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CONVERGENCE OF TELECOMMUNICATIONS, MEDIA AND INFORMATION TECHNOLOGY SECTORS AND ITS IMPACT UPON THE WAYS OF DOING BUSINESS

by

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ABSTRACT

This study aims to analyze the market changes in the telecommunication, broadcasting and IT according to some indicators such as revenues, traffic volumes, and penetrations. During the last 20-30 years, there have been some changes in the technology and the markets. Convergence is accepted as a generic name to show the evolution in these markets. In this study, the convergence concept was reviewed. In the second section, technological underpinning of convergence, which is called next generation networks, was explained. In the following sections, market changes in each of related sectors and some main converged services were analyzed. Finally the results of analysis were discussed in the conclusion. The results of the this study showed that convergence is a phenomenon that will shape the future of these three industries and all the market players should be aware of this phenomenon to survive in a converged environment.

Keywords: convergence, telecommunication, broadcasting, information technology, consolidation, NGN.

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1. Introduction

Traditionally, there are different networks and infrastructures which have been used to carry specific types of services. Every infrastructure has its own specifications and they meet specific requirements of the services they carry. For example, telephony services were carried on telephony infrastructure, TV services over broadcasting infrastructure, etc. However, especially during the last 20-30 years, there have been radical changes in the technology of information and communication services. These advances resulted in new types of infrastructures and better integration of services across different infrastructures.

Market players in each of telecommunication, broadcasting or IT sectors have seen this convergence as a way to facilitate their networks for differentiated services, to decrease the costs, to reach new customers and to increase profitability. They had chance to enter new markets, this situation resulted in increased competition and lower prices. There are many possibilities for convergence at a horizontal level between different industries as well as vertical integration between different levels.

1.1.Convergence Concept

The dictionary definition of convergence is "the act of converging and especially moving toward union or uniformity." In the telecommunications world, convergence means a moving towards the use of one medium as opposed to many. Although there is not a precise definition of convergence in telecommunications, there are some similar definitions which are mostly cited in the popular press. For example, in December 1997, European Commission published a Green Paper on the convergence of the telecommunications, media and information technology and in this Green Paper convergence is defined as (EC, 1997):

- 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.

International Telecommunications Union (ITU, 2012) defined the convergence as; "the ability of different networks to carry similar kinds of services (*e.g.*, voice over Internet Protocol (IP) or over circuit switched networks, video over cable television or Asynchronous Digital Subscriber Line (ADSL)) or, alternatively, the ability to provide a range of services over a single network."

Main idea behind the convergence is a converged environment where everything is simpler. As the technological progress is caused by the needs existing at the time of their development and introduction, the vision of convergence is a "clean slate" approach in which better and more flexible services can be provided in the future (Fowler, 2002).

1.2.Drivers of Convergence

Today, innovative offers and new business models in the communications sector are stemmed from convergence in network technologies, services and terminal equipment. The growing role of the internet in the economy and society has enhanced the process of convergence and its rate of change. Digitalization of content, the emergence of IP, and the adoption of high-speed broadband are bringing previously distinct communication networks and services together in one network (OECD, 2007). Technological improvements that facilitate the convergence will be explained in the next section. Aside from technological improvements, a number of key drivers for convergence are summarized below.

Convergence increases the savings of market players by decreasing the costs. The cost of provisioning, operation, and maintenance of individual telecommunication infrastructures can be reduced by means of the multiplexed infrastructure. Provisioning of telecommunications services involves physical installation, checkout, and monitoring of inside cabling, interface equipment, switching equipment, and so on (Fowler, 2002). For this reason, operating and managing an additional and separate network infrastructure to support Internet IP traffic is very costly. Convergence delivers benefits in this area at all levels by reducing the number of physical cables, delivering content via only one medium instead of separate cable TV plants, antennas, and satellite dishes, and also minimizing the number of separate equipment and suppliers. For instance, as the technology matures to provide voice services over IP networks, it becomes attractive to combine data and voice services at the IP protocol layer, and benefit from reduced costs by only operating a single network (Wilksch and Shoubridge, 2001). This situation also makes the management easier and maintenance less expensive.

The opening-up of the telecommunications market to competition has also acted as a catalyst on the process of convergence. New market players tried to gain market share by adopting different market models from traditional telecommunications firms. Voice over IP (VoIP) is an example of such services; it disrupted the traditional voice services and facilitated the convergence (OECD, 2007). As Nystrom and Hacklin indicated, together with technological change, the liberalization of telecommunications market is one of the foremost drivers behind the convergence process (Nyström and Hacklin, 2005).

The possibility to provide video content over IP became an opportunity for network operators to increase the number of services they offer. This situation increased the competition in the content industry. Moreover, an increasing number of users are creating and exchanging

their own content on a multiplicity of devices and these developments also increase the need to communicate, and the demand for symmetric communications (OECD, 2007). More operators are now beginning to offer more flexible programming with video on demand and distribution of video content from popular internet sites. Due to the increasing digital content and service variety, the market for digital content is growing rapidly and content services, especially those over managed IP networks, have still not exploited their full potential. Market players in the telecommunications industry generally aim to gain a sizeable share of this market (Nelson, Dam and Cline, 2008).

1.3.Barriers to the Development of Convergence

As described in the previous section, there are many motives for the convergence; however, on the other hand there are some barriers. In this section main barriers to the development of the convergence phenomenon will be discussed.

Basically, there are different approaches among sectors in terms of the ownership and operation of networks. This situation may decrease the level of competition since there may be some bottlenecks in facilities which are controlled by vertically integrated players (EC, 1997). It is argued that without the actions by regulators, carriers will be able to integrate their services vertically and this situation will create additional bottlenecks, especially for the delivery of audiovisual content (Cohen, 2007).

Increase in the choice of delivery methods thanks to the technological improvements may change the type of bottleneck from delivery method to the content. In the medium term, there may be shortages of adequate content where premium content is already a key factor for success in TV market (EC, 1997). The competitive position of operators may affect the content industry because they will become a distributor of digital content, services and applications in a

converged environment. Because of potential preferential agreements between operators and content providers in order to enhance profitability, today, so called "net neutrality" became a one of the most important potential regulatory tools (EC, 2006).

Since digital content is easier than analogue content to share and adapt, owners of IPR may have some difficulties in order to control how their digital content is used, and users may not always identify and trace rights holders easily (WEF, 2007). For this reason, content providers will not be willing to make content available if their intellectual property rights are not sufficiently protected, and also publishers and operators will only invest in innovative services if they are confident that new means of delivering information and/or services provides an adequate degree of protection for the intellectual and industrial effort of their organizations and those of content providers (EC, 1997).

In today's market, regulations are based on traditional market definitions and possible changes in these definitions parallel to convergence constitute an important issue for decision making process of market players. They must think about in which market definitions their services will be included, so regulatory uncertainty may become a barrier to investment by market players. Also, different regulatory approaches to similar services, (i.e. TV over IP and traditional TV services) may result disproportionate regulatory burden on certain services (EC, 1997). Moreover, in most developed countries, broadcasting and telecoms have traditionally been regulated separately, meaning that new services such as IPTV and VoIP are competing in the same space without being overseen by the same regulators (WEF, 2007). Since it is too early in the evolution of converged market to determine prescriptive and definitive principles and approach, at this stage, regulatory authorities can only have a light touch to facilitate the regulatory stance (Cohen, 2007).

Television broadcasting, mobile multimedia and voice applications are all expanding simultaneously and additionally the use of wireless technologies within fixed networks is increasing the demand. This growth and expansion increase the need for spectrum but on the other hand, there is a finite supply of spectrum. In addition to redundancy, there are differences between spectrum frequencies in terms of capacity. Wireless carriers with high levels of spectrum have the capacity to handle more data over their networks. But those with insufficient spectrum must either acquire it or build more tower sites to avoid forcing users to compete for the same antenna. This situation requires significant capital expenditures (Salen, 2011).

