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Veselin Petkov

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Table of Contents

<i>LIST OF FIGURES</i>	<i>III</i>
<i>LIST OF TABLES</i>	<i>V</i>
<i>LIST OF ABBREVIATIONS</i>	<i>VI</i>
1 INTRODUCTION	1
2 CHARACTERISTICS OF THE TELECOMMUNICATIONS MARKET	2
2.1 GLOBAL DEVELOPMENT OF TELECOMMUNICATIONS MARKET	2
2.1.1 <i>TELECOM MARKET OVERVIEW</i>	3
2.1.2 <i>FUTURE PERSPECTIVES IN THE GLOBAL TELECOMMUNICATIONS SECTOR</i>	22
2.2 ANALYSIS OF THE TELECOMMUNICATIONS MARKET IN BULGARIA	25
2.2.1 <i>VALUE AND DYNAMICS OF BULGARIAN TELECOMMUNICATIONS MARKET BY SEGMENT</i> ..	
.....	26
2.2.2 <i>FUTURE PERSPECTIVES IN BULGARIAN TELECOMMUNICATIONS MARKET</i>	50
3 DIGITAL CONVERGENCE, SERVICE BUNDLING AND COMPETITION IN TELECOMMUNICATIONS MARKET	52
3.1 NETWORK CONVERGENCE, SERVICE CONVERGENCE AND SERVICE BUNDLING	54
3.2 CONVERGENCE, SERVICE BUNDLING AND COMPETITION IN TELECOMMUNICATIONS MARKET IN BULGARIA	56
4 PRICE EFFECT OF DIGITAL CONVERGENCE	67
4.1 MODEL SET-UP UNDER DIFFERENT MARKET REGIMES	68
4.1.1 <i>DETERMINING EQUILIBRIUM PRICE UNDER MONOPOLY MARKET STRUCTURE</i>	68
4.1.2 <i>DETERMINING EQUILIBRIUM PRICE UNDER DUOPOLY MARKET STRUCTURE</i>	69
4.1.3 <i>DETERMINING EQUILIBRIUM PRICES UNDER DUOPOLY MARKET STRUCTURE WHEN FIRMS PRACTICE MIXED BUNDLING</i>	71
4.2 COMPARISON OF PRICES UNDER THE DIFFERENT MARKET STRUCTURES	73
4.3 CONCLUSIONS	74
5 CONCLUSION	75
<i>REFERENCES</i>	<i>77</i>
<i>APPENDICES</i>	<i>82</i>

LIST OF FIGURES

FIGURE 1: WORLDWIDE TELECOMMUNICATIONS MARKET ANNUAL GROWTH, 2006-2008.....	4
FIGURE 2: TELECOM SERVICE REVENUE BY REGION, 2007.....	5
FIGURE 3: WORLDWIDE FIXED TELEPHONE LINES PER 100 INHABITANTS, 1998-2007	6
FIGURE 4: TELEPHONE ACCESS (FIXED AND/ OR MOBILE) PENETRATION RATE AMONG HOUSEHOLDS IN EU, WINTER 2007-WINTER 2008.....	6
FIGURE 5: EU FIXED-LINE INCUMBENT'S AVERAGE MARKET SHARE, 2004-2006	7
FIGURE 6: MOBILE PENETRATION BY REGION, 2005-2010	9
FIGURE 7: PENETRATION LEVEL OF MOBILE TELEPHONE SUBSCRIBERS IN DEVELOPED AND DEVELOPING COUNTRIES, 1998-2007	10
FIGURE 8: WORLDWIDE MOBILE SERVICES REVENUE, 2005-2010	12
FIGURE 9: INTERNET USERS BY REGION, 2006-2007	13
FIGURE 10: WORLD INTERNET PENETRATION RATE BY REGION, 1998-2007.....	14
FIGURE 11: WORLD INTERNET USERS BY REGION, 2007	15
FIGURE 12: BROADBAND CONNECTIONS DISTRIBUTIONS BY REGION, 2007	16
FIGURE 13: BROADBAND CONNECTIONS DISTRIBUTION BY TECHNOLOGY, 2007	17
FIGURE 14: WORLDWIDE WiMAX USERS, 2007-2012	18
FIGURE 15: WiMAX USERS BY REGION, 2007 & 2012.....	19
FIGURE 16: WORLDWIDE WiMAX SERVICES REVENUE, 2007-2012	19
FIGURE 17: EUROPEAN VOIP AND FIXED TELEPHONY REVENUES, 2005-2012.....	21
FIGURE 18: SKYPE REVENUE AND NUMBER OF REGISTERED USERS, Q4 2006-Q1 2008.....	22
FIGURE 19: IPTV SUBSCRIBERS BY REGION, Q1 2007-Q1 2008.....	24
FIGURE 20: PENETRATION OF BUNDLED SERVICES IN EU, 2005-2007.....	25
FIGURE 21: GROWTH OF THE BULGARIAN TELECOMMUNICATIONS MARKET, 2001-2007	27
FIGURE 22: BREAKDOWN OF BULGARIAN TELECOM MARKET BY KEY SEGMENTS, 2006-2007.....	27
FIGURE 23: MOBILE SERVICE REVENUES IN BULGARIA, 2001-2007.....	28
FIGURE 24: REVENUES OF THE BULGARIAN GSM OPERATORS, 2003-2007.....	29
FIGURE 25: SUBSCRIBERS AND PENETRATION OF MOBILE SERVICES IN BULGARIA, 2002-2007	30
FIGURE 26: MARKET SHARE OF BULGARIAN MOBILE OPERATORS BY NUMBER OF SUBSCRIBERS, 2003-2007	31
FIGURE 27: BULGARIAN MOBILE MARKET REVENUES BREAKDOWN BY SERVICES, 2003-2007	32
FIGURE 28: FIXED SERVICES REVENUES IN BULGARIA, 2001-2007	33
FIGURE 29: BREAKDOWN OF REVENUES OF BTC AND THE ALTERNATIVE OPERATORS, 2007	34
FIGURE 30: FIXED AND MOBILE PENETRATION LEVEL IN BULGARIA, 2001-2007	35
FIGURE 31: LEASED LINES REVENUES IN BULGARIA, 2001-2007	36

FIGURE 32: BREAKDOWN OF REVENUES FROM LEASED LINES OF BTC AND ALTERNATIVE OPERATORS IN BULGARIA, 2006-2007	37
FIGURE 33: NUMBER OF CABLE OPERATORS AND NUMBER OF CABLE NETWORKS IN BULGARIA, 2004-2007	38
FIGURE 34: PENETRATION RATE FOR CABLE TELEVISION AMONG BULGARIAN HOUSEHOLDS, 2004-2007	39
FIGURE 35: REVENUES FROM CABLE TELECOMMUNICATIONS SERVICES IN BULGARIA, 2001-2007.....	39
FIGURE 36: TELEVISION RECEPTION IN BULGARIAN HOUSEHOLDS BY KIND OF NETWORK, 2007	40
FIGURE 37: REVENUES FROM FIXED SATELLITE SERVICES IN BULGARIA, 2003-2007	42
FIGURE 38: BREAKDOWN OF REVENUES FROM FIXED SATELLITE SERVICES IN BULGARIA, 2007	42
FIGURE 39: NUMBER OF SUBSCRIBERS OF CABLE TELEVISION AND SATELLITE DIGITAL TELEVISION IN BULGARIA, 2004-2007.....	43
FIGURE 40: NUMBER OF DATA TRANSMISSION OPERATORS IN BULGARIA, 2002-2007	44
FIGURE 41: BREAKDOWN OF REVENUES FROM DATA TRANSMISSION NETWORKS AND INTERNET ACCESS IN BULGARIA, 2007	45
FIGURE 42: INTERNET PENETRATION RATE PER POPULATION IN BULGARIA AND EU (AVERAGE), 2006-2007	46
FIGURE 43: BROADBAND PENETRATION RATE IN BULGARIA AND EU, JAN 2006-JAN 2008	46
FIGURE 44: DISTRIBUTION OF BROADBAND MARKET SHARE IN BULGARIA BY TYPE OF OPERATOR, JANUARY 2008	47
FIGURE 45: BROADBAND SUBSCRIBERS DISTRIBUTION BY TECHNOLOGY IN BULGARIA, 2007	48
FIGURE 46: STRUCTURE OF BULGARIAN TELECOMMUNICATIONS MARKET, 2007	51
FIGURE 47: BREAKDOWN OF REVENUES BY TYPE OF BUNDLED PACKAGE IN BULGARIA, 2007	51
FIGURE 48: SHARE OF BULGARIAN HOUSEHOLDS BUYING COMMUNICATIONS SERVICES AS A PART OF BUNDLE, 2005-2007.....	52
FIGURE 49: TRADITIONAL SEGMENTATION OF NETWORKS AND SERVICES	54
FIGURE 50: NEW TECHNOLOGIES AND, NETWORKS AND SERVICES	55
FIGURE 51: AVERAGE COST PER 10 MINUTE INTERNATIONAL CALL IN BULGARIA, 2006-2007	57
FIGURE 52: PENETRATION OF BUNDLED SERVICES AMONG SUBSCRIBERS OF BULGARIAN CABLE TELEVISION OPERATORS, 2006-2007.....	63

LIST OF TABLES

TABLE 1: MULTIPLE SERVICE PROVISION UNDER DIFFERENT NETWORK INFRASTRUCTURES.....	55
TABLE 2: LIST OF ALTERNATIVE OPERATORS IN BULGARIA HOLDING INDIVIDUAL LICENSE (116A) FOR CARRYING OUT OF TELECOMMUNICATIONS THROUGH PUBLIC FIXED TELECOMMUNICATIONS NETWORK AND PROVIDING OF FIXED VOICE TELEPHONE SERVICE ON THE TERRITORY OF REPUBLIC OF BULGARIA.....	56
TABLE 3: LIST AND TYPE OF BUNDLE PACKAGES OFFERED BY THE ALTERNATIVE FIXED VOICE OPERATORS IN BULGARIA, AS OF JUNE 2008	59
TABLE 4: NEW SERVICES INTRODUCED BY THE BULGARIAN MOBILE OPERATORS, 2004-2006	60
TABLE 5: SUBSCRIPTION PLAN OF TRIPLE PLAY (“EUROCOM CABLE MANAGEMENT BULGARIA” EOOD)	63
TABLE 6: OPERATORS PROVIDING TELEVISION VIA FIXED SATELLITE SYSTEMS IN BULGARIA, 2007	64
TABLE 7: SPECTRUM OF WiMAX SERVICES PROVIDED BY BULGARIAN OPERATORS, AS OF JUNE 2008	65

LIST OF ABBREVIATIONS

INSTITUTIONS AND ORGANIZATIONS

BTC	= Bulgarian Telecommunications Company AD
CRC	= Bulgaria's Communications Regulation Commission
EITO	= European Information Technology Observatory
NSI	= National Statistics Institute (Bulgaria)
SAITC	= State Agency for Information Technology and Communications

ECONOMIC

ARPU	= Average Revenue per User
GDP	= Gross Domestic Product
VAT	= Value Added Tax

TECHNOLOGICAL

2G	= Second Generation
3G	= Third generation
3Play	= Triple Play
4G	= Fourth generation
4Play	= Quadruple Play
ADSL	= Asymmetric Digital Subscriber Line
CDMA	= Code division multiple access
DSL/ xDSL	= Domain-Specific Language
FMS	= fixed to mobile substitution
FTTH	= Fiber-to-the-Home
GSM	= Global System for Mobile communications
HDTV	= High-definition television
HSDPA	= High-Speed Downlink Packet Access
HSPA	= High Speed Packet Access
ICT	= Information and Communication Technologies
IEEE 802.16	= Institute of Electrical and Electronics Engineers 802.16 standard
IM	= Internet Messaging
IP	= Internet Protocol

GEOGRAPHIC REGIONS

EU	= European Union
MEA	= Middle East and Asia
USA	= United States of America

CURRENCY

\$	= Dollar, USA
BGB	= Bulgarian Lev (Bulgaria's Currency)
EUR	= Euro
USD	= Dollar, USA

OTHERS

Q1	= Quarter one
z.B	= zum Beispiel
Ibid	= "the same place"

IPTV	= Internet Protocol Television
ISP	= Internet service provider
LAN	= Local Area Network
MAN	= Metropolitan Area Network
MVNO	= Mobile Virtual Network Operators
NGN	= Next-Generation Network
PC	= Personal Computer
PDA	= Personal Data Assistant
PTSN	= Public Telephone Switched Network
RLAN	= Remote Local Area Network
SIM	= Subscriber Identity Module
SMS	= Short Message Service
TV	= Television
UMTS	= Universal Mobile Telecommunications System
VLAN	= Virtual LAN
VoIP	= Voice over Internet Protocol
VPN	= Virtual Private Network
WCDMA	= Wideband Code Division Multiple Access
WiMAX	= Worldwide Interoperability for Microwave Access

1 INTRODUCTION

The goal of this work is to examine the effect of current technological developments, namely Digital Convergence on the competition in telecommunications industry sector, in particular in Bulgaria. Convergence in the telecommunications is a very hot topic since Information and Communications Technologies (ICT) have significant impact on our lives. ICT are one of the main drivers for socio-economic growth. ICT's development changes the way we live and contribute to a better lifestyle. The increasing technological convergence of voice, video, and data services has had significant impact on the service offerings as well. Digital Convergence and its effect on competition is now a well established research topic in industrial economics.

The current work has the following structure:

- Firstly, I provide an overview of the global telecommunications market and I describe the market value and dynamics of the telecommunications industry. Current processes and trends are pointed out. Historic data series and forecasts for the major segments of the global telecommunications market such as fixed telephone lines, Internet, broadband, and mobile services, are included.
- Secondly, I analyze the telecommunications market in Bulgaria by describing the size, segments, shares and the main players in the industry. I also describe what the perspectives for its development are. Market statistics and forecast for all segments of the Bulgarian telecommunications sectors are provided.
- Thirdly, my work outlines the current technological developments in the telecommunications market and their economic consequences. One of the main technological developments, namely the process of *Digital Convergence* is considered. Market structure transformation of telecommunications industry due to the convergence is outlined.
- Fourthly, Digital Convergence process in the Bulgarian telecommunications market is examined. Its impact on networks for communications services, market structure, competition among major players on the Bulgarian market and their offerings is presented. The analysis of competition between the major players on the Bulgarian telecommunications market is described by recent and expected events. Practices adopted by the Bulgarian firms in terms of pricing and structure of their communications service offerings are examined.

- A simple mathematic model is developed in order to examine the impact of the new service offerings resulting from the convergence in the telecommunications sector on the price of the products (price effect of the Digital Convergence in telecommunication market). The model shows and contrasts the price equilibriums under different market structure.

- I finish my work with conclusions about the economic consequences of Digital Convergence in the telecommunications sector, in particular the effect of the Digital Convergence on the competition in terms of price and structure of service offerings.

Statistical information used throughout the current paper is compiled from different information sources such as online newspapers, reports, surveys and media publications, information provided on the websites of different public and commercial institutions – such as Eurostat in the European Union, and Bulgarian National Statistical Institute (NSI).

2 CHARACTERISTICS OF THE TELECOMMUNICATIONS MARKET

Telecommunications is an important part the modern society. Communications media impact our lifestyle. Technological development of the telecommunications leads to significant socio-economic benefits. Telecommunications remains one of the most significant providers of employment in the world.

2.1 GLOBAL DEVELOPMENT OF TELECOMMUNICATIONS MARKET

Telecommunications are one of the most dynamically developing areas in the world. The electronic communications sector is characterised by rapid technological advances, which leads to significant changes in industry.¹ Variety of new services has been created and others are expected to emerge due to network convergence. Global telecom industry is expected to continue expanding over the period 2009-2013 despite the current economic crisis according to the Insight Research Corp, since it is one of the main drivers for the global socio-economic development.²

¹ see Picot (2006), pp. 72-74

² see The Insight Research Corporation [accessed 20.09.2008a]

Competition in the telecommunications sector has increased significantly and it is anticipated to grow, because of the rapid development and adoption of new technologies and because the users of all forms of technologies continue to grow worldwide.

2.1.1 TELECOM MARKET OVERVIEW

Telecommunications industry statistics and analyses have been provided by various research and consulting organizations. Differences between their statistics and forecasts arise due to different methodology and definitions used to estimate the market.

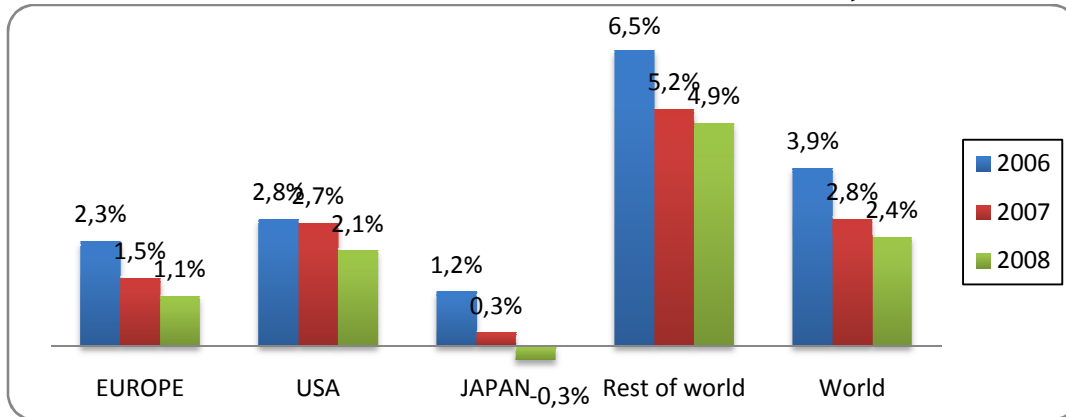
In 2007, total revenue from the global telecommunications market amounted to \$1.8 trillion and the telecom market revenue is expected to grow by 7.6% in 2008 and to reach \$2 trillion. As a comparison, the total revenue from the telecom industry in 2006 amounted to \$1.3 trillion.³ According to Insight Research Corp.,⁴ overall telecommunications services revenues will amount to \$1.7 trillion in 2008 and revenues are expected to reach \$2.7 trillion by 2013.

According to the European Information Technology Observatory (EITO) forecasts, the telecommunications market growth will be 2.4% in 2008, and the slightest estimated growth will be registered in the mature markets in Japan, Europe (in particular Western Europe) and the United States of America (USA), characterized by high saturation level and fierce competition (Figure 1). Greater growth potential is expected for 2008 and over the next few years in the markets of Latin America, Middle East and Africa (MEA), as well as in some of the countries of the Asian-Pacific region, because of the weaker competition, cooperatively low penetration level of the communications services, and underdeveloped infrastructure they exhibit. Next figure (Figure 1) shows the worldwide telecommunications market annual growth for the period 2006-2008.

³ see Gartner [accessed 20.09.2008]

⁴ see The Insight Research Corporation [accessed 20.09.2008b]

Figure 1: Worldwide Telecommunications Market Annual Growth, 2006-2008



Source: EITO (2007), presentation, p. 5 [accessed 22.09.2008]

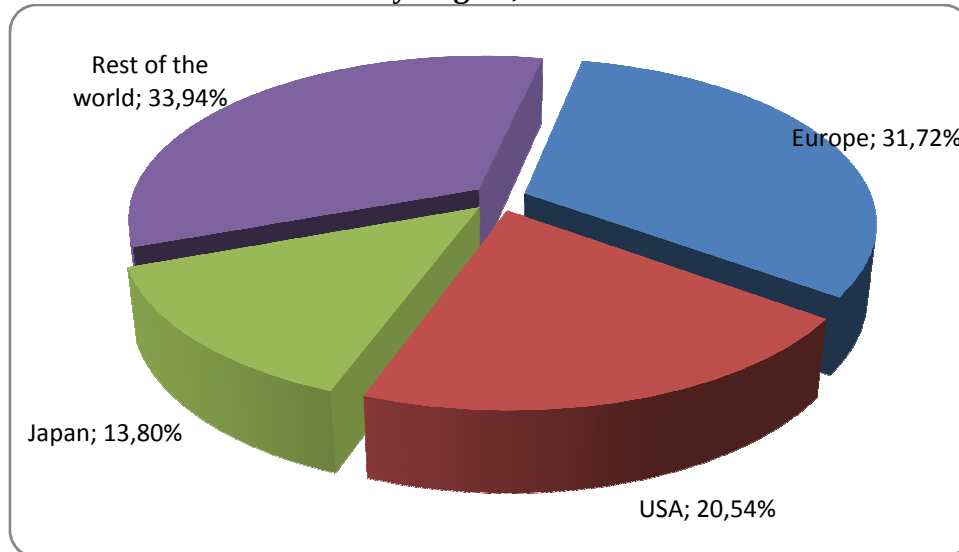
Strong economic growth in Asia facilitates fast and early introduction of new technologies and with that there has been a correspondingly strong software, hardware and service development. Main drivers for the telecommunications market developments, in the region, have been broadband and Internet Protocol (IP) services. Next Generation Networks (NGNs) are being rolled out in Asia as well, with strong move to bundled services on the back of NGNs. Since highest economic growth is expected to be in Asia's emerging markets, telecommunications demand in Asian Region is estimated to rise significantly. In 2007, the Asian telecom market amounted to \$350 billion.⁵

Telecommunications markets in North America, Western Europe and Japan are seeing a period of consolidation, with a relatively high competition and market saturation. This constitutes the relatively lower telecommunications market growth in these regions over the period 2006-2008 (Figure 1).

Although higher growth in telecom sector is expected in Latin America, MEA and in the emerging markets in Asia, nearly two thirds of the year-2007 total revenue in the global telecom market was generated in Europe, USA and Japan (Figure 2).

⁵ see Market Research [accessed 20.09.2008]

Figure 2: Telecom Service Revenue by Region, 2007



Source: EITO (2007), presentation, p. 6 [accessed 22.09.2008]

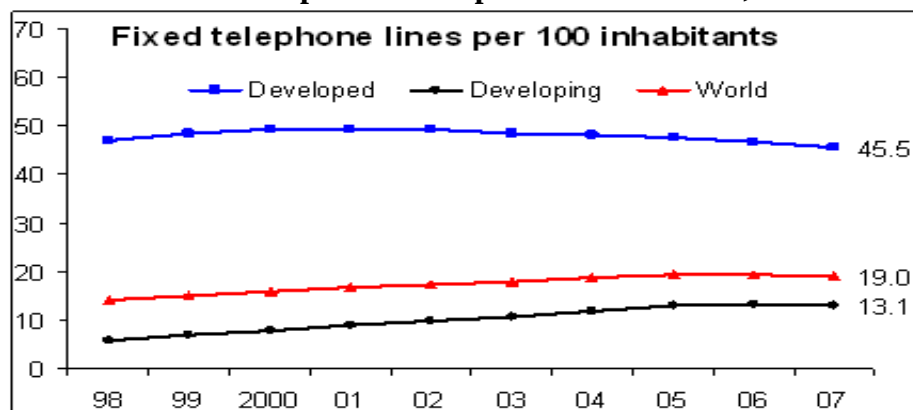
Figure 2 shows that European market was the largest single telecom services market in 2007 with 31.72% of the global telecom revenue, followed by the US market, and the Japanese market with 20.54% and 13.8% respectively.

2.1.1.1 Fixed lines market

The fixed voice sector in most of the developed countries has slowed down and has even begun to shrink due to the increasing severe competitive pressure of alternative voice transmission technologies. The volume of fixed telephony is falling mainly because more and more often fixed telephony is substituted by mobile one due to its mobility and additional services it offers. Another reason for the falling traffic is the continuing switch to Internet Protocol (IP) based telephony instead of traditional fixed telephony, because of its lower costs (some of the calls are even free).

In the developing countries the substitution phenomenon (from fixed to mobile telephony) is also observable, resulting from the underdeveloped fixed telephony infrastructure and the liberalization of the mobile market. In the developing economies, the building of essential fixed-line infrastructure has been largely ignored in favor of rolling out mobile networks as an alternative way of providing telephone services to the population. Next figure (Figure 3) illustrates the worldwide fixed-line decline over the period 1998-2007.

Figure 3: Worldwide Fixed Telephone Lines per 100 Inhabitants, 1998-2007

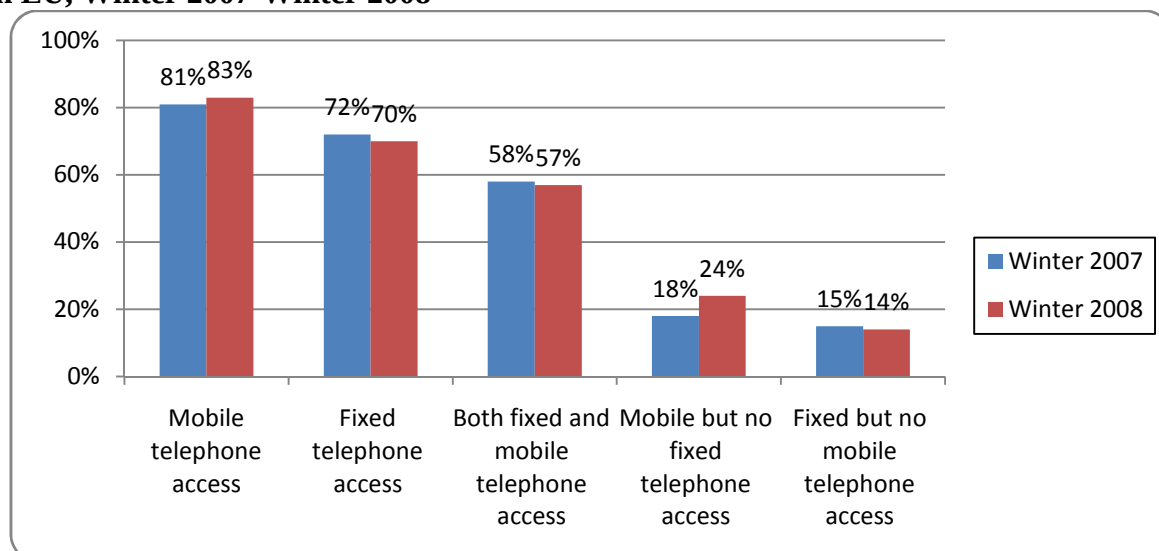


Source: Teltscher (2008), presentation, p. 4 [accessed 23.09.2008]

Figure 3 shows that overall global stagnation is observed in the fixed telephone lines over the period 2004-2007, in terms of penetration among the population. In the developed countries, downward trend of penetration of fixed telephone lines has been observed since 2000. Important characteristic of the fixed-line market is that the growth in the developing countries has flattened out and gone into serious decline as well.

Next figure (Figure 4) illustrates the telephone access among the EU households.

