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**REGULATORY CHALLENGES OF VOICE OVER IP  
TELEPHONY: ANALYSIS FOR SELECTED SOUTH AND  
EASTERN EUROPEAN COUNTRIES**

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## ACCRONYMS

ADSL	Asymmetric Digital Subscriber Line
ANRC	National Regulatory Authority for Communications (Romania)
ARPU	Average revenue per user
BTC	Bulgarian Telecommunications Company
BWA	Broadband Wireless Access
CaTV	Cable Television
CRC	Communication Regulation Commission (Bulgaria)
CTA	Croatian Telecommunications Agency
ERG	European Regulators Group
ETSI	European Telecommunications Standards Institute
EU	European Union
FDI	Foreign Direct Investment
IETF	Internet Engineering Task Force
IP	Internet Protocol
ISP	Internet Service Provider
ITSP	Internet Telephony Service Provider
ITU	International Telecommunication Union
LAN	Local Area Network
MCIT	Ministry of Communications and Information Technology (Romania)
NATO	North Atlantic Treaty Organisation
NGN	Next Generation Network
NRA	National Regulation Authority
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RIO	Reference Interconnection Offer
SEECs	South and Eastern European Countries
SMP	Significant market power
TA	Telecommunications Authority (Turkey)
USO	Universal Service Obligation
VoIP	Voice over Internet Protocol
WAN	Wide Area Network
WTO	World Trade Organisation

# 1 INTRODUCTION

*“There is no doubt about the speed at which the VoIP asteroid is hurtling toward planet telecom. The question is how deep will be the impact of VoIP when it strikes home.”*

*Total Telecom Magazine, 1 March 2006*

A wide range of services, including voice, video, and data, can be transmitted via IP-enabled networks. These digital networks are cheaper to build and operate than traditional circuit-switched networks, have lower entry costs and are better suited to provide a range of improved, innovative, and economic service offerings to users of all kinds. One of the services that triggered the overall transition to IP environment is Voice over Internet Protocol (VoIP).

The number of VoIP subscribers worldwide is estimated to reach about 125 million in 2008, compared to 25 million in 2005, according to iDATE, while at the same time there is slowing growth in mainlines worldwide. Similar overall market trends are observed mainly in developed western economies, such as the EU 15. But what do these trends mean for economies with a differently structured telecommunications market, with weaker infrastructure and lower GDP per capita? With regards to Europe, the focus of this paper, is to find out how accession candidates are addressing the challenges posed by the growth of VoIP as long as the EU has not decided on a regulatory framework regarding VoIP? Should they regulate this way of communication at all or allow it to develop in order to boost market growth and increase penetration rates?

There are many difficult questions arising, but it is a fact, that a country will be at a disadvantage if it does not embrace VoIP because of all the economic and consumer advantages that VoIP services offer. Countries that follow this path will fall behind gradually, depriving their businesses and citizens of the chance to share the benefits of rapid innovation, more competition and lower prices. Whilst the EU is working to revise the Framework (some) individual countries have forged ahead and produced their own regulations relating to VoIP (e.g. UK, Ireland). The EU seems, until recently, to be following a somewhat “laissez-faire” approach to VoIP.<sup>1</sup>

This Report analyses the regulatory challenges of Voice over IP, focussing in particular on selected South and Eastern European Countries (SEECs): namely, Romania, Bulgaria, Croatia and Turkey. These countries are all official accession candidates to the EU. Romania and Bulgaria are joining the EU in January 2007, whereas Croatia and Turkey are still conducting negotiations. All the accession countries were chosen, with the exception of Macedonia (owing to time constraints).

In order to understand VoIP itself, some definitions and a review of past developments, the technology, economic implications and, most importantly, the regulatory aspects regarding VoIP are given in chapter two. In chapter three, the four country case studies are presented. With the intention of gaining a deeper insight into the selected countries, a general country overview is presented, examining their politics and economies in particular. Moreover, the telecommunications market with its three main sectors (fixed, mobile and Internet) is described. A regulatory overview helps to understand the types of obligations and opportunities traditional operators have that might be applied to VoIP providers in the future as well. Existing VoIP regulations and the treatment of VoIP in each telecommunication market are explained. To get an up-to-date impression of what is happening in each telecommunication market, recent developments (including investments, mergers or acquisitions) are considered. In chapter 3.5, the outcomes of the case studies are compared, highlighting common trends and differences. The recency of the topic meant that it was not possible to find exactly the same information for each country; nevertheless, there are some issues that are common to all countries.

## 2 VOICE OVER INTERNET PROTOCOL

### 2.1 Definitions

The expressions ‘IP Telephony’, ‘Internet Telephony’ and ‘VoIP’ are perceived by some users as interchangeable, but in fact, they have subtly different meanings. Newton's Telecom Dictionary defines them as follows:

**Internet Telephony:** “In the beginning, Internet telephony simply meant the technology and techniques to let you make voice phone calls — local, long distance, and international — over the Internet using your PC ... the definition of Internet telephony is broadening day by day to include all forms of media (voice, video, image), and all forms of messaging and all variations of speed from real-time to time-delayed.”

**IP Telephony:** (defined by Microsoft) “IP Telephony is an emerging set of technologies that enables voice, data, and video collaboration over existing IP-based LANs (local area network), WANs (wide area network) and the Internet. Specifically, IP Telephony uses open IETF (Internet Engineering Task Force) and ITU (International Telecommunication Union) standards to move multimedia traffic over any network that uses IP.”

And finally **VoIP:** “The technology used to transmit voice conversations over a data network using IP. Such data network may be the Internet or a corporate Intranet, or managed networks typically used by long distance and local service traditional providers and ISPs (Internet Service Provider) that use VoIP.”

VoIP has not been defined yet by the ITU Telecommunication Standardization Sector Study Groups, which are responsible for developing definitions within ITU-T. So far, definitions for IP Telephony and Internet Telephony have been provided.

### 2.2 Development of VoIP

The history of VoIP began with conversations by a few computer users over the Internet. Initially, VoIP required a headset to be plugged into the computer, and the participants could only speak with others who had a similar set up. They had to phone each other ahead or sent a text message, in order to alert the user at the other end of the incoming call and the exact time.<sup>2</sup>

In November 1977, the IETF published the ‘Specifications for the NVP (network voice protocol)’. In the preface to this document, the objectives for the research were explained as the development and the demonstration of the ‘feasibility of secure, high-quality, low-bandwidth, real-time, full-duplex<sup>1</sup> digital voice communications over packet-switched computer communications networks’.<sup>3</sup>

In the mid-90s, IP networks were growing, the technology had progressed and the use of personal computers had grown extensively. The belief that VoIP could start to make some impact on the market resulted in high expectations and the distribution of the first software packages.

In its early stages, the technology was not sufficiently mature. There was a big gap between the marketing hype and the technological reality, resulting in an overall agreement that technical shortages stopped any major transition to VoIP. However, VoIP has continued to make technical and commercial progress and most of the technical problems have been solved, while others arose. Now its presence is no longer restricted to a limited market niche.<sup>4</sup>

While communications network providers are hurrying to adopt IP in their infrastructure, enterprises are adopting IP for private corporate networks. By facilitating communications amongst employees whether working at corporate locations, working at home, or travelling, VoIP can augment corporate efficiencies. Many enterprises are testing VoIP, doing a tryout, or engaging in incremental upgrades. The majority of

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<sup>1</sup> Full-duplex systems enable communication in both directions. All wire networks are full-duplex, for example.

multinational corporations see VoIP not as a remote possibility, but as a business opportunity, which will be a major part of their business operations in the near future.<sup>5</sup>

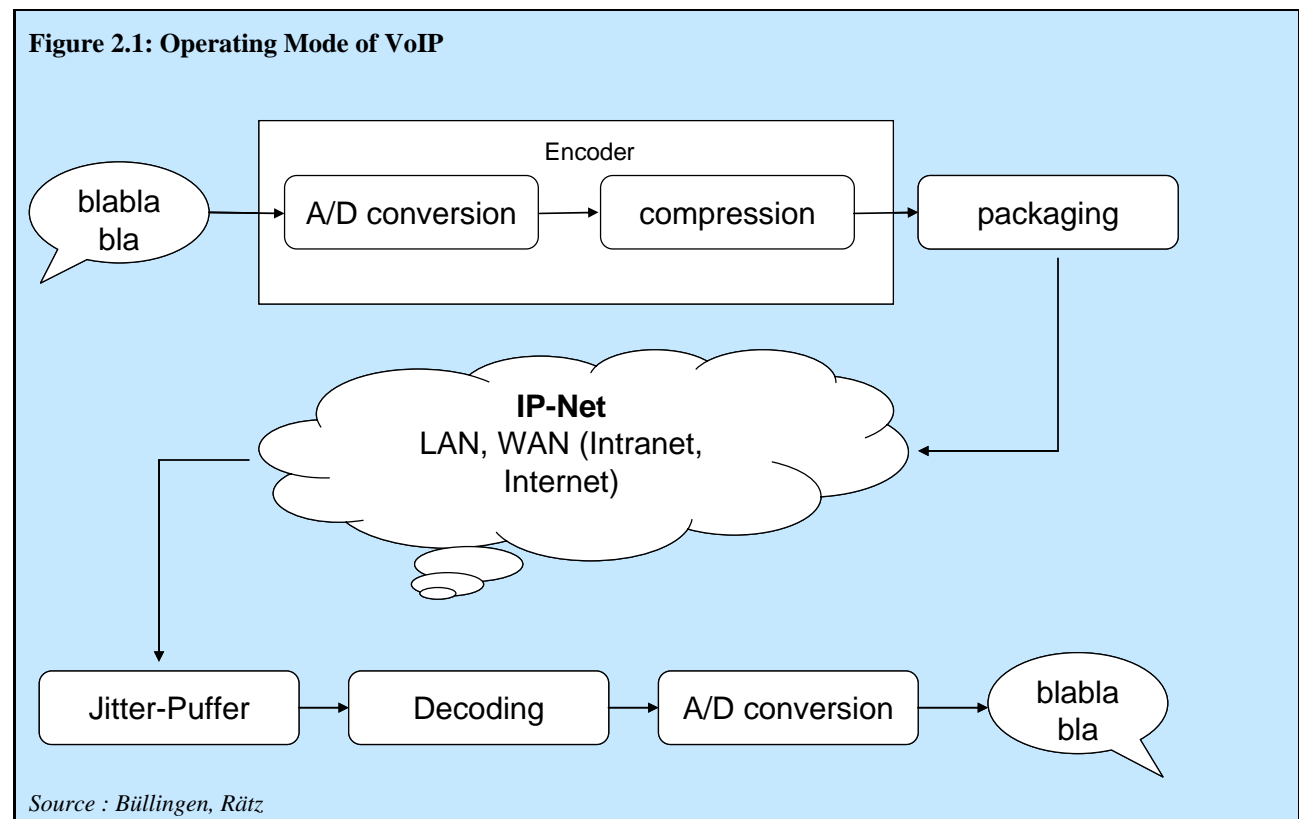
### 2.3 Technological aspects

Traditional telephony is circuit-switched, which means that a dedicated connection between the caller and the person receiving the call is established, and the circuit remains busy for the duration of the call.

IP is a data protocol based on the transmission of data packets, rather than circuit-switching, and is used for routing and transporting information over the Internet. As any type of electronic information can be transported in packets, IP can also be employed to transport voice calls.<sup>6</sup>

Using an analogue-digital converter, a message or voice is separated into single packages and converted into a bitstream. Each package is provided with a header, which contains the number and the destination address of the receiving party (see Figure 2.1).

The packages do not have to reach their destination via the same physical route and there is no permanent connection between the parties. To achieve an adequate quality of voice transmission, a certain minimum bandwidth is necessary.<sup>7</sup> Therefore, broadband Internet access, i.e. DSL, is a vital enabler of VoIP market growth.

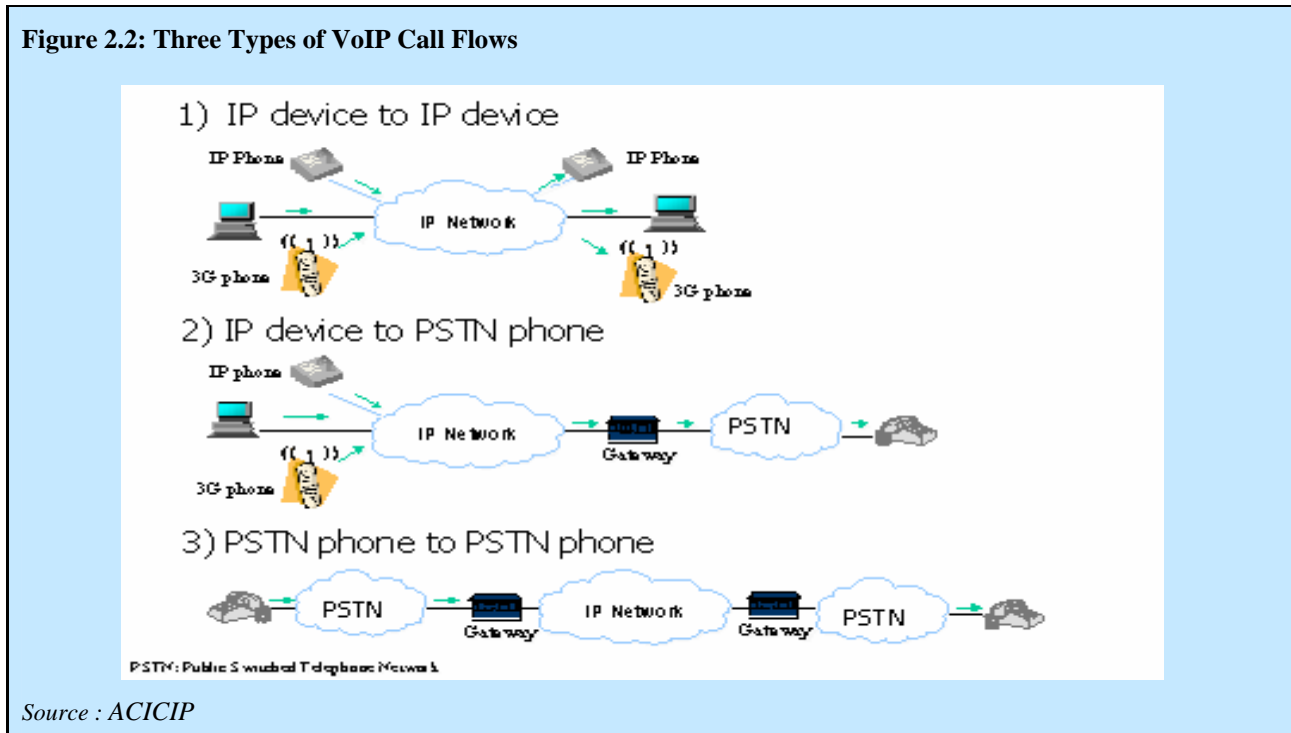


Most VoIP service providers offer only the application of VoIP, while a different service provider may control the infrastructure. This separation of infrastructure and application is one of the key features made possible by IP.

IP-based networks are not only capable of carrying voice communications, but also data and video across diverse and numerous devices. The benefits of IP in these networks include the low costs of developing and upgrading applications. They are easier and less expensive to create and they permit new innovation more

rapidly. Other benefits exist in the life cycle of IP networks with feature enhancements. Since updates and maintenance can be made electronically and network performance is improved, the total maintenance costs over the life of the system are reduced.<sup>8</sup>

Currently, there are three types of VoIP call flows (see Figure 2.2), which can be distinguished by the devices used and by the transmission of data to the end-user. When using only IP devices, conversion through a gateway is not needed. If the consumer uses a Public Switched Telephone Network (PSTN) telephone, there has to be a gateway to convert the digital data into analogue. VoIP may be used via a telephone or microphone directly connected to a computer or using a separate device like a Pocket PC or a conventional telephone with a special adapter.



