisms should work in an optimal way because each institutional, as well as operational weakness, can cause a slow-down of the diffusion process. This fact is particularly evident when one analyzes that the last Russian institutional reform brought about the following three main problems in the mobile telecommunication diffusion. Firstly, a lack of number capacity distributed by the Minsvyaz to the market operators slowed down the selling volume of all operating companies. According to Vedomosti, in July 2004, BaikalVestCom and SMARTS stopped accepting new users. VimpelCom, using the non-geographical codes 903 and 905 with a maximum capacity of 20 million numbers, decided to use numbers starting with 0.[19] Secondly, certification problems occurred and new kinds of mobile telecommunication equipment could not be certificated by the Minsvyaz. The losses were significant.[20] Thirdly, the awarding of licenses and license extensions were stopped. However, the new list of business activities in the field of telecommunications which requires licenses has been prepared but is still waiting for acceptance by the government.

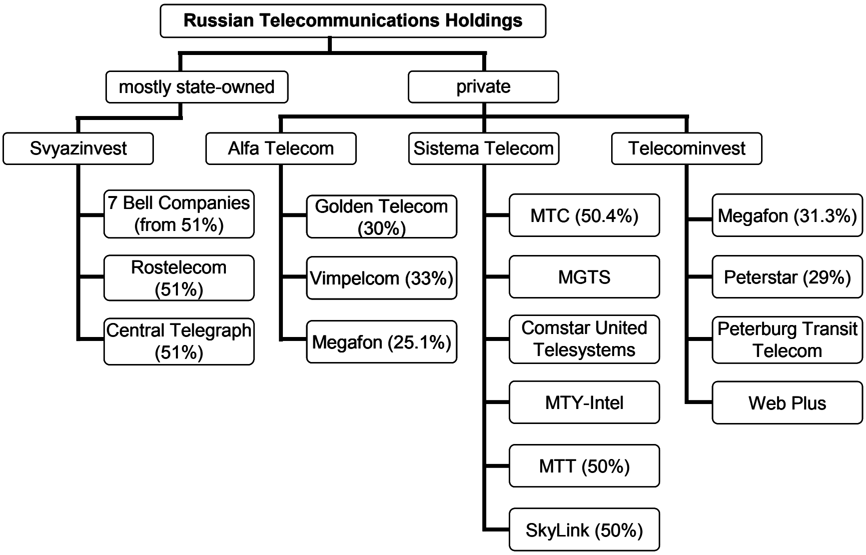
The efficiency of the reformed New Ministry is partly still questionable. Independence and impartiality are issues to be worked on; the Russian institutional framework still requires improvement. The creation of an independent regulator with clearly defined duties and obligations anchored in telecommunications laws should be an advantage for the growth dynamics of the telecommunications sector.

2.4.3 Market Structure

In 2006, in the Russian telecommunication market, the four main holdings – Sistema Telecom, Alfa-Group, Telecominvest, and Svyazinvest – incorporated 90% of all telecommunications market revenues. Fig. 2.26 illustrates the market structure schematically. All holdings are active in many telecommunications subsectors: fixed telecommunications, mobile telecommunications and the Internet. In the following, each holding is presented, including some of its main subsidiaries and strategic investors.

[19] This is not common practice in the Russian telecommunications sector and was allowed for VimpelCom only in the spring 2004.

[20] In June 2004 alone, Motorola had estimated losses of Rub 7 mil. per month; experts referred to budget losses of $15 million per month.



Source: Own description

Fig. 2.26. Main market players on the Russian telecommunications market

2.4.3.1 Svyazinvest Holding

The telecommunications holding company, Svyazinvest, was founded in 1994 to consolidate government-owned shares in the regional operators of Russia. In 2002, the fixed-line industry was reorganized, with 70 regional operators being consolidated into seven pan-regional companies. The Russian government owns 75% of Svyazinvest's shares. The other 25% are owned by the private company Mustcom Limited. Svyazinvest is a controlling shareholder of Rostelecom (50.67%), the nationwide backbone operator, and of the seven pan-regional companies. Svyazinvest and its subsidiaries make up the network of Incumbent Local Exchange Carriers. The Russian government intends to sell its shares in Svyazinvest; the procedure is ongoing but at the beginning of 2007 the incumbent company had still not been privatized.

2.4.3.2 Alfa Telecom

The Alfa Group is one of the most influential industry and finance groups in Russia. Its activities cover many sectors of the Russian economy. Alfa Telecom is a holding company dealing with telecommunications. In the telecommunications sector, Alfa Telecom owns 30% shares in the Golden Telecom group, which is a provider of a broad range of telecommunication services to businesses, other telecommunications service providers and consumers. This group provides telecommunications services through its operation of voice, Internet and data networks, international gateways, local access and various value-added services in the Commonwealth of Independent States (CIS), primarily in Russia, and through its fixed line and mobile operations in the Ukraine. A further 20% of Golden Telecom's shares are owned by the strategic investor of the Alfa Group: Telenor. In addition, the Alfa Group and Telenor are shareholders in the second biggest Russian mobile operator, VimpelCom, with 32.9 and 26.6% respectively. Moreover, Alfa Telecom own 25.1% in the third biggest Russian mobile operator, Megafon, through ZT-Mobile.