Figure 4: Telephone Access (fixed and/ or mobile) Penetration Rate among Households in EU, Winter 2007-Winter 2008



Source: Data derived from Eurobarometer (2008), pp. 16-43

Figure 4 shows that fixed telephone penetration rate dropped by 2% (from 72% to 70%) and the relative position of households with mobile but no fixed telephone access increased

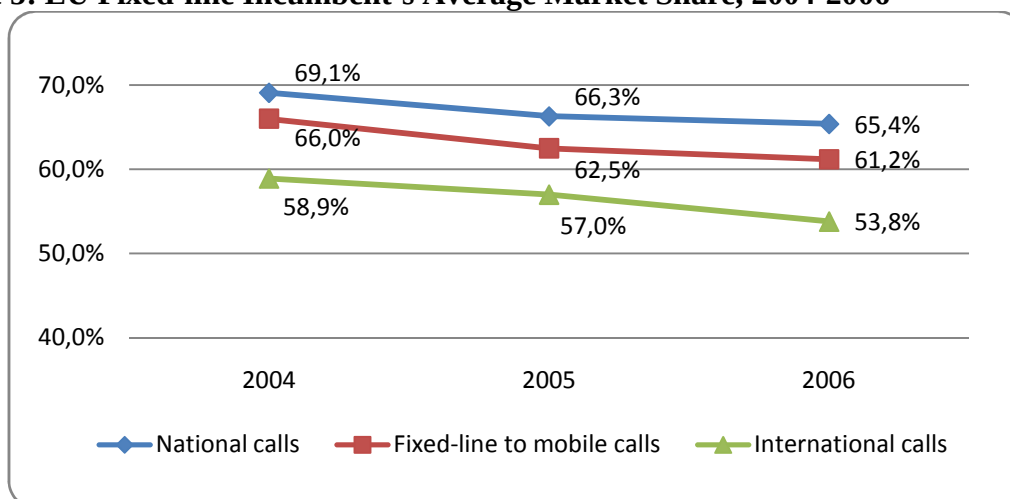
from 18% to 24% over the period winter 2007-winter 2008. Users are continuously switching from fixed to mobile phones thus restraining the fixed telephony revenues.

The incumbent fixed-line operators, especially in the European countries face increasing competition by alternative operators. The European Union (EU) market data as of July 2007 shows that the significance of alternative operators grows: 29.8% of the customers prefer the services of alternative operators when making international calls, 13.5% of them – for long-distance calls, compared to July 2006 – 26.3 % and 9.5% respectively. Among the member states of the EU, the countries with greatest number of subscribers to alternative operators are Finland and the Netherlands (45% for international calls), followed by Austria (44.9%) and Sweden (42.5%).⁶

The incumbent telecom operators, most of which are partly or wholly privatized former national monopolies, are also loosing subscribers to competing fixed-line operators. In most countries, especially in the most developed ones, regulations require the incumbents to lease their lines to other service providers, to let them offer telephone services without having to develop their own copper-wire network, which in turn increases the competition in this market segment. Incumbents face additional competition from cable operators that have started offering telephone services over their cable network as well.

Figure 5 shows the incumbents' fixed-line market share decline in EU in the period 2004-2006.

Figure 5: EU Fixed-line Incumbent's Average Market Share, 2004-2006



Source: Commission of the European Communities (2008a), p. 7

⁶ see Commission of the European Communities (2008b), pp. 49, 50

Figure 5 shows that the biggest decline is in the revenue from the international calls, followed by those from calls to mobile and from those from national calls.

In recent years, the volume of traffic has steadily declined as well, leading to downward trend of global fixed telephony revenue. In 2007, the revenue from the European fixed telephony market dropped by more than five percent and amounted to 118.5 billion EUR, and there are similar expectations for decline in 2008.⁷

The drop of revenues from standard fixed telephony and the threat of alternative telephony service providers put pressure on the incumbent operators (generating their major part of their revenues from traditional telephony) to look for new revenue sources. In order to survive under conditions of increasing competition and consumer migration, the incumbents change their offers, their pricing structures, as well as their communication with the customers. Some of them minimize their costs, concentrating on access provision for big corporate clients and transfer the servicing of millions of end users to companies having experience with certain customer segments. Many operators are offering now bundles that include unlimited local and national calls for a flat fee. Other possible future direction for development is the provision of new services, including content and for the consumers – IP television, music, online game, etc. Many incumbent operators launch bundles of services - beside the popular two-service bundle, Double Play (fixed telephony + Internet access), also Triple Play (3Play) and Quadruple play (4Play) are already offered in some of the countries.

2.1.1.2 *Mobile market*

The mobile communications keep the trend of rapid development. Telecom services market has continuously shifted towards mobile services.

By the middle of 2008, more than half of the world's population has a mobile phone and the number of mobile subscribers worldwide surpassed 3.6 billion. At the year-end 2007, their number reached 3.3 billion users which represents a 22% year on year increase, according to data provided by Wireless Intelligence.⁸

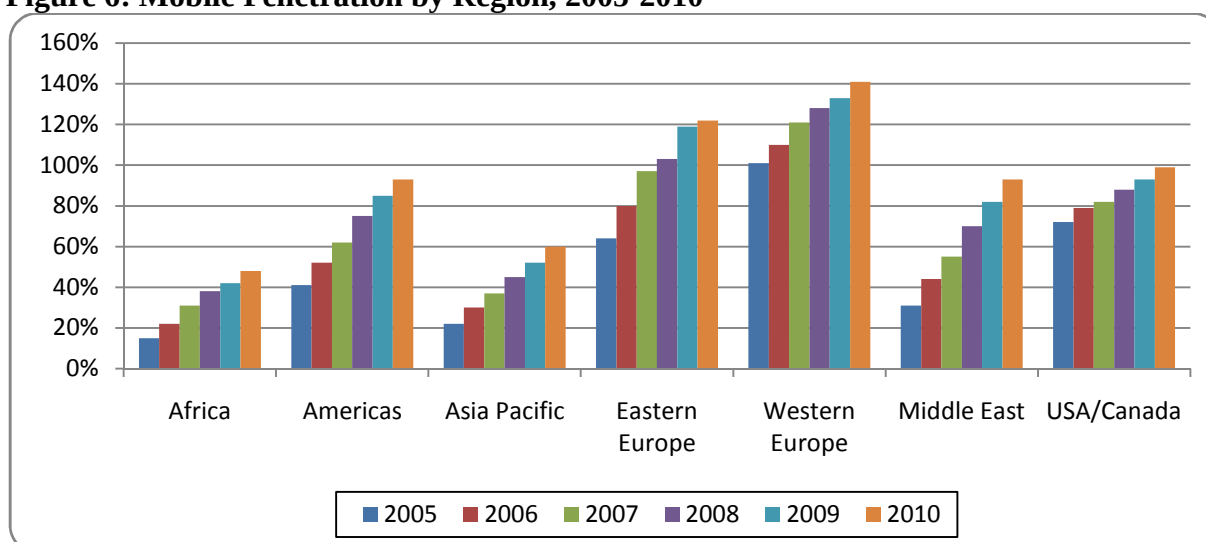
⁷ see EITO [accessed 19.09.2008]

⁸ see Wireless Intelligence (2008), p. 2

The worldwide mobile subscriber base is still growing, outpacing population growth. According to Portio Research,⁹ mobile users will increase by more than 1.8 billion before 2012 and this can be attributed to emerging markets having more room for growth.

In 2008, most of the mature markets (especially in Europe) reached penetration level of over 100%, thus they can be considered highly saturated. Significant growth in number of mobile subscribers is expected in the markets with lower penetration level – Latin America, MEA and Asia Pacific Region. Next figure (Figure 6) presents the worldwide cellular penetration rates by region over the period 2005-2010.

Figure 6: Mobile Penetration by Region, 2005-2010



Source: Data derived from Wireless Intelligence (2008), pp. 3-15

The figure shows that Europe leads in terms of penetration level. In some European countries mobile penetration indicator exceeded 140% (Luxemburg – 151.6%, Italy – 148% and Lithuania – 144% as of Oct. 2007) in 2007.¹⁰ Clearly this means that there are multiple connections per one user.

In absolute value, the world biggest mobile market is China with 524 million mobile subscribers, followed by the USA with nearly 254 million, and followed by India and Russia with 237 million and 168 million subscribers respectively. But the market penetration is still very low in China and India – 39.3% and 21% of the total population respectively, if compared to the one in the USA and Russia – over 86% and 120%.¹¹ In the EU, the total

⁹ see Portio Research [accessed 25.09.2008]

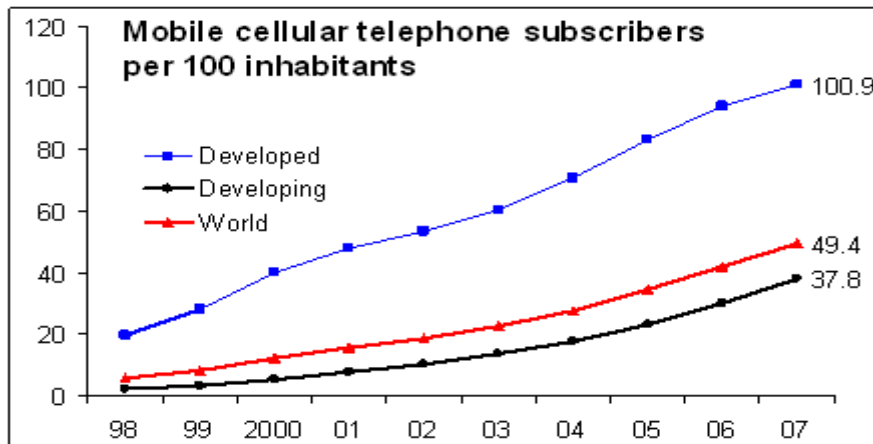
¹⁰ see Commission of the European Communities (2008c), p. 12

¹¹ see Wireless Intelligence [accessed 29.09.2008]

number of mobile subscribers reached 553.46 million and the average penetration rate hit 111.8% in 2007.¹²

Next figure (Figure 7) contrasts the market penetration level in the developed countries and the developing ones.

Figure 7: Penetration Level of Mobile Telephone Subscribers in Developed and Developing Countries, 1998-2007



Source: Teltscher (2008), presentation, p. 6 [accessed 23.09.2008]

As mobile penetration reached saturation in the developed markets (100.9% in 2007), the emerging markets will be a key player for the further development of cellular phone sector, where mobile penetration (37.8%) is still below the world average (49.4%) (Figure 7). Mobile communications have been considerably valuable in offering telephone services to developing countries due to its flexibility and underdeveloped fixed-line infrastructure in these markets.

In June 2008, the number of mobile subscribers (3.6 billion) represented 55.3% mobile penetration level and the penetration is expected to reach nearly 59% by the end of 2008 and to hit 4 billion subscribers worldwide.¹³

Among mobile standards Global System for Mobile communications (GSM) is the most popular for mobile communication in the world with more than 2.6 billion subscribers in 2008, the equivalent for approximately 85% of mobile services market. Despite the general slowdown in subscribers' growth, due to migration to third generation (3G) services, GSM subscribers are expected to grow due to increasing penetration in the developing markets. The

¹² see Commission of the European Communities (2008c), pp. 3, 4

¹³ see Wireless Intelligence [accessed 02.10.2008]

second-most popular mobile technology is Code Division Multiple Access (CDMA) technology with 310 million subscribers worldwide (or 9.3% market share). Constant shift to 3G technologies is observed, with Wideband Code Division Multiple Access (WCDMA) technologies the most popular among the 3G subscriptions worldwide.¹⁴

In 2007, the number of 3G subscribers in EU rose by 96% and reached 88 million users, or 20% of all mobile users in EU.¹⁵ The highest 3G penetration rate was observed in Sweden, Norway and Italy, which had rates of over 25%.¹⁶

Mobile services revenue is estimated to reach \$1 billion by year-end 2008, thus constituting nearly 50% of the total telecom services revenue.¹⁷ In the EU countries, overall revenue rose by 3.8% in 2007 from 133 billion EUR to 137 billion EUR, thus generating more than 40% of the revenues of the total EU telecommunications market (293 billion EUR in 2007).¹⁸

Although demand for mobile communications increases continuously, decline in prices per minute for mobile voice services is observed. For instance, most markets in the world exhibit increasing volume and declining prices. On a global scale, drop in Average Revenue per User (ARPU) from voice and increase in ARPU from data is observed. Overall ARPU declined at nearly 13% in 2007. North America and Western Europe were the only regions who appear to have maintained their ARPU. While voice still constitutes the majority of mobile traffic, a shift toward rise in revenues from mobile data services at 11% per year was observed in 2007.¹⁹

Figure 8 shows the drop in ARPU and the increase in overall revenue from provision of mobile services worldwide over the period 2005-2010.

¹⁴ see Paul Bude Communication (2008), pp. 38-40

¹⁵ see Commission of the European Communities (2008a), pp. 4, 5

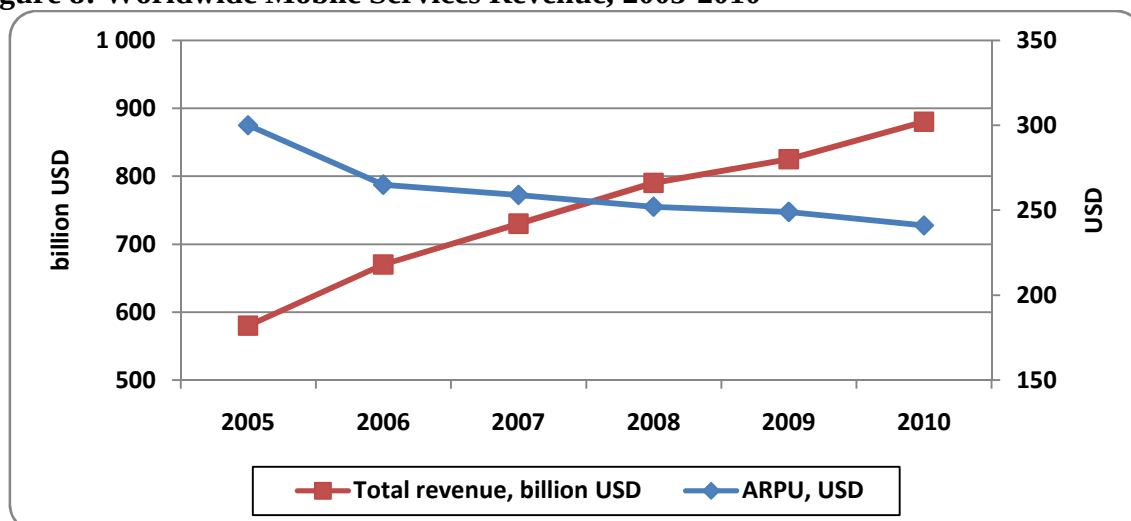
¹⁶ see MocoNews.net [accessed 02.10.2008]

¹⁷ see Portio Research [accessed 05.10.2008]

¹⁸ see Commission of the European Communities (2008a), pp. 2, 3

¹⁹ see Totel [accessed 10.10.2008]

Figure 8: Worldwide Mobile Services Revenue, 2005-2010



Source: Arber and Yu (2007), pp. 6-9

Although mobile voice services still generate the lion's share of mobile services revenue – 81% of the total operators' mobile revenue worldwide, their share is expected to decline to 74% by year-end 2012 due to the increasing demand of non-voice mobile services. In 2007, revenue from non-voice mobile services reached 20% of the total revenues in Western Europe; 15% in Central and Eastern Europe; 24.5% in Asia Pacific; 18% in North America; 10.5% in Latin America; 7% in Africa; and 11% in the Middle East. The contribution of non-voice mobile services to total mobile services revenues is expected to increase significantly in the next years, across all world regions.²⁰

Short Message Service (SMS) services' have the largest share within the volume of mobile data services revenues. In 2007, SMS accounted for 49% of the global mobile data services. Increase of SMS traffic is observed due to the introduction of new applications and services: parking payment through SMS, notifications for fines, news, advertising, etc. and traffic is expected to grow worldwide. Other data services such as mobile music, mobile games, mobile e-mail, mobile instant messaging (IM) and mobile video are gaining popularity as well. SMS as a percentage of mobile data revenue is expected to decline, but is expected to keep its leading position in the total revenues from global mobile data in the next years – 37% in 2012. Worldwide mobile data is expected to increase to \$251.9 billion by year-end 2012 from \$102.4 billion at year-end 2006.²¹

²⁰ see Portio Resarch [accessed 12.10.2008]

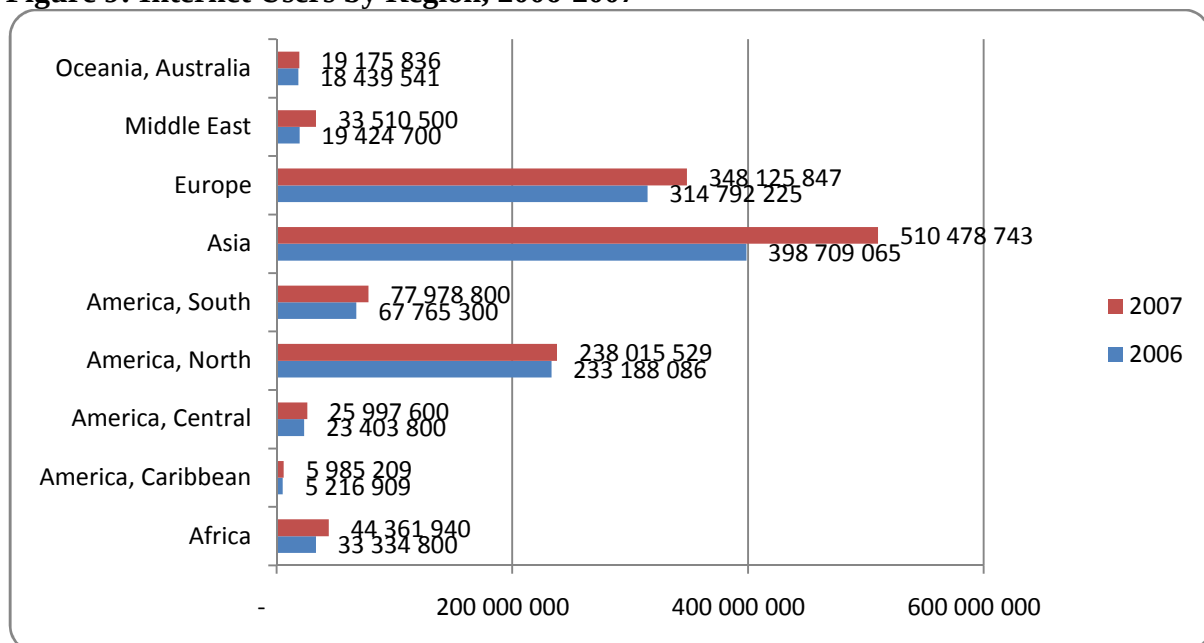
²¹ see Portio Resarch [accessed 10.10.2008]

According to a report from Juniper Research,²² strong mobile entertainment market growth is expected. Total revenue from mobile entertainment services reached \$20 billion in 2007 and is expected to grow to \$64 billion by 2012.

2.1.1.3 Internet market

Internet is the fastest growing communications sub-segment. At the end of 2007, the number of Internet subscribers reached 1.3 billion users worldwide, representing more than 20% of the world's population.²³ The number of users increased by nearly 18% compared to 2006, when the Internet users amounted to approximately 1.1 billion.²⁴ The following figure (Figure 9) illustrates the dynamics of the number of Internet users by region over the period 2006-2007.

Figure 9: Internet Users by Region, 2006-2007



Source: Data derived from Internet World Stats [accessed 20.09.2008a], ibid [accessed 20.09.2008b]

The figure (Figure 9) shows that, over the period 2006-2007, Middle East registered the highest percentage increase with nearly 73% (from 19.424 million to 33.510 million), followed by Africa and Asia with 33% and 28% respectively. The number of Internet users in

²² see Juniper Research [accessed 22.09.2008]

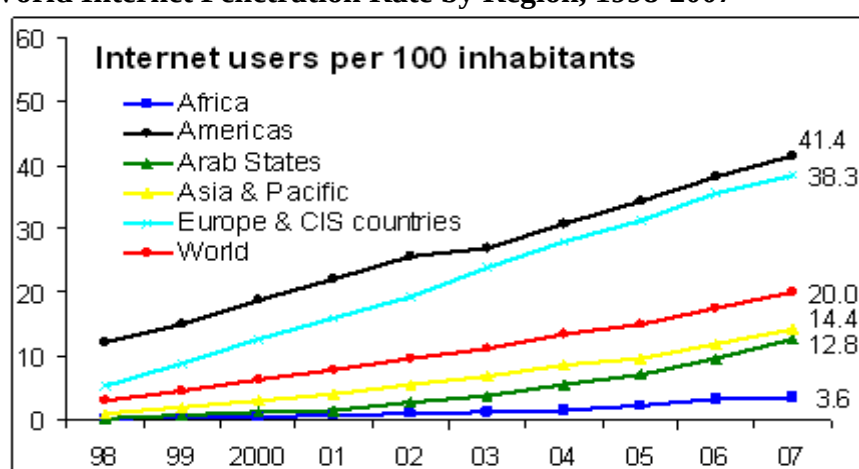
²³ see Internet World Stats [accessed 20.09.2008a]

²⁴ see Internet World Stats [accessed 20.09.2008b]

Europe increased in 2007 just by 10.59% to 348 million. The lowest growth is observed in North America and Oceania/ Australia – 2.1% and 4% respectively. Although Internet penetration is still some way away from saturation in the developed world, a slowdown in growth is observed.

The highest Internet penetration is observed in North America, followed by Europe – 41.4% and 38.3% respectively. Africa is characterized by the lowest penetration level, where the percentage of users was just 3.6% of the African population in 2007 and is well below the world average (20%) (Figure 10).

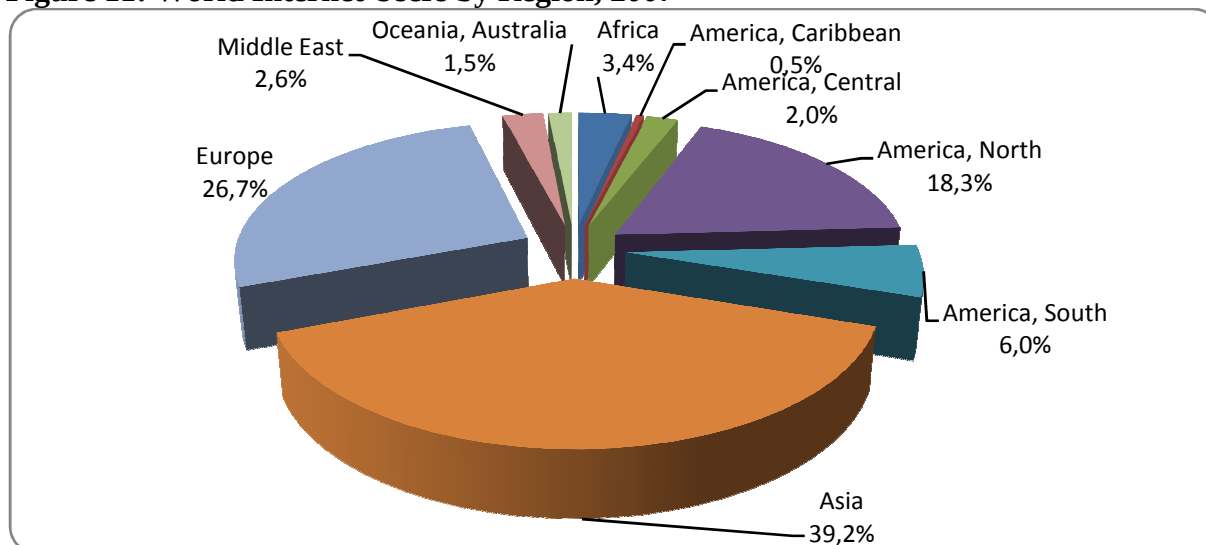
Figure 10: World Internet Penetration Rate by Region, 1998-2007



Source: Teltscher (2008), presentation, p. 8 [accessed 23.09.2008]

In absolute values, Asia (without the Middle East) is the world's biggest Internet user, with more than 39% of total global Internet users, or nearly 510 million (Figure 9), followed by Europe and North America with 26.7% and 18.3% respectively (Figure 11), or 348 million and 238 million users respectively (Figure 9). Next figure (Figure 11) illustrates the relative share of the Internet users by region in 2007.

Figure 11: World Internet Users by Region, 2007



Source: Data derived from Internet World Stats [accessed 20.09.2008a]

2.1.1.4 *Broadband access*

At the end of 2007, total number of users around the world accessing the Internet by using fast broadband connections reached 349.89 million, which represents a 19.7% growth compared to 2006, while the broadband penetration rate reached 6.1% by the of 2007 – a 24% year-over-year increase from 4.9% rate at the year-end 2006.²⁵ The significant growth, in recent years, is driven by price cuts of more than 10% a year and due to increased service speed as well.²⁶

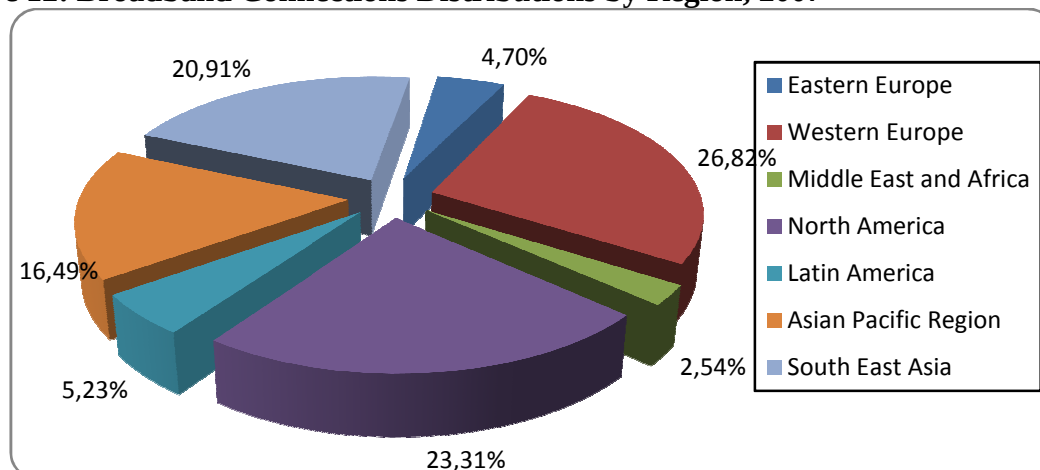
Competition in the telecommunications market is positively correlated with the broadband penetration. Since the broadband penetration is increasing at a considerable speed (a 24% increase over the period 2006-2007), fierce contest in the telecommunications market is expected in a short run. Intense competition in the broadband market presses the operators to lower their monthly prices and to increase bandwidth quality.

In 2007, Western Europe kept its leading position as a market with the biggest number of broadband lines – 26.82% from all lines around the world or 93.8 million lines. North America stood at second position with 23.31% of the overall lines or 81.56 million lines. Middle East and Africa is the most underdeveloped region with just 2.54% or 8.89 million lines in 2007 (Figure 12).