Although the migration to VoIP is already underway, the complete implementation of IP in communications networks will take several years to finalize. Meanwhile PSTN and IP networks are expected to coexist. Simultaneously, new wireless broadband technologies are gaining market share. Wireless offers a new and affordable strategy for many countries to connect their citizens who lack fixed line access to telecommunication networks. Developing countries are witnessing significant adoption of all types of wireless. IP is one bridge between the PSTN, wireless and the broadband world.<sup>9</sup>

## 2.4 Economical implications

There are multiple models for providing VoIP and a variety of market players. Each player's model corresponds to its respective competencies and its positioning. According to an analysis by Stratix, there are five different types of VoIP providers on the market<sup>10</sup> :

- *Telecom Operators* : The majority of telecom operators, especially incumbents, have an ambivalent attitude to the migration to IP-based telephony. On the one hand, fixed networks still generate considerable profits; however, mobile telephony and VoIP service providers threaten their profit margins and, increasingly, their survival. Therefore, fixed network providers will try to use their existing PSTNs as long as possible to recoup historical sunk investments, while judging the



appropriate moment to migrate to an IP-based network. Many incumbents are driven to migrate to IP-based networks in order to avoid the heavy maintenance costs of their old legacy network. On the other hand, growing competition motivates incumbents to cut costs and to stop the coexistence of PSTN and IP within a single network. More and more incumbents and infrastructure-based competitors have announced their intentions to offer VoIP commercially. IP has been used for years by some integrated carriers in order to avoid the International Accounting Rate System.

- *Cable Companies* : In addition to their existing product portfolio (TV and Radio), cable companies try to provide Internet access services and VoIP in order to generate enough profits to finance their cost intensive migration investments. More and more cable companies are turning to Triple Play, offering TV, Internet and telephony in one set.
- *Internet Service Providers* : This type of provider has its own Internet access and is therefore dedicated to developing the infrastructure. Often, they already have an existing customer base, which is of great advantage. Moreover, they can guarantee a certain QoS because they control their own connections.
- *Newcomers* : These companies try to enter the telecommunication market for the first time by offering VoIP-based telephony services. Very often, they are start-ups like Vonage or Sipgate, but external players like Microsoft, who were never active in the telecommunications market before, may also influence this industry in the future as well. These providers are often called Internet Telephony Service Providers (ITSP).
- *Not-for-Profit Clubs* : Some organisations like Skype or Free World Dialup offer free Internet telephony when customers download their special software. This kind of VoIP provider is characterised by continuous and sustainable modification processes and always offers new services. So far, these organisations have the biggest VoIP customer base worldwide. One can observe a recent, increasing commercialisation of Not-for-Profit Clubs to sheer profit-orientated companies.<sup>11</sup>

While telecom operators and ISPs have control over the whole value chain, cable companies and ITSPs can cover only parts of it. Not-for-Profit Clubs control the smallest bits of the value chain, which means they make fewer investments but have less market power.

Due to the new types of providers entering the market, new ways to exercise and abuse market power may develop. The control of network capacity allows competing service providers the possibility of discrimination against other service providers by refusing, blocking or degrading their data traffic. In addition, it means that operators can vary the quality of interconnections with other networks and hence, allows discrimination between on- and off-net services. The refusal to provide basic services or degradation in QoS can increase costs for competitors. Control over service access and customer information makes it possible to discriminate against competing providers and to exploit economies of scale.

There are few obvious regulatory conclusions to be drawn. Firstly, it is unclear to what extent, and in which markets, providers will amass enough market power. The fore-mentioned models of VoIP providers could pave the way for competitive market structures. Secondly, it is also unclear which methods may be used to discriminate against competitors and how relevant they will be. In particular, QoS provisions require new interconnection and new business models for the billing of consumers.

Another possibility that may reduce the need for regulation is the establishment of an association which will agree on interoperability and interconnection standards and define the required standards, like the ITU. Standards help to create a level playing field by coordination and by reducing risk in investment decisions. They can also lead to less market segmentation and therefore, increased variety and competition. Standards may be agreed for processes, interfaces or descriptions/comparisons of technical details: for instance, QoS service agreements.<sup>12</sup>

## 2.5 Regulatory Aspects

Some efforts have been made to develop specific regulation for VoIP during the peak of the liberalisation process of the telecommunications sector. The European Commission (EC) published two documents

regarding VoIP regulation in 1998 and in 2000, which became outdated after the new regulatory framework for electronic communications was passed in July 2003. In its 11<sup>th</sup> report on European Electronic Communications Regulation and Markets 2005, the Commission stated that:

*“The Commission supports a light regulatory touch and welcomes the fact that a number of NRAs have taken a forward-looking stance, which reflects the Commission approach, on regulatory treatment of VoIP.”*

Together with a number of NRAs, the EC decided that VoIP is part of the telephony market. Regulation of VoIP in the Member States has been very moderate so far; therefore, in practice, there seem to be low barriers to market entry.<sup>13</sup>

Most of the consultations are considering the idea of VoIP regulation in relation to newly established or ‘emerging markets’. The argument in favour of regulation is that it would be reasonable to apply minimum ex-ante regulations during an initial period, while applying the common rules of competition later. This argument results from the expectation that VoIP could potentially level the provision of services over different infrastructures and will contribute to more effective competition. However, in practice, many interconnection and access problems occur from the ‘bundling’ of services (i.e. broadband access and voice) by operators with Significant Market Power (SMP). The European Regulators Group (ERG) has stated that these innovative services should not be hindered by any regulatory hurdles. NRAs have used different approaches in applying regulation to these new services. Most of the authorities are taking a light-touch approach, while others are taking a more interventionist one. Overall, all regulation authorities have taken notice of the importance of giving the right signals to the market and encouraging innovation.<sup>14</sup>

According to Feijo Gonzalez, there are five different models for the regulation of VoIP:

- *VoIP as a Data Service* : The view that VoIP is a data service maintains the existing default situation and considers VoIP as just another type of data service, rather than a voice service. The argument behind this model claims that it makes no sense to make any differentiation between audio data and other data. Moreover, it is difficult to distinguish between real-time, full-duplex communication and store-and-forward<sup>2</sup> information. Since the Internet, with all its value-added services, is not regulated as a whole, it would be unreasonable to regulate VoIP using this concept. VoIP is not considered as a publicly available telephony service, but instead, as a private one. Consequently, no numbering allocation is necessary and the usual obligations would not be imposed on the operators.
- *Limited Interconnection* : A stricter approach to the regulation of VoIP is to configure a separate VoIP access market with specific numbering and interconnection agreements with the PSTN. The interconnection regulation regime could vary, depending on the development of new networks and their impact on existing infrastructure, especially the PSTN. The interconnection between both networks would be adapted, according to the evolution of VoIP. Initially, there would be only minimal obligations for operators (e.g. no emergency call obligations) and later, obligations would change, according to the development of VoIP. Specific numbers would be assigned to IP services without geographical recognition.
- *Specific Numbering* : This model is similar to the previous model; however, in regards to interconnection, it also includes those elements that are necessary for the introduction of VoIP offers over other infrastructures under fair conditions. This means there are no hurdles between VoIP and conventional telephony domains, but the technical and economical aspects to achieve this objective have to be authorised. Number portability between both operators, for example, could be considered. The allocation of numbers is identical to the previous model and the operators’ obligations are dependent on their SMP. The progress of VoIP influences the evolution of the regulation.
- *Geographic Numbering* : This model is comparable to the prior model, although it considers the employment of geographic numbering similar to that used in traditional telephony. Geographic numbering can be disposed to some restrictions and/or differentiating characteristics.

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<sup>2</sup> Store-and-forward is a technique by which information is sent to an in-between station where it is kept and sent later to the final destination or to another intermediate station.

- *Equality between VoIP and Conventional Telephony*: The idea behind this scenario (“voice is voice”) is convergent regulation which, due to the non-existence of specific regulations for VoIP services, implies an adjustment of the traditional regulatory model and a high level of technological neutrality. This means that the obligations of VoIP operators providing publicly available services are identical to those of existing public telephony operators. These obligations involve fulfilling all the requirements in the appropriate Directives, i.e. the option to pass on calls to emergency numbers or cut communications at the request of the authorities. Furthermore, other standards (for instance, number portability; efficient, objective and non-discriminatory usage of telephony numbering; and conformity with the rights of users in quality commitments, agreements, specified rating) have to be met.

These scenarios are not exclusive. It is possible that several of them could operate concurrently, depending on the type of VoIP, the strategy of the operator or the relevant regulation (according to operators’ SMP).<sup>15</sup>

No matter which regulatory approach is favoured, many academics and politicians believe that the concept of ‘technological neutrality’ should be preserved. Different definitions of ‘technological neutrality’ exist depending on the context, but this principle basically means the absence of restrictions, based on the type of technology.<sup>16</sup>

In brief, there are different relevant approaches to the regulation of VoIP: market power and interconnection agreements, USOs (universal service obligations) and QoS (Quality of Service) and other competitive safeguards.<sup>17</sup>

### **2.5.1 Market power and interconnection**

In the 2003 *Acquis Communautaire*, the European Commission classified eighteen relevant markets to be analysed with the intention of determining operators as having SMP. Eleven are wholesale markets (of which, three are related to fixed network interconnection) and seven are retail markets. The Access Directive (2002/19/EC) gives NRAs the possibility to choose which ex-ante access and interconnection obligations to enforce on operators with SMP in relevant wholesale markets.<sup>18</sup> If VoIP is considered as for the equivalent of fixed telephony, an operator with SMP will have to give any VoIP operator the opportunity to interconnect, if the call terminates outside the Internet.

Interconnection ensures that newcomers have access to the public fixed and mobile infrastructure of electronic communications and can encourage new operators to enter the market. Providers with SMP must obey measures which prevent an abuse of market power, promote competition and protect users’ rights and interests.

Typical measures include the right to access certain facilities, cost-orientation of tariffs and separate accounts, as well as obligations regarding transparency and non-discrimination in relation to the other players on the market.<sup>19</sup>

The European Union’s approach towards the principle of ex-ante regulation in the telecommunications sector has demonstrated the necessity of prior market analysis. The Commission required the member states to conclude an examination related to the proposed markets by July 2003 in an effort to sustain a consistent competition in the predefined markets. There are three steps in this process: (1) the definition of the related markets; (2) the definition of operators which have SMP in the related markets; and (3) the remedies to increase the level of competition which will be applied to operators with SMP.

The concepts of SMP and dominant position are united in the new regulatory framework and they are often used interchangeably. To analyze the degree of competition and define operators as having SMP, criteria such as the total size of operator, market share, control over infrastructures that can not be duplicated easily, technological advantage and superiority, low or zero countervailing buying power, easy and privileged access to financial resources, product/service differentiation, economies of scale and scope, vertical integration, an advanced distribution and sale network, lack of potential competition and obstacles to expansion are taken into consideration.<sup>20</sup>

### 2.5.2 Universal Service Obligations and Quality of Service

The 2002/22/EC Directive defines universal services and users' rights relating to electronic communications networks and services (Universal Service Directive) as follows:

*“Ensuring universal service (that is to say, the provision of a defined minimum set of services to all end-users at an affordable price) may involve the provision of some services to some end-users at prices that depart from those resulting from normal market conditions. However, compensating undertakings designated to provide such services in such circumstances need not result in any distortion of competition, provided that designated undertakings are compensated for the specific net cost involved and provided that the net cost burden is recovered in a competitively neutral way.”<sup>21</sup>*

A common way of financing USOs is to designate an operator as the Universal Service Operator and provide it with a universal service fund in order to compensate its extra costs. However, it can be problematic to calculate the net cost attributable to this extra obligation.

It can be complicated for packet-switched network operators to guarantee end-to-end QoS, especially when part of the communication link is transmitted over a third party's network. QoS can be defined as “the collective effect of service performances, which determine the degree of satisfaction of a user of the service”.<sup>22</sup>

QoS criteria are of great importance for consumers in competitive markets; therefore, operators will try to increase their QoS independently. However, it is necessary to determine some QoS criteria by regulation to protect the rights of consumers. Even in competitive markets, QoS regulation is essential for consumers to receive proper information regarding technical issues before choosing an operator. NRAs can demand technical information (such as supply time for initial connection, fault repair time, faults rate per access line, unsuccessful call ratio, call set up time, response times or bill complaints) be made publicly available.<sup>23</sup>

With the intention of guaranteeing a certain level of voice transmission quality, several measures can be taken in order to minimize quality deficits, including delay, package loss, jitter and echo. Delay can be caused by the network itself as well as by devices. Normally, delay is not perceived until 100ms and after 300ms a conversation is significantly disturbed. Based on this, the ITU recommends a delay smaller than 150ms.

Package loss is the loss of data packages during a communication session. This leads to a deterioration of voice quality. In general, 5% package loss can be compensated for by the human brain without being consciously noticed, more than a 5% loss causes a disruption in the communication, and more than a 10% loss make a conversation impossible.

Jitter is the difference between the ideal package arrival and the actual package arrival resulting from the different packaging processing times in the various network components. In order to achieve a high quality of voice, jitters should not exceed 20ms. A jitter-buffer can help to minimize jitter effects.

Echo, hearing one's own voice, has previously caused problems in PSTN, but the small delay did not make it as obvious as it can be in VoIP (>25ms). Technical measures can be implemented to compensate for echo. Delay, package loss, jitter and echo all have been gradually improved since the late 1990s and do not represent elementary restrictions for quality in VoIP services.<sup>24</sup>

### 2.5.3 Competitive Safeguards

The provision of telephone services is dependent on the allocation of telephone numbers to subscribers. Where VoIP operators do not have access to local telephone numbers, numbering could prove a barrier to market entry. Access is especially important for VoIP operators who offer their services without a network connection. Non-geographical numbers, which were assigned in the beginning, lead to a distortion of geographical information. Now, for example in Germany, VoIP users have the choice between a geographical number, which must correlate with their residence, and a special VoIP number, which has an individual area code without any physical reference, similar to mobile numbers.<sup>25</sup> The main argument against geographic numbers for VoIP services is nomadic use and the exhaustion of geographic numbering resources. The

nomadic use means that people can now travel with their Notebook and wherever they have access to the Internet, they can make and receive calls with their geographic number, no matter where they are. This does not raise any billing problems, because the receiver does not use any other telecommunication network except the Internet access network, which they are paying for anyway, but it could lead to a misinterpretation of geographical information, which plays a crucial role when it comes to issues like investigating criminal matters and emergency calls (see below).

Another important competitive safeguard is number portability, which allows a subscriber to keep his or her old telephone number when changing providers. This capability is most important to business users, for whom a change of telephone number can be costly and represents a risk of lost of revenue. Art. 30 of the Universal Service Directive requires that all operators of publicly available telephone services (mobile as well as fixed) provide number portability.<sup>26</sup> If a fee is charged to keep the customer's old telephone number, portability represents a type of switching cost in telecommunications. The strategy of switching costs effectively differentiates goods which are otherwise perfectly identical.<sup>27</sup>

Also of key importance are emergency calls. When the caller is not able to communicate or does not know his location, location data is required in order to provide fast and reliable help. In the USA and Canada, there are two types of emergency call services. The basic service does not automatically provide location data, whereas the enhanced version makes location data available, independent of the caller. At present, the common opinion is that each provider must inform its customers of the deficiencies and the abilities of its service, especially if the VoIP service is offered independently from a telephone network, i.e. via 'naked DSL'.<sup>28</sup> As a result of nomadicity, practical questions arise, such as how an emergency call should be routed to the nearest emergency centre or how should the caller location be obtained.<sup>29</sup>

Currently, emergency calls in VoIP are not subject to regulations as extensive as in the PSTN, but the introduction of QoS, the potential of providing location data and priority routing could lead to the introduction of regulatory remedies.

#### **2.5.4 Static and dynamic efficiency**

From a rather economic, rather than political point of view, regulation can enhance economic efficiency. There are two different types of efficiency to achieve welfare maximizing long-term economic efficiency: static efficiency, including efficient production of existing services, and dynamic efficiency, which brings about new demand, creation and innovation.

Static efficiency involves the application of cost-oriented prices, guaranteeing fair network access and interconnection conditions, minimizing costs of production and the absence of predatory pricing. For VoIP, this would mean that all VoIP providers, whose services are publicly available and comparable to the PSTN, have to be subject to all obligations any other fixed telephony operator is subject to (i.e. USOs, emergency calls, etc.).