Consumer protection is also a major issue in communication market and there are different security levels and capabilities across sectors in this market. Each has its own security policy, so in a converged environment, the coordination of these different security policies will become very important and lack of coordination may result a failure of convergence process. One of the concerns in achieving an all-IP always-best-connected broadband network is the requirement for enhanced security and privacy (TalebiFarda, Wongb and Leunga, 2009).

Additionally, convergence has the potential to turn lack of interoperability into a common problem against development of ICT sectors. The goal of ensuring that any user can communicate with any other user will be held back where market action is unable to deliver products and services which are interoperable. Proprietary standards controlled by dominant players can limit such interoperability (Beydogan, 2009).

2. Next Generation Networks

Next generation networks (NGN) provide the technical underpinning of convergence, representing a single transport platform on which the carriage of previously distinct service types (video, voice, and data) “converges”, together with new and emerging services and applications.

NGN is defined by the International Telecommunication Union (ITU) as a "packet based network able to provide services including telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service related functions are independent from underlying transport-related technologies." NGN includes next generation "core" networks, a converged IP infrastructure capable of carrying a large number of services, and next generation "access" networks that will guarantee the delivery of innovative services (OECD, 2007).

2.1.Core Networks

Next generation core networks generally cover the migration from multiple legacy core networks to IP-based networks for the provision of all services. The circuit switches that comprise the core of the transport and aggregation networks of existing switched fixed and mobile networks are being replaced altogether by packet switched IP routers. Since all the information is transmitted via packets and packets do not require an end to end network, different networks can be used as core networks. Traditional networks are dedicated to provide voice, data and video separately, with next generation core networks; all of those will be transferred into packets and after labeling, they will be transmitted simultaneously over different transport technologies. It will change the traditional single-purpose networks to multi-purpose networks. During the transition period to next generation networks, there will exist media gateways that will provide interworking between new network structure and the existing ones such as PSTN, cable and mobile (OECD, 2007). This generates operating efficiencies, and also enables networks to carry voice and video services together with data in a fully integrated manner.

Obviously, core networks are related to common costs of all services carried by the network and contain relatively low proportion of costs based on the volume of each service. For

this reason, altering the legacy network with the next generation core network will increase the economies of scale and scope and decrease the overall cost level compared to legacy networks (ERG, 2008).

The deployment of NGN into the core has some different aspects than access networks. Main issue in the migration of core network is to reduce the operating expense; however, the primary reason behind the access network migration is to have competitive advantage in a competitive market among access technologies. Typically access network migration requires huge amounts of investments (EP, 2009).

2.2.Access Networks

Fiber is often described as the most future proof of next generation access technologies, but there are some other access technologies that are used by operators either alternatively or complementarily (OECD, 2007).

Cable television (CATV) operators have begun to upgrade their infrastructure to hybrid fiber copper (HFC) allowing for bidirectional traffic and using Docsis technology to increase network capacity. The Hybrid Fiber Coax (HFC) is a modern broadband access network, providing advanced interactive services such as internet access, digital interactive television and cable telephony (Wauters, Bruyne and Martens, 2007). Cable TV companies facilitate these technological developments to offer voice and internet access and by this way, they become a competitor to telecommunications companies that began to offer internet TV correspondingly.

Broadband Wireless Access (BWA) technologies provide wireless access over a wide area. WiMAX and similar technologies are mainly designed to address some of the shortcomings such as market gaps left by wired networks. Wi-Fi (or wireless fidelity) is a local area network and Wi-Fi hotspots are increasing in number and they are expected to increase (Behmann, 2005).

Main driver behind its rapid growth is that they can be deployed without the cost and complexity of cable infrastructure. Due to its affordability, scalability and versatility, its popularity has spread to rural and urban area (OECD, 2007).

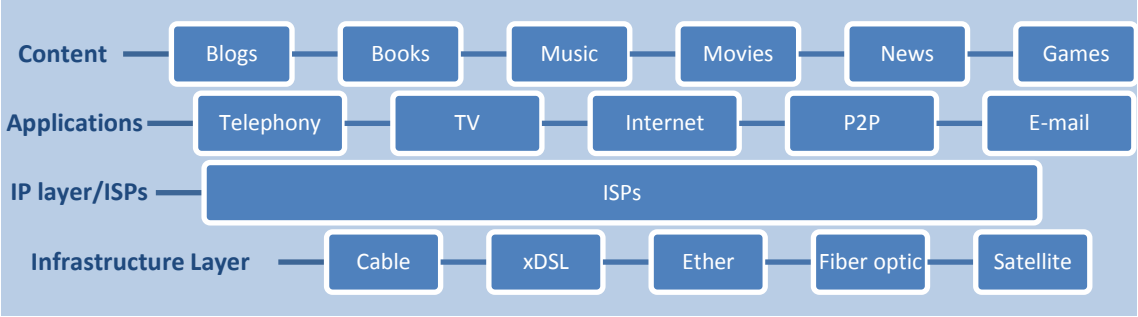
The introduction of 3G technology provides the transmission of high-speed data, and by this way, users are now able to access innovative services such as mobile TV on the go. Operators are expanding their 3G (and somewhat 4G) networks, especially in the developed countries (OECD, 2007). This technology created more opportunities for mobile operators to increase their revenue and their service variety. Day by day, operators are upgrading their infrastructure and launching a lot of mobile video content, such as full-length movies, mobile TV programs and music videos (Xu, Ma and See-To, 2010).

Traditional satellite services are home television and video services, radio and specialized telephony uses. Recent technological improvements also increased technical efficiency in satellite communications. Thus, satellite operators began to use spectrum more efficiently, they reduced redundancy and by this way, they increased data density and reduced transmission bandwidth. Several operators began to offer broadband satellite service to residential consumers, particularly in the areas where wired broadband services did not reach, with affordable prices and comparable speeds (OECD, 2007). Satellites became an attractive alternative for broadband communication thanks to its ability to serve many users without dedicating to each user cable, fiber, switching equipment ports, etc. Even though terrestrial links are today most common access networks, satellites start to play more important roles in the broadband communication (Hadjitheodosiou, Ephremides and Friedman, 1999).

3. Market Analysis

Changes in the market and technological advances result in the availability of bundles in which various products are offered via a single network, for example broadband internet access and television services. There are two types of bundling; technically integrated services and technically nonintegrated services. Examples of technically integrated services are broadband internet access and voice over IP; examples of nonintegrated services are telephony via PSTN and television via digital broadcasting technology (OPTA, 2006).

Existing network providers try to consolidate their position on existing markets in response to the increasing competition as a result of convergence. On the one hand, it makes operators to consolidate in order to strengthen their positions within a horizontal market, such as concentration within the cable sectors and the takeovers on markets including the broadband internet access market (OPTA, 2006).