²⁵ see Point Topic (2008), pp. 4, 5

²⁶ see Gartner [accessed 10.10.2008]

Figure 12: Broadband Connections Distributions by Region, 2007



Source: Point Topic (2008), p. 6

While the broadband penetration level in Western Europe, North America and high-tech economies like South Korea and Japan is relatively high, usage in the developing countries and especially in Africa and some countries in Middle East is pitiful. Penetration in Eastern Europe, meanwhile, may be low, but the region registered the highest level of growth in take-up – 10% in 2007 compared to 2006, thus the region is catching up with Western Europe and Eastern Europe is expected to continue its growth.²⁷

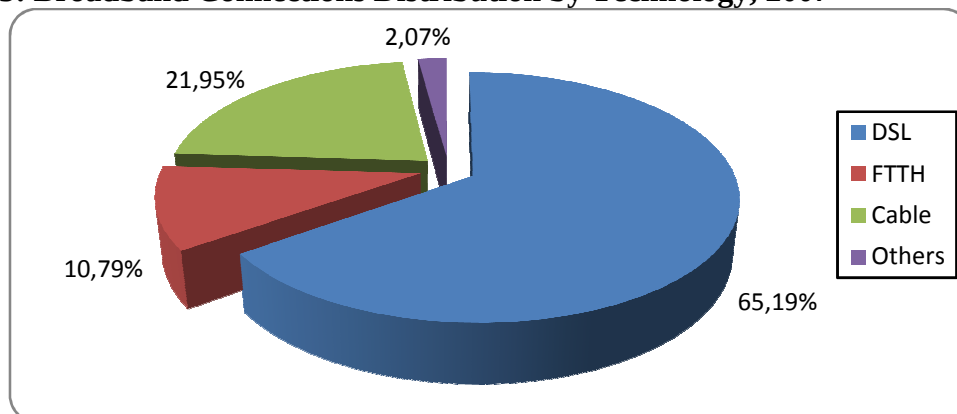
More than 19 million broadband connections were built in the EU in 2007. At the end of 2007 the total number of broadband lines amounted to 99 million lines compared to 80 million in 2006, but there were significant differences regarding the penetration rates among the Member States of the Union and among the rural and urban areas as well. In EU, the average broadband penetration rate was nearly 20% for 2007, or almost 20% increase compared to 2006, when the average penetration rate was 16.3%.²⁸

Domain-specific Language (DSL) continued to be by far the predominant broadband access technology around the world, accounting for over 65% of all broadband lines in 2007, followed by fiber and cable lines. At the same time, alternative technologies, mainly cable and Fiber-to-the-Home (FTTH) are beginning to provide potential for significant platform competition. Broadband access via cable networks are distributed mainly in USA, Canada and South Korea, representing almost 22% of all broadband lines and optic lines are popular in Japan and South Korea – 10.79% (Figure 13).

²⁷ see Guardian [accessed 03.10.2008]

²⁸ see Commission of the European Communities (2008a), pp. 7, 8

Figure 13: Broadband Connections Distribution by Technology, 2007



Source: Point Topic (2008), p. 9

In the EU countries, the dominant broadband access technology remains DSL (79.9%), followed by access via cable networks (15.3%) – distributed mainly in Malta, Hungary, Belgium and the Netherlands, and FTTH networks (1.3%) – with highest ratio in Sweden, Lithuania and Estonia.²⁹

DSL is the predominant technology in the developed countries due to the huge installed base of Public Telephone Switched Network (PSTN) physical infrastructure.

According to forecasts provided by Point Topic,³⁰ broadband lines will reach 683 million in 2013. Highest growth is expected in the Asia Pacific Region due to the rapidly developing Chinese broadband market – a result of economic changes and government intervention. By the end of 2008, China is expected to be the biggest broadband market and to reach by the end of 2013 153 million lines, followed by USA with 117 million lines. Denmark is expected to remain the most broadband-intensive major country, going from 37.0% in 2007 to 46.3% in 2008 take-up. Emerging economies are expected to develop their broadband infrastructure more intensively than the developed economies over the period 2008-2013.

One of the main benefits of the broadband is the faster Internet surfing. It also enables the ability to use bandwidth applications such as voice, video conferencing, e-business, radio, streaming video and digital television. Thus broadband can be identified as the future of the telecommunications.

In the next years, too, there will be a significant degree of convergence between fixed, wireless and mobile broadband services, meaning that a single operator will often offer access to broadband via a range of networks, including fixed, wireless and mobile.

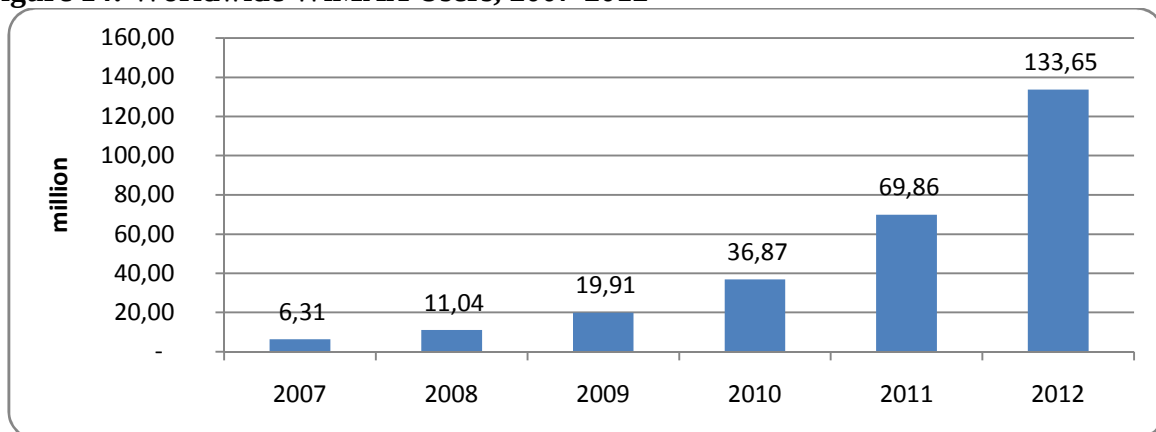
²⁹ see Commission of the European Communities (2008b), pp. 29, 30

³⁰ see Point Topic [accessed 16.12.2008]

2.1.1.5 *Worldwide Interoperability for Microwave Access (WiMAX)*

The WiMAX technology, based on the IEEE 802.16 standard (also called Broadband Wireless Access) is catching on worldwide. WiMAX technology subscribers use it mainly for the transmission of multimedia services such as Internet, voice, data, IPTV (Internet Protocol Television), email, games, etc. Thus WiMAX services can be considered an alternative to the cable Internet and traditional phone lines. The next figure (Figure 14) sets out the number of WiMAX users worldwide over the period 2007-2012.

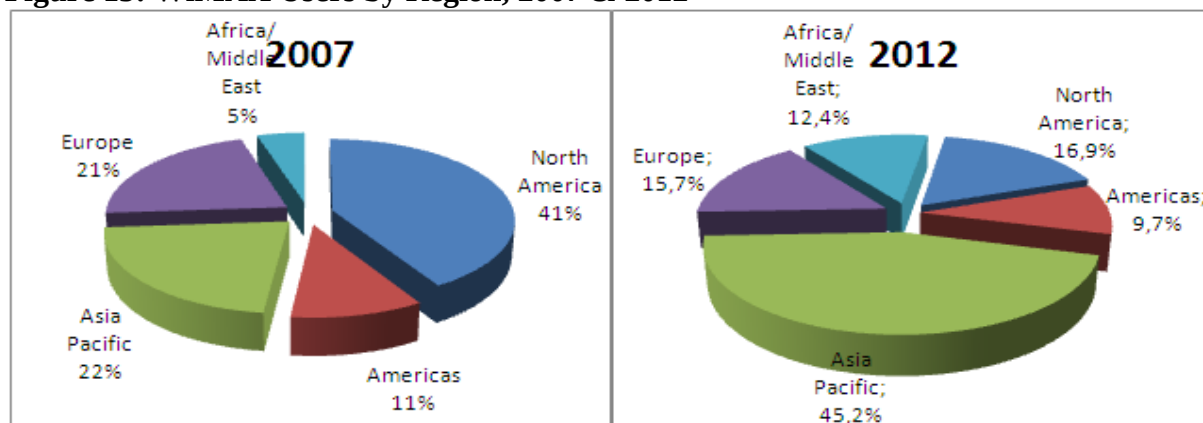
Figure 14: Worldwide WiMAX Users, 2007-2012



Source: Data derived from WiMAX Forum (2008), p. 3 [accessed 08.11.2008]

The figure above (Figure 14) shows the rapid forecasted increase of WiMAX users in the next few years (2008-2012). Currently most of the WiMAX users are in North America (41% of all users in 2007) followed by Europe and Asia Pacific with – 22% and 21% respectively (Figure 15).

Figure 15: WiMAX Users by Region, 2007 & 2012

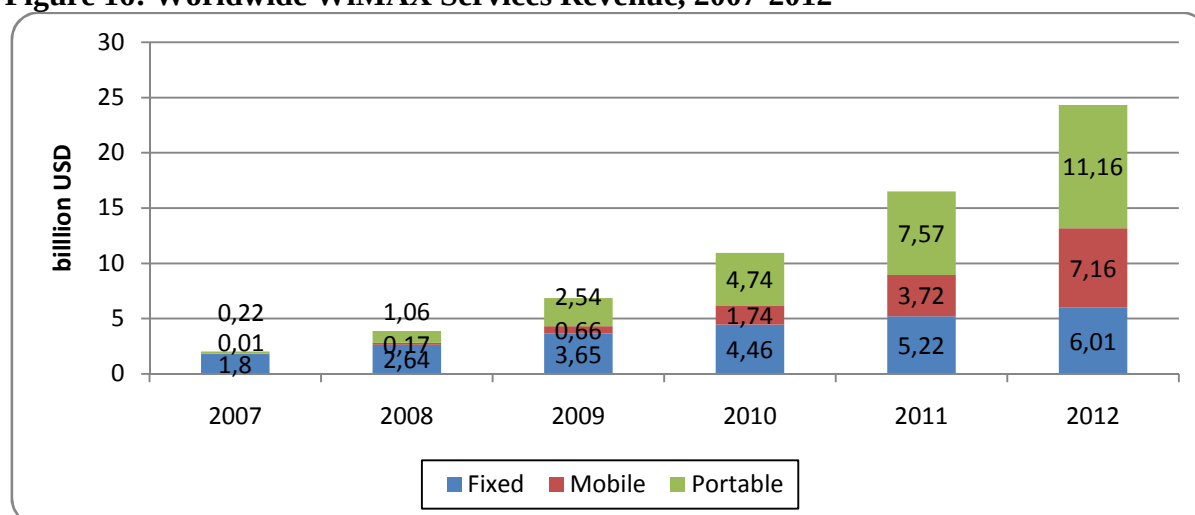


Source: Data from WiMAX Forum (2008), p.3 [accessed 08.11.2008]

Asia is anticipated to be the leading market with more than 45% of all WiMAX users by the year-end 2012 due to its huge population and the relatively fast adoption and deployment of new technologies. Second position will be held by North America, followed by Europe – with 16.9% and 15.7% respectively (Figure 15).

Global revenue from WiMAX services amounted to more than \$2 billion in 2007 and is anticipated to hit \$24 billion in 2012 (Figure 16).

Figure 16: Worldwide WiMAX Services Revenue, 2007-2012



Source: Data derived from Informa Telecoms & Media [accessed 03.11.2008]

Figure 16 shows that the revenues from mobile and portable WiMAX users are anticipated to grow and reach more than 30% and 46% respectively, of the total revenues from WiMAX services by 2012.

The solid support by leading equipment manufacturers contributes to WiMAX expansion as well. In the emerging markets (Eastern Europe, Latin America, Asia Pacific, Africa/Middle East) WiMAX networks are being deployed relatively faster due to lower penetration rates of fixed and mobile broadband rates. Introduction of WiMAX technology in these regions holds back the expansion of other networks, because WiMAX enables a wide range of value added services. In contrast, in the developed geographic regions (such as Western Europe, North America, Australia), the adoption and deployment of WiMAX is slower, because of the high broadband penetration rates.

WiMAX penetration will increase with the decrease of service costs and the increase in utilizing mobile and portable WiMAX devices to access broadband Internet services. WiMAX boom is expected in the next years with the launch of mobile consumer devices with integrated mobile WiMAX (laptops, personal data assistants (PDAs), GSM), which will enable end consumers to access high-speed Internet and phone everywhere.

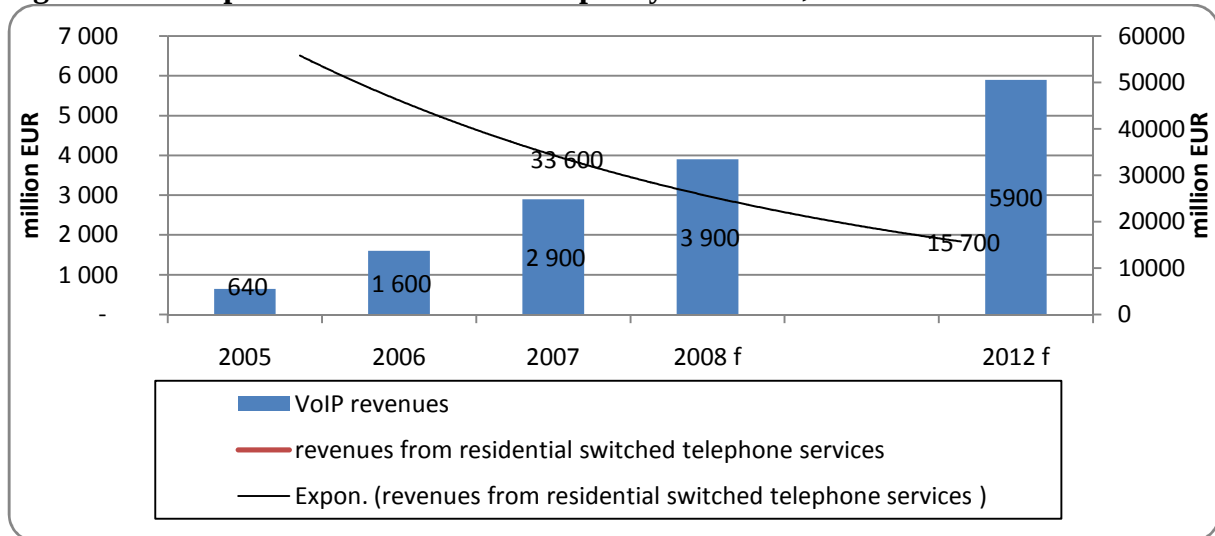
2.1.1.6 Voice over Internet Protocol (VoIP)

Voice over Internet protocol, the technology which allows the transmission of voice over the Internet is gaining popularity. VoIP technology and the general Internet as a backbone enable the operators to offer competitive prices, particularly for long distance and for international calls. The transmission of voice service over long distances within the Internet is much cheaper than within the traditional infrastructure used, thus putting pressure on the traditional voice service providers. The entry barriers for VoIP service providers are lower and their number is increasing, intensifying the overall competition in the public voice market.³¹

Cheap and almost free international calls make the Internet telephony attractive. Internet penetration growth contributes to the increase of VoIP consumption as well. Over the last few years, fast growth of consumption of VoIP telephony was observed. For example, according to TeleGeography research, IP based voice services have been adopted by European consumers at blistering pace. Next figure (Figure 17) exhibits VoIP revenue growth in Europe in the period 2005-2012. The figure contrasts the VoIP revenues with the fixed voice revenues in Europe in the period 2005-2012 as well.

³¹ see Gillet and Vogelsang (1999), pp. 236-254

Figure 17: European VoIP and Fixed Telephony Revenues, 2005-2012



Source: Data derived from TeleGeography [accessed 25.10.2008]

TeleGeography³² expects revenues from traditional telephony in Europe to decline from 33.6 billion EUR in 2007 to 15.7 billion EUR in 2012, as a result of revenue lost to VoIP services. TeleGeography estimates that VoIP subscribers growth will continue to soar in Western Europe and subscribers will grow from 25.3 million at year-end 2007 to 37.6 million by the year-end 2008, and will hit 58 million by 2012.

According to a European Commission report,³³ in Europe the number of VoIP subscribers reached 25.3 million (without client-based VoIP applications such as Skype) at the end of 2007 and their number is constantly growing. In 2007 the usage of VoIP was still limited but the number of VoIP users is growing at a blistering level, for example, in 2007 it constituted 14% of the overall fixed traffic in France, thus being the dominant market player, 6.3% in Austria and 5.6% in Slovenia.

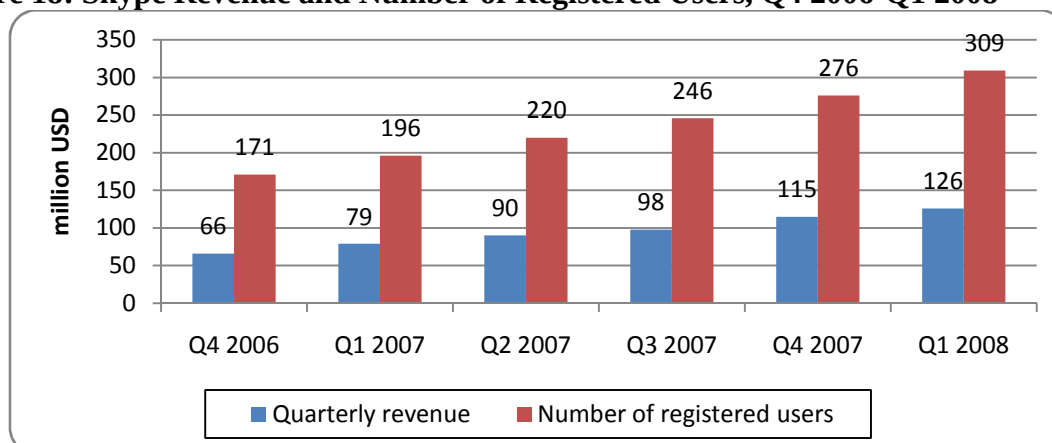
Rapid growth in the popularity of VoIP software, providing free computer-to-computer voice communication, has been observed. VoIP software like Skype, ICQ, MSN and Yahoo is attracting more and more users.

Skype, the global leader of software-based VoIP service, continues its strong growth and reached 309 million registered users in March 2008, with \$126 million revenue for the first quarter of 2008 (Figure 18). The next figure illustrates the revenue and the number of registered users for the period Q4 2006-Q1 2008.

³² see TeleGeography [accessed 25.10.2008]

³³ see Commission of the European Communities (2008b), p. 39

Figure 18: Skype Revenue and Number of Registered Users, Q4 2006-Q1 2008



Source: EBAY (2008), p. 12 [accessed 08.01.2009]

Skype's revenue grew by \$11 million from Q4 2007 to Q1 2008 and increased by nearly 60% in Q1 2008 compared to Q1 2007 – from \$79 million to \$126 million. Significant growth (57.6%) of the number of registered users is observed over the period Q1 2007-Q1 2008 as well (Figure 18).

The increasing popularity of VoIP is unlikely to slow down anytime soon and such consumption growth is putting additional pressure on traditional telephony and traditional providers, intensifying the competition in the voice transmission market. Increasing VoIP adoption will change the way telecoms do business in Europe, and it will challenge the historical stronghold of incumbent operators.

2.1.2 FUTURE PERSPECTIVES IN THE GLOBAL TELECOMMUNICATIONS SECTOR

In most of the countries around the world development and upgrade of telecommunications infrastructure will continue and even intensify. Development of high-speed network architectures will be a priority of operators in the telecom market. NGN developments will take place in many geographic regions.

A strong global migration of fixed to mobile services is expected. The demand for mobile services and applications will be increasing due to increasing consumers' mobility and expanding wireless capacity. Mobile video services will grow at a significantly high rate. Mobile services such as: personal mapping applications, mobile TV, mobile e-mail, audio and

video on demand, file and data transfer between different consumers, etc. – will gain popularity around the world.

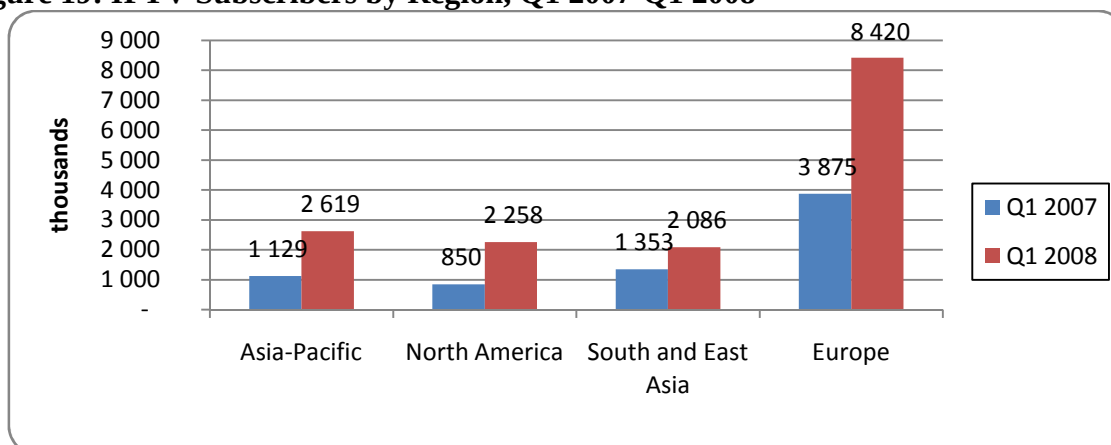
Another key perspective of the development of the global telecommunications market will be the fast adoption of WiMAX technologies. It can be considered not only as a step towards 4G mobile communication, but as a last mile access solution for providing services to their consumers as well. More than one billion people use mobile services without fixed ones. For those users WiMAX Broadband Wireless Access Technology is the only reliable technology. In 2008, many WiMAX projects will be realized in countries like Mexico, Russia, and Brazil due to underdeveloped copper-wire networks, which deter to roll out a DSL broadband network. WiMAX networks promise to be fast and cheap and to intensify the competition between mobile operators and telecom operators that provide DSL.

A switch from analog to digital broadcast television (TV) will spread worldwide. Digital television provides a better picture quality and reception plus a variety of new features. Mobile TV is expected to gain popularity.

IPTV – TV over the Internet – is expected to exhibit a growing trend in many regions around the world that have a large broadband subscriber base. The drive to turn the TV into an Internet-capable device is likely to continue. According to a report released by the Broadband Forum and Point Topic,³⁴ IPTV subscribers have more than doubled over the period Q1 2007–Q1 008 hitting 15.4 million. Next figure (Figure 19) shows the significant increase of subscribers in Asia-Pacific Region, North America, South and East Asia and Europe.

³⁴ see Broadband Forum [accessed 22.11.2008]

Figure 19: IPTV Subscribers by Region, Q1 2007-Q1 2008



Source: Data derived from Point Topic [accessed 20.11.2008]

The trend of increased migration of TV consumption from linear to non-linear TV (TV On-Demand) will intensify due to the innovative ways of serving TV in a time-shifted manner and excess bandwidth available in NGNs. By 2012, over 25% of all TV content is expected to be time-shifted, on-demand, on the Web or on a mobile device.³⁵

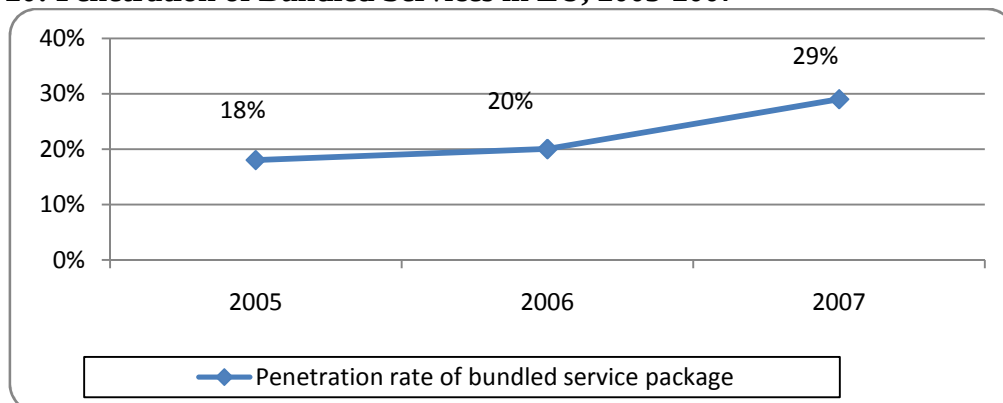
In the next five years, the tendency toward global convergence of information technology, telecommunications and electronic media infrastructure will increase, leading to service and end devices convergence as well.

Along with platform and service convergence, a clear trend towards bundled services, representing a first step towards convergence, will gain more and more popularity. This type of services is offered by mobile operators, as well as fixed, cable, etc.

Service bundles are rapidly gaining popularity among the European households. Bundled-services subscribers, at the beginning of 2007, in EU reached 29% of the households (Figure 20). Next figure shows the penetration rate among the European households in the period 2005-2007.

³⁵ See Research and Markets [accessed 28.11.2008]

Figure 20: Penetration of Bundled Services in EU, 2005-2007



Source: Data derived from Eurobarometer (2008), p. 4

According to an EU survey,³⁶ the highest penetration rate was observed in Denmark, where 47% of the households used such bundles in 2007, followed by the Netherlands and Luxemburg – with 42% and 38% respectively. Finland and Greece registered the lowest penetration level among the Member States – 7% and 12% respectively.

In the EU, Internet access is included in 24% of all bundled packages, followed by fixed voice services, which are part of 23% of all bundles, and followed by television and mobile phone services – 12% and 6% respectively.³⁷ Prices for all packages fell across EU. In addition to lower prices, consumers had a greater choice of services.

Ultimately, a converged communication structure will lead to important socio-economic benefits.

2.2 ANALYSIS OF THE TELECOMMUNICATIONS MARKET IN BULGARIA

The State Agency for Information Technology and Communications (SAITC) is one of the governmental structures responsible for the ICT development at a national level. Another governmental structure in ICT policy implementation is the Communications Regulation Commission (CRC). CRC is a specialised independent state authority, entrusted with the functions of regulation and supervising of the telecommunication services and activities. In compliance with Bulgarian legislation, one of the main tasks of CRC is to promote competition in the country's electronic communications markets.

³⁶ see Eurobarometer (2008), p. 80

³⁷ see Commission of the European Communities (2008b), p. 110

2.2.1 VALUE AND DYNAMICS OF BULGARIAN TELECOMMUNICATIONS MARKET BY SEGMENT

Telecommunications has been an extraordinary dynamic and fast growing sector of the national economy in Bulgaria. The usage of telecommunications services by business and private consumers in Bulgaria increased significantly over the last years. According to Industry Watch,³⁸ telephone services amounted to 5.5-6% of the household budget in 2007.

Bulgarian telecommunications market has experienced significant changes in recent years which are inherent to an evolving market. In Bulgaria, in the period 2003-2007, was observed an increasing market competition among the main players in the fixed-line market and the mobile market, after the liberalization of the fixed telephone networks market in January 2003. In 2004, Bulgarian Telecommunications Company AD (BTC) was privatized.³⁹

Bulgarian telecommunications market can be divided into the following industry segments: fixed-line market, mobile services market, leased lines, cable services, fixed satellite networks, Internet Services market, WiMax networks, and other telecommunications services.