In telecommunications, dynamic efficiency is a central issue. Welfare gains through new services that satisfy growing user needs are much more powerful than welfare gains through static efficiency. One key example is the Internet itself, which is transforming market transactions in the economy as a whole and generating considerable demand for information services.<sup>30</sup> Innovation not only increases quality and variety, but it also leads to price reductions by inventing new technologies, which are less cost intensive.<sup>31</sup>

NRAs always have to question themselves as to which type of efficiency they want to achieve and then deduce their regulation policy. There is always a trade-off between static efficiency (which might hamper the development of new technologies) and dynamic efficiency (which supports new entrants and innovation, but may discriminate already existing providers, who are subject to many obligations).

## **3 COUNTRY CASE STUDIES**

### **3.1 Romania**

#### **3.1.1 Country overview**

Situated in south-eastern Europe, just north of the Balkan Peninsula, Romania is the second-largest country in Central and Eastern Europe, with an area of 238,391 square kilometres. The surrounding countries are Ukraine to the north, the Republic of Moldova to the north-east, Bulgaria to the south, Serbia to the south-west, and Hungary to the north-west. It is bordered by the Black Sea to the east. Romania has a diverse topography and large areas of the country are mountainous. It is rich in natural resources, including natural gas and coal.

#### Politics

From 1946 to 1989, Romania was governed by the Communist Party, led after 1965 by Nicolae Ceausescu. Ceausescu's regime was known for dictatorial excess and oppression. The December Revolution of 1989 overthrew Ceausescu. In 1991, the Parliament approved the Constitution, which proclaims Romania a Republic and a parliamentary democracy. The President is elected for serve a five-year term, according to a Constitutional amendment in 2003, whilst the bicameral Parliament is elected for four-year terms.<sup>32</sup>

In November 2002, Romania was invited to begin negotiations for NATO membership in May 2004. In December 2002, the Copenhagen European Council offered Romania a road-map with the objective of EU membership in 2007. These achievements demonstrated that Romania was making progress, despite the difficulties of reform in some areas (UK Presidency of the EU 2005).

Romania signed the EU Accession treaty in April 2005 and the scheduled date of accession is set for 1 January 2007.

#### Economy

Recent developments in the Romanian economy have been influenced by negotiations for accession to the EU, which started in February 2000. After years of recession, the implementation of the EU *acquis communautaire* was followed by years of uninterrupted economic growth.

In 2005, a slowdown in economic growth and disinflation occurred. This was combined with a widening current account deficit. However, because of strong FDI (foreign direct investment) and large public investment projects, investment activities remained strong.

GDP growth was 5.2% in 2005 down from 7.2% in 2004, mainly because of the negative impact of natural disasters and insufficient export growth. In 2004 the rich agricultural harvest caused extra GDP growth, however, in 2005, the countrywide floods brought about significant damage to the agricultural output and on the whole economy.

Slow but stable improvement was registered regarding the per capita income levels. In 2005, the GDP per capita was approximately 33% of the EU average, which is still fairly low in comparison to the ten new EU members. It varies between 46% in Latvia and 86% in Cyprus. Despite the continuous growth of the GDP volume, the structure of this indicator remained relatively unchanged. Services have made the greatest contribution to GDP, but their weight reaches only about 43%, while other countries in this region reach up to 60% (i.e. Hungary and the Czech Republic). Industry ranks second followed by agriculture, which still accounts for 11.6% of the GDP, a weight superior to EU-15 levels of around 5%.<sup>33</sup>

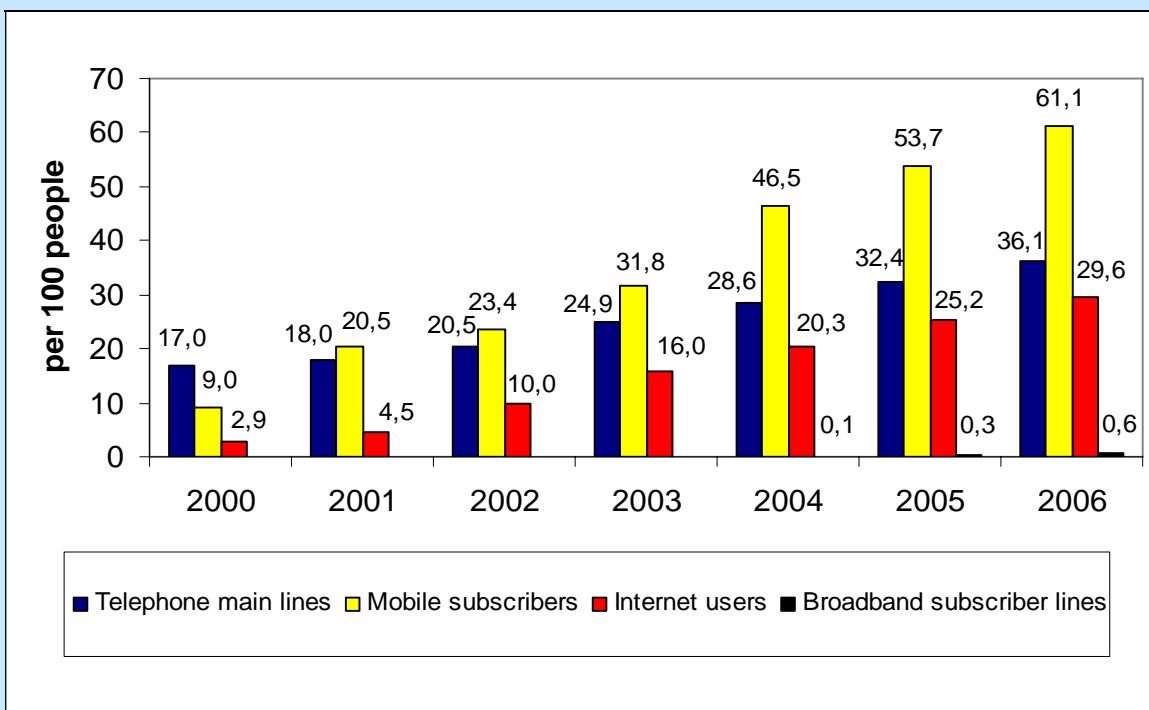
#### **3.1.2 Telecommunications Market**

##### Growth and Investments

The volume of the investments in the electronic communications sector reached €1.8 billion in 2005. In terms of FDI, between October 2001 and April 2006, the telecommunications sector attracted fifty-seven projects, which were worth €1,024 million, representing 23.54% of the total FDI.

The value of the communications market increased during 2003-2004 by 22%, while a 20-25% rise is estimated for 2004-2005. This represents much higher growth than the overall economic growth.<sup>34</sup>

**Figure 3.1: The Romanian ICT Market**



Note: ITU and EIU (2006 forecast)

### Fixed Telephony

After deregulation in 2003, it was not until 2005 that the Romanian incumbent operator, Romtelecom, had to face fully-fledged competitive offers. Although Romtelecom still controls most of the local access market (around 95%), its total number of lines in service has been reduced by approximately 25,000 during 2005 to 4.1 million lines. Moreover, Romtelecom has initiated the deployment of NGNs (new generation networks), which allow integrated telecom service offers (i.e. voice, data and VPN, Internet and video services). Since the incumbent is planning to spend € 500 million on this project and the decision to radically reduce the interconnection tariffs charged as of 2006, the ANRC (National Regulatory Authority for Communications) is still reviewing the project. The foundation of the investment programme is the creation of an IP-centric network, based on a modern backbone capacity using fibre optics and enhanced local loop infrastructure, which will allow broadband services, coupled with the complete digitalization of local exchanges.<sup>35</sup>

By mid-2005, 226 companies had been granted the right to provide telephony services. The majority of the companies applied for a license for international calls. Sixty-seven companies out of this group have received numbering resources, totalling 31.6 million numbers. Most of the players are VoIP providers acting only in the international calls market and using pre-paid telephone cards. The two main providers of fixed telephony services alongside the incumbent are S.C. Romania data Systems S.A. and S.C. UPC Romania S.A.

While the European penetration rate has continually decreased over the last few years, the Romanian penetration rate grew and reached around 30% in 2005. This indicates that the alternative providers are attracting more and more users as a result of their diversified and customer-oriented offers while they are also replacing the loss registered by the incumbent. However, there is a high discrepancy between rural and urban areas regarding fixed penetration. Expanding the infrastructure on the countryside would mean considerable investments.<sup>36</sup>

### Mobile Telephony

The penetration rate for mobile services is almost double that of the fixed line penetration rate. Currently, there are four operating providers in Romanian mobile market: Orange Romania, Vodafone Romania, Cosmote Romanian Mobile Telecommunications and Telemobil. The penetration rate of mobile telephony had reached 53.7% by the end of 2005 (2004: 46.5%).<sup>37</sup>

However, the immense increase was artificially stimulated by the fact that some operators introduced pre-paid cards as a bonus scheme to existing customers. Furthermore, users tend to have subscriptions or pre-paid cards from more than one operator. Nevertheless, the operators were also able to increase the ARPU (average revenue per user) in 2005 to € 125 from € 120 in 2004. Moreover the operators were able to reduce the pressure on ARPU by focusing on provision of applications, customized solutions to the banking and business segment and additional services to large traffic generating customers.<sup>38</sup>

### Internet Services Market

Impressive growth was registered in the market of Internet access services, with more than 980 active providers by the end of 2005, of which 600 provided broadband Internet access. In addition, the total number of access connections exceeded 1.8 million, almost double the number at the end of 2004. For 41% of these connections broadband Internet access was guaranteed. This sector grew 96% in one year.<sup>39</sup>

Users increasingly prefer dedicated Internet access. The number of dedicated access connections rose 3.3 times in 2005 and exceeded the growth rate of dial-up connections by 1.6 times. Of the 500,000 dedicated access connections, 75% were broadband connections.<sup>40</sup>

The market, including the leased business lines, is estimated at around € 130 million in 2005, having quadrupled its value in the last three years. This is attributed to the growing broadband market that has resulted from companies seeking high quality and high speed transmissions. The two most important broadband offers are the service packages offered by the CaTV (Cable TV) operator and the ADSL service offered by the incumbent's infrastructure. Triple play services (Internet access, voice services and CaTV) are made available by the main CaTV operators (Astral and RCS&RDS) via their broadband offer. After the unbundling of the local loop at the end of 2004, the incumbent had to face eight ADSL offers from alternative providers by September 2005.<sup>41</sup>

Generally speaking there is competition taking place in the mobile market, although there are four providers with SMP in the mobile telephony market. The Internet service market is heading towards competition since the end of 2005. In the fixed market, however, the incumbent's market share is still too high, which will be tackled by the ANRC with lower interconnection tariffs, for example, in order to achieve a competitive market and thus economic efficiency in the long run.

### **3.1.3 Regulatory Overview**

On 1<sup>st</sup> January 2003, six months after a new regulatory framework was adopted and an independent regulatory authority was created, Romania's telecommunications market was fully opened to competition. The new legislation included basic anti-monopoly safeguards, i.e. interconnection agreements between operators, where major operators have to publish interconnection rate schemes, the definitions of SMP characteristics and the obligations for the operators so classified. Moreover, the legislation took into account a general authorisation framework for all electronic communications providers in Romania. Romania's efforts to join the EU and its dedication to a WTO (World Trade Organisation) agreement on the liberalisation of the global telecommunication accelerated the implementation of full competition.

The roles of the state-managed MCIT (Ministry of Communications, Information Technology) and the independent regulator, the ANRC, were clearly defined, as were any areas where these roles would overlap. While the ANRC is responsible for the day-to-day policy of the telecommunications market, the MCIT has a broader responsibility that includes defining Romania's long-term telecommunications policy. Additional legislation was introduced to establish regulations to cover topics such as interconnection and universal service obligations, as well as defining SMP in certain retail and wholesale markets.<sup>42</sup>



### Market Power and Interconnection

S.C. Romtelecom S.A. was designated as an operator with SMP in the market of access to the public fixed telephone networks for call origination, termination and transit and in the market of leased lines-terminal segments services in February 2003. In response, the company published the RIO (Reference Interconnection Offer) on its homepage, which made available the minimal set of services for interconnection with the public fixed telephone network and the conditions, including tariffs, under which the relevant services would be offered to the alternative providers. Moreover, ANRC classified four operators with SMP in the market of access to its own mobile telephony network for call termination: Cosmorom, Mobifon, Telemobil and Orange Romania. The following obligations were imposed on these operators: transparency, the provision of certain services, and guaranteed access to certain facilities. Besides the above mentioned obligations, Mobifon and Orange Romania also must follow the principle of non-discrimination and cost-orientation of the tariffs and keep separate accounts.<sup>43</sup>

### Universal Service Obligations and Quality of Service

The providers of public electronic communications networks and the providers of publicly available telephone services, which generated a turnover equal to or higher than €3 million in the previous year, must pay an annual contribution to the ANRC. For 2005 and 2006, this contribution corresponds to 0.5% of the turnover minus the revenues obtained from interconnection and roaming services provided on the wholesale market to mobile telephony operators from outside Romania for their users who are in Romania. The amount cannot exceed €2 million for 2005 and €3 million for 2006 for each provider. The universal service providers are chosen ex officio or by public open tender and are compensated for the net cost of the provision of services within the range of universal service.<sup>44</sup>

In the ANRC President's Decision no.138/2002 on the imposition of minimum requirements for the provision of the publicly available electronic communications services, the NRA set out the quality requirements for operators with SMP. However, the operators are not obligated to publish the QoS measurements and have not done so.<sup>45</sup>

### Competitive Safeguards

ANRC uses a two-step assignment of the numbering resources via an administrative procedure. Numbering resources are allocated to public electronic communications service providers through a license. The interested providers are asked to send a request to ANRC for permission to use a certain numbering range that will be included in the National Numbering Plan.<sup>46</sup>

For all types of calls<sup>3</sup>, carrier selection has been available in Romania since February 2003, but carrier pre-selection has not been. In July 2005, the ANRC decided to impose carrier pre-selection starting in June 2006. Another competitive safeguard, number portability, will be provided starting May-June 2007 for both fixed and mobile numbers.<sup>47</sup>

#### **3.1.4 VoIP Regulations**

Romania currently has in place authorisation frameworks that are in line with the provisions of the Authorisation Directive. According to the ANRC authorisation regime, VoIP providers fall into the category of 'other electronic communications service' provider, which means data transmission services provider. They must comply with the general authorization regime under circumstances similar to any other provider of electronic communications. VoIP is not considered as a separate category of networks and therefore, separate regulation of VoIP does not exist. However, a distinction was made between VoIP service providers and private enterprise networks. A company that offers its services only for internal use does not need any ANRC authorisation, whereas companies that provide electronic network communications publicly (including VoIP) must send a request for authorisation to the ANRC.<sup>48</sup>

Because of the principle of technological neutrality, VoIP services are only considered telephony services if they fall within the scope of the definition of the publicly available telephony services. ANRC is currently

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<sup>3</sup> Local, long distance calls, international calls, calls to mobiles, calls to non geographical numbers.

reviewing its position on other types of VoIP services. There is no one-off fee for the licensing, but the providers are required to pay an annual fee of 0.5% of their annual revenues. Cable TV operators must have authorization from local authorities for infrastructure construction works.<sup>49</sup>

In November 2005, all except one alternative provider were using VoIP technology for providing their voice services, twenty-four used their own networks and forty-two used other provider's networks.<sup>50</sup>

### **3.1.5 Recent Developments**

The Romanian telecommunications market is developing rapidly. In May 2006, Atlas Telecom made its intention public to deliver residential VoIP to residential and business consumers over a fixed-wireless telecom network using Digital Enhanced Cordless Telecommunications in tandem with the SIP-based BroadWorks VoIP application platform. This technology sends a signal up to 200 meters from a base station and is deployed on lamp posts. There are approximately 4200 lamp posts planned per city.<sup>51</sup>

Combridge SRL launched a new telecom brand in February 2006, called Eufonika. It uses the RomTelecom network, and customers have access to a free number in order to get connected to the VoIP offer. The Eufonika service is an alternative for RomTelecom clients and allows them to reduce their costs for national calls by 20% and international calls by 40%.<sup>52</sup>

Regarding mobile VoIP, Orange launched its first 3G offer in Bucharest and Timisoara in June 2006, targeting 25,000 customers by the end of this year. The 3G network ensures data transfer speeds of up to 384 kbps. For €22 per month, customers can get a package which includes 180 minutes of national voice calls, 18 national-network minutes of video calls, 18 MB for data transfer, a 10 MB mobile email account and access to Organiser and Mail Manager, which can save up to 50 MB of data.<sup>53</sup>

The final two licenses for 3G telephony, which raised Cosmote's and Zapp's interest, shall be given out by the end of 2006. In March 2006 the government removed the financial requirements imposed on the 3G-license applicants, which excluded companies with a turnover lower than €300 million.