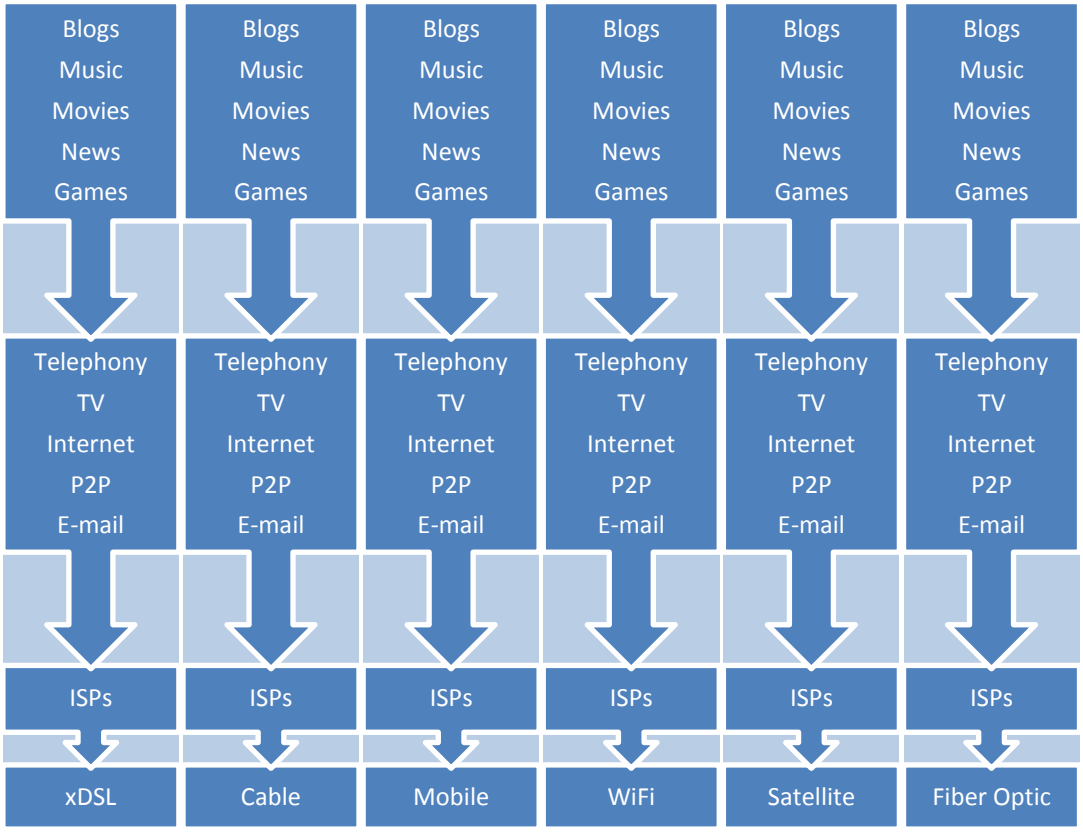


Source: OPTA (2006).

Figure 1. Horizontal Market Structure

Some people claim that technological advances are forcing disintegration of telecom companies at vertical level and integration at horizontal level. Even though traditionally telecom companies had a tendency to vertical integration and they ran the network and delivered the services simultaneously, Wang, Kan and Du (2010) claimed that Internet Protocol (IP) has caused a separation between infrastructure and services. They also stated that in next generation

networks service creation will be independent of the infrastructure to make it fast and economical (Wang, Kan and Du, 2010). Similarly, due to increasing capacity of transmission networks, changing cost structure from "distance-based" to networks' utilization rates" and the diversification of telecommunication services thanks to the digitalization of transmission, network service providers began to attempt to increase the utilization rate of networks instead of providing similar services which cause inefficient use of networks. On the other hand, vertical integration is seen as a serious waste of network resources and impedance for introducing competition to the industry because of the duplication of the network (Wang, Luo and Wu, 2010).



Source: OPTA (2006).

Figure 2. Vertical Market Structure

On the other hand, technological advances may urge operators to consolidate vertically because of attempts by network providers to offer appealing content and applications themselves, possibly through alliances with other parties. This vertical concentration may create exclusive relationships between network providers and content and application providers, as a result of which certain services would not be freely accessible over all types of broadband connections (OPTA, 2006).

According to Dai and Tang (2009), there are basically two main reasons behind the vertical expansion of telecom operators. Firstly, vertical expansion can help improve economic efficiency especially for industries with stronger scale economy. Secondly, telecom operators who hold monopolistic position in the telecom network operation market can strengthen their monopolistic status and competitive advantages by upstream and downstream expansions. Since early 2000s, value added services (VAS) have gained more importance, especially after the rise of profit from Short Message Service (SMS). Most of the telecommunications operators started to introduce a variety of VAS and developed cooperation with service providers. In the first few years, the telecom operators only provided a system platform for service providers to distribute their services. With development of the technology and maturity of the market, their management ability and R & D capability of VAS has been greatly improved. Hence, they intend to develop their own VAS to control the industrial chain tightly and grab more profits (Dai and Tang, 2009).

Today, vertical consolidation, particularly between content suppliers and ISPs, started to attract more attention. There have been some debates that arguing how vertical ownership ties between ISPs and content suppliers might affect Internet users' access to information. The potential threat of joint ISP/content ownership on content supply was discussed because of

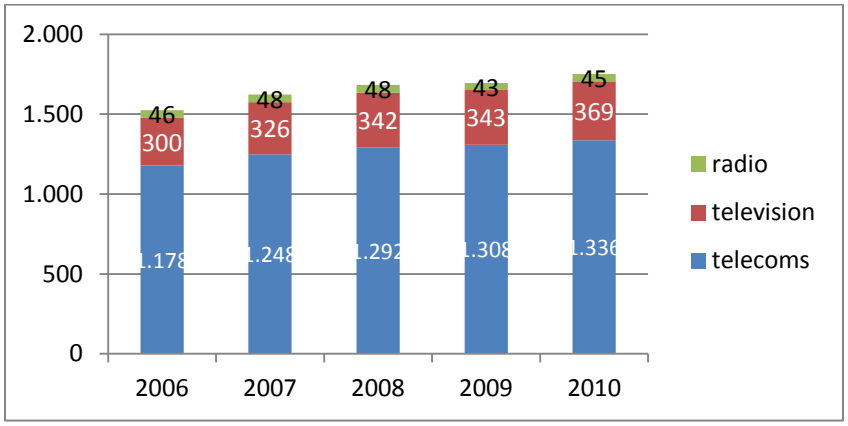
Comcast/NBC-Universal merger, which was approved in January, 2011 combined a major ISP and cable TV operator (Comcast) with substantial television programming assets (NBC-Universal). There are two concerns about this type of vertical integrations. One of them is that the ISPs may discriminate against some content services and by this way, they can reduce the competition in programming supply by limiting the access by independent program suppliers. The other concern is that ISPs may restrict the access of other ISPs to "must have" programming content and by this way; they can reduce the competition in ISP market (Watermana and Choib, 2011).

Both the vertical integration and horizontal integration are two extreme future scenarios to shape the future market structure alone. Probably there will be a mixed form that will contain elements of both horizontalization and verticalization. One possible mixed type consists of a large number of vertically oriented parties that offer a complete package of services over their own network alongside a number of smaller providers that are specialized in providing services within one layer. But this type of a scenario assumes that network providers will open their networks to smaller providers or that new, smaller networks emerge via innovation (OPTA, 2006).

3.1.Global Communications Market

Communications sector is one of the main contributors to the national economies. Communications sector consists of telecoms, television and radio services. In 2010, global revenue in communications sector was $1,750 billion, representing 14.9% increase since 2006 and 3.4% since 2009. As seen from Figure-3, telecom services revenue had the largest proportion among communication services, which was 76% of the total. Even though its amount increased from $1,178bn to $1,336bn, its share declined from 77% to 76% from 2006 to 2010. Because of

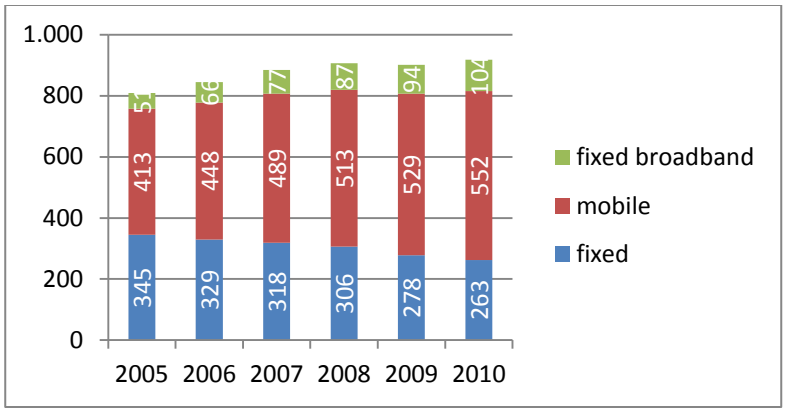
the size of the telecoms market, this relatively small percentage change represents a significant change in absolute terms. On the other hand, the proportion of television services increased from 20% in 2006 to %21 in 2010 and its absolute amount also increased in the same time interval, indicating growth in the global television markets. Since 2009, global television revenues increased by 7.7%, radio sector revenue increased by % 5 and telecoms revenue increased by 2.2% (OFCOM, 2011).