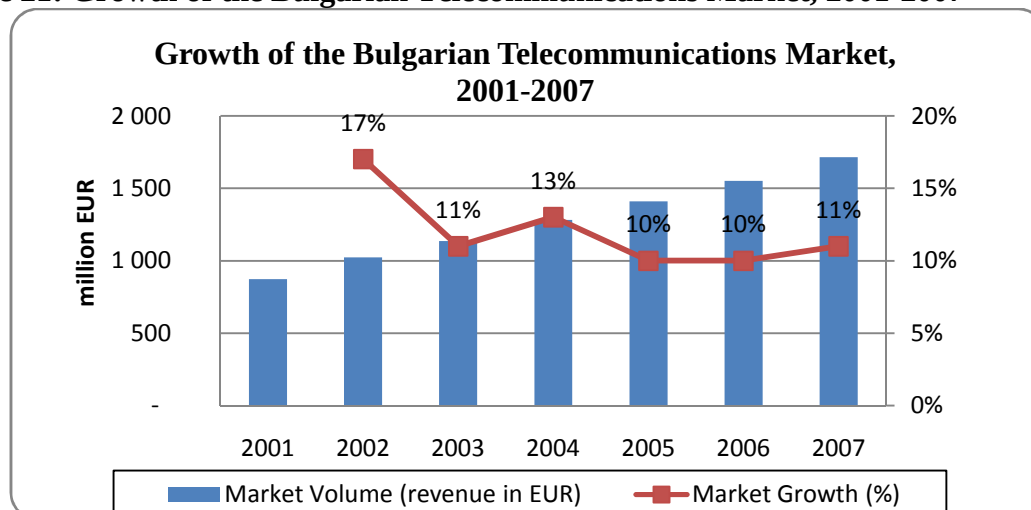
At year-end 2007, the volume of Bulgaria's telecommunications market, estimated on the basis of the revenues from each segment, amounted to 3.355 billion BGN or 1.716 billion EUR, which constitutes an increase of 11% towards the year-end 2006. For comparison, the increase in 2006 with respect to 2005, and the increase in 2005 with respect to 2004 was nearly 10%, showing that Bulgarian telecommunications market holds its continuing growth rate (Figure 21). In 2007, the volume of the telecommunications market was around 6% of the total Gross Domestic Product (GDP) of Bulgaria.⁴⁰ Figure 21 illustrates the telecommunications market growth in Bulgaria for the years 2001-2007.

³⁸ see Industry Watch [accessed 19.10.2008]

³⁹ see BTC [accessed 17.10.2008]

⁴⁰ see National Statistical Institute [accessed 02.10.2008]

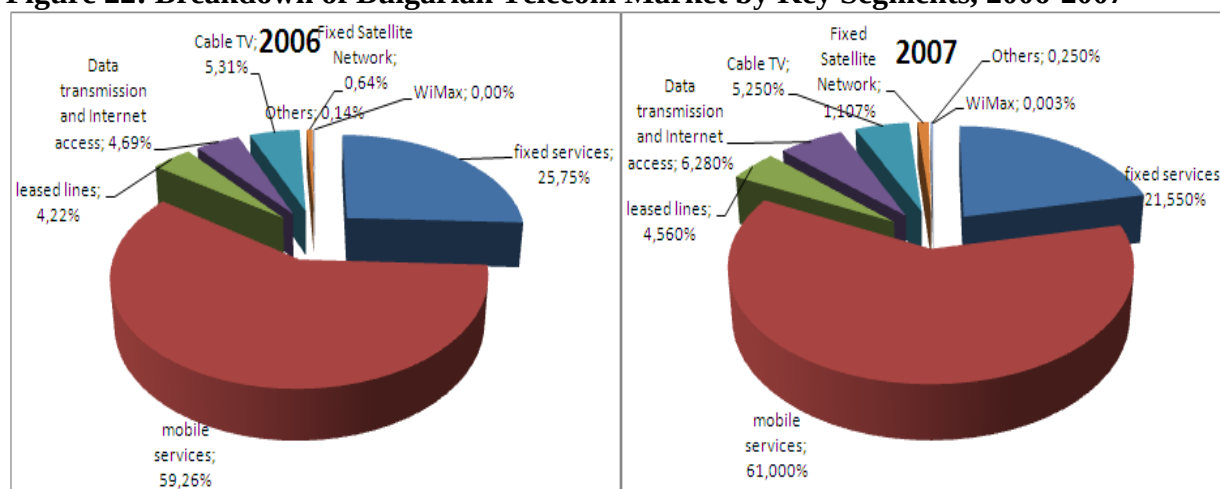
Figure 21: Growth of the Bulgarian Telecommunications Market, 2001-2007



Source: CRC (2008), p. 18

The next figure represents the breakdown of Bulgarian telecommunications sector by key segments in 2006 and in 2007.

Figure 22: Breakdown of Bulgarian Telecom Market by Key Segments, 2006-2007



Source: Data derived from CRC (2008), pp. 17, 18

Figure 22 shows that more than half (61%) of the Bulgaria's telecom market revenues were generated by mobile services in 2007, thus the mobile communications dominated the telecom market in the country. The sector of mobile services in Bulgaria kept its dominant relative position in the telecommunications market over the period 2006-2007 – 59.26% and 61.00% respectively.

Drop by a little more than 4 percentage points in the fixed services segment is observed for the same period – from 25.75% to 21.55% (Figure 22). Fixed-line revenue declined due to

drop in fixed voice revenue. Bulgarians increasingly use mobile phones, cancelling their fixed-line service.

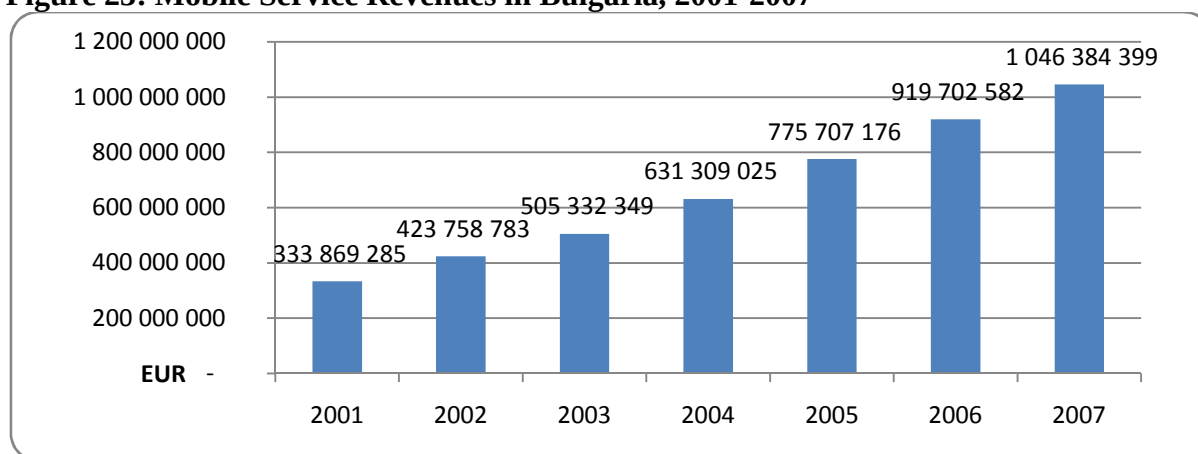
In 2007 was launched the provision of service over point-to-multipoint network based on WiMAX technology.

2.2.1.1 Mobile services market

The mobile market is the most dynamic sector in the telecommunications sector in Bulgaria. The mobile phone in Bulgaria is not only a necessity but a lifestyle as well.

Bulgarian mobile segment continued its rapid development under conditions of an increasing competition and a high market saturation. In 2007, the revenues from mobile services increased in absolute value by nearly 13% and amounted to over 1 billion EUR (Figure 23), thus constituting more than a half (61%) of the total revenue of the Bulgarian telecommunications market (Figure 22) – being a dominant segment in the telecom sector in Bulgaria. Figure 23 shows the mobile service revenues in Bulgaria over the period 2001-2007.

Figure 23: Mobile Service Revenues in Bulgaria, 2001-2007

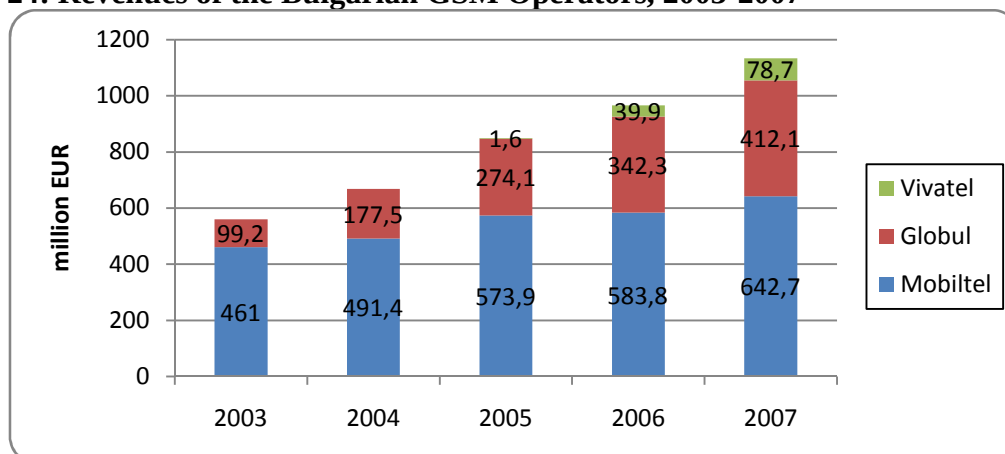


Source: Data derived from CRC (2008), pp. 16, 17

At present there are four operators carrying out activities on mobile cellular networks and services market: “Mobiltel” EAD (trade name M-Tel), “Cosmo Bulgaria Mobile” EAD (trade name Globul), “BTC Mobile” EOOD (trade name Vivatel) and “Radiotelecommunications company” EOOD (trade name Mobikom). Mobikom is the only analog mobile network operator.

The mobile market has been a lot more competitive compared to the market of fixed lines, with three major players. The next figure (Figure 24) illustrates the Bulgarian GSM operators' revenues for the period 2003-2007.

Figure 24: Revenues of the Bulgarian GSM Operators, 2003-2007

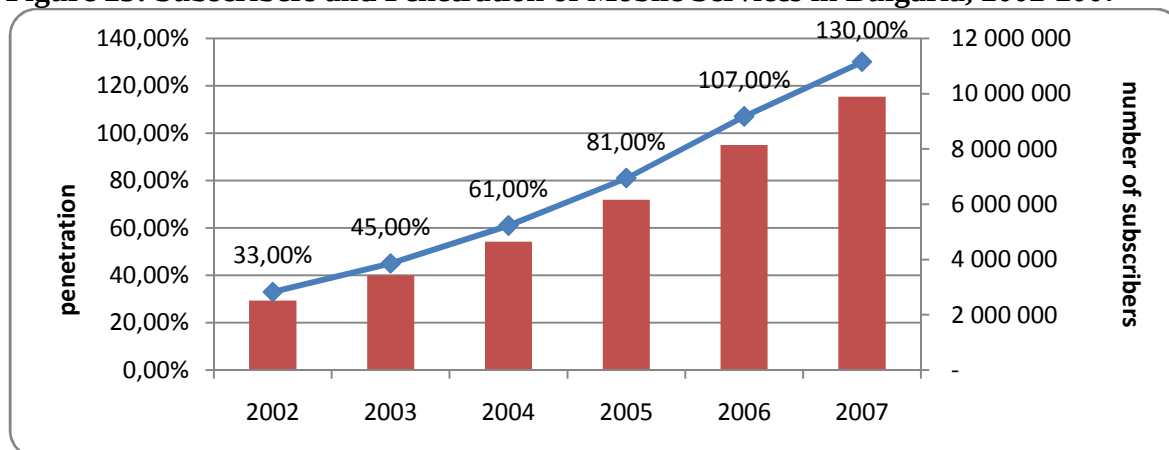


Source: Data derived from Computer World BG [accessed 15.10.2008]

The total revenues of the three mobile-phone operators reached 1.13 billion EUR in 2007, thus outpacing more than two times the business of landline competitors – 370 billion EUR (Figure 28).

The significant growth rate and the high relative share of the mobile services sector in the total telecommunications market is due to the continuing trend more and more consumers to replace the fixed voice services with mobile ones and due to the aggressive marketing policy of the mobile operators for attracting new customers held during the recent years, in particular in the pre-paid segment. The number of mobile services subscribers reached 9 897 477 at the year-end 2007, what is a growth by nearly 20% compared to year-end 2006. The next figure (Figure 25) shows the recent trend of the mobile penetration level and the number of subscribers in Bulgaria for the period 2002-2007.

Figure 25: Subscribers and Penetration of Mobile Services in Bulgaria, 2002-2007



Source: CRC (2008), p. 44, CRC (2007), p. 58

As we see, the number of total mobile operators' subscribers exceeds the total number of population in Bulgaria, which means that the number of consumers using more than one Subscriber Identity Module (SIM) card grows, especially for the pre-paid services. This is a clear sign of significant market saturation. At the year-end 2007, Bulgaria has a mobile penetration level (130%) well above the EU average – 111.8%.⁴¹ The part of the subscribers using the services of more than one operator is increasing due to the significant price difference in the on-net and off-net calls, as well as to the variety of attractive promotions offered by the operators.

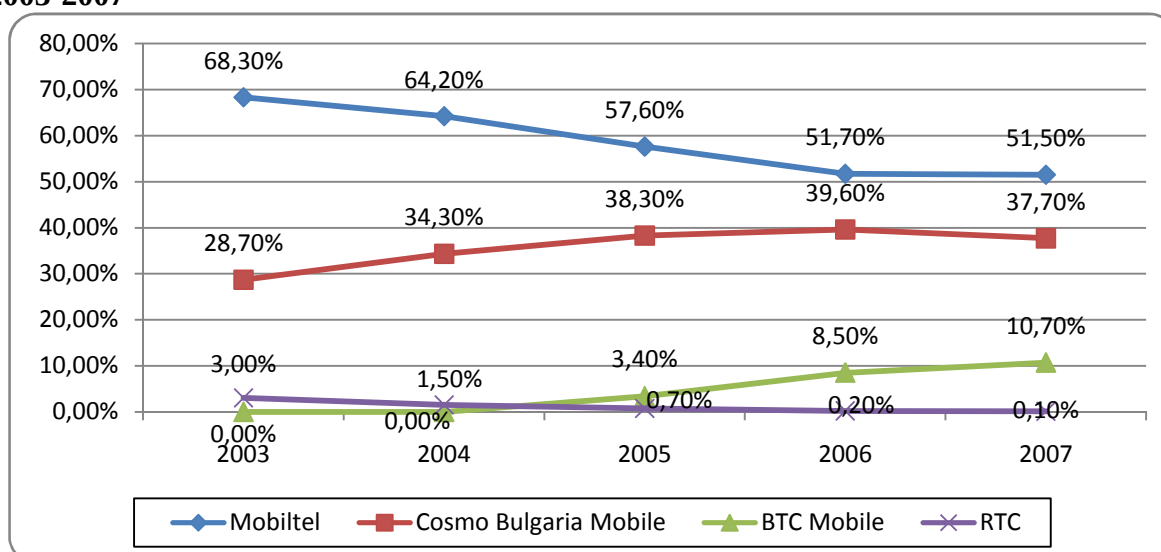
For fifth consecutive year more than the half of subscribers uses the services of mobile operators through pre-paid cards. According to data submitted to CRC, 64% of the new subscribers in 2007 used pre-paid cards and their relative share was 57% of the total market.⁴²

The next figure (Figure 26) depicts the dynamics of market shares of the mobile operators in Bulgaria by number of subscribers for the period 2003-2007.

⁴¹ see Commission of the European Communities (2008a), p. 3

⁴² see CRC (2008), p. 46

Figure 26: Market Share of Bulgarian Mobile Operators by Number of Subscribers, 2003-2007



Source: CRC (2008), p. 47, CRC (2007), p. 61

Over the period 2003-2007, the market share of the leading mobile operator, Mobiltel dropped from 68.3% to 51.50%. The third GSM operator, Vivatel (the trade name of “BTC Mobile” EOOD) has increased its market share to 10.7% due to aggressive price policy and attractive service structures. After the emergence in November 2005 of the third Bulgarian GSM operator,⁴³ namely Vivatel, serious and increasing price war has been stimulated in the market for mobile services.

Due to technological innovations on the telecommunication market, Bulgarian mobile operators continue to introduce the new technologies. Operators started offering new services such as UMTS applications, High-Speed Downlink Packet Access (HSDPA) data services transfer, video calls, music and video download, mobile Internet packages, etc. In 2006 Mobiltel and Globul launched their first 3G services, namely video call and access to mobile data, based on UMTS. In March 2007, the third Bulgarian GSM operator, “BTC Mobile” EOOD started offering 3G services as well.^{44, 45, 46}

Although Bulgarian mobile operators offer a wide portfolio of services (2G, 2G+ and 3G), mobile services market has primarily been driven by regular voice transmission services. The main part of the revenues, or almost 43%, is generated by voice telephony. Next figure

⁴³ see Vivatel [accessed 04.11.2008a]

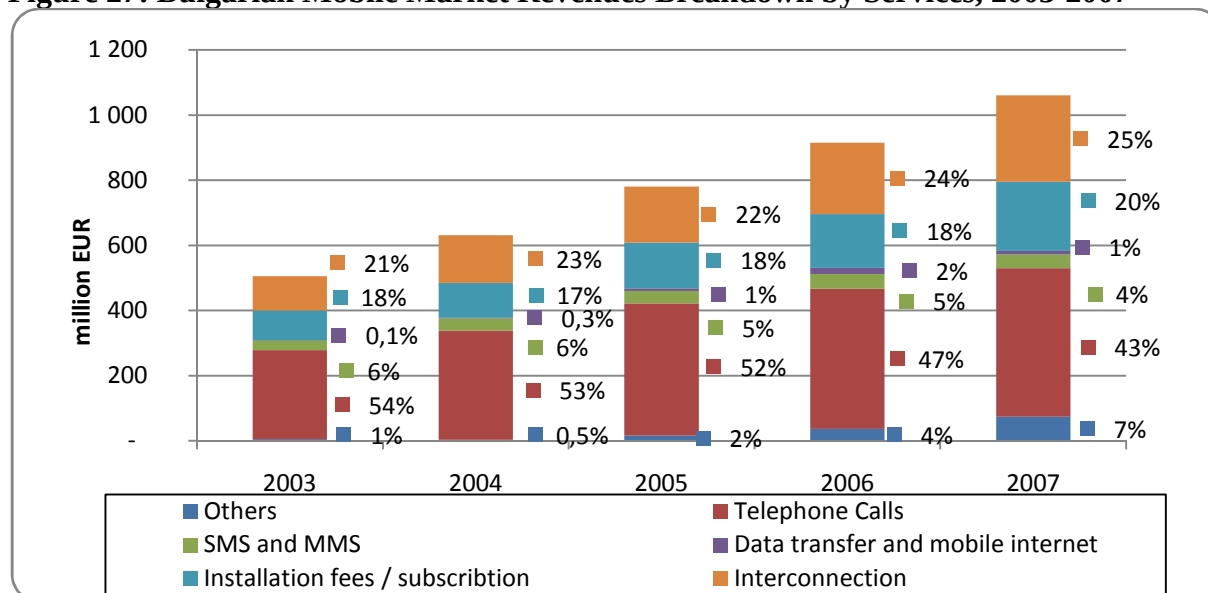
⁴⁴ see Mtel [accessed 05.11.2008]

⁴⁵ see Globul [accessed 05.11.2008]

⁴⁶ see Vivatel [accessed 04.11.2008b]

(Figure 27) illustrates the revenues breakdown from provision of mobile telecommunication services in Bulgaria for the period 2003-2007.

Figure 27: Bulgarian Mobile Market Revenues Breakdown by Services, 2003-2007



Source: CRC (2008), p. 49

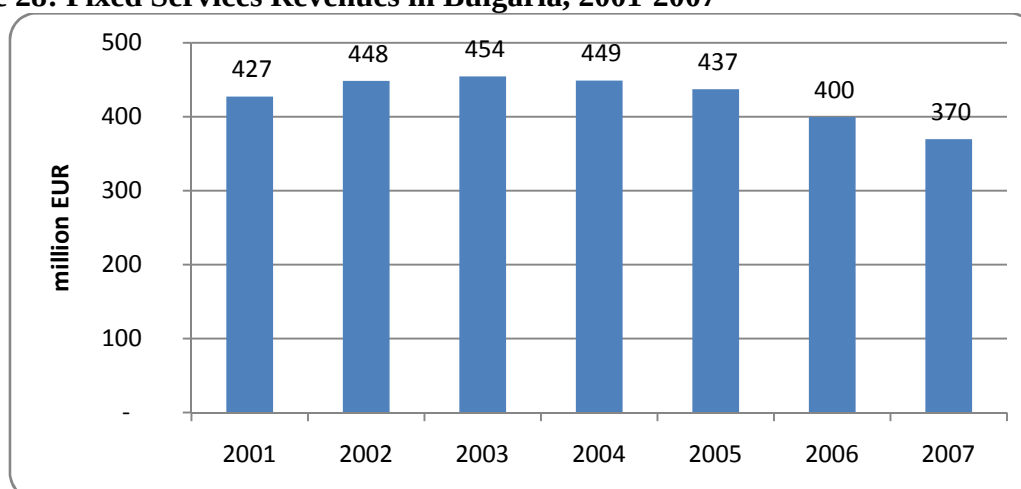
Figure 27 shows that mobile services in Bulgaria are dominated by regular voice services. The percentage of non-voice services, such as data and Internet services, is expected to grow further from 2008 onwards due to the introduction and development of new technologies – 3G. Consumption of mobile Internet and data transfer services is expected to grow due to the constantly increasing subscribers' mobility.

Even though Bulgarian mobile phone services market can be considered to be in a saturation period, its importance within the telecom market continues to grow, in terms of realized revenues, traffic volume, and number of users.

2.2.1.2 Fixed-line market

In 2007, drop in revenues from fixed telephone networks and provision of fixed voice telephone services by 7% in absolute value and by 4% in relative value towards the total market volume compared to the preceding 2006 year is observed. The total revenues of this segment amounted to almost 370 million EUR, according to data published by CRC. Next figure (Figure 28) illustrates the revenues from fixed services in Bulgaria over the period 2001-2007.

Figure 28: Fixed Services Revenues in Bulgaria, 2001-2007



Source: Data derived from CRC (2008), pp. 16, 17

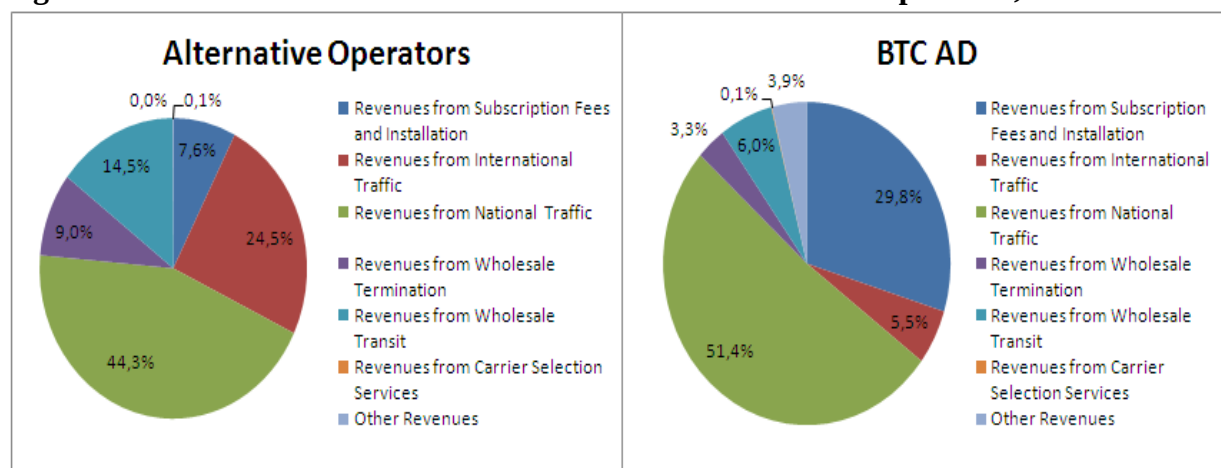
Reduction in revenues is a result, on one side, of the decrease in BTC revenues from fixed telephony and from the migration to mobile operators, the migration to services provided by VoIP providers, the usage of software like Skype and ICQ, enabled by the possibility of PC-to-PC⁴⁷ real-time voice transmission over Internet, and due to the fact that the alternative operators still have a limited access to the subscribers of the incumbent operator.

After the monopoly of Bulgarian Telecommunications Company AD (BTC) was over many new players entered the market. CRC granted licenses giving the right to offer phone services over own network. Despite the presence of 18 active alternative providers of fixed telephony services, the relative share of BTC based on revenues from the provision of those services in 2007 remains too high (96,54%), which is an indicator of still low and insufficient level of competition in this market segment.⁴⁸ The following figure (Figure 29) illustrates the breakdown of revenues of BTC and alternative operators, for 2007.

⁴⁷ Personal Computer (PC)

⁴⁸ see CRC (2008), p. 18

Figure 29: Breakdown of Revenues of BTC and the Alternative Operators, 2007



Source: Data derived from CRC (2008), p. 20

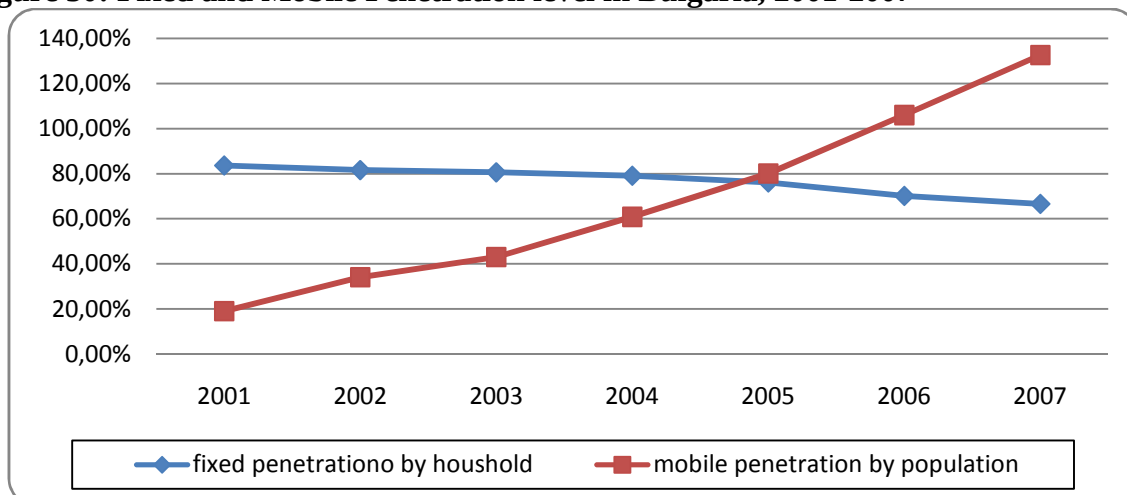
The figure (Figure 29) shows that the main part of the revenues, for both BTC and alternative operators, is generated by national traffic – 51.4% and 44.3% respectively. Subscribers prefer alternative providers for making international calls – constituting 24.5% of their total revenue compared to just 5.5% of the total revenue of the incumbent BTC. In order to gain new subscribers alternative operators are introducing aggressive pricing policies (different service packages), characterized by lower prices compared to the ones of the incumbent operator BTC bringing the market players in price war.