2.4.3.3 AFK Systema

AFK Systema also belongs to one of the most influential industry and finance groups in Russia. It operates in the Russian telecommunications market through its subsidiary, Sistema Telecom, which was set up in 1998.[21] Sistema Telecom is a shareholder in more than 50 telecommunications companies. Some of these companies are active in the Moscow fixed telecommunications market, e.g. MGTS, Comstar United Telesystems, and MTY-Intel. Sistema Telecom owns 50% of Multiregional TransitTelecom (MTT), which is the most important player in the field traffic services to the Russian mobile and fixed network operators. Moreover, this holding owns 50.4% of the biggest Russian mobile operator, MTS. The strategic investor of Sistema Telecom in MTS is Deutsche Telekom, with holdings of 10%. In the near future, Deutsche Telekom will sell its shares. Sky Link holding – founded in order to implement projects of creating federal mobile communications network operating in IMT-MC-450 (CDMA 2000) standard – also belongs to Sistema Telecom (50%). Sistema as a multi-profile telecommunications group is already developing to meet convergence challenges. It is planning not only to introduce unified branding across all its telecoms subsidiaries but also to develop unified retail outlets. These will offer products from all of Sistema's telecoms operations.

2.4.3.4 Telecominvest

The First Holding A.S. is the biggest shareholder of Telecominvest (85%). At the same time, 29.5% of shares in the First Holding A.S. are owned by Telia-Sonera and 70.5% by the Commerzbank. Telecominvest is mostly active in the North-West region. It is a shareholder with 31% in the third biggest Russian mobile operator Megafon and holds 29% in PeterStar, the leading alternative local exchange carrier in St. Petersburg. Petersburg TransitTelecom belongs to the Telecominvest group as well. Web Plus is the leading ISP in St. Petersburg and is owned 100% by Telecominvest.

2.4.4 Fixed Telecommunications

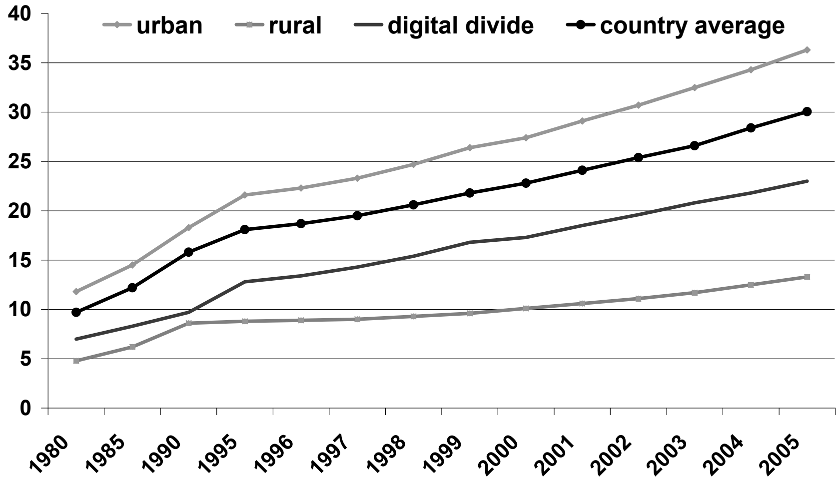
In 2005, the fixed penetration rate in Russia reached 30% (Minsvyaz 2006). This is close to the level of other CEE countries such as Poland (30.6%) and Latvia (31.7%) and relatively low compared to the level of industrial countries. The EU-15

[21] The other subsidiary of Sistema Telecom, Sistema Mass-Media, deals with business in the field of cable TV and is in the process of consolidation of many cable TV activities.

average penetration rates were about 56% in 2000, and 51% in 2005. Some of the industrial countries have achieved a penetration level of more than 70%, which – due to the high competition – has been significantly decreasing since 2001–2002, e.g. in Sweden, Denmark, and Switzerland (ITU 2006a). The Russian waiting list for basic services included approximately 5.8 million names in 2003 (WDI 2005).[22]

The main Russian population centers are quite well served, but large areas of this vast country have extremely poor or no access at all. In the Russian fixed telecommunications sector, one can see a clear increase in problems related to this digital divide between population in cities and population in rural areas. Figure 2.27 demonstrates the annually growing digital divide in fixed telecommunications.

The number of telephone lines per employee of telecommunications enterprises indicates the low efficiency of Russia's telecommunications firms. According to Russian incumbent's figures in 2003, one employee operated merely 63–130 telephone lines in the seven regional `mega companies` in 2000, while their counterparts in the USA had 172 and Poland 159 telephones lines per employee (WDI 2003).



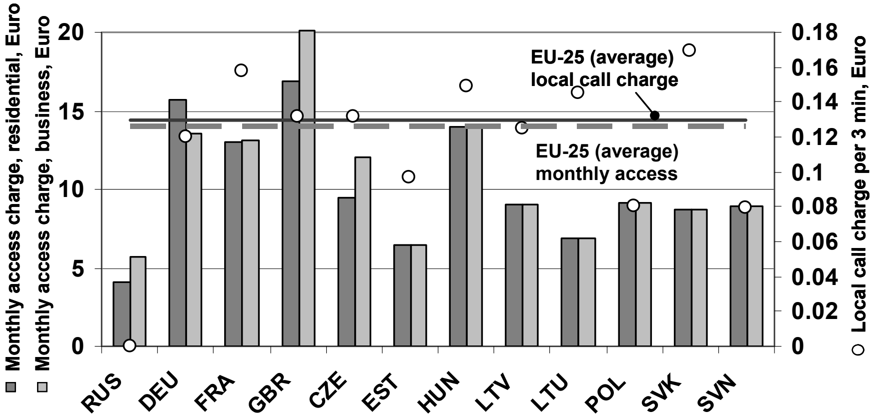
*digital divide between urban and rural regions (lines per 100 inhabitants) = density of fixed telecommunications users (100 person) in urban areas in the year i – density of fixed telecommunication users (100 person) in rural areas in the year i.