Source: OFCOM (2011).

Figure 3. Global Communications Revenues

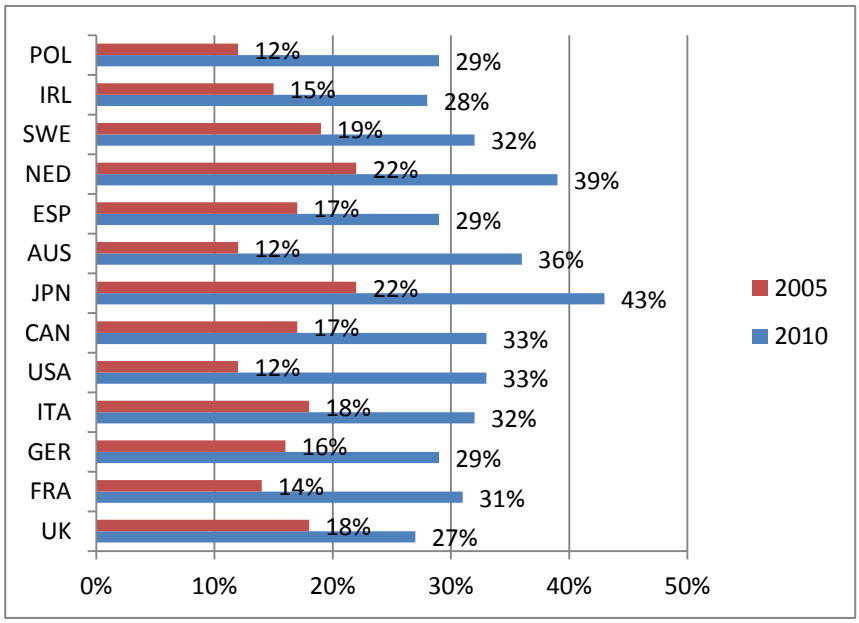
Distribution of total revenue among the components of the telecom services is shown in Figure-4. Data shows the results of International Communications Market Report (ICMR) published by OFCOM in 2011, covering 17 countries. Total telecoms revenue generated in these countries amounted to $ 918bn in 2010. Among the components of telecoms revenues, fastest growing element was the revenue of fixed broadband services and it increased by an average of 14.8% a year, from $51bn in 2005 to $104bn in 2010. Over the same time period, mobile service revenue increased by an average of 6%, while fixed line voice service revenue fell by 5.3% a year (OFCOM, 2011).



Source: OFCOM (2011).

Figure 4. Retail Telecoms Revenue by Sector

According to the same research report (OFCOM, 2011), source of revenue for telecom operators in these countries have changed gradually. Voice revenues have declined while both mobile and fixed data revenues have increased. Figur-5 shows the percentages of data and voice revenues in the comparator countries. Revenue generated by data services was 34% of total telecom revenues in these countries, in 2010 and ranged from 27% to 43% on a country basis.



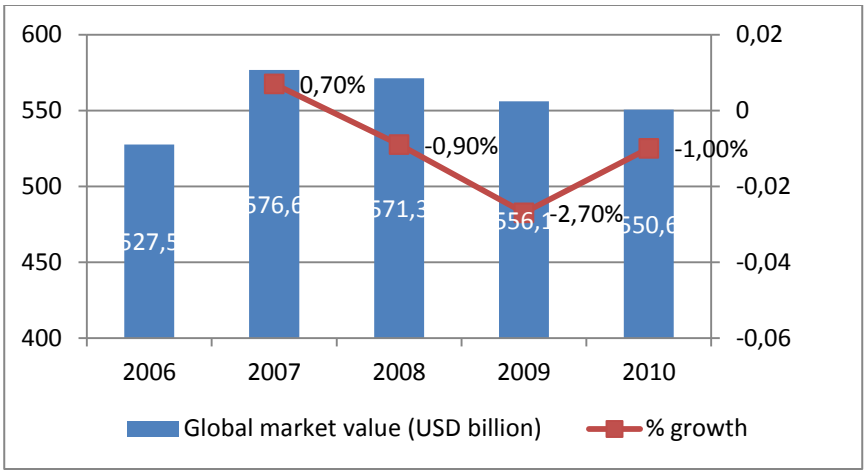
Source: OFCOM (2011).

Figure 5. Data Revenue as a proportion of Total Telecoms Revenue

3.2. Fixed Telecommunications Market

Fixed line telecom market players generally own the physical network as a result of previously being a state owned service provider. For this reason, there are only a few companies that have ability to supply complex, reliable and geographically extensive networks. Recently, fixed line telephony market entered a decline period due to increasing mobile phones and applications and decreasing switching cost to mobile services (Datamonitor, 2011). People increasingly expect to call and be called wherever they are and it makes traffic to move from fixed to mobile. Adding new features to mobile phones such as internet access, location services, VoIP, etc. became a mainstream and this led to new demands by consumers for value added services in the telephony market (OECD, 2007). In addition to this, cost structure of telecommunications market has changed significantly because of voice over IP and broadband. It further reduced the expense of consumers to telecommunications services and caused a decrease in ARPU of fixed telecom operators. Fixed telecom operators responded these changes by trying to differentiate their services with multiple plays and they expect that next generations networks will increase their profitability (Yang, Kim, Nam and Moon, 2004).

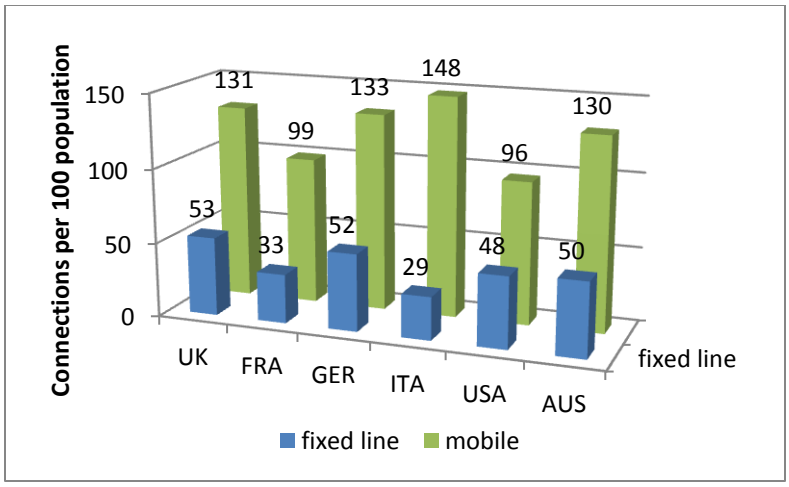
Figure-6 shows the changes in global fixed line telecoms market revenue. Global fixed telecoms market in 2007 was about $576.6bn and since then, it has been declining. It is expected to decrease in the near future and Datamonitor estimates that the market value will be about $524.3 billion by the end of 2015 (Datamonitor, 2011).



Source: Datamonitor (2011).

Figure 6. Global Fixed Line Telecoms Market Revenue

The number of fixed-line connections also fell between 2005 and 2010 in the UK, France, Germany, Italy, the US and Australia. Figure-7 shows the fixed line and mobile connections per 100 people and the changes since 2005 in these countries. Even though in all these countries, fixed line connections fell and mobile connections increased, since there are different market conditions and regulatory environment in each of these countries, they all have different penetrations and changes in penetration. For example, in UK, fixed bundle services including broadband must also include fixed line connection; it means broadband services cannot be sold without fixed line connection. As a result, penetration of fixed line is a bit high compared to other countries and also its decrease is lower than the others (OFCOM, 2011).