At the year-end 2007, eight alternative operators offered bundled packages including fixed voice telephony: “Nexcom Bulgaria” EAD, “Net is Sat” OOD, “Mobiltel” EAD, “Vestitel BG” AD, “Eurocom Cable Management Bulgaria” EOOD, “CableTEL” EAD, “Cosmo Bulgaria Mobile” EAD and “Trans Telecom” EAD.⁴⁹ This brings more competition in the Bulgarian telecom market and enables the subscribers to pay less than if subscribed to these services separately and to save time.

Figure 30 exhibits the tendency of fixed to mobile substitution (FMS), expressed by the dynamics of the level of penetration of fixed telephony and mobile telephony over the period 2001-2007. Mobile services are gaining more and more popularity among the users in Bulgaria, causing a smooth decline in the use of fixed telephony in the country.

⁴⁹ see CRC (2008), p. 16

Figure 30: Fixed and Mobile Penetration level in Bulgaria, 2001-2007



Source: CRC (2008), p. 18

Although, at present, the competition level in the fixed voice market is relatively poor, FMS phenomenon is a key threat to fixed phone calls. More and more consumers substitute cellular phones for hard-wire phones. Consumers prefer mobile phones for their portability and convenience. Another threat for the incumbent BTC is the integrated communications solutions – mobile and fixed telephony offered by the mobile operators in Bulgaria. For instance, in 2005, Globul launched an integrated mobile-fixed telephony solution – Mobile Virtual Private Network (mVPN).⁵⁰

2.2.1.3 Leased line segment

Leased lines are telephone lines that have been leased for private use to mobile operators, Internet providers, and other companies performing communications activities. This practice is expected to boost competition among different telecommunications operators and to bring down prices for end users.

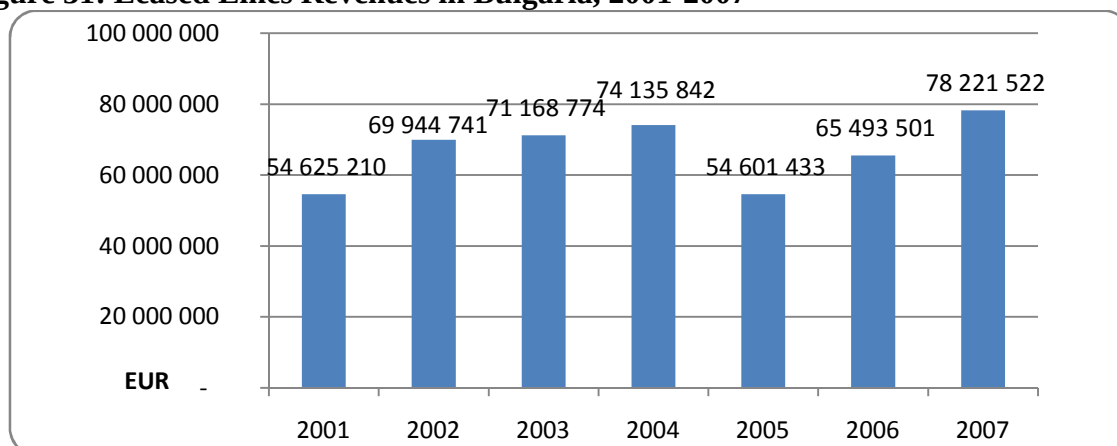
In Bulgaria, individual licenses for carrying out of telecommunications through a telecommunication network for provision of the leased line service are held by the incumbent operator BTC, by the mobile operators (“Mobiltel” EAD, “Cosmo Bulgaria Mobile” EAD, “Radiotelecommunications Company” EOOD), by a cable operator (“Eurocom Cable Management Bulgaria” EOOD) and by data transfer operators (“Sofia Communications” AD, “Nettera” EOOD, “Novatel” EOOD). In 2007, two new individual licenses for carrying out of electronic communications through telecommunication network for provision of the leased

⁵⁰ see Globul [accessed 07.10.2008]

line service were issued to “RAKOM” AD and “Telecom Partners Network” EAD.⁵¹

The revenues from leased lines have increased approximately by 20% in 2007 compared to the previous year and amounted to approximately 78 million EUR (Figure 31). Next figure illustrates the dynamics of Bulgarian leased line segment in the period 2001-2007.

Figure 31: Leased Lines Revenues in Bulgaria, 2001-2007



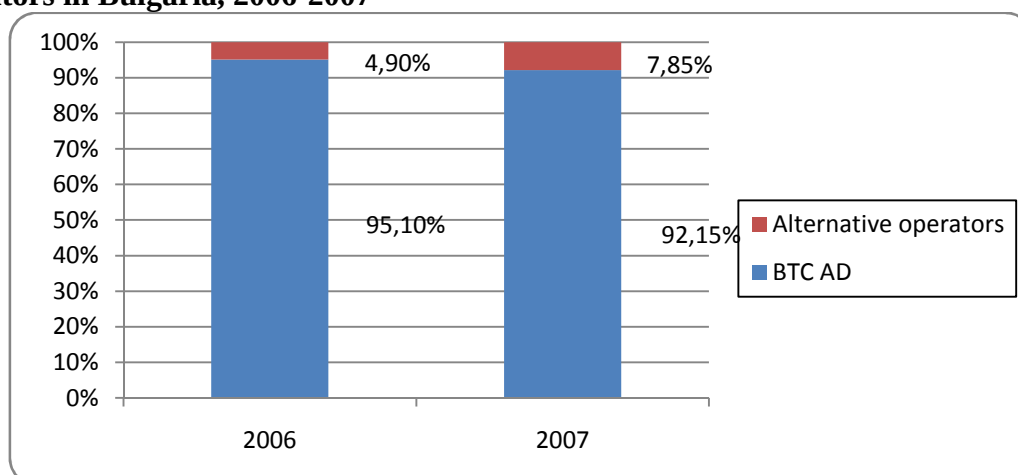
Source: Derived from CRC (2008), pp. 16, 17

Increase in revenues in the last three years (2005-2007) is due to the greater number of alternative operators carrying out activities in the market (12 in 2007 compared to 10 in 2006 and 7 in 2005), as well as to the growth, in absolute value, in the revenues from leased lines of the incumbent operator BTC.⁵² The relative share of the ex-monopolist in the structure of leased line segment is around 92.15%, which represents reduction by nearly 3 percentage points in comparison to 2006, while the share of the competitors has increased up to 7.85% (Figure 32).

⁵¹ see CRC (2008), p. 72

⁵² see *ibid*, pp. 72, 73

Figure 32: Breakdown of Revenues from Leased Lines of BTC and Alternative Operators in Bulgaria, 2006-2007



Source: Data derived from CRC (2008), pp. 73, 74

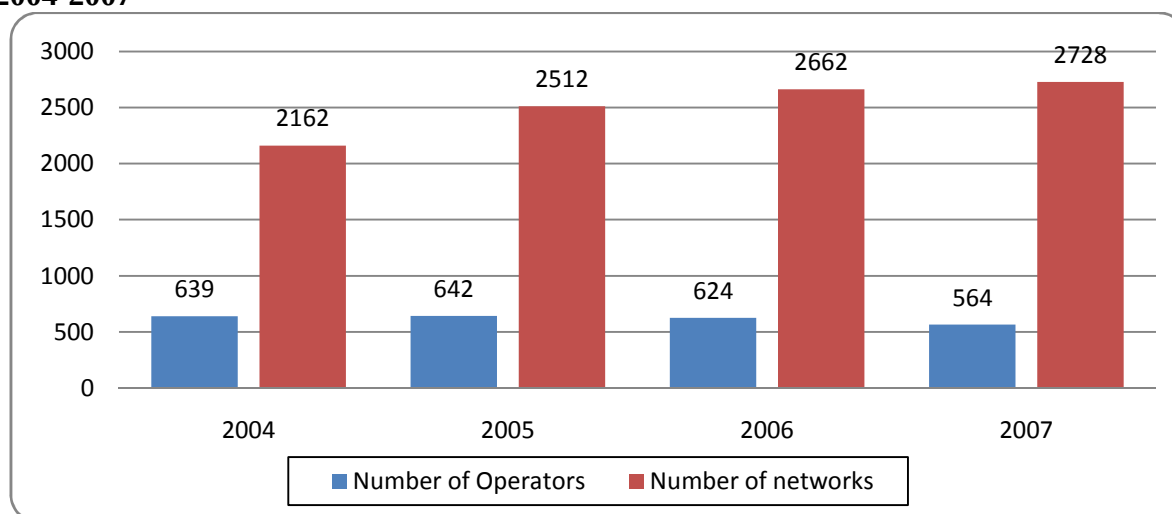
In the next years new market entrants are expected to come into the leased lines segment. Thus the market share of the incumbent BTC is expected to decline.

2.2.1.4 Cable market

The Bulgarian cable market was officially opened to competition in 1998, since many operators had conducted activities illegally. Many new operators entered the market since that year. After the liberalization of the Bulgarian telecommunications sector in 2003, many cable operators started provision of cable telephony as well. Cable TV infrastructure in Bulgaria is capable and is used for distribution of not only television, but other communication services as well. At present, Bulgarian cable operators offer television services, Internet access and fixed telephony.

Now, cable operators in Bulgaria are considered to be in a highly saturated marketplace. This market segment demonstrates highly competitive environment. At year-end 2007, the total number of cable operators was 564 and the number of cable networks reached 2 728 (Figure 33). Figure 33 illustrates the recent development in the segment over the period 2004-2007.

Figure 33: Number of Cable Operators and Number of Cable Networks in Bulgaria, 2004-2007



Source: CRC (2008), p. 96

A tendency toward consolidation in the cable market is observed over the period 2005-2007. In 2007 the number of the operators for the third consecutive year decreased, but the number of cable networks continues to increase, which implies a strengthening of the position of the big players (Figure 33).

The first step toward consolidation of the Bulgarian cable market was undertaken by “CableTEL” EAD, the leading cable operator in the country. In 2005, the company signed an agreement with “Recording Haskovo” OOD and “Variant-62” EAD-Shumen.⁵³

In 2006, “Eurocom Cable Management Bulgaria” EOOD acquired direct control over “Eurcom Plovdiv” EOOD and “Centrum Grup-BG” AD.⁵⁴

Nowadays, CableTEL and Eurocom are among the leading cable operators in Bulgaria.

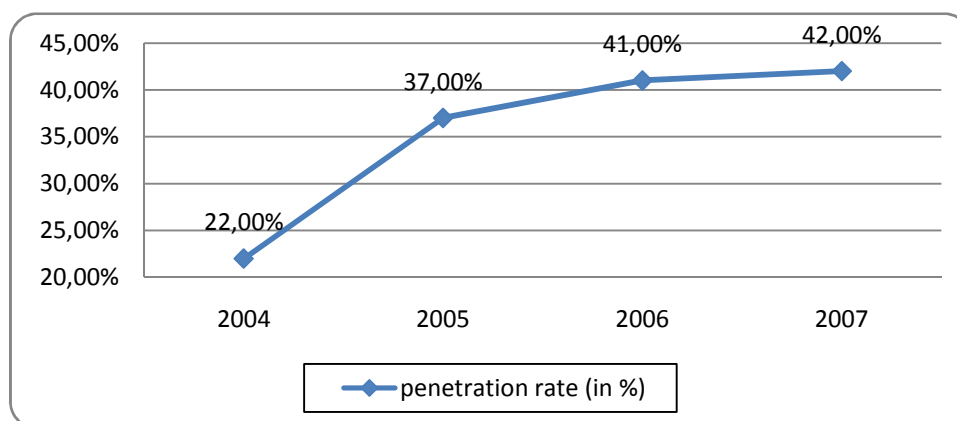
The total number of cable operators’ subscribers in Bulgaria as of December, 31th 2007 was approximately 1.22 million and there was an increase by 3% compared to 2006.⁵⁵ The following figure (Figure 34) shows the penetration level for cable television among the Bulgarian households in the period 2004-2007.

⁵³ see CableTEL [accessed 10.11.2008]

⁵⁴ see Eurocom [accessed 10.11.2008]

⁵⁵ see CRC (2008), p. 100

Figure 34: Penetration Rate for Cable Television among Bulgarian Households, 2004-2007

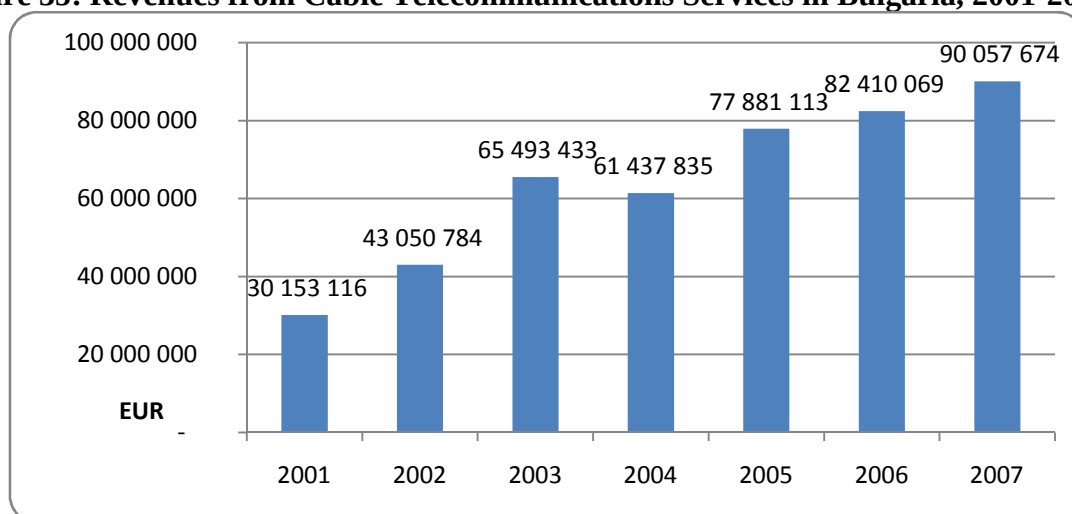


Source: CRC (2008), p. 100

Cable TV penetration among Bulgarian households is relatively high although the number of major service providers is decreasing due to the process of consolidation. The penetration rate for cable television in Bulgaria in 2007 reached 42% of the households, which is by 1 percentage point more compared to 2006 (Figure 34). Slowdown in the growth of penetration level had been observed over the period from 2005 to 2007. Development of satellite broadcasting in Bulgaria can be considered as a significant threat to cable TV, thus intensifying the competition in the provision of television among Bulgarian consumers.

Next Figure (Figure 35) exhibits the total revenues in cable telecommunications segment in Bulgaria over the period 2001-2007.

Figure 35: Revenues from Cable Telecommunications Services in Bulgaria, 2001-2007

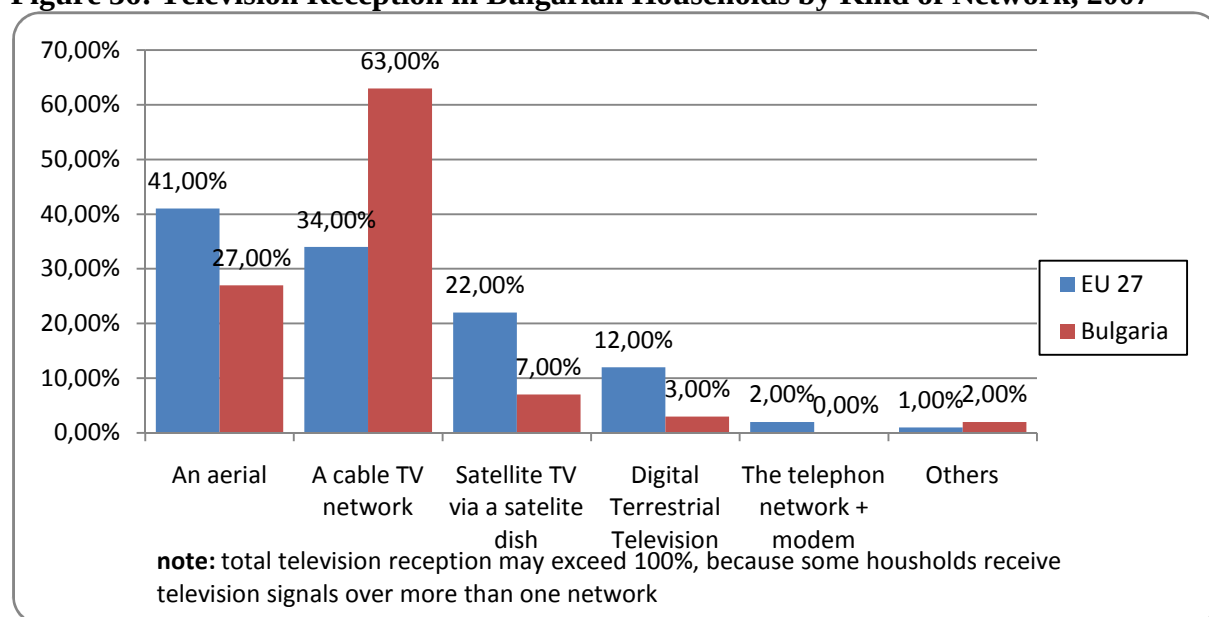


Source: Data derived from CRC (2008), p. 16

Total revenues from cable telecommunication networks amounted to nearly 90 million EUR in 2007, which is almost 10% more in comparison with 2006, when revenues amounted to 82 million EUR (Figure 35). The greater part of them are still generated from broadcasting of radio and television programs, the revenues from which mark growth of 4% and reach 85% of the total revenues from the market segment, while the relative share of the coded programs decreases by around 5% and amounted to 1% in 2007⁵⁶

Television reception in Bulgaria is mainly via a cable TV network. The next figure (Figure 36) shows the way, in which Bulgarian households receive television.

Figure 36: Television Reception in Bulgarian Households by Kind of Network, 2007



Source: Eurobarometer [accessed 05.12.2008]

Due to the fast introduction of new technologies cable operators expanded the diversity of programs and number of channels providing the subscribers with multiple choice of programs and audio-visual services.

One of the main advantages of Bulgarian cable operators is that they possess their own infrastructure. This enables them to model their own service offerings. Thus they have a great potential in combining many telecommunications services. Most of the cable operators already started provision or have intentions to offer bundled services such as two-service bundle (cable TV coupled with an Internet access or with voice services), three-service bundle (voice, data and television), coded programs, data transfer, High-definition television (HDTV)

⁵⁶ see CRC (2008), pp. 100, 101

and video on demand. Revenues from provision of bundled offerings such as Double Play (cable TV and Internet access) have increased by approximately 3 percentage points to 11.4%, those from provision of Triple Play – 0.9%, those from transmission of digital television reached 1.9% from the aggregate revenue of the cable networks.⁵⁷ The bundles allow the cable operators in Bulgaria to keep their subscribers from switching to satellite digital television operators, and the main advantage to the subscribers is the convenience and price discounts, if subscribing to a bundle offering.

2.2.1.5 *Satellite Systems market*

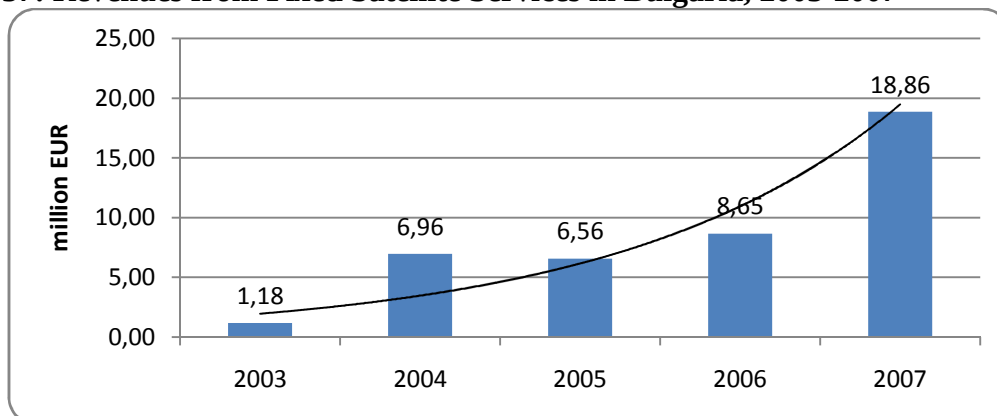
Services provided by satellite systems have been gaining increasing popularity. In Bulgaria satellite networks are used mainly for digital TV and radio broadcasting, voice transmission, data transfer and Internet access provision and for mobile and personal communications. Satellite services provision increases the competition in all segments of the telecommunications market.

In 2007, ten operators had individual licenses for transmission of services over satellite network.⁵⁸ The volume of the segment amounted to 18.86 million EUR and has increased more than twice compared to 2006, when the total revenues amounted to 8.65 million. The following figure (Figure 37) illustrates the revenue growth of fixed satellite services in Bulgaria, for the period 2003-2007.

⁵⁷ see CRC (2008), pp. 85, 86

⁵⁸ see *ibid*, p. 86

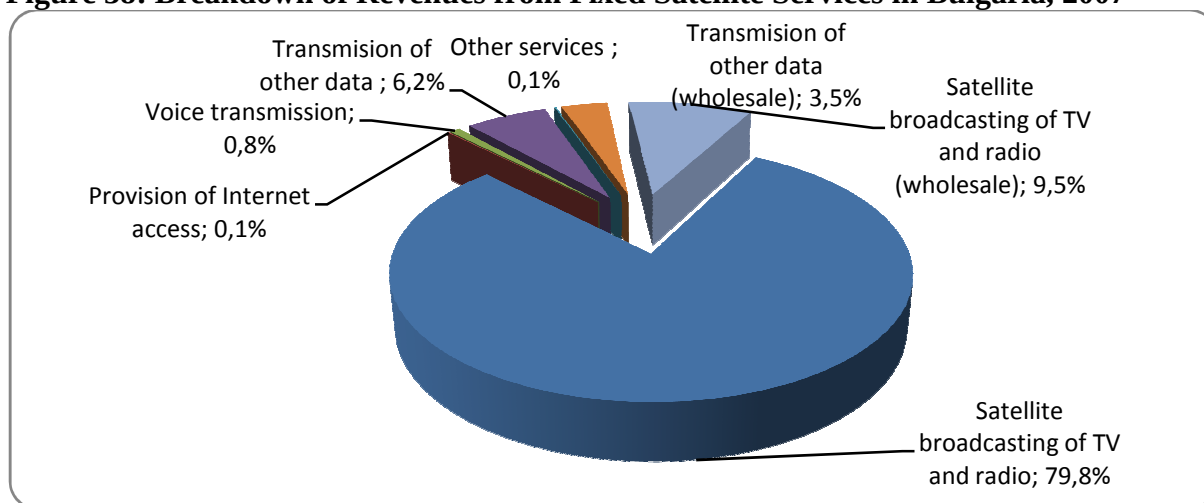
Figure 37: Revenues from Fixed Satellite Services in Bulgaria, 2003-2007



Source: Data derived from CRC (2008), p. 87, CRC (2007), p. 83

The growth of the market (118% from 2006 to 2007) is staggering and is explained by the significant share of satellite digital television services and radio. In 2007 revenues from digital satellite television and radio amounted to over 15 million EUR, or 79.8% of the total market share of the satellites systems segment (Figure 38). In Bulgaria satellite TV demand is expanding continuously.

Figure 38: Breakdown of Revenues from Fixed Satellite Services in Bulgaria, 2007



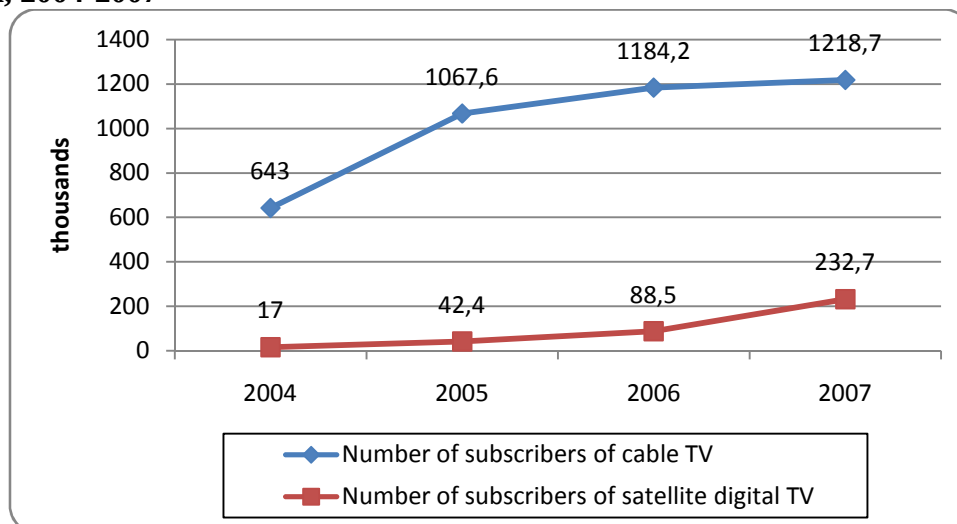
Source: CRC (2008), p. 88

According to statistical information provided by CRC, the penetration rate of satellite digital television increased from 3% to 8% of the number of households in 2007 over a one-year period.⁵⁹ For the sake of comparison, the penetration level of cable TV in 2007 reached

⁵⁹see CRC (2008), pp. 87-89

42%, compared to 41% in 2006 (Figure 34). The data in Figure 39 shows that despite the significant difference in the absolute values of number of subscribers, among cable TV and satellite digital television, satellite TV broadcasting is rapidly gaining speed – the number of subscribers has doubled almost every year since 2004 and increased more than 2.6 times in 2007 compared to 2006 – from 88.5 thousands to 232.7 thousands.

Figure 39: Number of Subscribers of Cable Television and Satellite Digital Television in Bulgaria, 2004-2007



Source: CRC (2008), p. 89

Satellite television remains a significant threat to cable television providers. Although the advantages over the cable TV are questionable, in Bulgaria, in the recent years has been observed a tendency toward cable to satellite television replacement as a solution to TV watching. Users switch to satellite TV, because of the following advantages: clearer and sharper pictures, significant hardware compatibilities, more programming choices, etc.

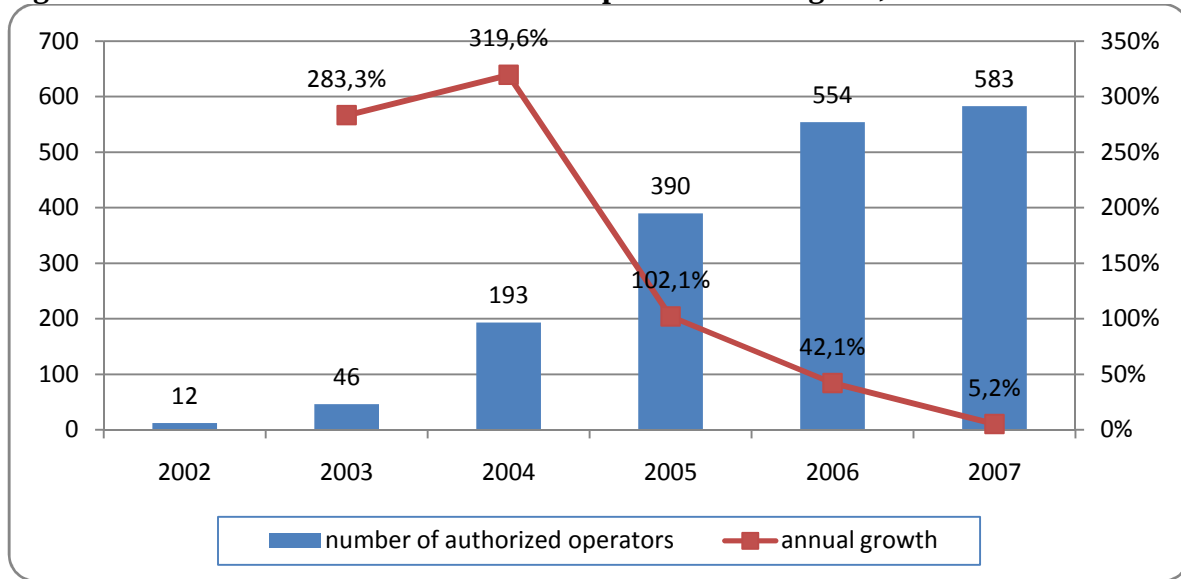
2.2.1.6 Internet services market

Internet is already widely available throughout Bulgaria. Internet is also changing the way Bulgarians access media.