Source: Goskomstat (2004), Minsvyaz (2006) and own calculations

Fig. 2.27. Increasing digital divide in the Russian fixed telecommunications between urban und rural areas

[22] The latest available figure.

Prices in fixed telecommunications, when compared to other countries, reflect cross-subsidies. Rates for local calls and residential monthly telephone subscription are relatively cheap in comparison to other countries (see Fig. 2.28). In contrast, international calls are quite expensive. A 10-minute-call from the incumbent company in Russia to the USA costs about €6.7 (EU-25 average is €2.4); to Japan €8.2 (EU-25 average about €7).[23]



Source: www.svyazinvest.ru and EC (2005b)

Fig. 2.28. Monthly subscription fees and local call charges in transition countries 2004

The main players in the Russian fixed telecommunications market in terms of revenues are still the incumbent companies (MGTS, regional "mega-operators"). The newcomers like Golden Telecom and Peterstar mostly focus on the segment of corporate clients and the urban areas. Their share is about 25% of the urban and long-distance calls revenues. In terms of the number of access lines, the situation is similar. For example, in the Moscow market, one of the most competitive Russian markets, 80% of all access lines are owned by MGTS (incumbent company). However, in the residential and business segments the situations are different: in the residential segment MGTS has 97.5% of all residential users' phones; in the business segment its share is only 37%.[24]

2.4.5 Mobile Telecommunications

The role of mobile telecommunications in Russia is prominent. Mobile telecommunications arrived on the Russian market in the initial stages of transition, amidst poorly developed fixed telecommunications networks, low per capita income relative to the industrialized countries, and low demand for mobile telecommunications services. Due to this, as well as to relatively modest initial investments, the

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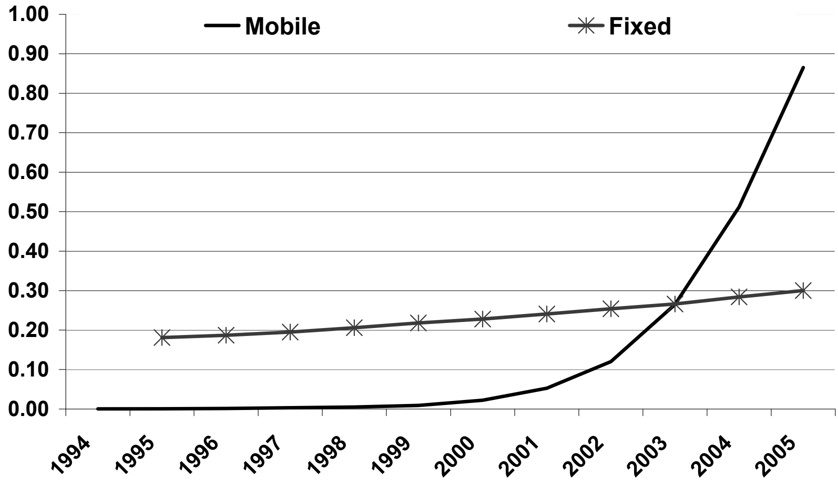
[23] The data in Russia are for the Central region in 2004.

[24] www.sistel.ru



Source: ITU (2006a), Minsvyaz (2006)

Fig. 2.29. Fixed vs. mobile phone density in Russia

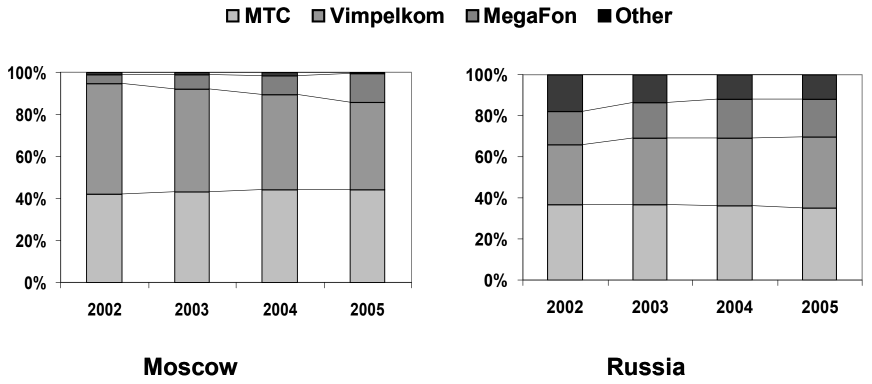
Russian government decided that the volume of the mobile telecommunications markets were very low, and did not regulate these services extensively. The lack of regulation in the mobile telecommunications market had a positive influence on its development. After 2003, mobile line density began to exceed the number of fixed lines and their revenues amounted to more than 50% of the entire telecommunications sector revenues. Mobile telecommunications are often, to some extent, a substitute for fixed telecommunications (WTO 2004). As illustrated in Fig. 2.29, after 2003, the mobile penetration rates in Russia are higher than fixed penetration rates.

Until 2005, mobile telephony in Russia grew rapidly, reaching saturation in 2007. In 2Q06, Russia had 140 million subscribers and a penetration rate of 96.6% per 100 inhabitants. However, according to Sotovik (2006a), penetration rates of active SIM-cards accounts for 2Q06 are only about 66%.

Diffusion of mobile telecommunications in Russia started from Moscow and St. Petersburg, as well as other urban areas, and then proceeded to spread across the rural areas, which offered a wide potential for market growth. One of the main factors behind the differences in mobile diffusion in the Russian regions was certainly GDP per capita in PPP (Markova and Ponder 2006, p. 174). However, the price level, resulting partly from the intensity of competition, has been and is quite important. Highly competitive Russian regional markets, with a leading operator's market share of less than 50%,[25] accounted for only 28% of all regional markets in 2004. In 26 and 16% of all regions, the market leader's share is more than 70% and 60–70% respectively. In spite of the Russian regional markets, three to four GSM operators exist and anti-competitive behavior from the respective dominant mobile operator is very likely in 72% of regions Sotovik (2004).