## **3.2 Bulgaria**

### **3.2.1 Country Overview**

Bulgaria is positioned in the Balkan region and has its capital Sofia in the western centre. With 7.5 million inhabitants and a coastline of 354 km, its total area amounts to 110,910 square kilometres. Bordering Greece, Macedonia, Serbia, Montenegro, Romania and Turkey it is located in the centre of two of the biggest economies in SEE.<sup>54</sup>

#### *Politics*

Bulgaria was declared a People's Republic in 1946. 10 November 1989 was the beginning of conversion to democracy in Bulgaria. The 1990's were years of political and economic turmoil. The Constitution was adopted in 1991. The mass privatisation programme, which started in 1993, marked the beginning of the transition to a market economy. A heavy economic crisis led to strong protests in the winter of 1996/97 and the establishment of a new government. The Constitution provides for a multi-party parliamentary system and free elections and separates the legislative, the executive and the judicial power.<sup>55</sup>

In 2004, Bulgaria joined the NATO. It signed the EU accession treaty together with Romania and is expected to join the EU in January 2007.

#### *Economy*

The overall GDP growth reached 5.7% in 2004, 5.5% in 2005 and is forecasted to reach 5.5% in 2006. The economic growth continues to be driven mainly by strong domestic demand. In the second quarter of 2005, the difference between imports and exports of goods and services widened to 15.7% of GDP and consumer price inflation had increased to 4.9%. By November, the consumer price inflation was at 6.9% year-on-year. The inflation has been driven mainly by high increases in fuel prices, which rose to more than 20% on average in the first half of 2005. The current account deficit increased to 11.7% of GDP in 2005.

The unemployment rate decreased to 11.5% of the labour force in the 2005, compared to 12.6% one year earlier. Nominal wages increased by 9.3% in the first quarter 2005 compared to 5.7% a year earlier.<sup>56</sup>

FDI reached a record high of €1,957.7 million in 2004, equivalent to 9.2% of GDP. In 2005, it slowed to €1,824.6 million, of which more than one quarter went into the telecommunications sector (2004: 13.9%). The decline in FDI inflows can be credited to a slow down in privatisation where a number of privatisation projects could not be completed in the time leading up to the elections.<sup>57</sup>

### **3.2.2 Telecommunications Market**

#### *Growth and Investments*

The communications market in 2005 is estimated at €1.403 billion, which represents 10% growth for the period 2004-2005. The growth for the previous period was 13%. This corresponds to an average growth compared to the overall economic growth. The telecommunication market represents 7% of the GDP in Bulgaria.

In 2005, fifty-two new operators have been registered to provide telecom services by cable, 104 existing licences have been amended for providing additional services and forty-nine operators have withdrawn from the segment. This shows that the market is saturated and that the market is now in a phase of dynamic restructuring. Cablenet and Eurotur SAT have the biggest market shares in this segment. The revenue of the segment is estimated to be €80 million, and had a 30% growth compared to 2004. As Cable Internet offers permanent access to TV, radio and Internet services at a competitive price, it has become more and more popular. The triple play services are also growing steadily, mainly because of the prices charged by cable operators of the services. These prices are up to 27% lower than the standard prices.<sup>58</sup>

Utility companies, which use the infrastructure that they already have built for other purposes, have started delivering voice and data as well. BTC (Bulgarian Telecommunications Company) responded to that with the long awaited introduction of ADSL and a defence of its new monopoly. Another opportunity to improve communication services will result from the tender of HDTV licenses.<sup>59</sup>

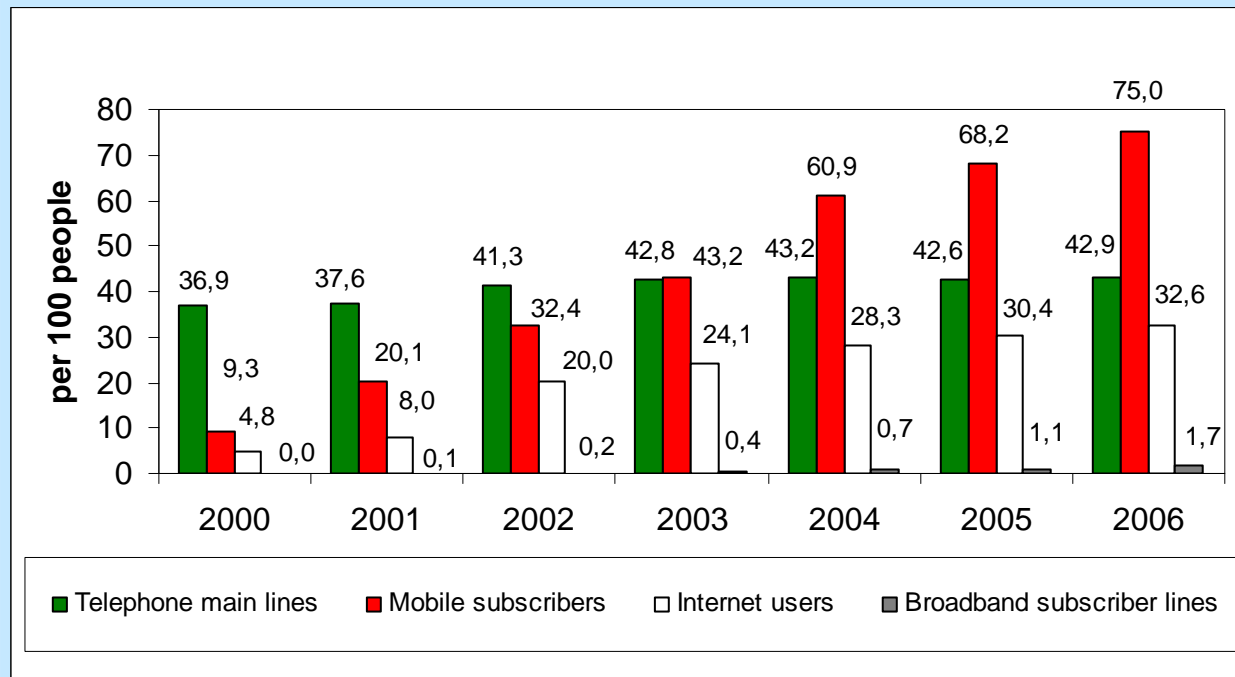
#### *Fixed Telephony*

At the end of 2005, the fixed lines of BTC represented almost 100% of the overall fixed lines. The trend in the past few years has shown a decrease in the overall number of fixed subscribers. In the period 2004-2005, the decrease was 9%, and it was 14% for 2000-2005. In 2005, BTC's fixed services revenue decreased by 3% (in absolute terms) and by 4% relative to the market volume. This loss has not been compensated for by the gains of the other operators due to the sustained depopulation of rural areas, the substitution of fixed with mobile, providing more flexibility, or VoIP.<sup>60</sup>

In 2005, eleven new licences have been issued to eight new operators and nine existing operators have been active on the fixed market. As of December 2005, there were thirty licensed operators of fixed services and networks. BTC's revenue represents 97.5% of the entire revenue in this segment, a clear sign that there is no effective competition on the fixed services market in Bulgaria.

Traditionally, fixed telecommunication was well developed in Bulgaria. Currently, 83% of households have a fixed line and more than 46% of these lines are digitalized (in Sofia and other big cities up to 80%). The majority of the new fixed telephony service providers are expected to use VoIP.<sup>61</sup>

**Figure 3.2: The Bulgarian ICT Market**



Note: ITU and EIU (2006 forecast)

### Mobile Telephony

The overall revenue of mobile services in Bulgaria for 2006 is expected to be €750 million, which indicates an annual growth of 22%. The revenues from mobile services have grown by 22% in 2005 and represent more than a half (55%) of the total telecommunications revenue in the country. This is the second consecutive year this level of growth has been maintained.

The chief competitors in the market are Mobiltel and Cosmo Bulgaria Mobile. A new operator licensed in 2005, Vivatel, is not yet very active but is expected to have a significant impact on competition on the Bulgarian market, particularly in terms of decreasing price of services. There is also one analogue operator, Mobicom. In 2005, there were changes in the operators' ownership. BTC bought a 49% share of Cable & Wireless, 12% of Radioelectronic systems and now owns 100% of Mobicom. In June, the 100% sale of Mobiltel to Austria Telecom at the price of €1.6 billion was finalised. In August, Greek OTE, owner of Globul, sold 100% of the company to its mobile branch Cosmote for €400 million.

In the beginning of 2005, the CRC (Communication Regulation Commission) started the licensing procedure for UMTS networks. Three licences have been issued so far: one class A licence to Mobiltel and two class B licences to Cosmo BG Mobile and BTC<sup>4</sup>. According to the terms of the licences, the first 3G services must be provided by the end of the second year after licensing. Mobiltel is obligated to cover 20% of the population while the other two operators must cover 15%. The mobile operator, Mobiltel, launched 3G services in the beginning of 2006, but it is difficult to determine the effect of this launch.<sup>62</sup>

New business opportunities, such as value-added SMS services are created by higher mobile phone penetration. In the last few years, SMS games and/or voting became a significant part of many TV shows and have delivered a high profit margin.

<sup>4</sup> Class A: 2x10+5MHz, Class B: 2x5+5MHz

The majority of mobile phone users in Bulgaria prefer prepaid services and this trend is growing. This is an indication of the high price sensitivity of customers. Mobile services are perceived as overpriced and customers do not want to enter into a long term contract. Prices are expected to go down and users want to be able to take advantage of the lowest price. In the area of mobile phone penetration, Bulgaria is closing the gap with EU's 15 countries very quickly. During 2005, the gap narrowed from 25% to 12%.<sup>63</sup>

### Internet Services

In 2005, the number of operators licensed to provide telecom services through the public network, without using scarce resources, reached 327. This is a growth of more than 70% compared to the number in 2004. During the last three years, the number of ISPs has grown 30-fold. In 2005, the CRC licensed two new operators for leased lines services, Novatel and Sofia Communications. However, the former monopolist still has 95% of the revenue in the segment. ADSL was commercially introduced in 2004, and during 2005, the number of ADSL subscribers grew 6-fold. Nevertheless, the offerings of and the demand for ADSL service is so far not noteworthy. The estimate is that ADSL penetration is about 1%. The number of dial-up users has been decreasing due to the low speed and the high additional cost for local phone calls. The most popular form of Internet access is cable access, followed by LAN networks. The LAN networks had an increase in the number of subscribers during 2005 because of the low costs of service.<sup>64</sup>

International access speeds are limited and there is a clear trend showing a decline in dial-up, although broadband access is closed in the LANs or in the territory of the country.

The state started a tender for radio-frequency licenses in the 3.5GHz range. These licenses are for the 'point - multiple points' networks using WiMAX technology, a possible alternative to the optical cable. They are a good solution for areas where laying optics is expensive or difficult. If the WiMAX services are priced at affordable rates, the number of Internet and broadband Internet subscribers will increase. Furthermore, in 2005, BTC tested the signal of the first Bulgarian digital television with terrestrial broadcasting in the Sofia region.<sup>65</sup>

Similarly to the Romanian telecommunications market, there is hardly any competition taking place on the Bulgarian fixed market and on the Internet access market yet. The mobile market on the other side is challenged by the two new competitors.

### **3.2.3 Regulatory Overview**

The competent authorities, who exercise power on the telecommunications market, are the Council of Ministers, the Ministry of Transport and Communications and the NRA, also known as the CRC.<sup>66</sup>

In the data service market, liberalisation began in 1993, when the first individual license for a public data communications network and the provision of data services was given to a joint venture of BTC and Sprint International. Infrastructure was partially liberalised in 1993, with the removal of restrictions on building new infrastructure. In addition, individual licences to provide data services were granted under the Telecommunications Act of 1998.<sup>67</sup> Fixed public telecommunications and services were liberalised by January 2003.

The Telecommunications Act of 2003 was adopted in October 2003 by the CRC and lead to the long-awaited privatisation of the incumbent operator BTC. It defined the incumbent's roles and obligations in a competitive environment and installed the following safeguards to protect new entrants and the incumbent. BTC was privatised in June 2004, but the state maintained a golden share, permitting the government to veto decisions by the board of the incumbent operator.<sup>68</sup>

### Market power and interconnection

The interconnection market was not defined as a relevant market in the Telecommunications Act; therefore, specific cost orientation obligations can be imposed on public mobile operators with SMP. In the 1998, *acquis*, the SMP regime, was associated with wider activities such as the fixed public telephone network and the public mobile telephone network.<sup>69</sup>

In 2004, for the first time, CRC experts analysed the fixed telephony market as well as the market of mobile telecommunication networks with the purpose of designating operators with SMP.

In compliance with Article 12 of the Telecommunication Act and on the basis of the gained results from the analyses, CRC declared BTC as the telecommunication operator with a market share of over 25% and imposed the specific obligations set out in the Telecommunications Act. In the mobile telecommunications market, CRC designated MOBILTEL AD as an operator with SMP.<sup>70</sup>

The operators classified with SMP were subject to preventive restrictions and obligations. The aim of these was to stimulate competition in the relevant markets by introducing interconnection agreements, guaranteeing equality among the operators with the right to interconnection and providing access to the local loop.<sup>71</sup>

#### Universal Service Obligations and Quality of Service

The incumbent operator is compensated for the provision of universal services, such as affordability, accessibility or public pay phones (according to EU acquis). Mobile telephony providers are not obligated to provide any universal services. Providing universal service throughout the country at an affordable price results in financial losses for the operators. To counteract this, an instrument is anticipated to compensate these losses. A fund for compensation of the net losses was established in 2005, as were rules for the calculation of the net losses of the public operators from provision of the universal services.<sup>72</sup>

The national regulatory authority for telecommunications monitors the QoS in compliance with the international standard EG 201 769 of ETSI (European Telecommunications Standards Institute). The CRC must publish its results and the latest data available is published in the CRC annual report for 2004.<sup>73</sup>

#### Competitive Safeguards

Numbering blocks are distributed in a manner similar to the Romanian system. Bulgaria is planning to offer number portability for fixed numbers in January 2009 and for mobile numbers in January 2007.

Bulgaria allows both carrier selection and carrier pre-selection for long distance and international calls, but no carrier selection for other types of calls. There are twelve licensed operators for carrier selection and carrier pre-selection services. Two of them were actively operating in June 2005.<sup>74</sup>

### **3.2.4 VoIP Regulations**

Before liberalisation occurred in January 2003, VoIP telephony services were offered freely provided that the service did not meet the specific QoS requirements for fixed voice telephone services. However, compliance with QoS requirements is a minimum requirement for an authorisation that gives the right to interconnect. Consequently, VoIP service providers that ask for a right to interconnect must apply for a fixed voice telephony licence.

So far, the CRC has no official position on regulating VoIP. There is no licensing/authorisation regime for VoIP so long as the least QoS requirements for voice telephony are not met; otherwise a fixed voice telephony licence will be required. There has not been any official liberalisation yet and for the moment there is no one-off fee and no annual fees for VoIP providers.<sup>75</sup>

Originally VoIP was provided by many operators (operators licensed for fixed networks and voice telephone services or carrier selection and carrier pre-selection services) through the incumbent's ISDN ports. In August 2005, BTC cancelled all contracts with licensed operators for providing voice services through ISDN. Since then, VoIP operators have been using other licensed operators to gain access to the incumbent's customers.<sup>76</sup>

### **3.2.5 Recent Developments**

Bulgarian's leading mobile operator, MobilTel, introduced an initiative called ITC Broadband Platform, for which more than ten companies have already affirmed participation. The State Agency for Information Technology and Communications, the Bulgarian Association of Information Technologies, Bulgarian ICT cluster and the CRC are supporting the project.