In Bulgaria has been observed tendency of Internet providers to register as data network operators. For this reason, data transmission and Internet access provision are considered to be in the same market segment.

The number of registered operators increased significantly in the period 2002-2007. In 2007 their number reached 583, a 5% growth compared with 2006.

Figure 40: Number of Data Transmission Operators in Bulgaria, 2002-2007



Source: CRC (2008), p. 79

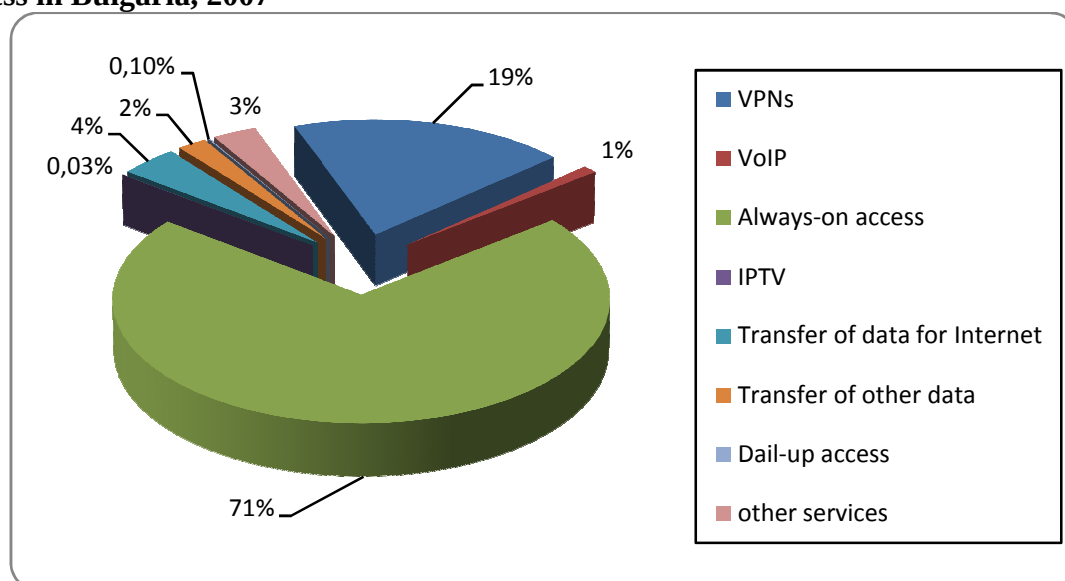
The slowdown, in 2006-2007, in the growth of the number of operators is due to increased market saturation. Market consolidation is observed as well – many small operators have been acquired by bigger ones and some of the small operators terminated activities as well. For instance, in March 2008, “Speedy Net” AD, a Sofia-based Internet services provider, acquired the networks of two other competitors – “Relief Net” OOD and “Ave Computer Products” OOD.⁶⁰

In 2007 the volume of the data transmission and Internet access provision segment amounted to nearly 107.8 million EUR and marked a growth of 49% compared to the preceding year.⁶¹ The following pie chart (Figure 41) illustrates the breakdown of the revenues by source in 2007.

⁶⁰ see Speedy Net [accessed 22.11.2008]

⁶¹ see CRC (2008), pp. 16, 17

Figure 41: Breakdown of Revenues from Data Transmission Networks and Internet Access in Bulgaria, 2007



Source: CRC (2008), p. 80

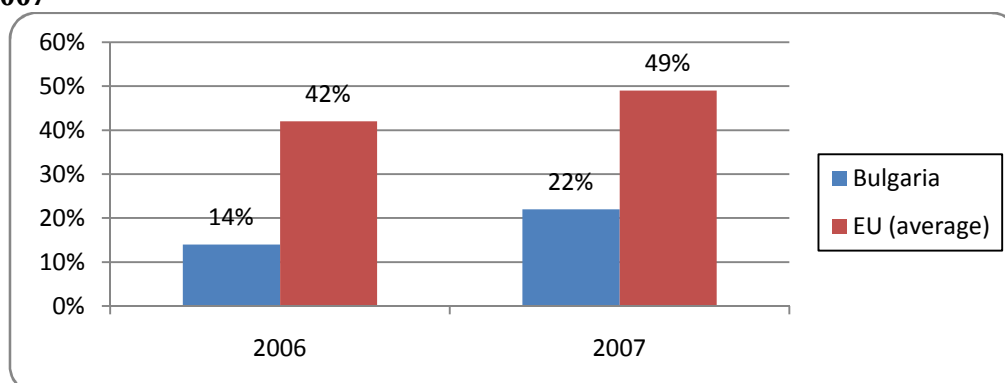
Figure 41 shows that in 2007, the main part of the revenues is generated from Always-on Access (71%). Significant share (19%) is constituted by the build-up of Virtual Private Networks (VPNs). Dial-up Internet connections continue to decrease due to a constant replacement by high-speed broadband.

In 2008, twenty-two data transfer network operators planned to start provision of VoIP services and twenty-seven intend to introduce IP television. As a comparison, in 2007 twenty-nine operators offered VoIP services and nineteen offered IP TV. In Bulgaria, VoIP and IPTV are gaining momentum and this will intensify the price war among all voice and television signal providers on the telecommunications sector in Bulgaria.⁶²

Although the demand for Internet services is increasing rapidly, the country is at the bottom in EU regarding the Internet penetration rate based on population. Next chart illustrates the penetration rate gap between Bulgaria and other EU countries.

⁶² see CRC (2008), p. 80

Figure 42: Internet Penetration Rate per Population in Bulgaria and EU (average), 2006-2007



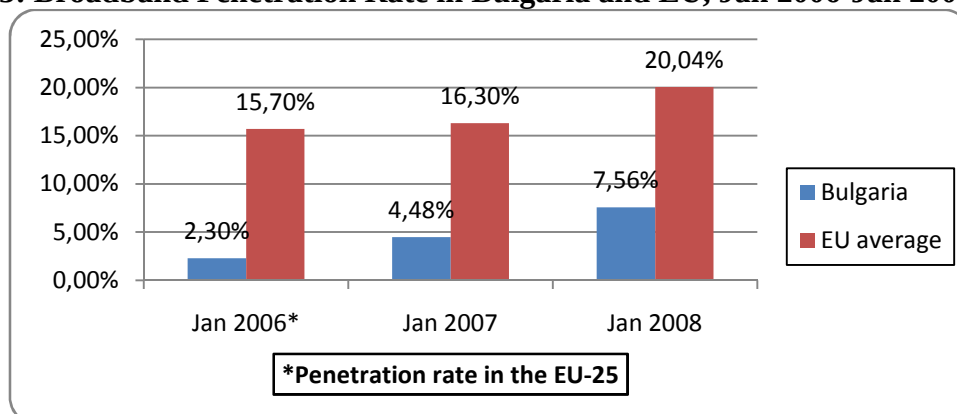
Source: Data derived from Eurobarometer (2008), p. 28

According to statistical data provided by the Internet providers in Bulgaria,⁶³ the total number of Internet access subscribers reached 652 181 at year-end 2007, or an increase of nearly 40% compared to year-end 2006, when the number of subscribers was 466 022. Internet subscription increased more than three times in 2006 compared to 2005.

The overall broadband penetration rate in Bulgaria has increased strongly since the beginning of 2006 – from 2.3% in January 2006 to 7.56% in January 2008 (Figure 43). But despite the significant growth in the last three years, broadband is significantly less prevalent in Bulgaria than the EU.

The next figure (Figure 43) compares the broadband penetration rates in EU and Bulgaria for the period January 2006-January 2008.

Figure 43: Broadband Penetration Rate in Bulgaria and EU, Jan 2006-Jan 2008



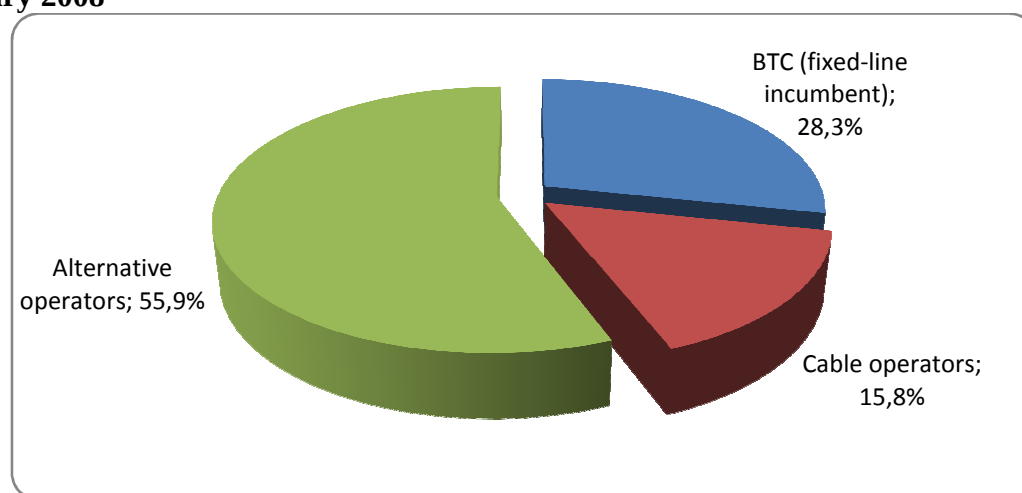
Source: Data derived from Commission of the European Communities (2008b), pp. 27, 86

⁶³ see CRC (2008), p. 82

Figure 43 shows that the broadband penetration in Bulgaria in January 2008 was just 7.6%, and it was the lowest in the EU and well below the EU-27 average rate – 20%. Thus the proportion of broadband users in Bulgaria is well behind the levels in other EU countries.

Relatively high competition exists between the platforms on the broadband market in Bulgaria. Cable operators, Local Area Networks (LANs) and fixed incumbent are present in this market segment. Competition between the different platforms will deliver competitive benefits to end consumers. The next figure (Figure 44) illustrates the breakdown of the broadband market share in Bulgaria among the fixed-line incumbent, cable operators and alternative operators, as of January 2008.

Figure 44: Distribution of Broadband Market Share in Bulgaria by Type of Operator, January 2008



Source: Data derived from Commission of the European Communities (2008b), pp. 86, 87

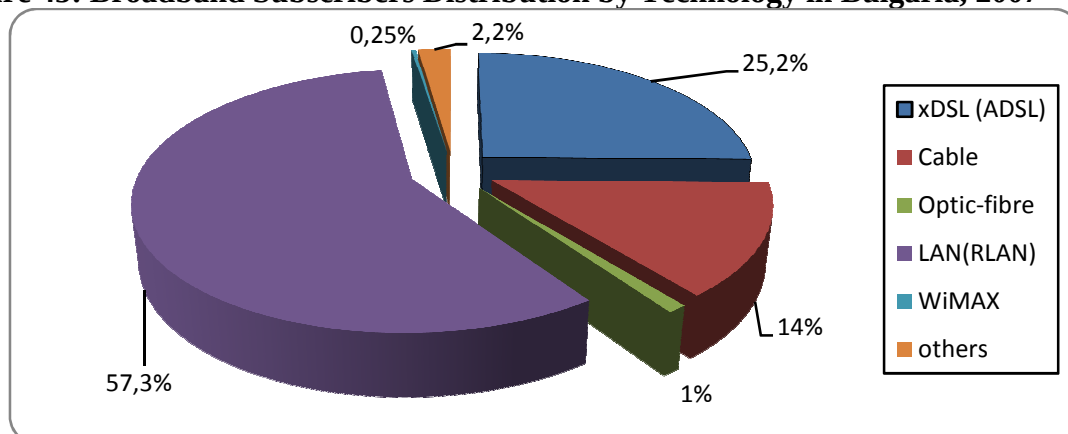
LAN, Remote Local Area Network (RLAN), Virtual LAN (VLA) and Metropolitan Area Network (MAN) are technologies mostly used by alternative operators in Bulgaria. The fixed line incumbent had 99% of the DSL lines in Bulgaria, as of January 2008.⁶⁴

In Bulgaria, the most widely deployed broadband access technology, in 2007, was Local Area Network and Remote Local Area Network (57.3% of all broadband subscribers), followed by xDSL (Asymmetric Digital Subscriber Line (ADSL)) with 25.2% of all subscribers, and followed by cable access (14%). The emergence of new technology for broadband provision is observed in 2007, namely WiMAX. The relative position of WiMAX

⁶⁴ see Commission of the European Communities (2008b), pp. 86, 87

is still small (0.25% or 1 657 subscribers), but an expanding demand for broadband Internet provided by this new technology is expected from this year onwards (Figure 45).

Figure 45: Broadband Subscribers Distribution by Technology in Bulgaria, 2007



Source: CRC (2008), p. 84

ADSL is gaining popularity among Bulgarian consumers due to its good speed and connection reliability. Due to infrastructure development and the need for high-speed Internet, the use of dial-up Internet has decreased and ADSL has increased. According to recent CRC survey,⁶⁵ in 2007 ADSL held second position, followed by cable Internet access, while in 2005 it held third position.

As a comparison, in EU the most widespread broadband technology is ADSL, accounting for above 80% of total lines.⁶⁶ In 2007, BTC was the only major provider of ADSL services in Bulgaria – indicator for insufficient competition in this market segment. The number of the BTC ADSL service subscribers has almost doubled in 2007 compared to 2006.

LAN and RLAN are the most popular in Bulgaria due to the tendency of introduction and deployment of new LAN networks. LAN and RLAN networks are preferred by Bulgarian consumers due to the faster access and lower access prices, and because most of the LANs are connected to big servers that enable subscribers to download free music, video, software and other content. Due to the lack of regulation and control of the governmental bodies, many LANs have accessed the incumbents' private property without any payment and

⁶⁵ see Econ.bg [accessed 09.01.2009]

⁶⁶ see Commission of the European Communities (2008b), pp. 29, 30

authorization. Others have even laid down cable networks illegally. This is one of the reasons they offer lower prices.

In the next years, Internet penetration is expected to increase strongly. According to Business Monitor International,⁶⁷ Internet penetration rate in the country will reach nearly 45% by 2010, and the broadband penetration will reach nearly 10% within the same period. There is a considerable scope for growth in the short to mid run. Broadband Internet revenues are expected to contribute around 25% of Bulgaria's fixed-line segment revenue by 2011, and revenues are expected to reach \$214 million in 2011.

The emergence of new technologies and further development of current available networks are expected to stimulate the demand of Internet services. Bundled services including Internet access are expected to spread widely among the users. Provision of new interactive services will facilitate the competition between the market players, which will benefit the end-consumers in terms of lower prices and higher quality.

2.2.1.7 WiMAX services

Three operators received WiMAX licenses in 2007 and one more license was issued in 2007.⁶⁸ By the end of 2008 a fifth operator, "Carrier BG" OOD, plans to start activities, currently developing its WiMAX network.⁶⁹

According to data provided by CRC, in 2007 four companies provided telecommunication services over point-to-multipoint kind of networks using WiMAX technology: "Max Telecom" OOD, "Nexcom Bulgaria" EAD, "Trans Telecom" EAD and Mobilтел.⁷⁰ Max Telecom is the only operator providing telecommunications services to end users only through WiMAX technology. The main services provided by the operators are Internet access and voice services. All four operators offer WiMAX broadband Internet access. In 2007 Max Telecom pioneered provision of bundled services (Triple Play) through its WiMAX network.⁷¹ Now, in 2008, Nexcom and Trans Telecom started using their WiMAX network for provision of bundles as well.

⁶⁷ see Business Monitor International (2008), pp. 14, 15

⁶⁸ see Commission of the European Communities (2008b), p. 90

⁶⁹ see Carrier BG [accessed 05.12.2008]

⁷⁰ see CRC (2008), p. 103

⁷¹ see Max Telecom [accessed 20.11.2008]

At year-end 2007, the total number of subscribers using WiMAX services in Bulgaria reached 1 767. Their number is expected to be between 50 000 and 100 000 by the end of 2008.⁷²

Total revenues at the end of 2007 were 47 257 EUR.⁷³ The total revenues from this segment still have relatively small share from the total telecommunications sector, but a growth in revenues is expected in the next years. The introduction of WiMAX technology is at the very beginning and further network enlargements and development is expected. Investments in this sector are expected to reach nearly 24 million EUR, or 6.6% of all investments in the telecommunications sector for 2008.⁷⁴

WiMAX technology enables operators to offer high-quality, competitive and reliable services to end users. This wireless technology has a potential for provision of wide range of services for the end users and it may be expected that WiMAX will have significant impact on the telecommunications market in Bulgaria.

2.2.2 FUTURE PERSPECTIVES IN BULGARIAN TELECOMMUNICATIONS MARKET

Cross-segment competition is expected to grow in the next years, with an increasing number of telecom operators marketing packages that include two or more services such as mobile and fixed-line services, television and access to Internet. In order to attract new customers and to reduce churn, fixed-line operators, mobile operators, ISPs, cable operators and other alternative telecommunications services providers will concentrate on the provision of bundled offerings. Due to the increasing competition, operators will also increase the spectrum of services they offer and will improve their quality as well.

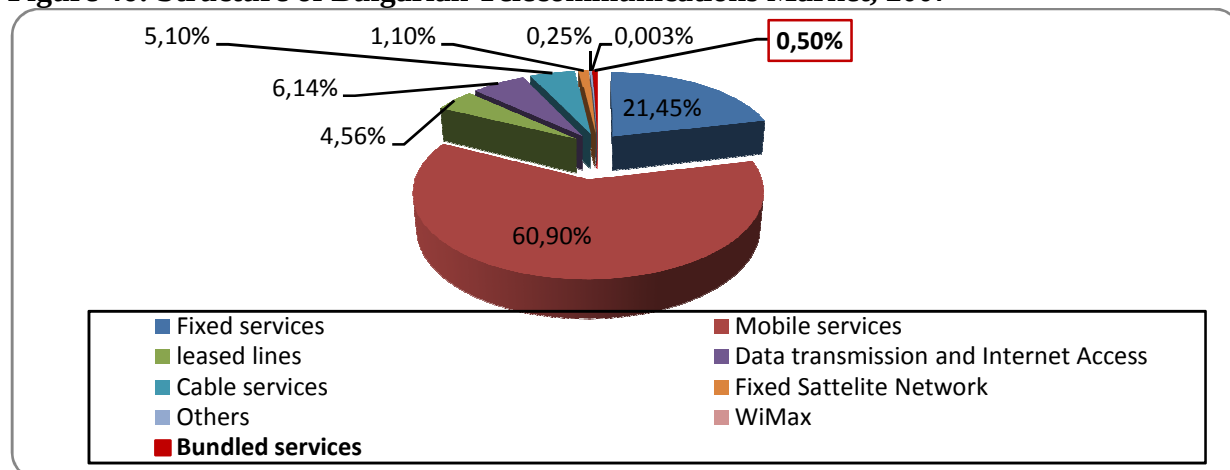
In recent years, activation of the provision of bundled services is observed. But their relative share of the total market is still low and was less than 1% in 2007 (Figure 46).

⁷² see CRC (2008), p. 105

⁷³ see *ibid*, p. 16

⁷⁴ see *ibid*, p. 105

Figure 46: Structure of Bulgarian Telecommunications Market, 2007

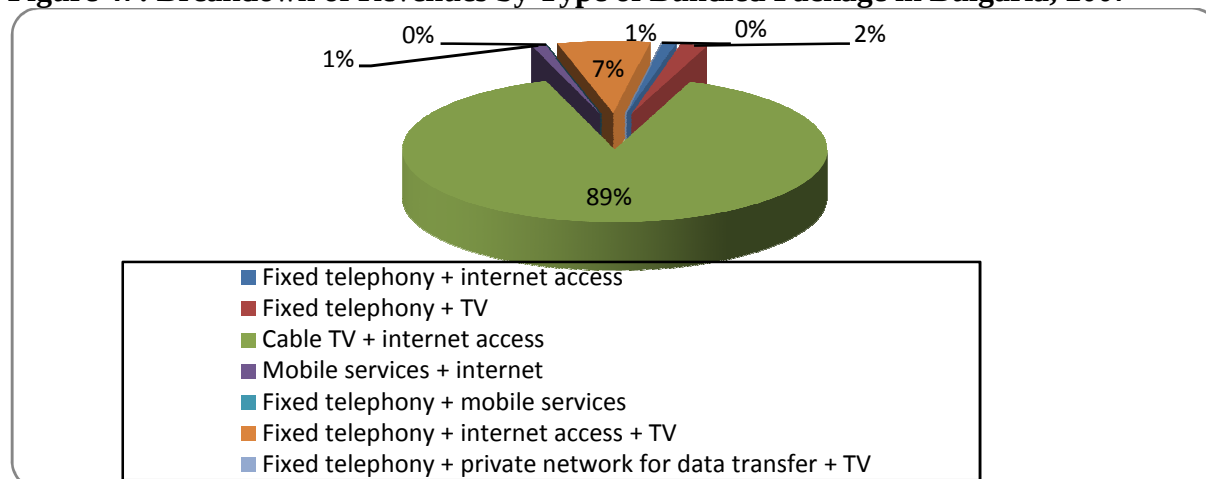


Source: CRC (2008), p. 21

An increasing number of operators and providers of telecommunications services will offer their customers a variety of single-priced packages or bundles combining several services, thus the relative share of revenues generated by bundled services, in the total Bulgarian market, is expected to grow.

According to Figure 47, the biggest relative position (almost 90%) from the total revenue of the service packages is formed by the Double Play comprising of cable television and provision of Internet access. The Triple Play package (fixed telephony, cable television and provision of Internet access) has 7% of the total revenue from bundled services.

Figure 47: Breakdown of Revenues by Type of Bundled Package in Bulgaria, 2007

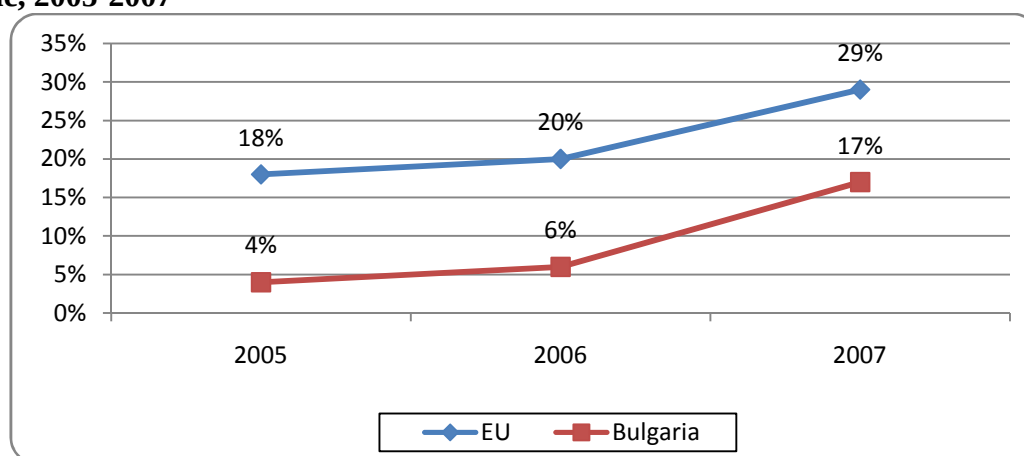


Source: CRC (2008), p. 21

Since the demand for bundled offerings is expected to grow significantly, more companies will progressively roll out triple-play services to their customers, thus the relative position of three-service bundles is expected to increase.

A trend of Bulgarian households buying more communication bundles over the last years is observed. More and more Bulgarians are interested in all-in-one packages, which implies a strong potential demand for bundled services.

Figure 48: Share of Bulgarian Households Buying Communications Services as a Part of Bundle, 2005-2007



Source: Data derived from Eurobarometer (2008), p. 81, 82

Service bundling will intensify the competition between market players on the Bulgarian telecommunications market and ultimately benefits will go to consumers.

3 DIGITAL CONVERGENCE, SERVICE BUNDLING AND COMPETITION IN TELECOMMUNICATIONS MARKET

The process by which different media as audio, video, data and voice communication services become digital and come to be delivered via one network is known as Digital Convergence. Since the late 1990s, the increasing technological convergence has been facilitating the new kind of interchangeability and interconnections among different media forms.

The business implications of Digital Convergence are profound. The economic organization of many fast growing industries is being transformed. Convergence is significantly altering traditional business models within the industries. Many researchers try

to predict precisely what shape this transformation will take and what the economic consequences will be. Nevertheless, some crucial aspects of a significant change in market structure are already visible.

At a market level convergence reshapes the market structure of the industries involved. Digital Convergence has created new market spaces and brought previously distinct industry sectors in competition with each other. Market players which used to be monopolies within their core industry are currently experiencing a dramatic change in their market structure – development of fiercely increasing competition.⁷⁵ Convergence creates and intensifies new forms of rivalry between companies previously operating in different markets. New technology does not respect geographic borders as well. World geographic borders are becoming increasingly meaningless – markets are becoming more and more international in nature.

Convergence is also changing the pricing strategies of the products adopted by the firms and the structure of their product offerings. Digital products are now usually tied to each other and sold as a combined product (package, bundle). Market players feel compelled to engage, to a certain extent, in product bundling strategies in order to reduce customer churn, minimize costs, improve service provision and brand name performance.⁷⁶

Bundling strategies and their effect on competition are now a very hot and challenging research topic for the Industrial Organization economists. Bundling is a marketing strategy used to offer two or more products combined within a single package. The most common types of bundling following Adams and Yellen (1976) are *mixed* and *pure bundling*. *Pure bundling* consists of the sale of two or more products only as one combined product, and the buyer cannot buy the products separately. *Mixed bundling* offers a choice between purchasing the entire bundle or just one of the parts of the bundle.

In some “new” converged markets customers have evidently benefited from this digital revolution. Convergence may provide significant benefits to customers such as price reduction.