Change since 2005		
	Fixed	Mobile
UK	-3%	18%
FRA	-19%	23%
GER	-15%	37%
ITA	-12%	27%
USA	-11%	28%
AUS	-5%	34%

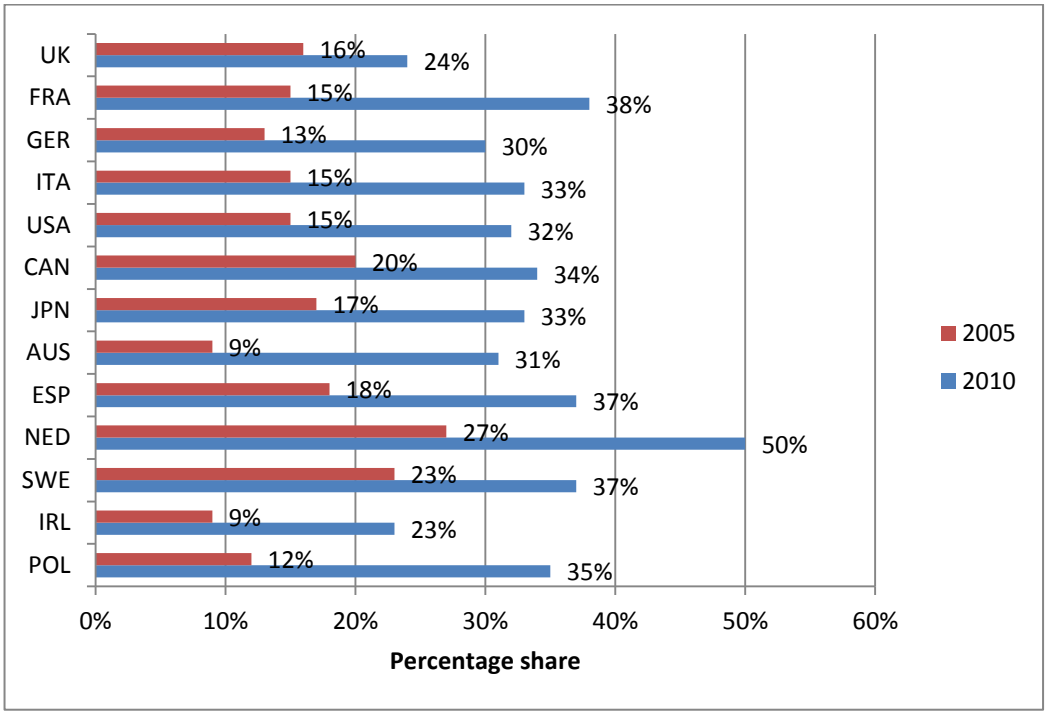
Source: OFCOM (2011).

Figure 7. Fixed line voice and mobile connections per 100 population, 2010

Fixed voice volumes also declined in almost all countries in 2010. Only in a few countries its volume increased. Among these countries, for instance, high growth rate of China in 2010 (up 4.0%) was a result of strong economic growth during the year, and in France (up 2.1%), as a result of the availability of cheap voice over IP (VoIP)-based fixed-line services (OFCOM, 2011).

When we look at the sources of revenue in fixed line telecom market, we see that the most of the revenue was gained from voice only segment in 2010, with total revenue of $314.8 billion, equivalent to 57.2% of the market's overall value. The non-voice segment contributed revenue of $235.8 billion in 2010, equating to the remaining 42.8% of the market's aggregate value (Datamonitor, 2011). However, in a converging environment, it is essential to highlight the fact that main driving force of fixed line service market became the broadband penetration. Fixed operators increased the customer loyalty by force of broadband that mobile technologies cannot offer products competitive enough to be a substitute (Yang, Kim, Nam and Moon, 2004).

Figure-8 shows the percentages of fixed broadband as a portion of total fixed revenues. There are different levels of percentages among countries but it can be said that its percentage increased significantly since 2005. France had the largest increase in terms of change and the reasons of this change were both the increasing revenue from broadband and also declining voice revenues due to the popularity of low-cost VoIP services. The lowest increase was in UK because of relatively low prices of fixed broadband services in this country (OFCOM, 2011).



Source: OFCOM (2011).

Figure 8. Fixed broadband as a portion of total fixed revenues: 2005 and 2010

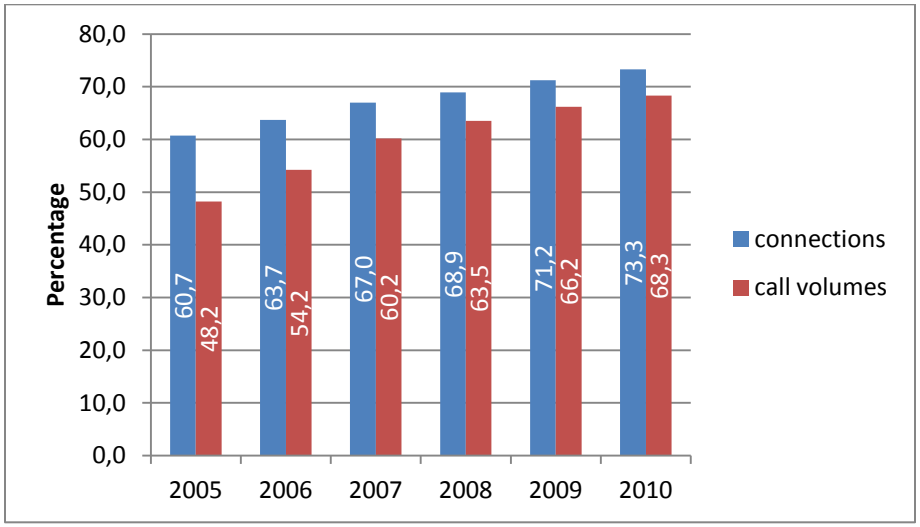
3.3. Mobile Telecommunications Market

In the first years of mobile communications, early 1990s, mobile communication services were seen as a complementary service to fixed communication services. It was only used for being reachable on the go and accepted as a luxury good. Most of the mobile calls went to fixed lines and calls to mobile phones originated from fixed lines. However, mobile market has had

extraordinary growth since those years and recently mobile telephones became almost a necessity (Vogelsang, 2010).

However, improved handsets, decreasing price levels and introduction of prepaid tariffs caused mobile communication to develop into a mass market. The year 2002 was a turning point in the history of telephony, because it was the year when the number of mobile subscribers passed the number of fixed-line subscribers worldwide (ITU, 2003). At present, there are about 5.9 billion mobile cellular subscriptions (ITU, 2011). When mobile networks mature, they became substitutes to fixed networks, meaning that mobile growth reduces the size of fixed networks and ultimately can cause to its collapse (Vogelsang, 2010).