The main goal is to increase Internet access to 50% of the Bulgarian population. MobilTel's initiative is about real high-speed broadband Internet, meaning 2MB/s. At the moment, users have a choice between three alternatives for high-speed Internet: LAN networks, cable TV or BTC DSL.

Several competitors to BTC in the market of DSL service are expected to appear in 2006. However, in the past, when telecommunication operators, planning to offer DSL packages using BTC's infrastructure, signed contracts with BTC, they were never able to offer their services on the market because of anticompetitive prices and terms within the contracts.

Furthermore, the CaTV market is experiencing a consolidation; CableTEL recently bought ESTnet and Eurocom Bulgaria seems to be interested in buying Eurcom Plovdiv.

Four operators were granted licences for WiMAX data transfer which allows for offering high-speed mobile Internet by the end of 2005. According to the terms of the license, the operators must launch the service by the end of 2006. The two main gas companies in Bulgaria also have telecommunication plans. Competition on the broadband Internet market will be strong in 2007 if gas companies, WiMAX operators and alternative DSL providers are quick to enter this market segment.<sup>77</sup>

### **3.3 Croatia**

#### **3.3.1 Country Overview**

Croatia has the smallest population of the four countries being analyzed (4.5 million inhabitants); however, its GDP per capita (2005: €6,000) is the highest. Croatia is located near densely populated and industrially developed European countries. It controls most land routes from Western Europe to the Aegean Sea and Turkish Straits. In addition, the Adriatic Sea make its possible for Croatia to welcome thousands of tourists each year.<sup>78</sup>

##### Politics

The Republic of Croatia is a young parliamentary democracy. When its Constitution was amended in November 2000, its semi-presidential system was converted into a pure parliamentary system. The government, lead by the Prime Minister, is politically responsible only to the Croatian Parliament, which is consists of the House of Representatives. The President of the Republic is the Head of State. The President is also Commander in Chief of the Armed Forces, and represents the Republic of Croatia.<sup>79</sup>

In 2001, Croatia was the second country to sign the Stabilisation and Association Agreement with the EU. In October 2005, the monitoring stage of accession negotiations started. Croatia is officially considered an accession candidate to the EU.<sup>80</sup>

##### Economy

Croatia has experienced a process of de-industrialisation since its independence in 1992. This has been less serious than in other transition countries. Industry, including construction, now has a 30% share of the economy. Since independence, the services sector, particularly tourism, had grown from about 50% to over 62% as of 2004. Agriculture declined slowly in the second half of the 1990s but still holds more 8%.<sup>81</sup>

After two years of strong economic growth in 2002/03 (~5%), growth fell to 3.8% in 2004. However, the economy recovered in 2005 and GDP grew by 4.3% year on year. Unemployment remained one of the main problems and ranges around 18%. After a slight recovery in 2004, the current account deficit rose back to 6.6% in 2005.<sup>82</sup>

#### **3.3.2 Telecommunications Market**

##### Growth and Investments

The overall telecommunications market increased its turnover by about 10% between 2004 and 2005. While mobile telephony generates approximately 54% of the telecommunications market, fixed telephony creates 40%. The effects of liberalisation have included increased efficiency of business, faster regional development

and a 6.4% decrease in the price indicator of the overall price changes in telecommunications (fixed and mobile). The national increase of investments in telecommunications rose by 30% in comparison to the national average of 7.5% in other sectors.<sup>83</sup>

Fixed Telephony

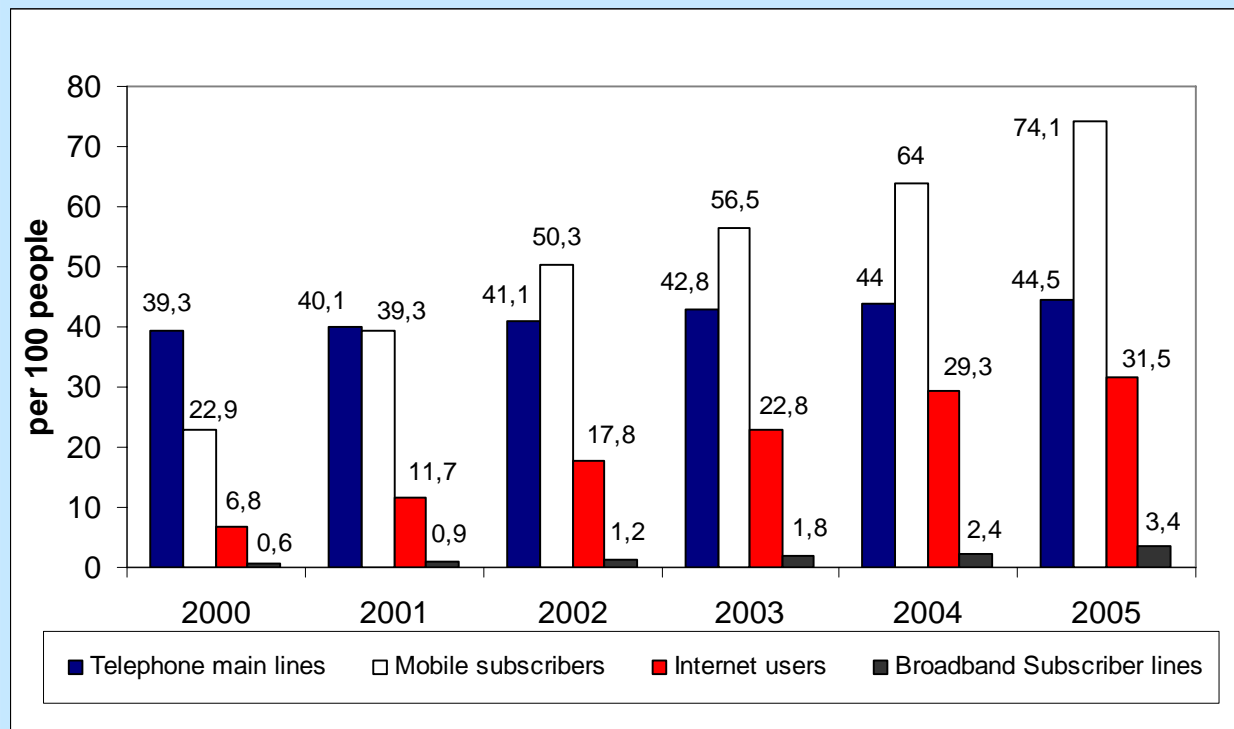
In January 2003, Croatia was one of the first SEECs to introduce full liberalisation of local, domestic long distance, and international networks and services. Since then, it has been 100% digital. T-HT (Hrvatske Telekomunikacije), who is owned by Deutsche Telekom (51%) and by the Croatian State (42%), is the incumbent operator in Croatia. The remaining 7% are held by a fund for homeland war veterans because the State transferred this share without compensation in February 2005.

In November 2004, the CTA (Croatian Telecommunications Agency) declared that a second fixed voice telephony licence with national coverage was approved for Optima Telekom, who has already launched its operations. Another operator, Portus, has also been licensed.

By June 2005, there were nine companies licensed for fixed telephony services at the national level under the new telecommunications law. All of them are 100% owned by Croatian interests.<sup>84</sup>

T-HT still held 97.4% market share by the end of 2005 and fixed telephony had a penetration rate of around 45%.

**Figure 3.3: The Croatian ICT Market**



*Note: ITU and Global Insight*

Mobile Telephony

Mobile telephony competition was increased by the entrance of the second operator, VIPnet, in 2001. In addition, three UMTS licenses have been granted, and the corresponding 3G services have been launched or are about to do so. A fourth UMTS frequency license will not be given out until 2009, because of restricted



requirements in privatisation contracts, which are neither in line with the *acquis* nor with the Stabilisation and Association Agreement.<sup>85</sup>

Croatia is one of the highest spenders on telecommunications (€300) per capita per year, which is clearly driven by their mobile telephony markets.

The Article 53(3) of the Telecommunications Law says that all mobile operators with SMP are required to agree to all reasonable requests for special access. This covers any category of service providers or virtual operators.<sup>86</sup>

After the Telecommunications Act of 2003, mobile operators must obtain two licenses: one for the right to use the frequency spectrum and another one for the provision of mobile services. There are three mobile operators in Croatia who operate nationwide: T-Mobile (100% owned by T-HT); VIPnet (99% owned by Mobilkom) and Tele2. Tele2 has signed the concession contract with the CTA council for a joint 2G/3G network in February 2005 after the beauty contest which was concluded in December 2004.<sup>87</sup>

### Internet Services

The Internet service market was liberalised in 1999 and there are thirteen national and 192 local alternative ISPs with 18% of the market share. The remaining 82% is held by the fixed incumbent T-HT. In March 2006, the CTA issued frequency concessions for wireless voice and/or data access networks (3.5 GHz) in Zagreb County following a beauty contest procedure. Frequencies were handed out to WiMAX Telecom, OiV, Iskon Internet and Optima Telecom. By the end of July 2006, the CTA had distributed twenty-five concessions in six counties and the District of Zagreb. Optima Telecom and WiMAX Telecom acquired licenses in all regions, apart from the District of Zagreb. For four additional counties, a beauty contest procedure will be held in 2006.<sup>88</sup>

Regarding broadband connections, Croatia is the second most developed country in the region with a penetration of 3.4%. Over 95% of these broadband connections are DSL lines while the rest operate through Cable TV, WiMax and some leased lines. The non-DSL lines are mostly supplied by alternative operators, who have an 11.6% market share. Nevertheless, more than 50% of the alternative operator connections are xDSL solutions based on the resale of the incumbent.<sup>89</sup>

Viewed as a whole, the Croatian fixed and Internet market is still dominated by the incumbent, while in the mobile market there are already three competitive players active.

### **3.3.3 Regulatory Overview**

The main institutions of the Croatian telecommunications regulatory framework are the Ministry of the Sea, Tourism, Transport and Development and the CTA.

The main government policy objectives for the telecommunications sector are defined by the Telecommunications Law of 2003. These objectives include the construction, maintenance, development and use of the telecommunications infrastructure and equipment; providing public telecommunications services; performing activities of national interest; the organization and use of the radio frequency spectrum and of the addressing and numbering space as naturally limited public resources.

In order to achieve these goals, the liberalisation of telecommunications sector and therefore, the reinforcement of competition in telecommunication markets were accomplished.

Theoretically, the CTA has significant powers to ask for information and to audit the business records of public telecommunication operators and other telecommunication companies. If the decisions by the CTA are not followed, it can issue a misdemeanour warrant. However in practice, it has been complicated for the CTA to carry out its powers.<sup>90</sup>

Croatia's regulatory framework is a mixture of the 1998 *acquis* and the 2003 *acquis*.

### Market Power and Interconnection

After Croatia has committed itself to the WTO Basic Telecommunications Agreement, liberalisation of the market took place in the beginning of 2003. Nonetheless, there was a transition period until December 2004.

This allowed T-HT to preserve its monopoly over the local loop and it was not required to grant number portability and carrier pre-selection services.<sup>91</sup>

Reference interconnections are only available between fixed operators and the incumbent. There is a 25% market share threshold for SMP designation on a relevant market. In 2005, the Agency Council decided on SMP providers in four relevant product and geographic markets. The T-HT was designated as having SMP in three relevant markets: public voice services on a national level; transmission of voice sound, data, documents and pictures in fixed networks on national level and public voice services in mobile networks on national level. All operators with SMP are responsible for all obligations of transparency, meeting all reasonable requests for access, respecting confidentiality, accounting separation and local loop unbundling.<sup>92</sup> Exemptions from the 25% rule are also possible and there are criteria for assessment of joint SMP. The CTA publishes a list with SMP operators yearly.<sup>93</sup>

#### Universal Service Obligations and Quality of Service

Croatia has approved legislation that will permit compensation schemes in the near future. Art. 29 of the USO ordinance states that the CTA shall initiate a USO fund upon the minister's proposal. However, the CTA cannot create the fund if there is merely one designated USO provider, or if there is a designated provider with more than 80% market share. All voice service providers holding more than 5% market share must contribute to the fund. Contributions are based on their individual market shares. This implies that all providers will pay the same percentage of annual revenues. The percentage is set yearly by the CTA. Nevertheless, a selected USO provider with more than 80% share in the market has no right to restitution, even though the CTA has chosen T-HT as the USO provider for five years starting from November 2005.<sup>94</sup>

In regards to QoS, the NRA has set out requirements for operators with SMP and for other operators based on ETSI, but no publication is required and so far, the measurements have not been published.

#### Competitive Safeguards

Regulation for opening markets, such as carrier selection, carrier pre-selection or number portability, was introduced in April 2005.<sup>95</sup> For fixed networks, the CTA has implemented carrier pre-selection. There are two active operators taking advantage of this possibility. Carrier selection is a legal requirement, but not yet implemented. Number portability in fixed telephony became operational in July 2005, whereas mobile number portability is expected to become operational in October 2006. This makes Croatia the only country in this report with a fixed date for implementing number portability.<sup>96</sup>

Concerning emergency calls, an Ordinance on a Unified Number for Emergency Services was published in September 2005.

### **3.3.4 VoIP regulations**

After VoIP was liberalised under the Telecommunication Law of 1999, it was seen as a part of Internet service and no authorisation was necessary. In 2003, VoIP was defined as a separate service, requiring authorisation with notification. In the beginning, the authorisation fees were relatively high (€33,000 one-off fee plus an annual fee of 1% of revenue). In February 2005, the one-off fee was lowered by 50% to €670, and the annual fee was lowered to 0.1%.<sup>97</sup>

Currently, the Telecommunications Act permits the provision of VOIP with a signal delay of 250 ms or more, through equipment connected to the existing fixed telecommunications infrastructure. The major VOIP providers in Croatia are Nexcom, Ceetel, and Amis Tel.<sup>98</sup>

### **3.3.5 Recent Developments**

Italy-based systems integrator Essentia will distribute broadband solutions, including VoIP, to Italy and nearby countries such as Croatia. Essentia will take full responsibility for turnkey supply, deployment and management of projects.

As of 2006, the WiMAX Telecom Group has been approved to offer wireless broadband, including VoIP, and last mile alternatives to residential and business customers in the region of Zagreb. With branches in

Switzerland, Austria, Slovakia and Croatia, WiMAX Telecom is the only independent and multinational provider of WiMAX services in Europe. Furthermore Slovenia's incumbent, Telekom Slovenije, is planning to acquire one of the largest ISPs, Vodatel.<sup>99</sup>

In May 2006, T-HT announced that it had acquired all shares of Iskon Internet, the second largest ISP after T-Com. Iskon is active in the broadband market, where it has been reselling T-HT offerings, and on the fixed market, where it has a smaller market share. Iskon will continue to provide services in its own name, and the two companies will keep their corporate identities. The merger has created a public debate. The transaction did not involve an approval from the Croatian Competition Agency because it failed the threshold value for mergers. In order to measure the joint dominance of the two companies, the CTA will assess whether Iskon should be designated as an operator with SMP in one of the relevant markets. Moreover, a withdrawal of the fixed BWA (Broadband Wireless Access) licence for the Zagreb County region, which Iskon recently won, is being considered.<sup>100</sup>

## **3.4 Turkey**

### **3.4.1 Country Overview**

Turkey creates a natural bridge between the continents of Asia, Africa and Europe, with the main part of the country lying in Southwest Asia. It has 70.4 million inhabitants and a total area of 780,580 square kilometres. The country is bordered to the east by Georgia, Armenia, and Iran and to the south by Iraq, Syria, and the Mediterranean Sea. The Aegean Sea, Greece, and Bulgaria are to the west, and the Black Sea shapes the northern border.<sup>101</sup>

#### Politics

Turkey is a parliamentary republic. In 1982, a new constitution was implemented. Previously, there had been martial law as a result of a military coup in 1980. The constitution has been altered several times since 1982. The changes shrank the parliament to a single house and formed a seven-year presidency. The Turkish Grand National Assembly consists of 550 members who serve five-year terms.