[25] e.g. Samarskay, Saratovskay, Nishegorodskay, Kaliningradskay distincts, Republic of Tatarstan.

In the early 90s, the enterprises which nowadays belong to the most significant players entered the Russian mobile telecommunications market. In the course of time, the Russian mobile telecommunications market has become dominated by three enterprises: Mobile TeleSystems (MTS), VimpelCom[26] and Megafon. They have successfully concentrated the market in their hands, attracting more then 80% of the market in the whole of Russia. The market share developments of the three main players in Moscow and in Russia as a whole are shown in Fig. 2.30.



Source: Based on Sotovik (2006b)

Fig. 2.30. Market shares of the mobile operators in Russia and the Moscow region

The Russian market is characterized by a huge number of regional/local mobile operators such as Uralsvyazinform (subsidiary of Svyazinvest holding), SMARTS, Tele2 and SkyLink. Some of them are fighting to become the fourth-largest operator; however, success is still doubtful. Considering the aggressive expansion policy of the dominant operators especially at the beginning of the twenty first century, the regional operators were jeopardized by the anti-competitive behavior of the big players, who are interested in forcing them out of the market or acquisition. However, in 2007 after the "big three" decided to focus mostly on the revenues and not on subscriber acquisitions, the share of the regional operators grew to 20%

In the past years, one has observed a tendency towards consolidation in terms of capital structure in the Russian mobile telecommunication market, associated with numerous mergers and acquisitions. This trend is taking place on two levels: on the level of the holdings and on the level of the mobile operators. On the level of holdings, the process of market concentration was especially visible shortly after the crisis of 1998. Sistema Telecom, Alfa-Group and Telecominvest holdings respectively have a share in one of three main mobile operators of GSM standards: MTC, VimpelCom and Megafon with the exception of the Alfa-Group, who has shares in the VimpelCom as well as in Megafon.[27]

[26] The market label "Beeline"

[27] The legality of the purchase of 25.1% of Megafon's shares by the Alfa-Group is still questionable and brings about many court cases.

The leading mobile operators often used the following three ways to expand service provision in the regions: (1) acquiring of licenses, (2) acquiring a non-operating license as well (3) acquiring or merging with an existing operator and mergers and acquisitions. Since December 2003, VimpelCom and MTC have possessed the licenses for most of the Russian regions. Megafon already held a license portfolio enabling it to serve 100% of the Russian territory.

The Russian mobile telecommunication market is characterized by certain influences from integration through international stake holders, especially European companies. However, this dependence is sometimes limited. At the beginning of 2007, the biggest Russian company MTC was owned by AFK "Sistema" (52.8%), free float (46.7%) and others (2%). The structure of VimpelCom share holders was as follows: Telenor (Norway Telecom) (26.6%), Alfa Group (32.9%), free float (39.4%) and treasury stock and others (1.1%). Megafon, the youngest company, had many international stake holders: Sonera Holding (26%), Telecominvest (owned by international investors) (31.3%), ZT – Mobile (owned by Alfa Group) (25.1%), IPOC International Grant Fund (6.5%), Telia International AB (6.37%).

Svyazinvest, the biggest Russian telecommunication holding, has undergone numerous restructuring programs and its revenues in mobile telecommunications are continuously falling when compared to the others. The subsidiaries of Svyazinvest were less than 10% of the whole Russian mobile telecommunications market at the end of 2003. The holding is selling its unprofitable business and seeking to concentrate only on the three main regions: Povolsh'e, Ural, and Dalnyi Vostoc, where the mobile subsidiaries of Svayzinvest are quite strong. A special feature of the Russian telecommunications market is that the subsidiaries of the state company do not have a high market share in the mobile telecommunications market, which differs from Poland and many other countries.

Finally, the structure of the Russian mobile telecommunications market is characterized by one more feature. According to the decision of the Minsvyaz (2003a), the long-distance and international traffic of the GSM mobile network operators between the regions have to route only through the network of traffic transit companies; direct connections are not allowed. The main players on the traffic transfer market are Rostelecom (incumbent long-distance carrier) and MTT (private long-distance carrier). The latter gathers up long-distance traffic from mobile operators and passes it between the regions using channels rented from Rostelecom, for which it pays Rostelecom a flat rate. MTT controls 50% of Russia's mobile traffic and Rostelecom around 40% (Troika-Dialog 2004). However, the latest investigation by the Ministry showed that the three main mobile operators breached the rules and, in some cases, routed traffic directly.

At the beginning of 2000, in the Russian telecommunications sector, about 6,150 licenses[28] were issued, 526 (355 in 1995) in the mobile telecommunications sector. The scarce spectrum influences the diffusion of mobile telecommunications in Russia, e. g. due to the fact that the required 900 MHz band was mostly reserved by military or other government facilities, the Ministry of Communications initially

[28] http://light.minsvayz.ru/cgi-bin/show_site_document.cgi?parent=12&id=77&03.05.04

limited licensing of GSM-900 services to one per region. Referring to Minsvayz,[29] only 5% of radio spectrum in Russia is free for commercial use. The rest still remains under the control of military and other federal agencies (around 80%), or is shared by telecom operators and the military.[30] The Russian Telecommunications Ministry has started a couple of initiatives designed to release a portion of this spectrum[31]; it now depends on the efficiency of the Ministry as to how fast that might happen. Free spectrum, of course, plays a crucial role in the development of 3G mobile technology networks and fixed-wireless technology networks, as well as digital TV.