⁷⁵ see Picot (2006), pp. 87-92

⁷⁶ see Caballero and Hens (2008), pp. 3, 4

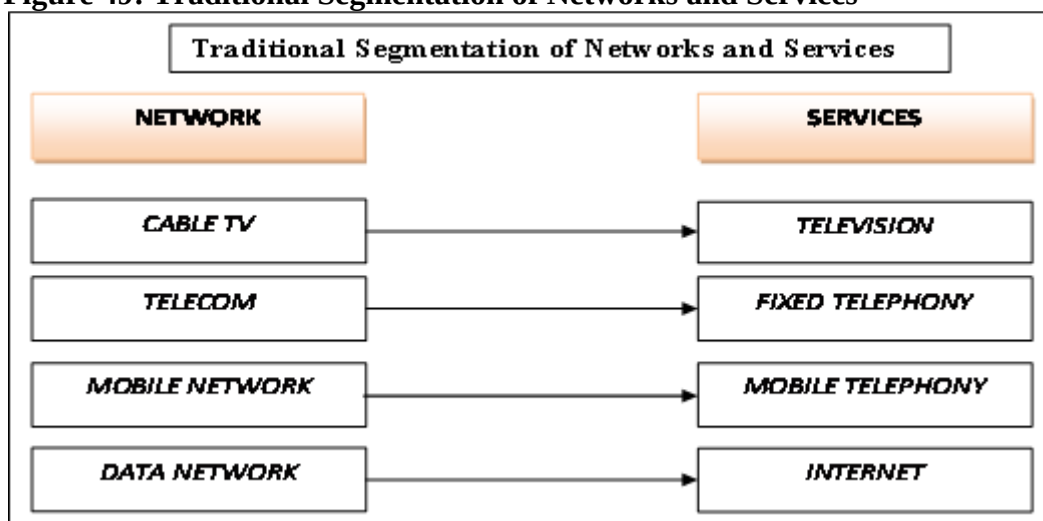
3.1 NETWORK CONVERGENCE, SERVICE CONVERGENCE AND SERVICE BUNDLING

Convergence can be expressed as:

“The ability of different network platforms to carry essentially similar kinds of services; or the coming together of consumer devices such as the telephone, television and personal computer”⁷⁷

Nowadays, different services can be carried on different infrastructures and the end users’ access equipment will be designed to communicate with different services. Historically networks were built to provide a certain type of service. In the past, fixed telephone lines were used for a conduit for voice telecommunications, mobile networks carried only mobile voice services, cable television networks only carried television signals to households, etc. The next figure (Figure 49) shows the traditional segmentation of networks and services.

Figure 49: Traditional Segmentation of Networks and Services



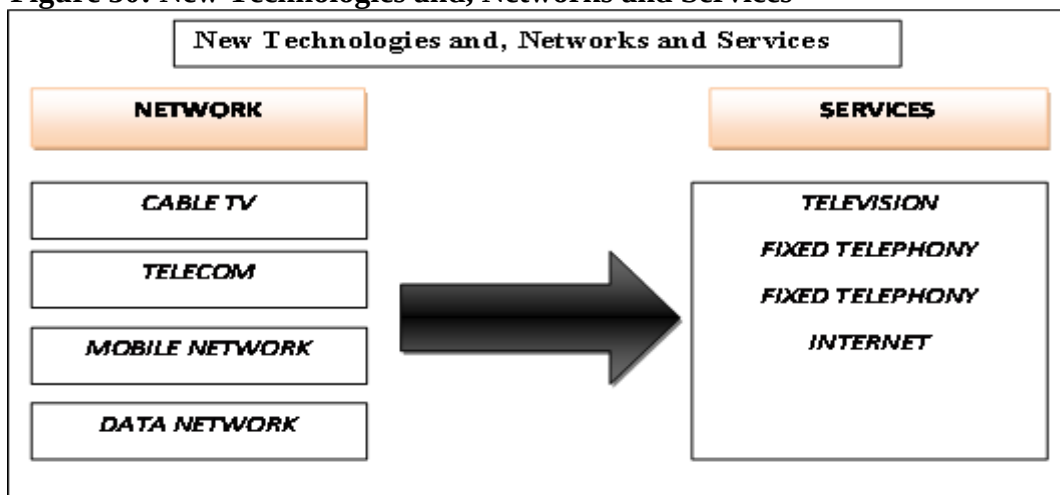
Source: Organization for Economic Co-Operation and Development (2006), p. 8

However, convergence has changed the network usage pattern. Digital Convergence enabled different networks to carry similar kinds of services, called *Service Convergence*. For instance, the development of ADSL and cable modem Internet access has enabled fixed line and cable television networks to transmit a much larger range of services over their copper

⁷⁷ European Commission (1997) *GREEN PAPER ON THE CONVERGENCE OF THE TELECOMMUNICATIONS, MEDIA AND INFORMATION TECHNOLOGY SECTORS, AND THE IMPLICATIONS FOR REGULATION*. Brussels, p. 1

and fibre infrastructure; voice over Internet Protocol or over circuit switched networks, video over cable television or ADSL, etc. The telecommunications industry is facing identity crisis. The following figure (Figure 50) illustrates the impact of technological change on networks and provision of services.

Figure 50: New Technologies and, Networks and Services



Source: Organization for Economic Co-Operation and Development (2006), p. 9

As a result from the convergence different network infrastructures can provide many services (Table 1).

Table 1: Multiple Service Provision under Different Network Infrastructures

Infrastructure	Voice	Data	Video
Copper line	PSTN	DSL, FTTP	VOD, IPTV
Cable	Some	Cable Modem	Analogue, DTV
Mobile	Analogue, 2G, 3G	2.5G, 3G	DVB-H, others
Fixed Wireless	Some (VoIP)	Proprietary, 3G, WiMAX, LMDS, MMDS	DVB
Powerline Communications	VoIP	BPL	VOD, DVB, IPTV
DSL=Digital Subscriber Line, FTTP=Fiber to the premise, VOD=Video on Demand, IPTV=Internet Protocol TV, DVB=Digital Video Broadcasting, 2G = Second generation mobile service, 3G=Third generation mobile service, BPL=Broadband over Power Line.			

Source: Telecommunications Management Group [accessed 20.09.2008]

New technologies have enabled the possibilities for creation of new services, new service offerings and created conditions for gaining synergy in the technological development. The advance of media and telecommunications convergence enabled access providers to market multi-play services combining Internet broadband, television and telephony.

3.2 CONVERGENCE, SERVICE BUNDLING AND COMPETITION IN TELECOMMUNICATIONS MARKET IN BULGARIA

In recent years, the convergence process has been observed in the Bulgarian telecommunications sector. Most of the main existing market players, such as BTC, mobile services operators, cable television providers, Internet providers, etc. started providing a plethora of services. New entrants came and some intend to come into the Bulgarian telecommunications market.

In 2003, the Bulgarian telecom market was completely liberalized and individual telecom licenses were given to six alternative operators: Orbitel, NetPlus, GlobalTech Bulgaria, East Telecom Co., Nexcom, and BOL.BG.⁷⁸ Since the privatization of Bulgarian Telecommunication Company in 2004 by VIVA Ventures, many smaller companies have entered the market and have been competing with BTC. The following table (Table 2) shows the list of alternatives operators, holding an Individual license (116A) for carrying out telecommunications through public fixed telecommunications network and providing of fixed voice telephone service on the territory of Republic of Bulgaria.

Table 2: List of Alternative Operators in Bulgaria Holding Individual License (116A) for Carrying Out Telecommunications through Public Fixed Telecommunications Network and Providing of Fixed Voice Telephone Service on the Territory of Republic of Bulgaria.

					Name of operator
Year- end 2007	Year- end 2006	Year- end 2005	Year- end 2004	Year- end 2003	"GlobalTech Bulgaria" EOOD / <i>in 2005 license was transferred to "CableTEL" EAD in 2005</i>
					"East Telecom Co" AD
					"NetPlus" OOD
					"Nexcom Bulgaria" EAD
					"Orbitel" EAD

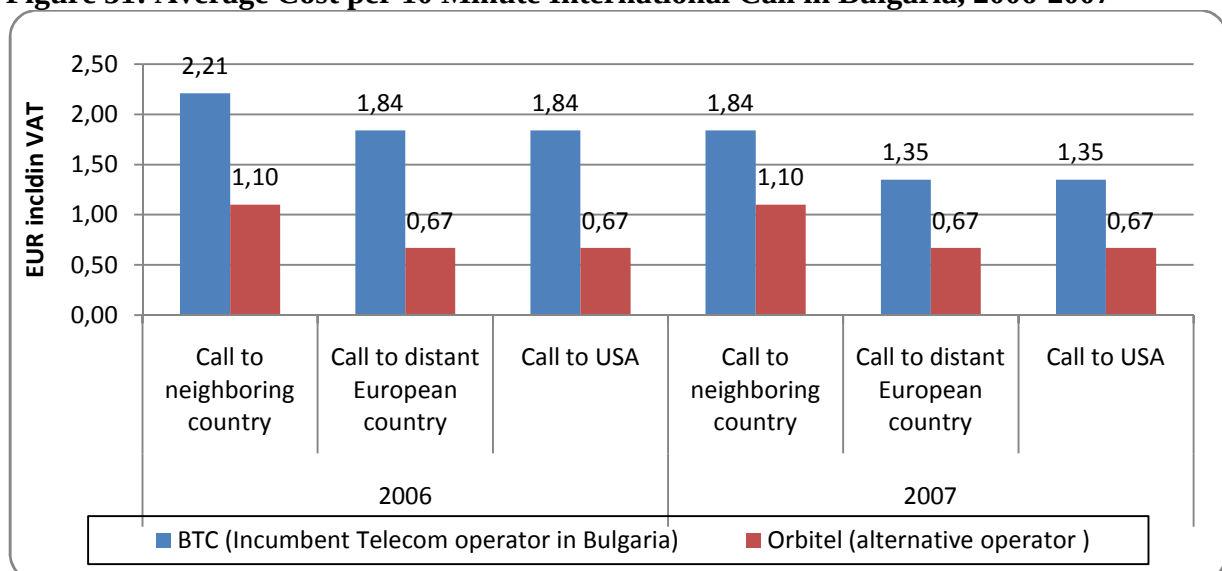
⁷⁸ CRC Decision № 142/20.05.2004.

					"Bulgaria Telecom Net" AD
					"Vestitel BG" AD
					"Spectrum Net" AD
					"Telecom Partners Network" AD
					"Trans Telecom" AD
					"Eurocom Cable Mgmt Bulgaria" EOOD
					"ITD Network" AD
					"Cosmo Bulgaria Mobile" EAD
					"Mobiltel" AD
					"Net is Sat" OOD
					"Novo" EOOD
					"Skat TV" OOD
					"Telecom 1" OOD
					"Globul Communication Net" EAD

Source: CRC (2008), p. 25

Although BTC, Bulgaria's former state-owned telecommunications monopoly, is still the dominant player in the fixed-line services, company revenues have been depressed by the trend toward mobile phone use and VoIP telephony; by the competitive pressure on prices by alternative operators – a typical consequence of Digital Convergence in the Bulgarian telecommunications market; and by the regulatory pressure on prices as well. The following figure (Figure 51) shows the price per 10 minute international call in Bulgaria, in 2006-2007.

Figure 51: Average Cost per 10 Minute International Call in Bulgaria, 2006-2007



Source: CRC (2008), p. 42

According to the figure above, international calls provided by alternative operators are relatively cheaper than those provided by the BTC, the incumbent telecom operator in the country. Since the prices of Orbitel are lower than those of the incumbent, customers will pay lower telephone bills and they will obviously save money.

The only way in which alternative operators may enter the voice services market is by offering conversation services at prices lower than the ones of BTC. In January 2008, Nexcom⁷⁹ announced price reduction (by 8% to 0.24 EUR per minute with VAT) for all private and corporate customers, using the service “Fixed Telephone”. This reduction will benefit the customers in terms of longer talks at lower prices.

Because the incumbent telecom, BTC has the largest revenue share of the fixed line services (96.54%),⁸⁰ it resists price decline and tend to be price follower. Its reactions are in order to keep its subscriber base in the increasingly competitive market and to prevent subscribers from switching to alternative providers. In order to improve performance, BTC launched provision of mobile services, under the brand name Vivatel in 2005, and in the beginning of 2004 BTC launched provision of Internet access service via ADSL to end users.⁸¹ According to the BTC investment plan, in 2008 the company will invest almost 110 million EUR in its fixed ADSL broadband structure and in the development of the infrastructure of its mobile operator Vivatel.⁸²

Alternative operators, licensed to provide fixed voice telephone services, offer their customers data / (or data and video) services as well. Most of them offer the subscribers various bundle packages such as Double Play and Triple Play (Table 3)

⁷⁹ see Saga Technology [accessed 12.11.2008]

⁸⁰ see CRC (2008), p. 33

⁸¹ see BTC [accessed 21.11.2008]

⁸² see Handy [accessed 22.11.2008]

Table 3: List and Type of Bundle Packages Offered by the Alternative Fixed Voice Operators in Bulgaria, as of June 2008

	Services Operator	Double Play			Triple Play	
		Fixed telephone service + Internet access	Fixed telephone service + Television	Fixed telephone service + Mobil telephone service	Fixed telephone service + Internet access + Television	Fixed telephone service + Private data transmission network + broadband Internet access
1	“Vestitel BG” AD	X	X		X	
2	“Eurocom Cable Mgmt Bulgaria” EOOD	X	X		X	
3	“CableTEL” EAD	X	X		X	
4	“Cosmo Bulgaria Mobile” EAD			X		
5	“Mobiltel” EAD					X
6	“Nexcom Bulgaria” EAD	X				
7	“Net is Sat” OOD	X				
	“Trans Telecom” EAD	X				

Source: CRC (2008), p. 34

According to statistical data provided by CRC,⁸³ in 2007 more than 60% of the subscribers of the alternative fixed voice providers had subscription to Double Play or Triple Play, with 72% of the three-service bundle comprising Internet access, television and fixed telephony. As a comparison in 2006 only one of the alternative operators, namely “CableTEL” EAD provided Triple Play comprising Internet access, television and fixed telephony, whereas in 2007 their number increased to three – plus “Vestitel BG” AD and “Eurocom Cable Management Bulgaria” EOOD. “ITD Network” AD plans to enter the market of bundled services by the end of 2008.

Due to technological progress, emergence of new patterns in consumption of telecom services in Bulgaria is observed. According to Eurobarometer survey,⁸⁴ in 2007 in Bulgaria, 46% of the households with Internet access used their PC for making calls. As a comparison, 22% of the European households made phone calls over the Internet in that year. Thus IP telephony is a threat to traditional telephony as well.

⁸³ see CRC (2008), p. 35

⁸⁴ see Eurostat [accessed 20.11.2008]

During the initial phase of the development of the Bulgarian mobile telecommunications sector, the scope of product differentiation was significantly low. The products were based only on mobile telephony. In 2007, the mobile operators in Bulgaria, M-Tel and Globul, started offering fixed voice telephony and mobile/fixed converged services as well. In recent years, rapid development of the provision of new converged services by the mobile operators has been observed. The following table (Table 4) illustrates the new services introduced by the Bulgarian mobile operators in the period 2004-2006.

Table 4: New Services Introduced by the Bulgarian Mobile Operators, 2004-2006

Mobile Operator	2004	2005	2006
Mobitel	•Mtel +’ – specialized news, horoscopes, etc., received through SMS •‘MMS news rental’ – receiving multimedia news (containing picture and text) •Mobile Internet through GPRS •WAP through GPRS	•GPRS applications •EDGE applications •Recharge of Prima through Internet •New animations, logos, pictures, skins, games •Video MMS •Musical - replacement of the standard "free" ringing tone with chosen by the user music	•Corporate VPN based on WiMax •Video telephony •HDMA •Expansion of WCDMA/HSDPA services •Vodafone Life! Portal & •Mobile TV •Vodafone mobile connect PC cards/ PC modem •Electronic prepaid account recharge
Globul	•GPRS applications •‘Globul chat’ – sending chat messages through SMS or WAP •Mobile Internet through GPRS •WAP through GPRS	•Globul MVPN •My Globul menu - easy and quick access to various inquiry, information and fun services •Globul 2 in 1- handling two numbers •GPRS roaming	•Services, based on WCDMA network •I-Mode •3G Globul Connect Center (when using Data SIM) •3G Internet Access •Automatic pre-paid account recharge
Vivatel	n/a	•Pre-paid roaming •Pre-paid GPRS •Pre-paid plan for business customers	•Post-paid services •Mobile Internet •MMS
Mobikom	•‘Mobifix Plus – a combination of the mobile service Mobifon and the VoIP service MobiVoice	n/a	n/a

Source: CRC (2006), p. 70

Dropping prices, too, have been observed in the mobile segment as the three main GSM operators – Mobiltel, Globul and Vivatel, compete among themselves for new customers, and due to the pressure from alternative voice conversation providers.

Vivatel, Bulgaria's third GSM operator, owned by the BTC, started a price war in the mobile communications in order to win subscribers from its competitors, mobile market leaders Mobiltel and Globul. In October 2005, the third Bulgarian GSM operator launched provision of services, with prices 22% lower than those of its rivals.⁸⁵ Since its arrival in the mobile market, Vivatel has heavily invested in infrastructure, and the operator has been applying aggressive pricing strategies and innovative service offerings. In reaction, the existing two major mobile GSM operators, namely Mobiltel and Globul, cut prices to resist the pressure by Vivatel and other alternative voice conversation providers as well. The mobile operators Globul and Mobiltel introduced some new attractive offers with cheaper calls immediately after Vivatel's entrance in the mobile market in 2005. Corporate clients of Globul started paying 0.12 EUR (including VAT) for on-net calls and calls to fixed networks compared to 0.24 EUR prior the entrance of the third Bulgarian GSM operator.⁸⁶

In 2005, Max Telecom, a Bulgarian mobile telecommunications company, was founded after a WiMAX license was obtained. The company started operation in 2007. The operator is thus the Bulgaria's fourth mobile and first 4G network. Max Telecom currently offers Internet access, VPNs, voice services, video, and IPTV to its subscribers.⁸⁷

Internet on cellular phones is still not widespread in Bulgaria – it is just popular among professionals, but further penetration among mobile phone subscribers is expected. According to National Statistical Institute,⁸⁸ 20% of all businesses accessed Internet via mobile phone, whereas in 2005 none had.

For example Globul, the second Bulgarian GSM operator, offers very attractive packages for data transfer over voice SIM cards, such as "GoWEB 10", "GoWEB 15".⁸⁹ Thus mobile operators entered the Internet market as well, and the threat to traditional ISP providers is expected to grow. Provision of Internet access over mobile phone is an example that mobile – data transfer convergence in Bulgaria already started.

⁸⁵ see Investor.BG [accessed 24.11.2008]

⁸⁶ see MalkiObyavi [accessed 24.11.2008]

⁸⁷ see Max Telecom [accessed 24.11.2008]

⁸⁸ see Global Information Society Watch [accessed 25.11.2008]

⁸⁹ see Globul [accessed 25.11.2008]

In the early stage of the development of Bulgarian cable TV sector, the range of services had been largely restricted to provision of a cable television. The situation became different when the introduction of new technologies started and after the liberalization of the Bulgarian telecommunications market in 2003.

Now, Bulgarian cable television providers offer consumers voice, Internet access, and broadcast services over the same network, separately or as one bundled package of services. Cable operators in Bulgaria, such as CableTEL, Orbitel, Nexcom, Net Plus, and Vesitel, currently are rolling out bundled television, voice and data services; thus they contribute to intensifying the competition among all players on the Bulgarian telecommunications market.

In November 2004, CableTEL, a leading Bulgarian cable TV operator, launched CableTEL telephone cable services, named “CableTel.Phone”, carried out via their fiber-optic network. The company introduced broadband cable Internet, “CableTel.Net” in that year as well. In November 2004, CableTEL launched provision of Triple Play services for the territory of the capital of Bulgaria, Sofia. CableTEL’s Triple Play, comprising of three services (TV programs, Internet access and fixed telephony) provided in one package, is provided to households via one cable only.⁹⁰ In 2008, CableTEL’s three-service bundle is available in the following cities: Sofia, Plovdiv, Stara Zagora, Sliven, Haskovo, Ruse, Shumen, Varna, Burgas, Sunny Beach, Dimitrovgrad and Targovishte.⁹¹

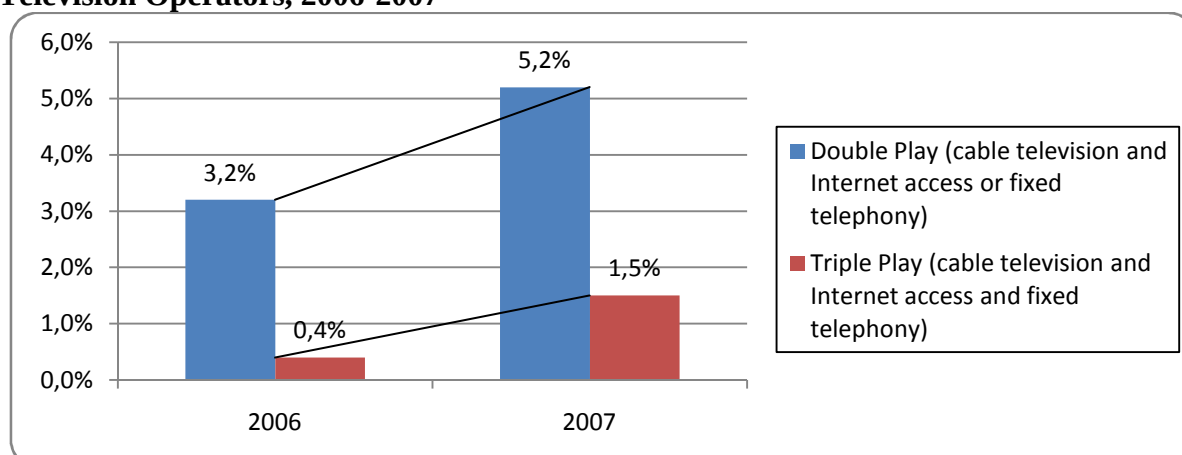
Cable television operators CableTEL and Eurocom were some of the first to offer Triple Play packages comprising television, landline phone and Internet access. In 2007, the cable TV operators’ revenues generated from bundled services increased their relative share of the total annual cable operators’ revenue from 8.4% to 11.4% for Double Play and from 0.4% to 0.9% for Triple Play.⁹² The penetration level in Bulgaria of the bundled offerings provided by cable operators, comprising access to cable television, fixed voice telephony service and high-speed Internet over one cable, continues to grow. The next figure (Figure 52) shows the penetration rate of Triple Play and Double Play among the subscribers of domestic cable telecommunications networks in the last two years, 2006-2007.

⁹⁰ see CableTEL [accessed 26.11.2008a]

⁹¹ see CableTEL [accessed 26.11.2008b]

⁹² see CRC (2008), p. 101, CRC (2007), pp. 95, 96

Figure 52: Penetration of Bundled Services among Subscribers of Bulgarian Cable Television Operators, 2006-2007



Source: Data derived from CRC (2008), p. 101, CRC (2007), p. 96

Provision of bundled services offerings such as Double play and Triple Play is going to be a significant revenue driver for cable TV operators in Bulgaria. Number of cable TV operators providing Triple Play increased from three in 2006 to seven in 2007. In 2007 “CableTEL” EAD, “Cable Information Systems” AD, “Vestitel BG” AD, “Videosat 21st Century” AD, “Eurocom Cable Management Bulgaria” EOOD, “Linus” OOD, “TeleCable” AD were the cable operators providing cable television, fixed voice telephony and Internet as one bundled package, whereas, in 2006 – just “CableTEL” EAD, “Cable Information Systems” AD and “Delta” AD were providing such bundle.⁹³

The following table (Table 5) exhibits the service bundles offered by one of the leading cable TV operators in Bulgaria, namely “Eurocom Cable Management Bulgaria” EOOD.

Table 5: Subscription Plan of Triple Play (“Eurocom Cable Management Bulgaria” EOOD)

Subscription Plans of Triple Play = Internet access + cable TV + fixed telephone					
Internet speed	Internet	Cable TV	Fixed telephone	Internet access + cable TV + fixed telephone	Triple Play
6 Mbs	17,60 BGN	23,90 BGN	8 BGN	49,50 BGN	39.60 BGN
10 Mbs	22,40 BGN	23,90 BGN	8 BGN	54,30 BGN	43,90 BGN
15 Mbs	28,00 BGN	23,90 BGN	8 BGN	59,50 BGN	49,90 BGN
20 Mbs	36,00 BGN	23,90 BGN	8 BGN	67,90 BGN	57,90 BGN

Source: Eurocom [accessed 28.11.2008]

⁹³ see CRC (2008), p. 101

One of the main advantages of subscribing to Triple Play plan is the lower costs paid (compared to paying separately for the three) and the single bill for the provision of services. According to Triple Play subscription plans offered by Eurocom, subscribers save up to 20% when choosing the bundle (Table 5).

Although a relatively high proportion of the Bulgarian households receives television via a cable television network, television via satellite is gaining popularity. Thus satellite growth has had an impact on the cable growth across the country. The penetration growth of cable TV subscribers over the period 2006-2007 was just one percentage point (Figure 34). The following table (Table 6) lists the operators providing satellite TV to end consumers in Bulgaria as at year-end 2007.

Table 6: Operators Providing Television via Fixed Satellite Systems in Bulgaria, 2007

	Name of provider
1	“Bikam” EOOD
2	“Bulsatcom” AD
3	BNT
4	“Interactive Technologies” AD
5	“Neterra” EOOD
6	“Telenor Bulgaria” EOOD

Source: CRC (2008), p. 86

The Bulgarian operators, providing television via fixed satellite network, offer a set of different digital radio and television program packages and paid programs and premium channels and the service Pay Per View as well. Consumers are able to pay via SMS or on-line for the access to certain broadcasts (films and sport events) after a one-time registration. Some of the satellite broadcasters in Bulgaria offer their customers an Internet access, data transfer and voice transfer as well.

Internet service providers (ISP) entered the television and fixed-line telephony markets in Bulgaria as well. “Megalan Network” AD, a Sofia based ISP plans to start offering cable television and fixed-line telephony services by the end of 2008. The company invested around 4 million EUR in installing fiber-to-the-building technology, expanding its network, and launching VoIP telephony and interactive digital television. By the end of 2008, total investment is expected to amount to over 7 million EUR. Megalan, set up ten years ago, is the biggest LAN operator in the capital of the country, Sofia. Megalan has a subscriber base of more than 50 000 and expects to have more than 100 000 by the end of 2009. The company

expects to expand its network and to cover the Bulgarian capital in full by the year-end 2009. By the year-end 2008, Megalan is expected to launch Triple Play. According to the company marketing strategy, Triple Play will be offered to end users for a fixed monthly fee lower than 20 Euro. At the moment, Triple Play is offered by other players on the Bulgarian telecommunications market on average at 21-22 EUR.⁹⁴

Other significant direction of development of the Bulgarian telecommunications market is the adoption of WiMAX. The WiMAX technology is used in Bulgaria for providing broadband Internet, fixed telephone services and data transfer. The technology is also used for the deployment of high-speed mobile network as well.

Nexcom is the first operator in Bulgaria to offer WiMAX services in January 2007. At the moment Nexcom provides WiMAX coverage in more than 19 cities and covers 50% of the population in Bulgaria. The company offers their users plethora of services, such as wireless Internet, telephony, leased lines, VPNs and MAN connection.⁹⁵

Several other companies have obtained WiMAX licenses in Bulgaria. In 2007 four companies provided services over WiMAX network: “Max Telecom Bulgaria” OOD, “Trans Telecom” EAD, “Mobiltel” EAD and “Nexcom Bulgaria” EAD. All four companies offer their services to corporate and private clients, except Mobiltel – only to corporate clients. Some of the operators provide bundled offerings to their customers. The next table (Table 7) shows the WiMAX services marketed by the Bulgarian operators.