In 1959, Turkey made its first application to join what was then the European Economic Community. After a temporary freeze in Turkish-EEC relations because of the military intervention in the early 1980s, relations were re-established and Turkey applied for full membership in 1987. The customs union between Turkey and the EU was founded in 1995. Turkey was officially accepted as a candidate state in 1999. When this occurred, the pre-accession strategy, which is to encourage and support the reform process through financial assistance and other forms of collaboration, began.

The Parliament started to pass reforms aimed at acquiring EU membership in 2002. The abolition of the death penalty was one of the first. Others were the respect for democracy and the rule of law, guaranteeing the rights of minorities and the protection of human rights.

In June 2005, a draft framework for accession negotiations was presented by the Commission, and it was adopted by the Council of Ministers in October 2005. Turkey's accession to the EU has been defined as an open-ended process, which may take another decade.<sup>102</sup>

#### Economy

Turkey's economy combines modern industry with a long-established agriculture sector, which still accounts for more than 35% of employment. It has a strong private sector, but the state still has a main role in basic industry, transport, and communication. Real GDP growth has exceeded 6% in the last few years (7.4% in 2005), while the GDP per capita culminated at € 4,000 in 2005. Inflation fell to 7.7% in 2005, which represents a 30-year low. A high current account deficit and high debts are still burdening the economy. After a long period of low FDIs, Turkey attracted €7.5 billion in 2005.<sup>103</sup>

### 3.4.2 Telecommunications Market

#### *Growth and Investments*

In 2005, mobile telecommunications attracted the biggest amount of FDIs (€11.4 billion). The privatization of Turk Telekom, the incumbent, was completed and the entrance of Vodafone through its purchase of Telsim altered the industry's landscape. The majority of Turk Telekom's shares were bought by the Saudi Oger Telecoms Joint Venture Group.

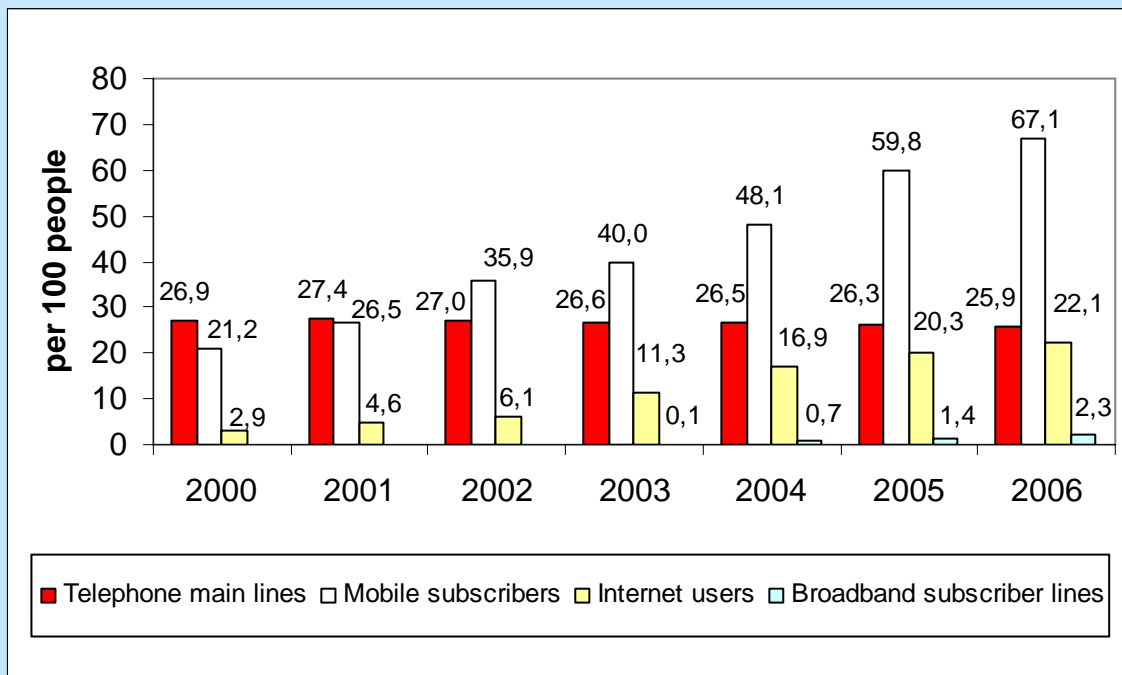
The telecommunications market was worth €14 billion in 2005 and carrier services played the main role. The market grew by 16% in 2005. Turk Telekom is focusing on upgrading the infrastructure and the implementation of NGNs.<sup>104</sup>

#### *Fixed telephony*

Fixed telephony penetration was scarcely 2.5% until 1980. In the early 1980s, Turk Telekom raised penetration to current levels through new investments, which made Turkey's fixed network the fourteenth largest in the world and the fifth largest in Europe based subscriber volume by the early 2000s. Nevertheless, throughout this period, revenue per subscriber remained very low. 50% of the investments were spent on digitalizing telephone lines, while other important investments included an Internet backbone and three communication satellites. However, fixed line investments decelerated as mobile networks were released.<sup>105</sup>

Turk Telekom's monopoly over the fixed-line services ended at the beginning of 2004. Its aims became to expand at data and value added services and to reduce its investments in the fixed telephony. In August 2005, the privatisation of Turk Telekom was accomplished through the sale of 55% to an Oger Telecoms Joint Venture Group, containing Oger Telecoms, Saudi Oger and Telecom Italia. The other 45% and a golden share are still owned by the Ministry of Transportation, which is responsible for the operational activities of Turk Telekom.

**Figure 3.4: The Turkish ICT Market**



Note: ITU and EIU (2006 forecast)

### Mobile Telephony

The mobile telephone services were liberalized in 1994 and have been growing ever since. With a penetration rate of almost 60% it is still a growing market and the upcoming 3G licenses will offer further business potential. Turk Telekom introduced mobile telephony in 1986, but the boom started with the liberalization and the entry of Turkcell, Telsim and Avea as main competitors in the GSM market. Turkcell is leading the market with 63% market share, followed by Telsim (22%). In 2006 there are expected to be 51 million mobile subscribers, up from 43 million in 2005. Due to a young and growing population and increasing national wealth, model changes decreased to 1.8 years, which makes Turkey an interesting market for FDI.<sup>106</sup> In fact, mobile operator Avea is 49% owned by Telecom Italia Mobile and Telsim was bought by Vodafone in July 2006. As of August 2006, there have not been any 3G licenses awarded yet.

### Internet Services

ADSL was marketed aggressively by Turk Telekom in 2005. The already existing copper telephone line infrastructure was capable of dealing with speeds up to fifty times faster than dial-up. The traditional switch works quickly and relatively failure-free. Moreover, ADSL is playing a strategic role as a locomotive for the Turkish Government's E-Government initiative. Government agencies have nearly concluded their migration to ADSL-based Internet technology and have invested in IT equipment.<sup>107</sup>

Turk Telekom gives out licenses to ISPs, varying prices depending on the leased line capacity (between € 20,000 and €40,000). There are over fifty private ISPs in Turkey, some of which include foreign ownership due to no foreign ownership limits affecting ISPs.<sup>108</sup>

As we have already seen with the previous three countries, broadband still has a very low penetration rate in relation to all Internet users, despite recent promotion. Broadband subscriber lines are forecasted to reach 2.3% in 2006, which would mean an almost 60% growth from the previous year. Overall Internet user penetration is relatively small compared the EU average of around 38%.<sup>109</sup>

In general, the fixed market and the Internet service market are still controlled mainly by the incumbent. The mobile telephony market, however, is facing already three competitors, whereby Turkcell is dominating by far.

### **3.4.3 Regulatory Overview**

Since the country is preparing itself for the EU accession, a new set of regulations and laws has been introduced.<sup>110</sup> In 2000, full liberalisation and the shift from a classical state-owned telecommunications sector to a structured and regulated one took place in broad accordance with the EU directives. The TA (Telecommunication Authority) was established and became the first sector specific regulator in the country. Concurrently, the regulatory functions were separated from the policy-making functions and the licensing criteria were made publicly available. Turk Telekom's monopoly in voice communication and infrastructure was officially ended in January.

The NRA has been active since August 2000. Its decision-making body is the Telecommunication Board and its main functions are regulation, authorization, monitoring and reconciliation. Furthermore, it is in charge of establishing competition in the market, facilitating market entry, providing effective and efficient use of the resources and protecting consumer rights.<sup>111</sup>

Several licenses for new telecommunication services and over 22,040 private sector companies have acquired various licenses, such as 44 for long distance telephony. Some of the others are in the process of signing an interconnection agreement with Turk Telekom. In August 2005, the Authority put pressure on Turk Telekom to decrease interconnection costs for other long-distance operators.<sup>112</sup>

Turkey represents an exception regarding the regulation of broadcasting networks, as they are not covered by the same regulatory framework as telecommunications.

### Market Power and Interconnection

In Turkey, the Telecommunications Board decides if the operators who are active in a certain market have SMP through the application of the following criteria: market share, power to influence market conditions,

relationship between sales and market share, power to control access devices to last consumer, power to access financial resources and experience on its products and services in the market.

After the Board Decision was published in December 2005, Turkcell, Telsim and Avea were defined as operators with SMP in the mobile call termination market, Turkcell was also classified as having SMP in mobile access and call origination market and Turk Telekom was designated with SMP in the fixed telephone network and services market. Currently, all but two markets are in the stage of public consultation.<sup>113</sup>

#### Universal Service Obligations and Quality of Service

Turk Telekom has been designated to offer universal services, such as fixed telephone access, directory inquiries and emergency calls. Additionally, it must provide payphones at various institutions and social facilities. The costs of USOs have not yet been calculated, but the contribution of other Turkish operators, except GSM, to the universal service fund correspond to 1% of their annual net sales revenues, regardless of how high the cost of USOs are. So far, no mechanisms for reimbursing universal service providers have been defined, but an extension of the scope of USOs is planned.<sup>114</sup>

In Turkey, USOs also include transportation services to regions where transportation can only be made by navigation and communication services related to emergency and safety in the sea, services intending to promote information technologies including and digital broadcasting services over terrestrial digital transmitters covering all residential areas in the country. The Ministry of Transport and Communication is conducting studies that shall define ‘Designation of Universal Service Provider’ and ‘Responsibilities of Universal Service Provider’.<sup>115</sup>

The idea behind the work on QoS is to define the measures and principles for providing telecommunications services and/or operating telecommunications infrastructure in a way that will conform to national and international standards. To achieve this aim, the Ordinance on QoS in the Telecommunications Sector has been set up. The EU 2002 regulatory framework and related standards and regulations of ETSI have been taken into account in preparing the Ordinance, which came into force in March 2005. As of June 2006, the operators had not published any QoS measurements although the NRA requires operators to publish the related information every six months.

Moreover, the TA agreed in a service level agreement with Turk Telekom to sustain a certain level of quality in leased lines services. This agreement will also be made public on the website of the operator. As a result, improvement should be achieved within two years.<sup>116</sup>

#### Competitive Safeguards

National numbering resources are managed and carried out by the TA in compliance with the rules and procedures defined in the Numbering Ordinance. The application procedure for number assignment is defined in this regulation. Once a complete application is received, the decision on allocation is made within three weeks on a first come, first serve basis.<sup>117</sup>

Regarding number portability, the rules and procedures are contained within the number portability ordinance, but number portability is not available in (non)-geographic fixed numbers or in mobile numbers. Call by call selection has been available since July 2004, the first contracts for carrier selection were signed in March 2006, and carrier pre-selection negotiations are still in progress.<sup>118</sup>

### **3.4.4 VoIP Regulations**

The providers that have long distance telephony service licenses can provide national and international long distance telephony services using any type of technology including VoIP. Therefore, technological neutrality exists. The long distance licenses were given out for the first time in May 2004. With this license, its subscribers are allowed to make on-net calls without using E.164<sup>5</sup> numbers.

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<sup>5</sup> ITU-T recommendation which defines the international public telecommunication numbering plan used in the PSTN and some other data networks.

Conversely, it is not possible for those VoIP subscribers to receive calls from other networks, as the relevant license does not allow the assignment of E.164 numbers.

In its 2006 work plan, the TA intends to create a study on 'Fixed Telecommunications Services', which will deal with all kinds of voice services including VoIP. Within this analysis, it plans to assign numbers to the providers. Apart from that, there are currently no regulatory rules to be applied for VoIP. The TA has been observing global regulatory development on this issue.<sup>119</sup>

However, the US Commercial Service claims, that Turk Telekom has allowed VoIP being used by approximately twelve companies, who have obtained licenses from Turk Telekom. However, these firms are allowed to use VoIP only for international destinations. Local and domestic calls over VoIP are not allowed except as exclusively approved by Turk Telekom. This means firms are only permitted to do so within their company structure, despite their location in Turkey.<sup>120</sup>

### **3.4.5 Recent Developments**

A Turkish ISP, Turbonet, has launched its first field trials of WiMAX in Istanbul. The provider, which uses 3.5GHz WiMAX equipment, has received a test license allowing it to carry out the tests.<sup>121</sup>

Also, interesting to examine is the fact that Teletek Telekom, Turkey's leading IP carrier, has integrated next generation SIP service architecture in its network.

In July 2006, UK's Vodafone acquired Turkey's second-biggest mobile phone operator, Telsim, for €3.6 billion, after winning an auction in December 2005. Emirates Telecommunications Corporation (Etisalat), MTC from Kuwait, Sistema from Russia, Emaar from the UAE and Orascom Telecom from Egypt all had been interested in the Telsim stake. After the purchase, Vodafone said that it would invest in almost €800 million over the next few years in the Telsim system.<sup>122</sup>

## **3.5 Country comparison**

Having looked at these four EU accession candidates, one can observe that they are very different but at the same time they have a lot of things in common.

Their telecommunication markets are liberalised in all sectors, and the former state owned incumbents are privatised partially. In order to minimize market power and enhance competition the NRAs designated at least one operator, the incumbent, with SMP and therefore imposed him with interconnection obligations and/or USOs (see Table 3.1).

Since they all were and are struggling to join the European Union, Romania and Bulgaria finally got accepted, they aligned their regulatory framework more or less with the EU framework. Regarding the QoS they all chose the ETSI criteria, but publications are not always required. Also the universal service requirements are according to the EU acquis in all countries but Turkey. There are legal carrier selection and pre-selection requirements in every country, but the degree of implementation varies from country to country. Number portability is not in place in any of the analysed economies, however Bulgaria is planning to have mobile number portability from January 2007 and the other countries will follow to that effect.

Concerning the penetration rates within the different telecommunications markets there are certain parallels to be noticed.

In general, the fixed penetration is rather low and stagnating while the mobile penetration is relatively high and growing enormously. The percentage of Internet users is also growing rapidly, but remains still significantly under the EU average. Especially noteworthy is the extremely low share of broadband subscriber lines per 100 people, which is an important driver for VoIP. Another key element for VoIP can be 3G mobile networks based on the UMTS standard, for which licenses have been granted in Romania, Bulgaria and Croatia.

With reference to VoIP regulation, the NRAs have come to different conclusions; while Turkey is regarding VoIP generally as a telephony service, without using E.164 numbers, which is subject to the same obligations and possibilities as any other operator, Croatia created a new category depending on the signal delay with

individual licensing requirements. In Romania and Bulgaria the regulatory framework for VoIP depends on the QoS and the availability for the public. None of the countries has special agreements on VoIP and emergency calls, but they all have general emergency services in place.

Since the EU itself has not yet published any official guideline regarding VoIP, there cannot be a consistent regulation within the EU accession candidates.