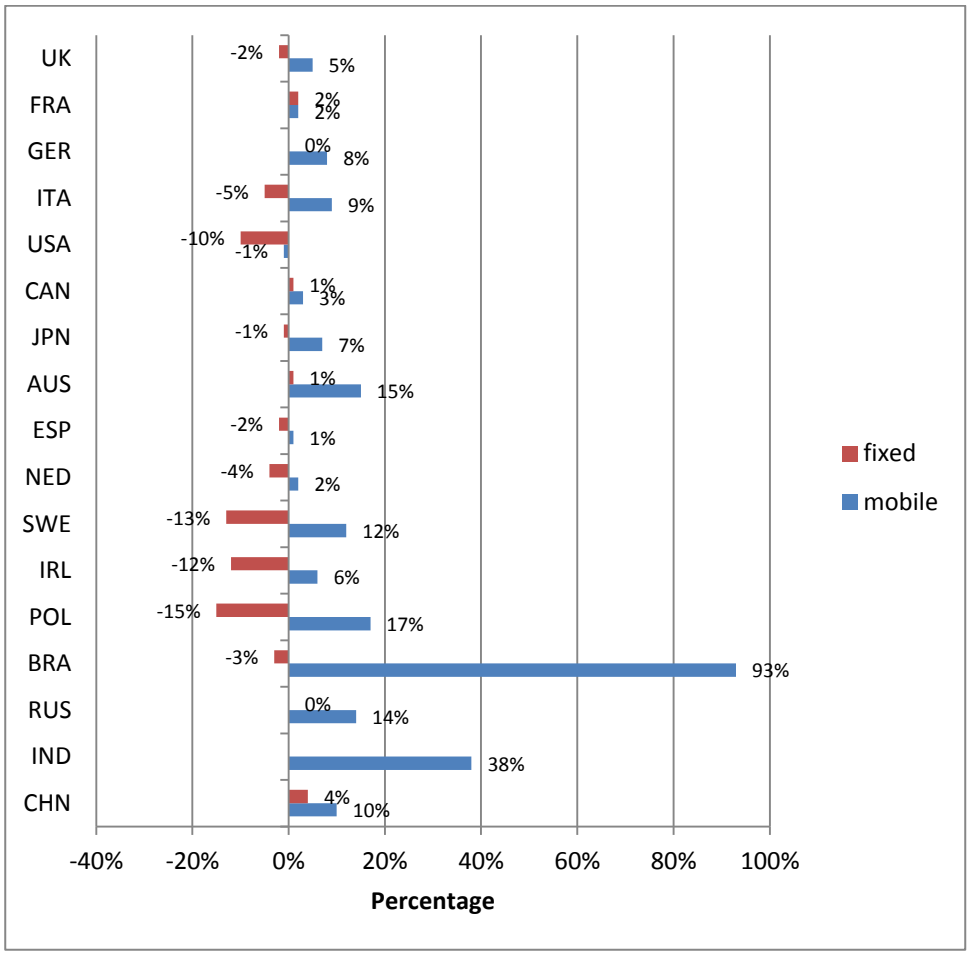
In recent years, use of mobile services for voice calls, messaging and data has increased. According to the data from UK regulatory authority OFCOM, on average, 68.3% of voice call minutes were made from mobile networks in 2010, up from 48.2% in 2005 and 66.2% in 2009 as shown in the Figure-9. Over the same period the proportion of voice connections that were mobile increased by 12.6 percentage points from 60.7% to 73.3% (OFCOM, 2011).



Source: OFCOM (2011).

Figure 9. Mobile as a portion of total connections and voice call volumes

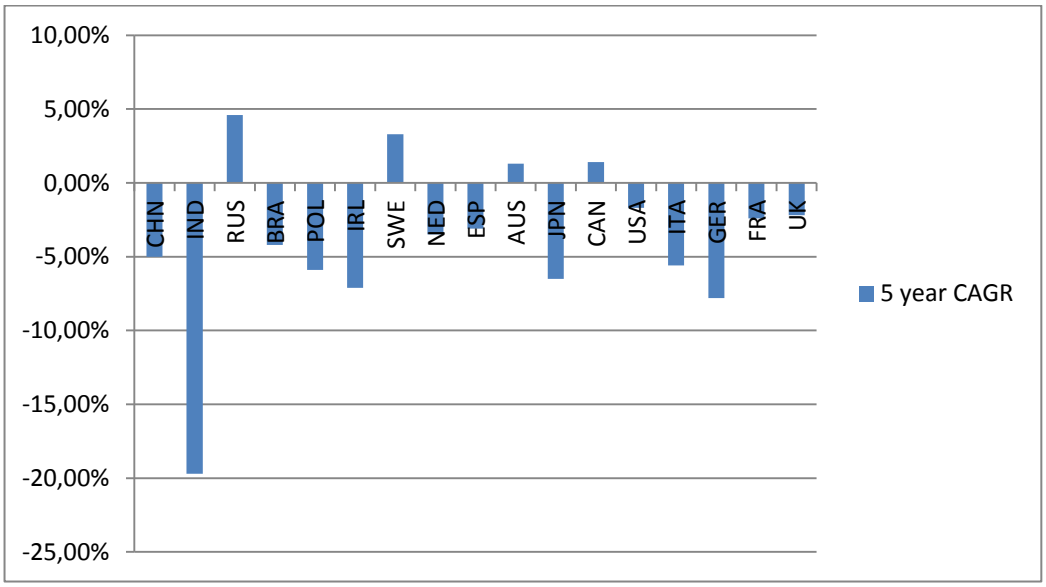
Figure-10 shows the percentage change in fixed and mobile voice call minutes for some countries in 2010, and it indicates that there were wide variations in call volume growth. The change in fixed voice call volumes ranged from a 15% fall to a 4% increase, whereas for mobile voice call volumes it ranged from a 1% fall to a 93% increase. Overall, total mobile voice call volumes increased by 15% in 2010, while fixed voice call volumes fell by 7% during the year. Among these countries, the 2.1% increase in France may be a result of the availability of DSL without a fixed line requirement. In 2010 over half of fixed voice call volumes in France were made over VoIP (OFCOM, 2011).



Source: OFCOM (2011).

Figure 10. Change in fixed and mobile voice call volumes, 2010

On the other hand, mobile operators are faced with market saturation in second generation mobile markets, declining average revenue per user (ARPU) in their existing markets and competition from voice calls made over the Internet and over Wi-Fi networks. It is estimated that the competition in mobile markets will increase parallel to the increase of new generation mobile devices that support Wi-Fi access and VoIP services (OECD, 2007). Figure-11 shows the change in average revenue per mobile connection in some major countries and it can be seen from the graph that average revenue per connection declined in most of those countries. Competition between mobile operators is the main factor behind falling prices in most of these countries. It is expected that falling prices due to the competition will also lead prices to further decrease in the near future. However, falling average voice revenue per connection is being offset by increasing average data revenues per connection (OFCOM, 2011).

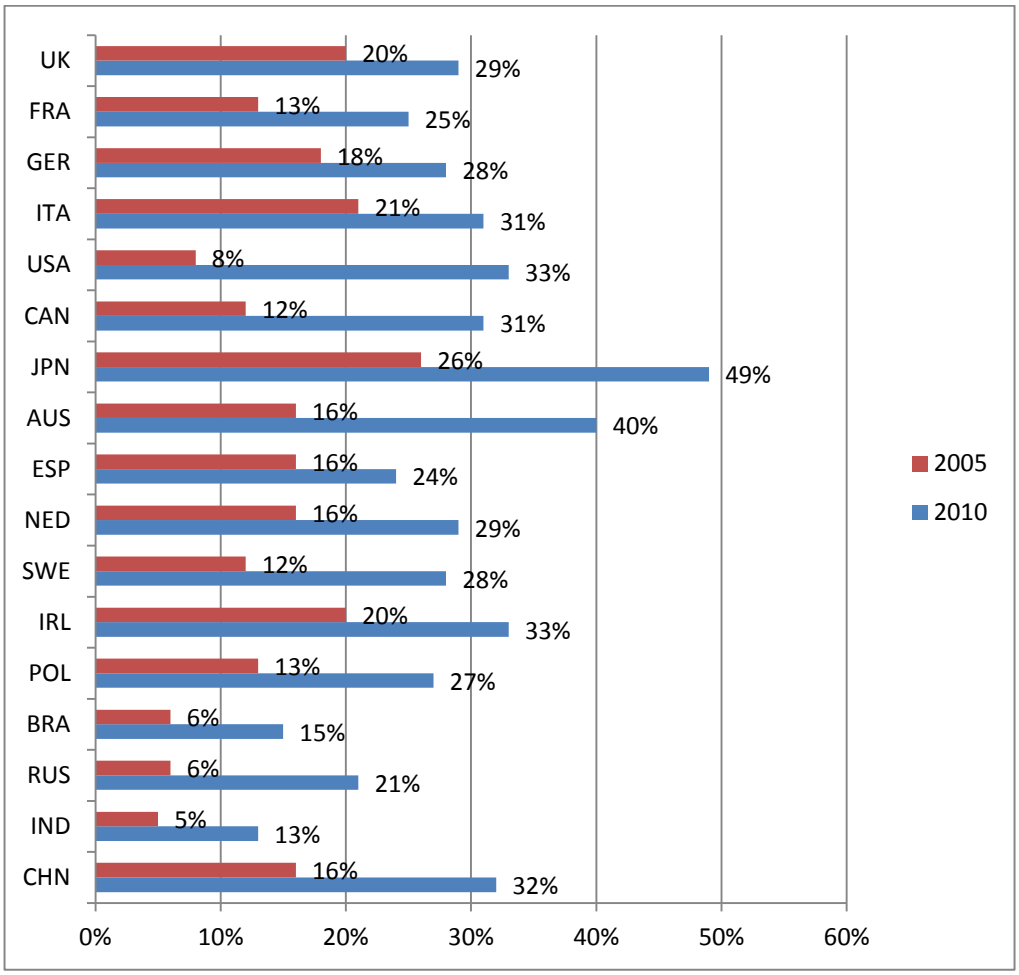


Source: OFCOM (2011).