As a result of historical development, in 2005 in Russia, five standards of mobile technology networks were in operation: GSM, AMPS/D-AMPS, NMT–450, IS-95, as well as IMT-MC-450. At the beginning of 2005, the GSM standard had a market share of 98.2%, while AMPS/D-AMPS, NMT–450, IS 95 and IMT-MC-450 operators had respectively 0.8, 0.3, 0.5 and 0.2% of the market (IKS 2005). Currently the GSM standard is clearly dominant. The dynamics of the CDMA standard development is quite slow; in 2004 the CDMA subscriber share (IS-95 and IMT-MC-450) amounted to only 1%. The number of subscribers in NMT-450 and AMPS/D-AMPS standards has decreased over the last couple of years.

Within the clients structure of Russian mobile telecommunications, prepaid tariffs play a very important role. Especially after the Russian crises of 1998, when the financial situation was very unstable, pre-paid tariffs were the only possible way to provide services, taking into account the low liquidity in the country.[32] The share of prepaid subscribers varies across the companies but, for the whole of Russia in 2006, it was higher than 80%. For example, 96.6% of VimpelCom's subscribers had prepaid contracts in 2006, and the company ranks within the top-ten European mobile operators based on this indicator. In terms of active subscribers, 82.7% of the total VimpelCom subscribers are prepaid.[33] In recent years, the number of prepaid subscribers, especially in markets with low penetration rates, has grown and is helping to raise overall mobile penetration rates.

The three main Russian players are characterized by high subscriber growth rates until the end of 2005, this growth significantly decreased in 2006. The experts speak about market saturation in Russia. At this time, the "big three" decided to concentrate on the usage per subscription in order to shore up revenues. The indicator of monthly average revenues per user (ARPU) for the biggest Russian mobile operators decreased to \$6.6–6.9 in 1Q06. However, in 2007 the ARPU leaped for

[29] Based on the Milovanzev's speech (2007).

[30] e.g. according to the Russian Newspaper Vedomosti, in 2004 SKY LINK shared the spectrum with the military-cosmos forces; because of this, the operator had to turn off the network for the connection to the international cosmos station for 20–30 min.

[31] The program of conversion is carried out by the state. The Mininformsvyaz's officials say that the operators do not need to participate in it; this is a challenge for the state.

[32] In October 1998, VimpelCom "launched a prepaid card program in an effort to reduce bad debt, eliminate monthly fees, and connection costs to its customers. Prepaid "Bee+" cards simplified the usage of cellular phones by eliminating deposits and monthly bills, and allowing customers to control their spending http://www.vimpelcom.ru/company/history1998.html.

[33] Company information.

MTS and VimpelCom to a high of $8.7–9.0 in 2Q07 "on the back of a number of one-off issues." The experts are sure that this increase is connected, not necessarily to price increases, but partly to the MOU increase as well as to the introduction of the CPP pricing regime, which gives an additional revenues source for the mobile operators.

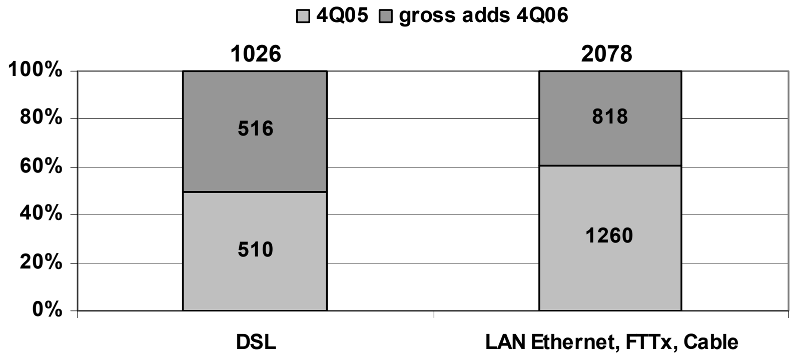
For a long period, among the Russian mobile operators, MTS based on the ARPU as well as MOU was always above its competitors. Contrary to this, VimpelCom had lower costs in terms of subscriber acquisition and a lower rate of churn. As a result, MTC focused on the business customers and had better service quality and coverage. VimpelCom positioned itself on the market with attractive tariffs, especially with the introduction of pre-paid tariffs, and attracted a high portion of users, outstripping to some extent MTC. At the end of 2006, their market shares in the Russian market were quite close at about 33%.

In terms of CIS expansion, until 2006 MTS showed high expansion trends but in 2006 the situation changed. As a result, at the end of 2006 Vimplecom owned operators in six CIS countries. MTS, at the same time, had only four.

After the introduction of the CPI pricing regime, as well as the end of the price war to gain market share (saturation is mostly reached), the Russian mobile operators turned their attention to the content and advertising market. MTS had already tried to introduce I-Mode in 2005, but failed and stopped the project. VimpelCom was more successful and introduced data offering Chameleon, which pushed content to subscribers using only one handset. In total, mobile telecommunications earned $408 million on content, whereof music content had the highest share. In the first half of 2004, non-voice accounted for 11% of all mobile telecommunications revenues. These are, primarily, SMS/MMS (49%), content services (24%) and mobile Internet (6%). In the first half of 2006, non-voice revenues accounted for about 14%.