Table 3.1: Country Comparison

	Romania	Bulgaria	Croatia	Turkey
Market Power and Interconnection	<ul style="list-style-type: none"> <li>All sectors liberalised</li> <li>Romtelecom, Cosmocom, Mobifon, Telemobil and Orange designated with SMP</li> </ul>	<ul style="list-style-type: none"> <li>All sectors liberalised</li> <li>BTC and Mobitel classified with SMP</li> </ul>	<ul style="list-style-type: none"> <li>All sectors liberalised</li> <li>T-HT designated with SMP in fixed, mobile and data</li> </ul>	<ul style="list-style-type: none"> <li>All sectors except liberalised</li> <li>Türk Telekom, Telsim, Turkcel and Avea designated with SMP</li> </ul>
Universal Service Obligation and Quality of Service	<ul style="list-style-type: none"> <li>Universal service requirements according to EU acquis</li> <li>QoS not after ETSI, but requirements set</li> <li>not obliged to publish</li> </ul>	<ul style="list-style-type: none"> <li>Universal service requirements according to EU acquis</li> <li>BTC compensated for US QoS after ETSI</li> <li>Obliged to publish (last in 2004)</li> </ul>	<ul style="list-style-type: none"> <li>Universal service requirements according to EU acquis</li> <li>USO cost recovery scheme in legislation, not yet applied</li> <li>QoS after ETSI, but no obligation to publish</li> </ul>	<ul style="list-style-type: none"> <li>Universal service requirements in law, but different from EU</li> <li>No USO cost recovery scheme yet</li> <li>QoS after ETSI, obliged to publish every six months</li> </ul>
Competitive Safeguards	<ul style="list-style-type: none"> <li>Carrier selection and pre-selection implemented and active</li> <li>Number portability probably from mid 2007</li> </ul>	<ul style="list-style-type: none"> <li>Carrier selection and pre-selection available for long distance and international calls</li> <li>Number portability from 2007 (mobile), 2009 (fixed)</li> </ul>	<ul style="list-style-type: none"> <li>Carrier selection and pre-selection obligations, but not yet implemented</li> <li>Number portability legal obligation, not yet implemented</li> </ul>	<ul style="list-style-type: none"> <li>Carrier selection and pre-selection legally required, but implementation delays</li> <li>Number portability not yet decided</li> </ul>
Telephony – Market Structure* *(in 2005, per 100 people)	<ul style="list-style-type: none"> <li>Romtelecom 45.99% state owned</li> <li>Two 3G licences, one active</li> <li>Main lines: 32.4</li> <li>Mobile subscribers: 53.7</li> </ul>	<ul style="list-style-type: none"> <li>BTC – Golden share owned by the State</li> <li>Three 3G licences one active</li> <li>Main lines: 42.2</li> <li>Mobile subscribers: 67.0</li> </ul>	<ul style="list-style-type: none"> <li>T-HT 49% state owned</li> <li>Three 3G licences</li> <li>Main lines: 44.5,</li> <li>Mobile subscribers: 74.1</li> </ul>	<ul style="list-style-type: none"> <li>Türk Telekom 45% state owned and golden share</li> <li>No 3G licences</li> <li>Main lines: 25.9</li> <li>Mobile subscribers: 67.1</li> </ul>
Internet and Broadband*	<ul style="list-style-type: none"> <li>Internet users: 25.2</li> <li>Broadband subscriber lines: 0.3</li> </ul>	<ul style="list-style-type: none"> <li>Internet users: 28.3%</li> <li>Broadband subscriber lines: 1.1</li> </ul>	<ul style="list-style-type: none"> <li>Internet users: 31.5</li> <li>Broadband subscriber lines: 3.43</li> </ul>	<ul style="list-style-type: none"> <li>Internet users: 22.1%</li> <li>Broadband subscriber lines: 2.3</li> </ul>
VoIP regulation	<ul style="list-style-type: none"> <li>VoIP = telephony if meeting criteria for publicly available telephony services</li> </ul>	<ul style="list-style-type: none"> <li>VoIP regime depends on quality of service</li> </ul>	<ul style="list-style-type: none"> <li>VoIP special category of general authorisation</li> </ul>	<ul style="list-style-type: none"> <li>VoIP falls into the same framework as telephony services</li> </ul>
Skype-out price	<ul style="list-style-type: none"> <li>€ 0.101 (mobile: € 0.236)</li> </ul>	<ul style="list-style-type: none"> <li>€ 0.055 (mobile: €0.215)</li> </ul>	<ul style="list-style-type: none"> <li>€ 0.043 (mobile: € 0.179)</li> </ul>	<ul style="list-style-type: none"> <li>€ 0.111 (mobile: € 0.173)</li> </ul>

Very interesting to look at, in the context of VoIP, are the Skype-out prices, because one can derive from their level, how the VoIP friendly is the telecommunication environment in this region. None of the analysed countries belongs into the Skype-out Global Rate, which combines around 30 countries in one unified rate (€0.017), including almost all EU15 countries, the US, South Korea, China and many more (Skype, 2006). Low Skype-out prices show indirectly how competitive the market is in that special region, due to the fact that a monopolist would automatically tend to set the interconnection rates on a high level. One can observe that calling a Turkish fixed line via Skype costs more than six times as much as calling a German fixed line, for example. This can have various reasons, such as low broadband penetrations in the regions or high interconnection and termination rates. On the other hand, calling to mobiles via Skype in the selected countries is relatively inexpensive (in comparison: calling to a German mobile costs €0.200), which is probably due to the fact that the mobile penetrations are significantly higher than the fixed penetrations and it indicates a high level of competitiveness on the market, which leads to lower interconnection rates. This indicator is not a sufficient one, but it gives an idea about the acceptance of VoIP in South and Eastern Europe so far.

## 4 CONCLUSION

The economic goal of telecommunication policy is to improve social welfare which depends on investments into process and product improvements. Such investments should lead to productivity gains that increase business productivity and the benefits to consumers through offers of new products and services and through lower prices.<sup>123</sup> While these efficiency goals are normally combined with other social and political objectives, for instance universal service, there are many reasons for regulating these markets.

VoIP represents a new challenge for regulators but also a chance for increasing productivity and consumer benefits. Although the idea was already mentioned by the IETF in 1977 and VoIP had its first marketing hype in the mid-90s, it took until the mid2000s to become a realistic way of communication without significant quality cut backs.

Due to the operating mode of packet switched voice transmission, there is no permanent physical route between the calling parties needed. The packages can choose different routes and don't occupy a whole line, which then would be busy. At present there are three types of VoIP calls, which differ mainly by the devices used and therefore also by the data transmitted.

Economically seen five different business models can offer VoIP: traditional Telecom operators, cable companies, ISPs, Newcomer such as ITSPs and Not-for-Profit-Clubs. As a result of the variety of potential providers, new ways to abuse market power will arise, while simultaneously the multiplicity creates competition.

From a regulatory point of view the European Commission and the NRAs agree on the principle of technological neutrality. Even though no specific VoIP regulation exists in the EU so far, the Commission favours a 'light regulatory touch'.

One can distinguish five types of regulation possibilities; from considering VoIP as a data service at the one end to equality between VoIP and conventional telephony at the other end.

Especially when applying the former possibility, one has to determine the consequences carefully, which emerge from market power designation, universal service and quality of service obligations. Competitive safeguards, such as numbering, number portability and emergency call agreements, are also of highest importance, when offering a telecommunication service publicly, because they can all represent barriers to entry for the new coming VoIP provider.

The country case studies have shown that the four EU accession candidates, Romania, Bulgaria, Croatia and Turkey, which are differing not only in size and political background, but also in their economic structure and power, have certain parallels in their telecommunications markets: relatively low fixed penetration rates and

high extremely growing mobile penetration rates combined with low Internet user percentages and particularly low broadband penetrations. Their regulatory frameworks differ as seen in Table 1, but the general direction towards a competitive telecommunications market can be observed in every country. The VoIP regulations in force vary considerably, but the information regarding this point was sometimes contradictory, as seen in the case of Turkey, and to what degree the respective regulatory measures affected the VoIP industries cannot be estimated by the author. In three of four countries, QoS plays a central role, when regulating VoIP.

According to the circumstances in the analysed markets, where especially the rural areas lack infrastructure and low broadband penetrations bring about long odds for VoIP, a light touch approach would be essential in order to gain dynamic efficiencies.

Therefore government strategies promoting broadband should be supported. In many regions WiMAX is being tested or even set up already with the purpose of avoiding cost intensive infrastructure deployment. Another possibility could be expanding 3G networks, which is already taking place in three of the four countries.

Regarding regulation type I errors occur when competition authorities intervene in the competition process instead of dismantling the barriers to entry. Conversely, type II errors are said to occur when necessary interventions are not exercised.<sup>124</sup> The challenge lies therefore in not over-regulating the market in order to leave innovations, in particular new technologies, the opportunity to unfold.

As long as the telecommunications markets are still in a growing phase, one should not hinder their development. Of course certain criteria like emergency calls have to be fulfilled in the long run, but as long as it is technically not possible, there could be a transition period, assuming that the provider has to inform its customers about this restriction.

Regarding the numbering issue, there can be VoIP specific numbers and geographical numbers, which allow nomadism only in a limited area and then have to switch to the VoIP number.<sup>125</sup>

The regulation of VoIP still leaves room for extensive research and new challenges will continuously arise with technological development, but for the moment the author is of the opinion that it would be wrong to regulate all EU members and candidates regarding VoIP in the same way, because their telecommunications markets are too diverse. The NRAs should have the opportunity to influence this subject individually, according to general guidelines given by the EC.

Due to the fact that telecommunication plays a key role in economic growth and social welfare, every country and every citizen should have the right to communicate. Even if there is no doubt about the speed at which VoIP is capturing the 'planet telecom', there should always be a way for regulators to be prepared when it strikes.



## REFERENCES

About Geography (2006): *Country profile Bulgaria*, Download: <http://geography.about.com/library/cia/blcbulgaria.htm> 10.07.2006

Advisory Committee on International Communications and Information Policy (ACICIP) (2005): *Voice Over Internet Protocol: Status and Industry Recommendations*, Download: <http://www.isoc.org/pubpolpillar/voip-paper.shtml> 15.08.2006

ANRC (2005): *Interconnection*, Download: <http://anrc.ro/DesktopDefault.aspx?tabid=1554> 10.07.2006

ANRC (2005a): *The Universal Service Fund*, Download: <http://anrc.ro/DesktopDefault.aspx?tabid=898> 10.07.2006

ANRC (2005b): *European Regional Seminar on Regulatory and Economic Aspects of VoIP and Broadband*, Download: [http://www.itu.int/ITU-D/treg/Events/Seminars/2005/ERRM/Presentations/Romania%20presentation%20for%20Istanbul%20Seminar\\_pdf.pdf](http://www.itu.int/ITU-D/treg/Events/Seminars/2005/ERRM/Presentations/Romania%20presentation%20for%20Istanbul%20Seminar_pdf.pdf) 10.06.2006

ANRC (2006): ITU correspondence, May to July 2006

Bijl, de Paul W. J., Peitz, Martin (2006): *Access Regulation and the Adoption of VoIP*, Download: <http://www.vwl.uni-mannheim.de/vthadden/fsempaper/peitz.pdf> 10.08.2006

Borreau, Marc, Dogan, Pinar (2000): *Regulation and Innovation in the Telecommunications Industry*, Download: <http://ses.enst.fr/bourreau/Recherche/reginnov.pdf> 27.09.2006

Büllingen, Franz, Rätz, Diana (2005): „VoIP – Marktentwicklungen und regulatorische Herausforderungen“ in *WIK Diskussionsbeiträge*, Bad Honnef

Candan, Murat (2006): *Regulatory Strategies in Mobile Communications*, Download: [http://www.wik.org/content/konf\\_istanbul/candan.pdf](http://www.wik.org/content/konf_istanbul/candan.pdf) 24.07.2006

Commission of the European Communities (2005): *11<sup>th</sup> report on European Electronic Communications Regulation and Markets 2005*, Brussels, Download: [http://europa.eu.int/information\\_society/policy/ecommm/doc/implementation\\_enforcement/annualreports/11threport/com\\_2006\\_68\\_en\\_final.pdf](http://europa.eu.int/information_society/policy/ecommm/doc/implementation_enforcement/annualreports/11threport/com_2006_68_en_final.pdf) 20.8.2006

ComReg (2006): *Review of VoIP framework*, Download: [http://www.odtr.ie/\\_fileupload/publications/ComReg0613.pdf](http://www.odtr.ie/_fileupload/publications/ComReg0613.pdf) 11.09.2006

CRC (2005): *Annual Report 2004*, Download: <http://www.crc.bg/v1/eng/index.htm>, 13.07.2006

CRC (2006): *Annual Report 2005*, Download: <http://www.crc.bg/v2/bul/index.htm>, 13.09.2006

CRC: TU correspondence, May to July 2006

Cullen International (2005): *Country profiles – Supply of services in monitoring of South East Europe – telecommunications services sector and related aspects*, Download: [http://www.agentel.cg.yu/izvjestaji/2005/eu/Report1%20\(Country%20profiles\).pdf](http://www.agentel.cg.yu/izvjestaji/2005/eu/Report1%20(Country%20profiles).pdf) 08.09.2006

Cullen International (2006): *Report 2 – Country Comparative Report Supply of services in monitoring of South East Europe - telecommunications services sector and related aspects*, Download: [http://europa.eu.int/information\\_society/activities/internationalrel/docs/eu\\_enlargement/cullen%20country%20comparative%20final%20draft%20May%202006%20revised.pdf](http://europa.eu.int/information_society/activities/internationalrel/docs/eu_enlargement/cullen%20country%20comparative%20final%20draft%20May%202006%20revised.pdf) 06.06.2006

Cullen International (2006a): *Telecommunications Central and Eastern Europe - Quarterly Update*, from CTA

CTA, Croatian Telecommunications Agency, ITU correspondence, May to July 2006

EIU (The Economist Intelligence Unit) (2006): *CountryData Annual time series*, Requested Data series, July 2006

Deloitte (2006): “Romania – Economic Overview” in: Roland Berger International Business Promotion: *Romanian Business Digest*, IBP Publishing and Conferences, Bucharest. Download: <http://rbd.doingbusiness.ro/download.php?dl=book>, 29.06.2006, p. 29-34

ERG (2005): *ERG Common Statement for VoIP regulatory approaches (05) 12*, Download: [http://erg.eu.int/doc/publications/erg0512\\_voip\\_common\\_statement.pdf#search=%22ERG%20Common%20Statement%20for%20VoIP%20regulatory%20approaches%22](http://erg.eu.int/doc/publications/erg0512_voip_common_statement.pdf#search=%22ERG%20Common%20Statement%20for%20VoIP%20regulatory%20approaches%22) 08.09.2006

EU Enlargement (2006): *Relations with Bulgaria*, Download: [http://ec.europa.eu/communication/enlargement/bulgaria/economical\\_profile.htm](http://ec.europa.eu/communication/enlargement/bulgaria/economical_profile.htm) 12.07.2006

EU Enlargement (2006a): *Relations with Croatia*, Download: [http://ec.europa.eu/comm/enlargement/croatia/eu\\_relations.htm](http://ec.europa.eu/comm/enlargement/croatia/eu_relations.htm) 18.07.2006

EU Enlargement (2006b): *Relations with Turkey*, Download: [http://ec.europa.eu/comm/enlargement/turkey/political\\_profile.htm](http://ec.europa.eu/comm/enlargement/turkey/political_profile.htm) 21.07.2006

EU Press Releases (2005): *The European Commission’s Approach to Voice over IP: Frequently Asked Questions*, Download: <http://europa.eu.int/rapid/pressReleasesAction.do?reference=MEMO/05/46&format=HTML&aged=0&language=EN&guiLanguage=en> 23.08.2006

Euractiv (2006): *EU Turkey Relations*, Download: <http://www.euractiv.com/en/eu-turkey-relations/article-129678> 24.07.2006

European Commission (2005): *Croatia 2005 Progress Report*, Download: [http://ec.europa.eu/comm/enlargement/report\\_2005/pdf/package/sec\\_1424\\_final\\_en\\_progress\\_report\\_hr.pdf](http://ec.europa.eu/comm/enlargement/report_2005/pdf/package/sec_1424_final_en_progress_report_hr.pdf) 18.07.2006