Figure 11. Change in average monthly revenue per mobile connection: 2005 to 2010

For the projections of future revenue structure of mobile operators, it is expected that voice services revenues will stay stagnant and the expansion of mobile market will be driven by

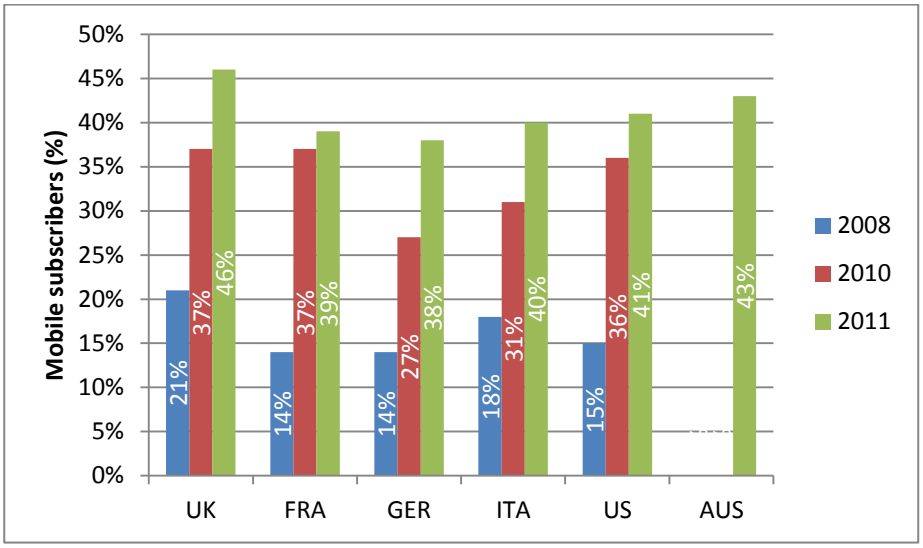
mobile data. To perform this market expansion, mobile operators have to increase network capacity and functionality as well as applications and services. This trend toward how new value can be created is based on `customer value` concept (Maitlanda, Bauerb and Westervelda, 2002). In Figure-12, proportions of data services in mobile revenues are shown for some major countries. Among these countries, Japan has the highest proportion of data services revenue in 2010 while India has the lowest proportion. Relatively low proportion of revenues generated by data services in India is the result of low availability of 3G networks and internet enabled handsets in India (OFCOM, 2011).



Source: OFCOM (2011).

Figure 12. Data as a proportion of total mobile service revenue: 2005 and 2010

Mobile devices are increasingly used for internet based services and Figure-13 shows the use of mobile phones to access internet. It can be seen that there is an increasing trend to use mobile phone to access internet in all the countries in the figure. This situation makes the mobile operators to offer 12- to 24-month contracts for free or with a discount, and with an inclusive data allowance in order to facilitate the internet services to make profit. Wide availability and take-up of smartphones is also a driver for mobile internet.



Source: OFCOM (2011).

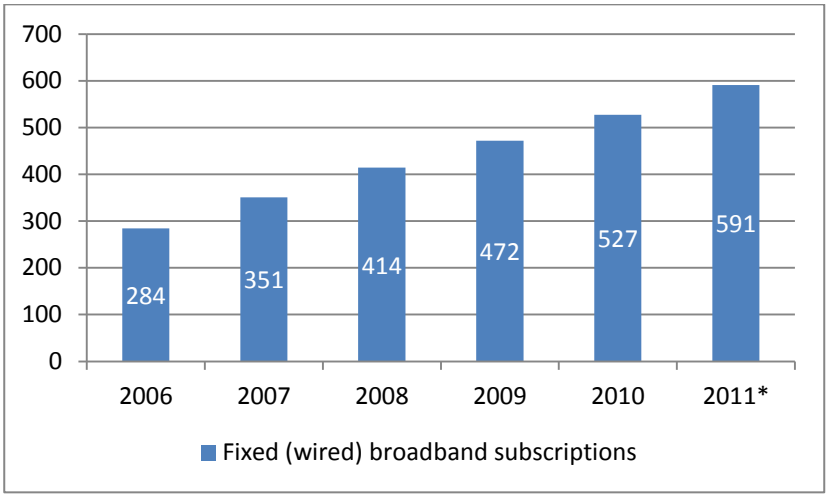
Figure 13. Use of mobile phone to access the internet

3.4. Internet

Rapid increase in the number of broadband connections based on IP creates more and more possibilities for convergence. Broadband is defined as a network offering a combined speed equal to, or greater than, 256 Kbit/s in one or both directions. Both fixed networks and mobile networks provide broadband services. Fixed broadband may be defined as transmission capacity with sufficient bandwidth to permit combined provision of voice, data, and video through a fixed line such as DSL and cable modem. On the other hand, mobile broadband

networks have data transport rates of at least 256 Kbit/s for all radio environments and they provide many advanced video applications such as mobile videoconferencing, video phone/mail, mobile TV/video player, and digital audio/video delivery (Lee and Marcub, 2011).

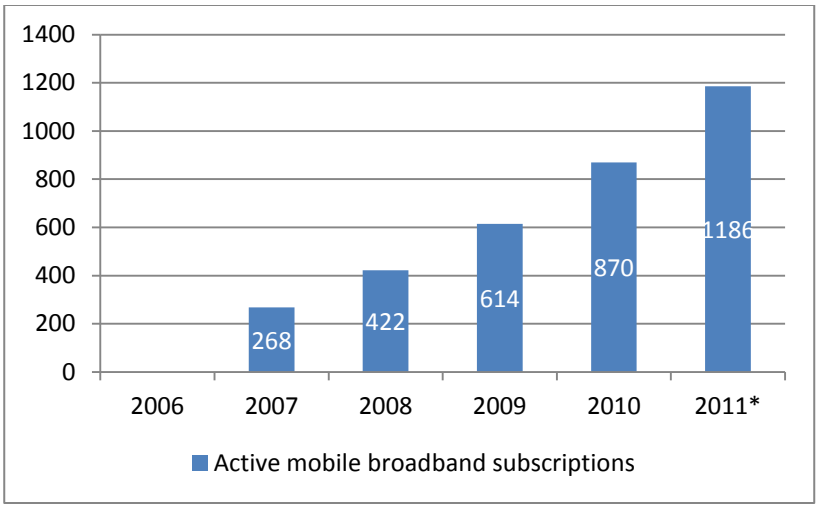
There are 612.6 million fixed lines worldwide as of end-March 2012. There is a growth trend in the recent years for fixed line broadband and particularly countries with lower penetration rates helped increase in fixed broadband growth. However, as growth continues across the board, there are signs that show the broadband market is entering a new phase where the market structure is determined by churn rather than new subscribers (Point-Topic, 2012). Figure-14 shows the change in fixed broadband subscriptions worldwide since 2006 (ITU, 2012).



Source: ITU (2012).