2.4.6 Broadband Infrastructure

Russia had only a small and scattered broadband installed base until very recently (Point Topic 2005). Up to 2004, most users were found in the business sector but considerable activity in the consumer/residential sector has started. In the middle of 2005, massive centralized investment programs were not an option in this country, but a plethora of smaller and localized companies were pushing broadband services through, whether DSL, cable modem or, increasingly, some form of "cable Ethernet" or "home networks". In 2006, the situation changed. The alternative operators' share of the broadband market fell in 2006 as a result of Svyazinvest's aggressive promotion of Internet services, in particular the introduction of new broadband service brands by some Svyazinvest units. As result, according to Point Topic (2007), the number of broadband lines achieved 3.1 million at the end of 2006; in 2005 they numbered 1.77 million, in 2004 only 890 thousand. As presented in Fig. 2.31, the informal 'Home Networks' which use Ethernet LANs to link up buildings, housing developments and sometimes whole neighborhoods to 'broadband' access as well as operators using Ethernet



Source: Point Topic (2007)

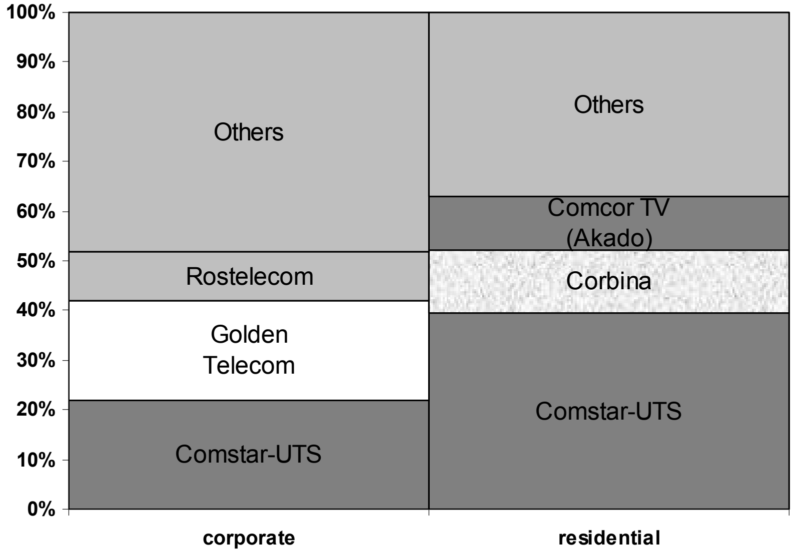
Fig. 2.31. Russian broadband subscribers by the deployed technology 4Q05 vs. 4Q06

fiber-to-the-x connections (cable modem connections is only a very small part from 2.078 million connections) still has the leading position in terms of the number of lines. Comstar UTS opines that there are about 100 home networks in Moscow, most of which operate without operational or content licenses and charge about the same price as for an ADSL connection.

Furthermore, in 2007 the DSL, cable and mobile operators were already facing competition from providers offering services using Wi-Fi and WiMAX technologies. While WiMAX network operators currently focus mostly on lucrative corporate clients, Wi-Fi has already become available for individual users in Moscow and in some other major cities. According to Romir Monitoring, 16% of Muscovites regularly use Wi-Fi to connect to the Internet. J'son&Partners expected Russian operators' revenues from providing Wi-Fi wireless broadband services to double in the year 2007 to U.S. $100 million–$120 million (Parfenov 2006).

The most profitable and more developed segment of the Russian market is the Moscow region. According to data of Comstar-UTS (Systema Holding), the biggest player in the broadband market in Moscow, at the end of 2006, the following market shares could be observed in the residential and business broadband market in Moscow (see Fig. 2.32).

The Comstar UTS advantage in the Moscow market is due the fact that Sistema Holding has a majority ownership of the local incumbent MGTS, which served more than half of all business and residential subscribers in Moscow. This ensures access to last mile in Moscow for the Comstar-UTS. The main competitors of Comstar-UTS are operators of "home networks" providing services through Ethernet fiber-to-the-x (FTTx) connections. These are: Corbina, Centel, and Moscow Cablecom. Corbina, as the second-largest operator in the residential broadband market, was acquired by Golden Telecom in February 2007. Centel is a subsidiary of the Central Telegraph, owned by the Svyazinvest. Moscow Cablecom owns the leading Moscow cable TV operator and broadband provider Comcor-TV. It operates



Note: 51% stake in Corbina was acquired by the Golden Telecom.

Source: www.sistel.ru

Fig. 2.32. Corporate and residential broadband markets in Moscow 4Q06

the FTTB network, covering 2.5 million apartments. This deal is important for Golden Telecom, because of Corbina's last mile access and a couple of licenses in the regions. Due to the fact that there is no local loop unbundling in Russia, Golden Telecom is constructing Wi-Fi hotspots in Moscow to bypass existing copper infrastructure.

Broadband operators are aiming to expand their customer bases beyond Moscow, into the Russian regions, through the rollout of new – very investment intensive – networks and acquisitions. Until 2007, they were mostly active in serving corporate networks in the larger Russian cities. With regards to acquisitions, the analysts say that "in Russia's regions there is virtually nothing to buy." In 2006, Comstar-UTS bought several companies, but they were all small. In the Russian regions, seven "mega-operators" have the best position to become leading broadband providers in their respective territories. Having full control over the last-mile infrastructure, they will be able to swiftly roll out DSL offers to most of their client base. All incumbent "mega-companies" have begun to roll out xDSL services and upgrade inter-regional backbone connections with fiber and/or radio. However, until 2006 the unique DSL development concept for Svyazinvest Holding was difficult to observe,[34] therefore e.g. 'mega-operators' buy DSL equipment separately that results in higher prices. In 2006, Svyazinvest's aggressive promotion of Internet services, in particular the introduction of new broadband service brands

[34] no DSL development plan is published (March 2006).

by some Svyazinvest units (e.g. J trade mark of Volgatelecom) as well as the promotion of new services and offer of unlimited tariff plans (e.g. Dalsvyaz, as a bundle with IPTV), brought about positive developments for Svyazinvest and its share increased. Svyazinvest's share in the Russian broadband access market accounted for 30% in 2007; the plans were to boost the share to 50% in the next 5–6 years.