European Parliament and the Council of the EU (2002): “Directive 2002/22/EC of 7 March 2002” in *Official Journal of the European Communities*, 2002

Feijo González, Claudio (2005): *VoIP at the crossroads: A critical overview of feasible regulatory models*, Download: [http://www.wik.org/content/cpr\\_2005\\_barroso.pdf#search=%22%22voip%20at%20the%20crossroads%22%22](http://www.wik.org/content/cpr_2005_barroso.pdf#search=%22%22voip%20at%20the%20crossroads%22%22) 28.8.2006

Gacina, Gasper (2006): *Telecommunications market of the Republic of Croatia today*, CTA

Global Information (2004): *Romania Telecommunications Market Intelligence Report*, Download: <http://www.gii.co.jp/english/iti29843-romania-telecom.html> 02.05.2006

Global Factiva (2006): *Orange launches 3G services in Bucharest and Timisoara*, Download: <http://global.factiva.com/ha/default.aspx> 20.06.2006

Global Insight (2006): *Global Insight Report: Croatia (Telecoms)*, Report printed on 09 May 2006

Global Technology Forum (2006): *Doing ebusiness in Turkey*, Download: [http://globaltechforum.eiu.com/index.asp?layout=newdebi&country\\_id=TR&country=Turkey&channelid=6&title=Doing+e-business+in+Turkey](http://globaltechforum.eiu.com/index.asp?layout=newdebi&country_id=TR&country=Turkey&channelid=6&title=Doing+e-business+in+Turkey) 25.07.2006

Global Technology Forum (2006a): *Vodafone buys Telsim*, Download: [http://globaltechforum.eiu.com/index.asp?layout=rich\\_story&doc\\_id=8958&country\\_id=TR&title=Turkey+telecoms%3A+Vodafone+buys+Telsim&channelid=4&categoryid=29&country=Turkey](http://globaltechforum.eiu.com/index.asp?layout=rich_story&doc_id=8958&country_id=TR&title=Turkey+telecoms%3A+Vodafone+buys+Telsim&channelid=4&categoryid=29&country=Turkey) 12.06.2006

Hernandez, Paulette (2006): *Worldwide VoIP Report*, by Office of Technology and Electronic Commerce, Download: <http://web.ita.doc.gov/ITI/itiHome.nsf/5713559d82a954b085256cc40075a766/cb2a434afea6790485256d020053fef0%21OpenDocument> 16.07.2006

IETF (1976): *Specifications for the Network Voice Protocol (NVP)*, Download: <http://www.ietf.org/rfc/rfc0741.txt?number=0741> 09.09.2006

International Telecoms Intelligence (2006): *Bulgaria Market Intelligence Report*, Download: [http://www.espicom.com/web3.nsf/structure/tel\\_bksmbulgaria?OpenDocument](http://www.espicom.com/web3.nsf/structure/tel_bksmbulgaria?OpenDocument) 2.05.2006

Invest Romania (2006): *A new telecom brand*, Download: <http://www.investromania.ro/news/news.php?tid=617&aid=3025> 11.07.2006

- Invest Bulgaria Agency (2006): *Bulgaria Investment Guide 2006 – Business Environment and Key Sectors*, Download: [http://investbg.government.bg/fce/001/0067/files/Inv\\_Guide\\_2006.pdf](http://investbg.government.bg/fce/001/0067/files/Inv_Guide_2006.pdf) 14.07.2006
- ITU (2006): *Regulatory Newslog*, Download: <http://www.itu.int/ituweblogs/treg/Turbonet+Trials+WiMAX+In+Turkey.aspx> 31.08.2006
- Kalman, Eva (2006): *Türk Telekom's Regulatory Challenges*, Download: [http://www.wik.org/content/konf\\_istanbul/kalman.pdf](http://www.wik.org/content/konf_istanbul/kalman.pdf) 25.07.2006
- Kiessling, Thomas; Blondeel, Yves (1999): *The impact of regulation on facility-based competition in telecommunications – A comparative analysis of recent developments in North America and the European Union*, Download: [http://www.tik.ee.ethz.ch/~m3i/related-work/cm/Cost-Regulation-in-Telecoms-Kiess\\_Mar99.pdf](http://www.tik.ee.ethz.ch/~m3i/related-work/cm/Cost-Regulation-in-Telecoms-Kiess_Mar99.pdf) 26.09.2006
- Monopolkommission (2005): *Hauptgutachten XVI – Mehr Wettbewerb auch im Dienstleistungssektor!*, Download: [http://monopolkommission.de/haupt\\_16/einleitung\\_h16.pdf](http://monopolkommission.de/haupt_16/einleitung_h16.pdf)
- Motta, Massimo (2004), *Competition Policy – Theory and Practice*, Cambridge University Press: Cambridge
- Newton, Harry.; Horak, Ray (2000): *Newton's Telecom Dictionary – the official dictionary of telecommunications & the Internet*, 16th ed., Telecom Books: New York
- Nyman-Metcalf, Katrin Dr; Salomon, Eve (2003): *Comments on the draft Law on Telecommunications of the Republic of Croatia*, Download: [http://www.osce.org/documents/mc/2003/06/1043\\_en.pdf#search=%22Art.%2051%20of%20the%20Telecommunication%20Law%20croatia%22](http://www.osce.org/documents/mc/2003/06/1043_en.pdf#search=%22Art.%2051%20of%20the%20Telecommunication%20Law%20croatia%22) 08.09.2006
- Ognyanova, K. (2006): “Speed Up High-Speed Internet in Bulgaria”, in ITU: *Regulatory Newslog*, Download: <http://www.itu.int/ituweblogs/treg/Speed+Up+HighSpeed+Internet++In+Bulgaria.aspx> 13.07.2006
- Pelzel, Robert (2001); *Deregulierte Telekommunikationsmärkte: Internationalisierungstendenzen, Newcomer-Dynamik, Mobilfunk- und Internetdienste*. Physica-Verlag: Heidelberg
- The President of the National Regulatory Authority for Communications (2002): *Decision on the application and granting procedure regarding the licenses for the use of numbering resources*, Download: [http://anrc.ro/Portals/57ad7180-c5e7-49f5-b282-c6475cdb7ee7/decision%202002\\_141.pdf](http://anrc.ro/Portals/57ad7180-c5e7-49f5-b282-c6475cdb7ee7/decision%202002_141.pdf) 10.07.2006
- The President of the National Regulatory Authority for Communications (2003): *Decision on imposing minimal requirements for the provision of publicly available electronic communications services*, Download: <http://www.anrc.ro/DesktopModules/Interogation/DownloadFile.aspx?intSurveyID=868&intSurveyFilledInstancesID=8839>, Download: 10.06.2006
- PricewaterhouseCoopers (2005): *Business Guide to Romania – 2005 Edition*, Download: <http://www.pwc.com/ro/eng/ins-sol/publ/allpublications.html> 26.06.2006
- Skype (2006): *Skype-out rates – all destinations*, Download: [http://www.skype.com/products/skypeout/rates/all\\_rates.html](http://www.skype.com/products/skypeout/rates/all_rates.html) 27.09.2006
- Spasov, Kamen Boyanov (2006): *Application of the Digital Opportunity Index to Bulgaria*, Download: <http://www.itu.int/osg/spu/digitalbridges/materials/spasov-paper.pdf> 16.09.2006 Presentation: <http://www.itu.int/osg/spu/digitalbridges/materials/spasov-ppt.pdf>
- Stratix Consulting (2003): *Voice-over-packet technology: Options for OPTA*, Download: <http://www.opta.nl/download/VoIP%20rapportage%20Stratix%20.pdf> 20.09.2006
- Roland Berger Strategy Consultants (2006): “Romanian Telecom Market Overview” in: Roland Berger International Business Promotion: *Romanian Business Digest*, IBP Publishing and Conferences, Bucharest. Download: <http://rbd.doingbusiness.ro/download.php?dl=book>, 29.06.2006, p.209-214
- TA: Turkish Telecommunications Authority, ITU correspondence from May to July 2006
- Turkey now (2006): *Information and Communication Technologies*, Download: <http://www.turkey-now.org/db%5Cdocs%5C%5Ctechnology06.doc> 12.07.2006
- TaiK Türk-Amerikan is Konsey (2006): *Information and Communication Technologies*, Download: [www.turkey-now.org/db%5Cdocs%5C%5CTechnology06.doc](http://www.turkey-now.org/db%5Cdocs%5C%5CTechnology06.doc) 20.07.2006

Turkish Embassy – Embassy of the Republic of Turkey in Washington DC (2006): *Geography*, Download: [http://www.turkishembassy.org/index.php?option=com\\_content&task=view&id=304&Itemid=321](http://www.turkishembassy.org/index.php?option=com_content&task=view&id=304&Itemid=321) 21.07.2006

UK Presidency of the EU 2005: Romania, Download: <http://www.eu2005.gov.uk/servlet/ServletFront?pagename=OpenMarket/Xcelerate/ShowPage&c=Page&cid=1115139941375> 03.07.2006

US Department of State (2006): *Background Note: Turkey*, Download: <http://www.state.gov/r/pa/ei/bgn/3432.htm> 20.07.2006

US Commercial Service (2006): *Guide to the European IT Markets*, Download: <https://www.buyusa.gov/quicktake/itmarketguide.pdf> 24.07.2006

Voipmonitor.net (2006): *VoIP gives lamp post a voice in Romania*, Download: <http://www.voipmonitor.net/voip+give+lamp+posts+a+voice+in+romania.aspx> 11.06.2006

Wey, Christian (2006): *Ruling the new and emerging markets in the telecommunications sector – Challenges: the emergence of Next Generation Networks*, Download: <http://www.itu.int/osg/spu/ngn/documents/Papers/Wey-060323-Prem-v1.1.pdf> 05.05.2006

www.hr (2006): *Geography and Nature*, Download: <http://www.hr/croatia/geography> 19.07.2006



## ENDNOTES

- <sup>1</sup> See ACICIP, 2005, p.1
- <sup>2</sup> See ACICIP, 2005
- <sup>3</sup> See IETF, 1976
- <sup>4</sup> See Feijo Gonzalez, 2005 p.3
- <sup>5</sup> See ACICIP, 2005, p.2
- <sup>6</sup> See Bijl, Peitz, 2006, p.5
- <sup>7</sup> See Monopolkommission, 2005, p.16
- <sup>8</sup> See ACICIP, 2005, p.2
- <sup>9</sup> See ACICIP, 2005, p.2
- <sup>10</sup> See Stratix, 20003, p.29
- <sup>11</sup> See Büllingen, Rätz, 2005, p.20
- <sup>12</sup> See Wey, 2006, p.13
- <sup>13</sup> See Commission of the European Communities, 2005
- <sup>14</sup> See EU Press Releases, 2005
- <sup>15</sup> See Feijo Gonzalez, 2005 p.13
- <sup>16</sup> See Wey, 2006, p.23
- <sup>17</sup> See Monopolkommission, 2005
- <sup>18</sup> See Cullen International, 2006, p.97
- <sup>19</sup> See ANRC, 2006
- <sup>20</sup> See TA, 2006
- <sup>21</sup> See European Parliament and the Council of the EU, 2002
- <sup>22</sup> See ITU-T Rec. E800
- <sup>23</sup> See TA, 2006
- <sup>24</sup> See Büllingen, Rätz, 2005, p.7
- <sup>25</sup> See Monopolkommission, 2006, p.22
- <sup>26</sup> See Cullen International, 2006, p.89
- <sup>27</sup> See Motta, 2004, p.79
- <sup>28</sup> See Wey, 2006, p.14
- <sup>29</sup> See ERG, 2005, p.9
- <sup>30</sup> See Kiessling, Blondeel, 1999
- <sup>31</sup> See Bourreau, Dogan, 2000
- <sup>32</sup> See PricewaterhouseCoopers, 2005, p.7
- <sup>33</sup> See Deloitte, 2006, p.30
- <sup>34</sup> See ANRC, 2006
- <sup>35</sup> See Roland Berger Strategy Consultants, 2006, p.209
- <sup>36</sup> See ANRC, 2006
- <sup>37</sup> See EIU, 2006
- <sup>38</sup> See Roland Berger Strategy Consultants, 2006, p. 212
- <sup>39</sup> See ANRC, 2006
- <sup>40</sup> See ANRC, 2006
- <sup>41</sup> See Roland Berger Strategy Consultants, 2006, p. 214
- <sup>42</sup> See Global Information, Inc., 2004
- <sup>43</sup> See ANRC, 2005
- <sup>44</sup> See ANRC, 2005a
- <sup>45</sup> See Cullen International, 2006, p.113
- <sup>46</sup> See The President of the National Regulatory Authority for Communications, 2002, p.1
- <sup>47</sup> See Cullen International, 2006, p.86
- <sup>48</sup> See ANRC, 2006
- <sup>49</sup> See Cullen International, 2006, p.70
- <sup>50</sup> See ANRC, 2005b

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- 51 See voipmonitor.net, 2006  
52 See Invest Romania, 2006  
53 See Global factiva, 2006  
54 See About Geography, 2006  
55 See EU Enlargement, 2006  
56 See EIU, 2006  
57 See EU Enlargement, 2006  
58 See CRC, 2006  
59 See Spasov, 2006, p.4  
60 See CRC, 2006  
61 See CRC, 2006  
62 See CRC, 2006  
63 See Spasov, 2006, p.5  
64 See CRC, 2006  
65 See Spasov, 2006, p.7  
66 See Invest Bulgaria Agency, 2006, p.66  
67 See Cullen, 2006, p.61  
68 See International Telecoms Intelligence, 2006  
69 See Cullen International, 2006, p.98  
70 See CRC, 2005, p.105  
71 See CRC, 2005, p.109  
72 See CRC, 2005, p.45  
73 See Cullen, 2006, p.114  
74 See Cullen, 2006, p.86  
75 See Cullen, 2006, p.69  
76 See Cullen, 2006, p.70  
77 See Ognyanova, 2006  
78 See www.hr, 2006  
79 See www.hr, 2006  
80 See EU Enlargement, 2006a  
81 See EU Enlargement, 2006a  
82 See EIU, 2006  
83 See Gacina, 2006  
84 See Cullen International, 2005, p.51  
85 See European Commission, 2005, p.62  
86 See Cullen International, 2006, p.81  
87 See Cullen International, 2005, p.52  
88 See Cullen International, 2006a, p.26  
89 See Cullen International, 2006, p.15  
90 See Cullen International, 2005, p.42  
91 See Global Insight, 2006, p.7  
92 See Nyman-Metcalf, Salomon, 2003, p.43  
93 See Cullen International, 2005, p.46  
94 See Cullen International, 2006, p.113  
95 See European Commission, 2005, p.62  
96 See Cullen International, 2006, p.19  
97 See Cullen, 2006, p.75  
98 See Hernandez, 2006, p.15  
99 See Factiva, 2006  
100 See Cullen International, 2006a, p.30  
101 See Turkish Embassy, 2006  
102 See EU Enlargement, 2006b and Euractiv, 2006  
103 See U.S. Department of State, 2006  
104 See Turkey now, 2006

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- <sup>105</sup> See Turkey now, 2006  
<sup>106</sup> See Turkey now, 2006  
<sup>107</sup> See US Commercial Service, 2006  
<sup>108</sup> See Hernandez, 2006  
<sup>109</sup> See EIU, 2006  
<sup>110</sup> See TaiK, 2006  
<sup>111</sup> See Candan, 2006  
<sup>112</sup> See Global Technology Forum, 2006  
<sup>113</sup> See TA, 2006  
<sup>114</sup> See Kalman, 2006  
<sup>115</sup> See TA, 2006  
<sup>116</sup> See TA, 2006  
<sup>117</sup> See TA, 2006  
<sup>118</sup> See Cullen, 2006, p.87  
<sup>119</sup> See TA, 2006  
<sup>120</sup> See US Commercial Service, 2006  
<sup>121</sup> See ITU, 2006  
<sup>122</sup> See Global Technology Forum, 2006a  
<sup>123</sup> See Wey, 2006  
<sup>124</sup> See Pelzel, 2001, p.98  
<sup>125</sup> See Monopolkommission, 2005