Table 7: Spectrum of WiMAX Services Provided by Bulgarian Operators, as of June 2008

	Mobiltel	Nexcom	Trans Telecom	Max Telecom
Prepaid services				X voice services
Voice services		X	X	X
Broadband	X	X	X	X
Data transfer	X	X	X	X
IPTV			X	X
Bundled services		X	X	X
Double Play (voice + Internet)		X	X	X
Double Play (other)			X	
Triple Play			X	

⁹⁴ see Dnevnik [accessed 28.11.2008]

⁹⁵ see Nexcom [accessed 28.11.2008]

Other services		X – MAN,VPN		X – mobile applications, VPN, VoIP, Video Surveillance
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Source: CRC (2008), p. 104

A fifth company providing services over WiMAX network, “Carrier BG” OOD is expected to launch by the end of 2008.⁹⁶ The company received its license in June 2007. The company aims to provide mobile and fixed voice services, Internet access and other value added services.⁹⁷

Services provided over WiMAX by the Bulgarian operators are considered to be an alternative of traditional services provided through LAN, cable modem, optics or DSL technology, thus putting pressure on the other players on the Bulgarian telecommunications market. At the moment, wireless WiMAX Internet is offered at a price close to the price of DSL and cable modem Internet, but the quality and safety are considered to be much better. Voice services over WiMAX network in Bulgaria are cheaper than the traditional fixed telephone tariffs.

Convergence and Consumers

Convergence continues to promote competition development across what had been different networks and between the services they offer. Bulgarian telecommunication market is constantly developing and the competition is driving players to invest in new technologies, to deliver innovative services based on convergence between broadband networks, audiovisual media and electronic devices, with consumers benefiting from higher data speeds and improved quality. Competitive pressure and changing consumptions habits are encouraging firms to market bundles of services that include telephony, Internet access and television.

Operators, competing with each other, will have the incentive to offer not only the lowest prices, but the highest quality of services and customer care as well. Consumers will have far greater choices in picking their providers. There will be more service providers, more services; new services will be created to meet the consumers’ needs. Consumers will be able to take advantage of subscribing to “one-stop” provider and they will be able to forget

⁹⁶ see Carrier BG [accessed 30.11.2008a]

⁹⁷ see Carrier BG [accessed 30.11.2008b]

separate bills. Among the main benefits to consumers, due to the Digital Convergence, will be the lower prices and the convenience of adopting a single service provider. No matter which operators will be able to remain in business and which technologies will win a dominant position in the provision of communication services, one certain thing is that Bulgarian customers will benefit in terms of lower prices due to the increased contest among the market players.

4 PRICE EFFECT OF DIGITAL CONVERGENCE

Since bundling and its effect on competition has become an interesting and a challenging topic of Industrial Organization research, a lot of economic literature and research on bundling exists. The early economic literature focused on the traditional theory of price discrimination among buyers by a monopolist (Adams and Yellen (1976), Schmalensee (1984), McAfee, McMillan and Whinston (1989)). The recent literature moves from the limit case of monopoly to the less restrictive structure of oligopoly (Crampes and Hollander (2005), Reisinger (2004)). In such instances, bundling can be pro-competitive and improve industry welfare.

In my work, I focus on market structure transformation from monopoly market to duopoly market where mixed bundling is practiced.

I consider a case in which Digital Convergence of services drove former monopolists into a duopoly market structure where each firm offers its services as a bundle or separately. I develop a simple model that explores the associated effect of Digital Convergence on the price paid by the customers in the different market regimes. The main contribution of the model is to show that transformation of the previously distinct industry sectors into one converged market benefits the customers in terms of price. In order to examine whether price reduction will occur due to Digital Convergence, I compare and contrast the equilibrium prices of the products under the different market structures – monopoly and duopoly. I try to prove theoretically that price of bundles, when Digital Convergence is possible, is lower than the price paid if the products were bought from two separate monopolies. In my analysis only mixed bundling is considered since it has become a more prevalent business practice than pure bundling in telecommunications market. Fixed and marginal costs are assumed to be zero.

The rest of this point is organized in the following way. I consider an environment with two separate industries in which firm (1) has the monopoly of product A and firm (2) has the monopoly of product (B). The convergence now transforms the independent markets of goods A and B into one market of composite good $A_i B_j$ where $i, j = 1, 2$ so that we have now oligopoly market – both firms 1 and 2 may offer the products A and B and firms can adopt mixed bundling. In order to show the benefits to the consumers in terms of lower prices of goods A and B, if bought as a bundle, as a result of the new market structure, I compare the monopoly equilibrium prices with the bundled price achieved when both firms may offer the two products and practice mixed bundling.

The first section comprises three subsections. In the first subsection of the model, I present the equilibrium price of the products under monopoly market structure. In the next subsection I develop a demand function of duopoly regime and I set out the equilibrium prices. The following subsection extends the analysis to a price setting under a duopoly regime with mixed bundling. This is followed by the second section – a comparison of the prices of the bundle under the oligopoly regimes, and the total price when goods are bought from monopolies. In this section I prove my main statement that Digital Convergence increases competition between the different market players and brings the prices down. This point finishes with section of some conclusions where I show that Digital Convergence is a driver for competition.

4.1 MODEL SET-UP UNDER DIFFERENT MARKET REGIMES

If there is only one firm in a certain market for a product then there is a monopoly market structure. The equilibrium price paid by the consumers will be as follows:

4.1.1 DETERMINING EQUILIBRIUM PRICE UNDER MONOPOLY MARKET STRUCTURE

Demand function of the monopoly is

$$Q_m = a - b_m p_m,$$

where Q_m is the monopoly output and p_m is the monopoly price.

The monopoly chooses the optimal price in order to maximize its profit. The profit maximization problem is as follows:

The monopoly profit equals the total revenue. The monopoly revenue is function of the price and the quantity it sells. Hence the profit is:

$$\Pi_m = p * Q(p) = ap_m - b_m p_m^2.$$

Taking the first order derivative with respect to price, p_m yields:

$$\partial \Pi_m / \partial p_m = a - 2b_m p_m = 0,$$

hence equilibrium price and output under the monopoly regime are $p_m = a/2b_m$ and $Q_m = a/2$.

The price paid by the consumers when only one firm operates in the market is $p_m = a/2b_m$.

4.1.2 DETERMINING EQUILIBRIUM PRICE UNDER DUOPOLY MARKET STRUCTURE

Now suppose that two firms operate in one market of a product. In this case we have oligopoly market structure. I consider a market in which the demand function of both firms is symmetric.⁹⁸ Thus, both firms charge the same price and both ones sell equal product outputs. In order to find the equilibrium prices paid by the consumers I develop the following duopoly demand system

$$D^1 = D^1(p_1, p_2),$$

$$D^2 = D^2(p_2, p_1),$$

and the following demand functions

⁹⁸ Symmetry of demand implies that if both prices are equal the realized demands by firm 1, 2 are also equal.

$$Q_d^1 = a - b_d p_d^1 + c_d p_d^2,$$

$$Q_d^2 = a - b_d p_d^2 + c_d p_d^1, \text{ where } b_d > c_d > 0 \text{ and } b_d - c_d \geq b_m > 0^{99}$$

where Q_d^i is the duopoly output of firm i , $i = 1, 2$ and p_d^i is the duopoly price of the firm i , $i = 1, 2$.

We have linear demand functions, and the demand function is symmetric.

The following demand function $Q_d^i = a - b_d p_d^i + c_d p_d^j$, where $i, j = 1, 2$ implies that increase/decrease of the price of product i will decrease/increase the demand for product i , and increase/decrease of the price of product j will increase/decrease the demand for product i . In the demand function developed above there is a negative co-relation between the output of the company i and the price of its product and positive co-relation between the output of the company i and the price of the product produced by the other firm, j .

The profit functions of the two firms are

$$\Pi_d^1 = p_d^1 D^1 = a p_d^1 - b_d (p_d^1)^2 + c_d p_d^2 p_d^1,$$

$$\Pi_d^2 = p_d^2 D^2 = a p_d^2 - b_d (p_d^2)^2 + c_d p_d^1 p_d^2.$$

The price equilibrium is characterized by the following conditions

$$\partial \Pi_d^1 / \partial p_d^1 = a - 2 b_d p_d^1 + c_d p_d^2 = 0,$$

$$\partial \Pi_d^2 / \partial p_d^2 = a - 2 b_d p_d^2 + c_d p_d^1 = 0.$$

It follows that $p_d^1 = p_d^2$ and $p_d^1 = p_d^2 = a / (2b_d - c_d)$.

The price paid by the consumers when we have oligopoly market structure is $p_d^1 = p_d^2 = a / (2b_d - c_d)$.

⁹⁹ See Appendix 1 why $b_d - c_d \geq b_m$.

In order to show that price paid by the consumers under the monopoly regime are greater than the one in the oligopoly market structure I prove if $p_d^{ij} < p_m$.

If $a/(2b_d - c_d) < a/2b_m$ then $p_d^{ij} < p_m$

$a/(2b_d - c_d) < a/2b_m \Leftrightarrow 2b_m < 2b_d - c_d$, if b_m is substituted by the greatest value it can obtain, or $(b_d - c_d)$, since $b_m \leq (b_d - c_d) \Rightarrow 2(b_d - c_d) < 2b_d - c_d \Leftrightarrow c_d > 0$.

This inequality always holds, since $c_d > 0$. Hence, the equilibrium prices under the duopoly regime, p_d^{ij} are lower than the equilibrium prices under the monopoly regime, p_m .

4.1.3 DETERMINING EQUILIBRIUM PRICES UNDER DUOPOLY MARKET STRUCTURE WHEN FIRMS PRACTICE MIXED BUNDLING

When each firm produces both products A and B a composite system of the goods $A_i B_j$ will be available at a price s_{ij} , where $i, j = 1, 2$. When firms practise mixed bundling the composite bundle $A_i B_i$ will sell at a price $s_{ii} < p_i + q_i$ and the composite bundle $A_i B_j$ will sell at a price $p_i + q_j$ with $i, j = 1, 2$ and p/q is the price of product A/ B.

Hence the demand system¹⁰⁰ under duopoly market structure when firms practice mixed bundling is

$$D^{11} = D^{11}(s_{11}, s_{12}, s_{21}, s_{22}),$$

$$D^{12} = D^{12}(s_{12}, s_{11}, s_{22}, s_{21}),$$

$$D^{21} = D^{21}(s_{21}, s_{22}, s_{11}, s_{12}),$$

$$D^{22} = D^{22}(s_{22}, s_{21}, s_{12}, s_{11}).$$

When demand functions are linear and the demand system is symmetric, it follows:

$$D^{11} = a - b_b s_{11} + c_b s_{12} + c_b s_{21} + c_b s_{22},$$

$$D^{12} = a - b_b s_{12} + c_b s_{11} + c_b s_{22} + c_b s_{21},$$

¹⁰⁰ Demand system derived from Economidies (1993), pp. 3-5.

$$D^{21} = a - b_b s_{21} + c_b s_{22} + c_b s_{11} + c_b s_{12},$$

$$D^{22} = a - b_b s_{22} + c_b s_{21} + c_b s_{12} + c_b s_{11}.$$

with $a, b_b, c_b > 0$ and $b_b - 3c_b > 0$, or $b_b > 3c_b$.

The profit functions of the two firms are

$$\Pi^1 = s_1 D^{11} + p_1 D^{12} + q_1 D^{21},^{101}$$

$$\Pi^2 = s_2 D^{22} + p_2 D^{21} + q_2 D^{12}.$$

I assume that firms will try to maximize the profits with respect to price. The price equilibrium is characterized by the following conditions:

$$(1) \partial \Pi^1 / \partial s_1 = D^{11} + s_1 (\partial D^{11} / \partial s_1) + p_1 (\partial D^{12} / \partial s_1) + q_1 (\partial D^{21} / \partial s_1) = 0,$$

$$(2) \partial \Pi^1 / \partial p_1 = s_1 (\partial D^{11} / \partial p_1) + D^{12} + p_1 (\partial D^{12} / \partial p_1) + q_1 (\partial D^{21} / \partial p_1) = 0,$$

$$(3) \partial \Pi^1 / \partial q_1 = s_1 (\partial D^{11} / \partial q_1) + p_1 (\partial D^{12} / \partial q_1) + D^{21} + q_1 (\partial D^{21} / \partial q_1) = 0,$$

$$\partial \Pi^2 / \partial s_2 = D^{22} + s_2 (\partial D^{22} / \partial s_2) + p_2 (\partial D^{21} / \partial s_2) + q_2 (\partial D^{12} / \partial s_2) = 0,$$

$$\partial \Pi^2 / \partial p_2 = s_2 (\partial D^{22} / \partial p_2) + D^{21} + p_2 (\partial D^{21} / \partial p_2) + q_2 (\partial D^{12} / \partial p_2) = 0,$$

$$\partial \Pi^2 / \partial q_2 = s_2 (\partial D^{22} / \partial q_2) + p_2 (\partial D^{21} / \partial q_2) + D^{12} + q_2 (\partial D^{12} / \partial q_2) = 0.$$

Equations (1) – (3) translate to

$$(1') a - b_b s + 2c_b(p+q) + c_b s - b_b s + c_b p + c_b q = 0,$$

$$(2') c_b s + a - b_b(p+q) + 2c_b s + c_b(p+q) - b_b p + c_b q = 0,$$

$$(3') c_b s + c_b p + a - b_b(p+q) + 2c_b s + c_b(p+q) - b_b q = 0.$$

¹⁰¹ For simplicity I denote $s_1 = s_{11}$ and $s_2 = s_{22}$.

Equations (1') – (3') are solved for the equilibrium prices of the bundles, s , and of the unbundled components, p and q ^{102,103}

$$s = a/(2b_b - 5c_b)$$

$$p = q = 2a/[3(2b_b - 5c_b)]^{104}$$

Obviously the bundle price is lower than the sum of the prices of the unbundled components

$$S < p + q,$$

Since $s = a/(2b_b - 5c_b)$ and $p + q = 4a/[3(2b_b - 5c_b)]$, or $s = 3(p+q)/4$.

The prices paid by the consumers when there is an oligopoly market structure and firms practice mixed bundling are $p = q = 2a/[3(2b_b - 5c_b)]$ of the parts of the bundle and the price of the bundle will be $s = a/(2b_b - 5c_b)$. It is obvious that the price of the bundle is lower than the cumulative price of the products if bought separately.

4.2 COMPARISON OF PRICES UNDER THE DIFFERENT MARKET STRUCTURES

Under the monopoly regime the equilibrium price is $p_m = a/2b_m$.

Under the duopoly regime with mixed bundling the equilibrium prices $p = q = 2a/[3(2b_b - 5c_b)]$ and the price of the bundle is $s = a/(2b_b - 5c_b)$.

Now, I compare the prices of the products paid by the consumer when we have monopoly market structure and the price for the bundle they pay under the oligopoly regime with mixed bundling.

If $p_m = a/2b_m$ is the price under the monopoly regime, consumers will pay $2p_m = a/b_m$, because they buy two goods from two separate monopoly markets.¹⁰⁵

¹⁰² From the last two equations follows that $p_{i,j} = q_{i,j}$.

¹⁰³ From the profit maximization conditions follows that $s_{ii} = s_{jj}$.

¹⁰⁴ Since $p_{i,j} = q_{i,j}$ and $s_{ii} = s_{jj}$, for simplicity I denote $s = s_{11} = s_{22}$ and $p = p_{1,2}$, $q = q_{1,2}$.

¹⁰⁵ I consider a case when there are two monopoly markets with the same demand functions.

If the inequality

$$a/b_m > a/(2b_b - 5c_b)$$

always holds, then the overall price of two products bought from two separate monopolies is greater than the duopoly price of the bundle. The inequality translates to

$$2b_b - 5c_b > b_m,$$

$$\text{but } b_d - c_d \geq b_m$$

so I substitute b_m with the maximum value it can obtain, or $b_d - c_d$ and the new inequality translates to

$$2b_b - 5c_b > b_d - c_d,$$

$$\text{but } (b_d - c_d)/2 \leq b_b - 3c_b^{106}$$

so I substitute $b_d - c_d$ with the maximum value it can obtain, or $2(b_b - 3c_b)$ and the new inequality translates to

$$2b_b - 5c_b > 2b_b - 6c_b \Leftrightarrow c_b > 0,$$

which inequality always holds, since $c_b > 0$.

4.3 CONCLUSIONS

Digital Convergence dilutes the borders of previously distinct industries and brings them into one “new” market with an increased competition. The previously “not existing” competition brings down the prices of the products, if bought as a part of bundle, and benefits the consumers. In this point, I presented a simple model from a theoretical perspective that gives the first insight into this reasoning, and an empirical validation has still to be done. Nevertheless, many industries, primarily the telecommunications ones, have gone through a

¹⁰⁶ see Appendix 2 why $(b_d - c_d)/2 \leq b_b - 3c_b$

process of Digital Convergence, which has transformed their market structures and has created a new competitive environment with new rules for competition.

Finally, the structure of the market indeed matters. The simple model developed shows that price reduction is a likely outcome of a market structure transformation driven by the Digital Convergence. When two monopoly markets are transformed into one combined duopoly market, where mixed service bundling is adopted by the firms, the consumers are likely to pay lower prices for the bundle than if the products were bought separately in monopoly markets.

5 CONCLUSION

The major contribution of my work is to recognize the effects of Digital Convergence in telecommunications market, in particular in the Bulgarian market. This work provides analysis of the global telecommunications market and the work identifies the future perspectives of its development. I show the structure and the volume of the different telecommunications segments in the recent years and what are the future perspectives and expectations over the next five years. Based on current statistical data in the work, telecommunications industry can be regarded as one of the fastest developing industries in the world, where new technologies are introduced and developed constantly. One of the main results of the current technological development is the Digital Convergence. Convergence dilutes the borders of the previously distinct industry markets and brings them into one “new” market with an increased competition. Companies operating in the telecommunication market start offering new services and bundled services as well. A competition increase in the telecommunications sector due to Digital Convergence is a worldwide phenomenon.

In particular, I analyze the telecommunications market in Bulgaria and I show what has been the value, structure and dynamics of the market in the recent years, using statistical data provided by statistical institutions in Bulgaria and Europe, and what are the current processes and short-term trends as well. It can be concluded that Bulgarian telecommunications market is experiencing dramatic change due to the Digital Convergence and the recent liberalization of the market. Companies feel compelled to start offering new services and extend the spectrum of their offerings, which increases the competition in the Bulgarian telecommunications sector and drives the prices down.

The work shows that telecommunications companies in Bulgaria, such as fixed voice operators, mobile services operators, Internet service providers, cable television operators, etc. enter other market segments and start providing new services and bundling offerings, which leads to an increased competition and brings most of the prices down. These companies feel compelled to broaden the plethora of services in order to resist the pressure of the intensifying competition. A competition between different technologies is observed as well. Most of the telecommunications services are carried on networks based on different technologies. Although it is still early to say which technology/ technologies will win the war and will dominate the Bulgarian telecommunications market, one thing is certain – no matter which technology/ technologies wins, the benefit will go to Bulgarian customers since such a contest will most certainly bring down prices of the services. In the work it is shown that prices of most of the telecommunication services have in general decreased in the recent years due to the competition driven by the Digital Convergence, and a more severe competition is expected over the short to midterm, especially in the bundled services market such as Triple Play.

In order to assess more effectively the price effect of Digital Convergence on the telecommunications market I developed a simple model to describe the price effect from a theoretical perspective. The model shows that price reduction of services, if bought as a bundle, is a likely outcome of the transformation of two monopoly markets into one duopoly market where firms practice mixed bundling. These results are general since I consider a case where we have the same monopoly demand functions for both products. This model gives the first insight into this reasoning and further development is recommended, which can be applied for more complex estimation of the development of the telecommunications industry and its effect on the social welfare; it can be further developed to an extent appropriate for price setting of telecommunication services under different market structures and used by the operators. The model can be developed to the competition among multiple players, extending the duopoly model. Many other industries, not just the telecom one, have undergone a process of Digital Convergence as well, which has transformed their market structures and created new competition rules. For this reason, this model can be applied to other industries such as financial, insurance markets, etc., where similar processes are observed and where service bundling can be practiced.

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APPENDICIES

Appendix 1

Let a monopoly and duopoly demand functions are as follows:

$$Q_m = a - b_m p_m,$$

where Q_m is the monopoly output and p_m is the monopoly price, with $b_m > 0$ and

$$Q_d^i = a - b_d p_d^i + c_d p_d^j,$$

where Q_d^i is the duopoly output and $p_d^i = p_d^j$ is the duopoly price with $i, j = 1, 2$, with $b_d - c_d > 0 \Leftrightarrow b_d > c_d$.

Proposition

I propose that $b_d - c_d \geq b_m$.

Proof

Under the duopoly regime the price the firm $i, j = 1, 2$ charges is $p_d^i = p_d^j$.

If I substitute $p_d^i = p_d^j$ with p_m in the duopoly demand function then the demand function translates to

$$Q_d^i = a - b_d p_m + c_d p_m = a - (b_d - c_d) p_m$$

if $(b_d - c_d) < b_m \Rightarrow$ when the firms $i, j = 1, 2$ under the duopoly regime sell their goods at monopoly price p_m then the total output will be greater than the monopoly output or the price the companies can charge can be greater than the monopoly one and have the monopoly equilibrium output. Hence, this assumption is not true $\Rightarrow b_m \leq (b_d - c_d)$.

Appendix 2

The duopoly demand function, when only one good is produced, is

$$Q_d^i = a - b_d p_d^i + c_d p_d^j,$$

where Q_d^i is the duopoly output of firm i and $p_d^i = p_d^j$ is the duopoly price with $i, j = 1, 2$, with $b_d - c_d > 0 \Leftrightarrow b_d > c_d$.

The duopoly demand system, when mixed bundling is practiced, is

$$D^{11} = a - b_b s_{11} + c_b s_{12} + c_b s_{21} + c_b s_{22},$$

$$D^{12} = a - b_b s_{12} + c_b s_{11} + c_b s_{22} + c_b s_{21},$$

$$D^{21} = a - b_b s_{21} + c_b s_{22} + c_b s_{11} + c_b s_{12},$$

$$D^{22} = a - b_b s_{22} + c_b s_{21} + c_b s_{12} + c_b s_{11},$$

with $a, b_b, c_b > 0$ and $b_b - 3c_b > 0$, or $b_b > 3c_b$.

Proposition

I propose that $b_b - 3c_b \geq (b_d - c_d)/2$.

Proof

Under the duopoly regime when we have symmetric function and only one good is produced $p_d^i = p_d^j = p_d$, then the output of each firm will be $Q_d^{1,2} = a - (b_d - c_d)p_d$.

Under the duopoly regime structure when two goods are produced, but no bundling is practiced the price at which composite system $A_i B_j$ will sell is $s_{ij} = p_i + q_j$, with $p_{i,j} = q_{i,j} = p$, or $s_{ij} = 2p$. Since $D^{11} = a - b_b s_{11} + c_b s_{12} + c_b s_{21} + c_b s_{22} = a - (b_b - 3c_b)2p$ can never be greater than $Q_d^{1,2} = a - (b_d - c_d)p_d$ if $p_d = p$, then it follows that $2(b_b - 3c_b) \geq (b_d - c_d)$.

ABSTRACT:

Effect of Digital Convergence on Service Bundling and Competition in the Telecommunications Market in Bulgaria

Meine Magisterarbeit beschäftigt sich mit der “*Digitalen Konvergenz*” im Bereich der Telekommunikation und daraus resultierenden Konsequenzen. Telekommunikation ist für vielfältige Änderungen im privaten und wirtschaftlichen Umfeld verantwortlich. Deshalb ist die Telekommunikation einer der wichtigsten Bereiche der Industrie.

Die Entwicklung von neuen Technologien, im Bereich der Informations- und Kommunikationstechnologien, führte zu Konvergenz zwischen ursprünglich unabhängigen Netzen und Diensten. Digitale Konvergenz bedeutet die Integration von verschiedenen Telekommunikationssystemen, die Digitalisierung von Netzwerken und das Entstehen von vielfältigen, neuen, innovativen Telekommunikationsdiensten.

Die rasante Entwicklung der “Digitalen Konvergenz” führte zu radikalen Veränderungen auf dem Telekommunikationsmarkt. Herkömmliche Marktstrukturen verändern sich und neue Geschäftsmodelle entstehen. Telekommunikationssbereiche, die deutlich voneinander abgegrenzt waren, rücken immer mehr zusammen. Wegen Überschreitens der klassischen Branchengrenzen steigt das Niveau des Wettbewerbs zwischen den Marktteilnehmern. Die Preise für Telekommunikationsdienste fallen aufgrund des steigenden Wettbewerbs.

Mit zunehmender Konvergenz von Plattformen gibt es auch einen dauerhaften Trend zu gebündelten Diensten. Unter einem Bündelangebot versteht man die Zusammenführung verschiedener Produkte oder Dienstleistungen (z.B. Festnetzsprachtelefon-, Breitband-, Fernseh- und Mobilfunkdienste) zu einem Paket.

In meiner Magisterarbeit analysiere ich den globalen und bulgarischen Telekommunikationsmarkt. Trends im Telekommunikationsmarkt Bulgariens werden beobachtet und analysiert. Beispiele “Digitaler Konvergenz” auf dem Telekommunikationsmarkt in Bulgarien werden gegeben. Die analysierten Beispiele zeigen, welche Konsequenzen die Entwicklung der Technologien hat.

LEBENS LAUF

Persönliche Daten

Name:	Veselin Petkov
Geburtsdatum:	08.06.1981
Geburtsort:	Dimitrovgrad, Bulgarien
Staatsangehörigkeit:	Bulgarien
Familienstand:	ledig
Anschrift:	Oborishte 18, Dimitrovgrad 6400, Bulgarien
Tel:	00359 888 787711
E-Mail:	vesko_petkov@abv.bg

Ausbildung

Seit 03/2005	Magisterstudium Betriebswirtschaftslehre, Vertiefung E-Economy, Universität Wien
03/2004-03/2007	Magisterstudium, Finanzen, Universität für National- und Weltwirtschaft, Sofia
10/1999-11/2003	Bakkalaureatstudium, Finanzen, Universität für National- und Weltwirtschaft, Sofia
09/1994-06/1999	Mathematik Gymnasium, Haskovo, Bulgarien

Berufliche Tätigkeit

Seit 10/2006	Steuerung und Verwaltung von Wertpapierportfolio <i>selbstständig</i>
12/2006-11/2007	Expat Capital AG, Sofia, Bulgarien <i>Finanzanalytiker</i>

Sonstige Kenntnisse und Qualifikationen

Sprachen:	Deutsch – sehr gut in Wort und Schrift Englisch – sehr gut Russisch – Muttersprache Bulgarisch – Muttersprache
EDV:	Microsoft Office, HTML, CSS, PHP, MySQL, Visual Basic, Excel VBA Programming