The competitive situation in the DSL access market for the whole of Russia is difficult to observe. For example, in the Volga region, VolgaTelecom and 70 ISPs provide Internet access. The share of VolgaTelecom is 65% in the dial-up market and 45% in the dedicated access market. The situation in the regions of the Volga area is, however, different. The market share of VolgaTelecom in the dial-up connection segment varies between 24% (Samara region) and 96% (Republic of Mordovia); in the dedicated connection segment it varies between 19% (Yuljanovsk region) and 100% (Kirov region) (Electronic Russia 2004b, p. 28).

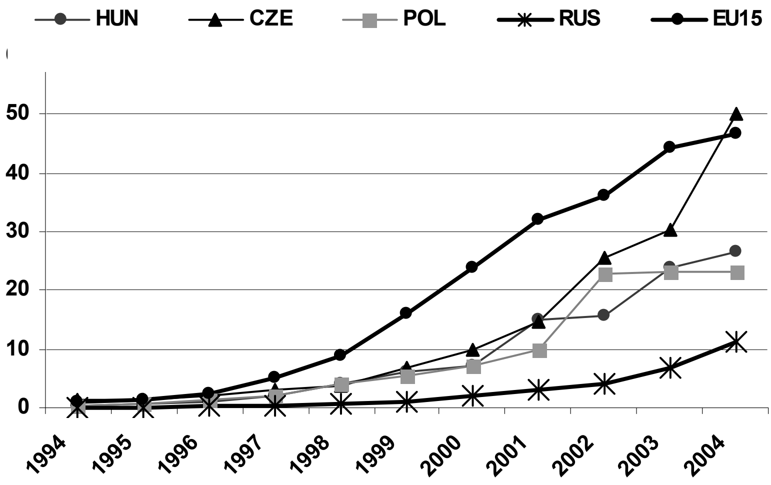
Last year, the Russian holding AFK Sistema's subsidiary Comstar UTS bought a blocking stake in national telecommunications holding Svyazinvest and was one of the candidates to gain the control share during Svyazinvest's privatization. This movement was interpreted as Comstar UTS seeking access to Svyazinvest regional networks. The privatization of Svyazinvest will not happen in 2008. Disagreements over a development strategy for the telecommunications giant between Svyazinvest and Sistema management are already spilling into the public arena. However, the experts predict that there are several market segments in which Comstar UTS could successfully cooperate with Svyazinvest units, e.g. business or ADSL segments.

However, though many cable TV companies exist in Russia, their cables often do not enable bi-directional carriage of signals to provide Internet access and need additional investment to achieve it. The share of cable providers in the Russian broadband market is not high. In the Moscow market, there are a couple of cable TV operators. Comcor TV (AKADO brand), the biggest one, uses the Comcor Moscow fiber optic network to provide all services over last mile. Comcor TV has the third-largest share in the Moscow broadband market. In the Russian regions, the consolidation process in the cable market has been observed since 2004. The main players are National Cable Networks (1.5 million subscribers, 30% are broadband and pay TV subscribers) operating in St. Petersburg, Moscow as well as Yekaterinburg, Novosibirsk, Kurgan and United Cable Networks (1.2 million subscribers) owned by Sistema. Most of the cable operators, which work on uni-directional carriage of signals, are announcing plans to upgrade their networks in the future to be able to provide a wide range of broadband services.[35]

2.4.7 Internet Dynamics and Information Society

Internet user penetration in Russia has very high growth rates but is still lagging behind other advanced transition countries and the EU-15 (see Fig. 2.33). In 2006, Internet user penetration in Russia reached 17.5%.

[35] In 2007, the Russian cable companies provided cable TV and broadband Internet. Telephony was seldom included in the bundling offers.



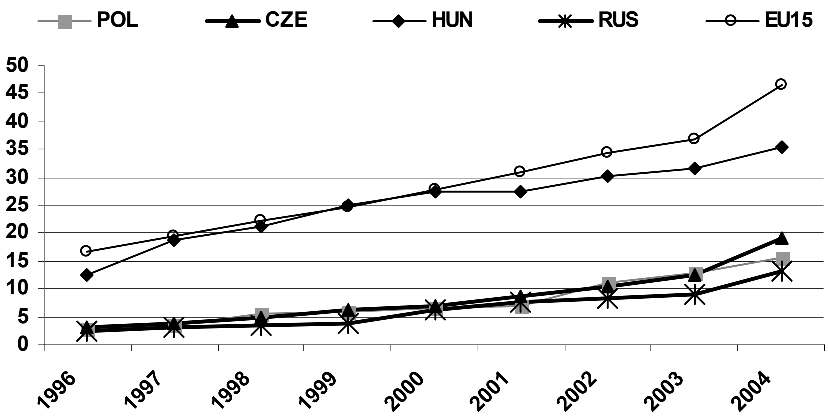
Source: ITU (2005), Minsvyaz (2005)

Fig. 2.33. Internet user penetration per 100 inhabitants

As mentioned above, the broadband market in Russia is still in an early stage of development. The broadband penetration rates are quite low: 2.2% per 100 inhabitants. However, a comparison of the number of personal computers per 100 persons in Russia with Poland, the Czech Republic and Hungary shows that the number of computers in Russia is quite close to the number in the Czech Republic and Poland (see Fig. 2.34). However, as one can see in Fig. 2.33, in both new EU member countries, the number of Internet users is significantly higher. The reasons for this could be manifold, e.g. prices, skills, public Internet access or Internet contest.

With respect to the computerization of the Russian population, in February 2007, the Mininformsvyaz started the Pilot project "PC in each house" cooperating with the Russian Post, Intel and Microsoft. This project is aimed at the Russian population in the remote regions to decrease the digital divide between rural and urban areas. Four different computer models, which will be put together by Russian manufacturers, will be offered with about 10% discount in comparison to the market price. It will be possible to buy and pay for a computer at all post offices, which also deals with the computer delivering services. The Ministry is very optimistic about this project, which was planned for 3 years.

With respect to the prioritization strategy, the issues of relatively high computerization and relatively low Internet participation seem quite controversial to the actions of the Mininformsvyaz's in terms of the program "Computer in each house". To keep a balance between supply and demand, in this case, one would expect more efforts on the development of a broadband infrastructure, price decreasing through promotion of competitions, encouragement of people to work with the Internet, as well as the creation of useful content rather than prioritizing the computer promotions.



Source: ITU (2005), Minsvyaz (2005)

Fig. 2.34. Personal computers per 100 inhabitants

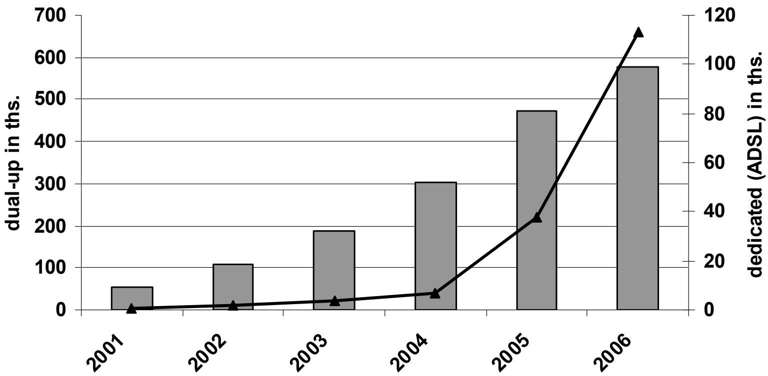
Internet usage in Russia, especially by governmental organizations, is quite low. The survey on local governments (Electronic Russia 2004a, p. 29) serves as an example. In the Astrachan region, only 39% of local leaders have worked with the Internet. On a local level, 92% do not have Internet access at all.

Broadband Internet connections offer the wide advantages of the Internet and the building of an advanced information society. According to J'son&Partners', as of late 2006, around 2.6 million households in Russia used broadband connections and 2.73 million used dial-up connections. The trend of users switching to broadband from dial-up is continuing, as the share of dial-up connections is still high, except for Moscow and St. Petersburg. Moreover, the broadband providers in Russian regions have recently started offering unlimited tariff plans, which is another driver for broadband development in Russia.

An interesting fact is that, in 2006, even low-speed dial-up access was still growing rapidly in Russian regions. VolgaTelecom (regional subsidiary of Svyazinvest) serves as an example and shows an increase of Internet users in both the dial-up and dedicated segments (see Fig. 2.35). However, the rates of growth in the dedicated sector are significantly higher than in the dial-up segment.

The Russian government has started a series of large Public Infrastructure Programs (PIP) in each infrastructure sector, including the telecommunications sector. The main financing in these programs come from the Russian government. The volumes of these programs are impressive but the question is whether these programs will actually be carried out or whether this is only a written plan.[36] Electronic

[36] These programs are typical for Eastern European countries and are analyzed by Von Hirschausen (1999) with respect to the Baltic countries, where similar programs were started but carried out with only a low degree of success (e.g. in 1995 only 29% of PIP in Lithuania was realized). A better result can be seen in Estonia, with a fulfillment ratio of the 1995–1997 PIP of 95.5%. This, however, seems to be strongly similar to the Soviet-type plan fulfillment ratio. In the opinion of von Hirschausen, efficient infrastructure investment policies are more easily "planned" than actually carried out and his lesson is not to waste time or resources drawing up the "plans" as long as they can be executed only marginally.



Source: Electronic Russia (2004b, p. 28) and press releases

Fig. 2.35. Internet connections of Volga Telecom (in thousands): dial-up vs. dedicated

Russia 2002–2010 is a Public Infrastructure Program of the Russian government in the field of ICTs with a financing volume of about US$ 2.4 billion from 2002 to 2010. This was 0.7% of GDP in 2002. Only 20% of this amount is planned to be from non-government budget sources. The program is aimed at the following main goals: improvement of the legal basis in the field of ICT, e-government, e-learning/e-skills, development of telecommunications infrastructure and opening of public Internet access points, e-commerce and actions to increase public support of this PIP. Some results are already visible; as mentioned above, the Internet users penetration is increasing, number of personal computers is growing, in several regions e-government programs, e-learning and e-commerce programs have started. However, especially in the early years, a rather low ratio of fulfillment of this program is observable, e.g. in 2003 on the federal budget level, this program was financed only to about 20% (Minsvyaz 2003b, 2004). In 2006, it is claimed that this program was fully financed. However, in the first 9 months the financing volume accounts for about 10–20%.

By the Russian President as well as by the Russian regions, different smaller programs, such as Internet to all schools or “Student notebook”, were or are realized which is certainly reasonable and positive for the formation of an information society in Russia.

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