Figure 14. Fixed (wired) broadband subscriptions (millions)

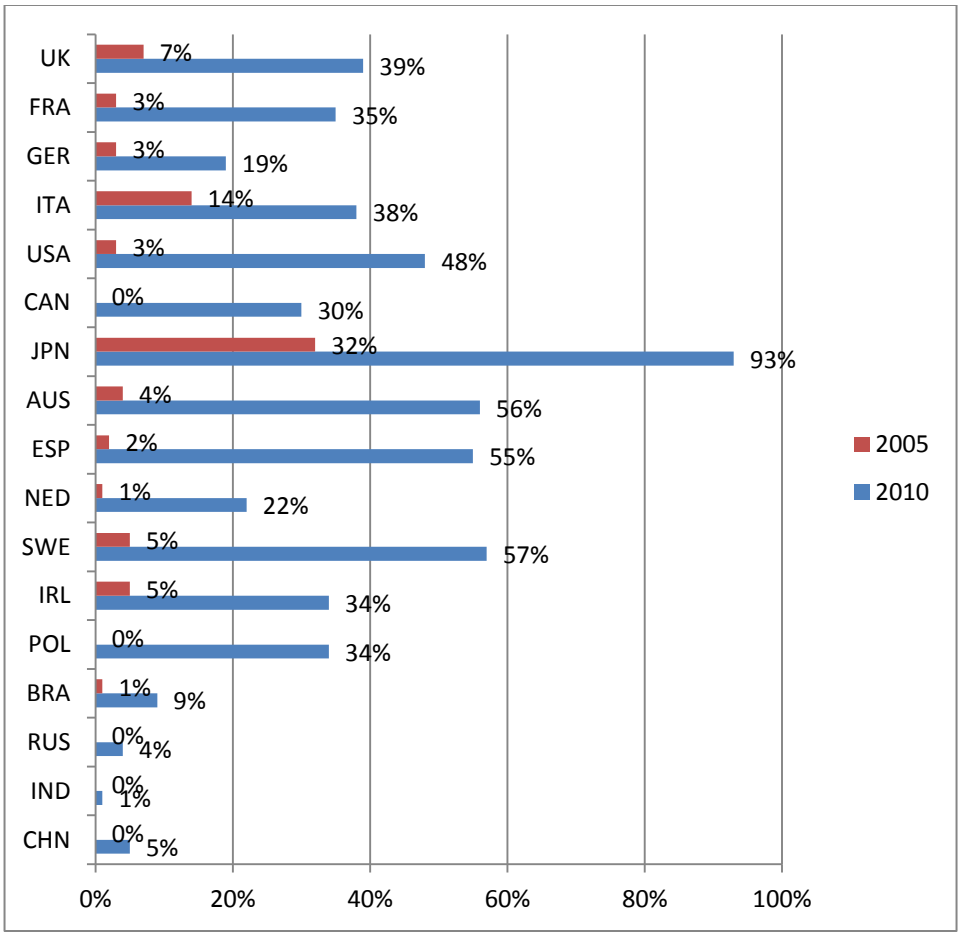
In a growing number of markets, number of mobile broadband subscribers already exceeded fixed broadband subscribers. People are getting used to having broadband access outside the home or the office. Increasingly more people are able to replace their fixed digital subscriber line connection with new mobile technologies (Eylert, Eras and Zeh, 2008). Figure-15 shows the rapid growth in take-up of mobile broadband worldwide (ITU, 2012).



Source: ITU (2012).

Figure 15. Active mobile broadband subscriptions (Millions)

Of course, mobile broadband networks can also be accessed via mobile phones, and Figure-16 shows that use of 3G mobile services in some countries since 2005. Among these countries, the highest percentage of 3G mobile services as a portion of total mobile communications was in Japan, where 93% of mobile connections used 3G at the end of the year 2010/ This was partly as a result of Japan being the first to launch 3G services (in 2001). Countries that have low take-up of 3G services reflect the ongoing roll-out of 3G networks and services in these countries. Meanwhile, in some more developed markets (such as the US and Sweden) 4G LTE networks have already launched (OFCOM, 2011).



Source: OFCOM (2011).

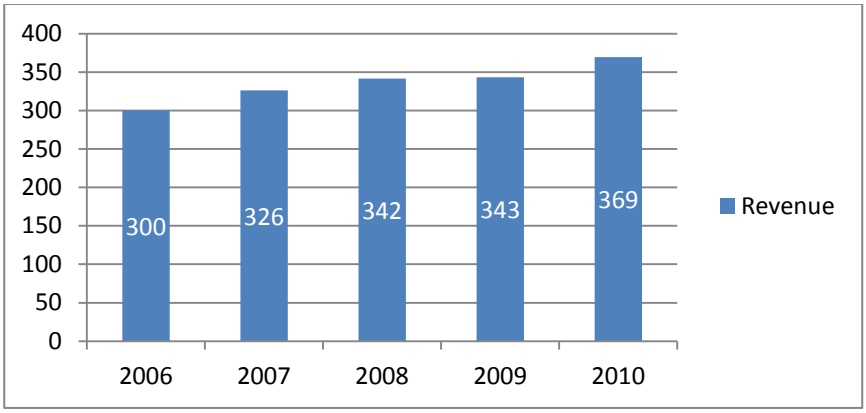
Figure 16. 3G as a proportion of total mobile connections: 2005 and 2010

3.5. Broadcasting

Until the advent of high-speed wired and wireless broadband access networks, TV and media service was a one-directional scheduled entertainment activity. Today, there are high speed broadband connections, advanced TV and audio sets, set-up boxes, PCs, game consoles and mobile devices in almost every modern digital home. Revenue structure and value chains in broadcasting industry have changed during the evolution of broadcasting. Hence, telecom operators are increasingly investing in IPTV and by this way complementing their voice and internet access services with TV and content services. Cable operators are changing their

infrastructure from analogue to digital, adding broadband access and complementing their traditional services with voice and internet access. Broadcasters are also searching hybrid solutions in order to have an interactive return channel and for this reason they are using telecom operators' or cable providers' voice and data networks (Ericsson, 2008).

Figure-17 shows the global TV revenues since 2006 and in 2010, it reached 369bn USD by 7.7% year on year increase. The figure includes net advertising revenue, TV license fees and subscriptions. The 7.7% increase in global television revenues in 2010 was driven by a recovery in the advertising market, coupled with continued growth in subscription revenues. Growth in pay-TV, launch of new services and products has also contributes to the increase in revenues (OFCOM, 2011).



Source: OFCOM (2011).

Figure 17. Global TV Revenues, billion USD

Deloitte expects that the television will be the leading sector in media industry in terms of total revenues such as advertising, subscriptions, pay-per-view, license fees etc. Deloitte claims that the majority of DVR owners will continue watching their television live although there is an option to skip advertisements in DVRs. A study in UK shows that 70 percent of people always checked to see what are shown on broadcast first, only 16 percent checked their pre-recorded

options first, and it states that despite the huge amount of TV set sales, the majority of viewing will be delivered on a pushed basis (Deloitte, 2011).

4. Main Converged Services

4.1. VoIP

VoIP services are becoming more common as electronic communications services are shifting to IP-based networks. There are some different names for VoIP services according to its underlying transport technology, such as voice over broadband (VoB) or VoIP over mobile (VoWLAN etc.). People use IP-phones, PCs, smartphones or dual mode mobile phones to access through ADSL, cable modem, Wi-Fi, 3G or other broadband connections (ERG, 2009).

VoIP services can be provided by DSL, cable or fiber broadband network operators, or third-party application providers. Since VoIP is a threat for traditional business model of incumbent operators, they often bundled VoIP services with their broadband services in order to keep their customers. Firstly, VoIP is offered on fixed broadband networks and there were only a little use of VoIP on mobile networks since mobile operators prohibited the use of VoIP services by other players on their networks. But after the smartphones became widespread, third party application providers used these smartphones to provide VoIP service and after a while, some mobile operators started to provide VoIP services on their networks (OECD, 2011).

The number of Voice over IP (VoIP) subscribers worldwide increased by 12.6% during 2010. At the end of the year, there were about just over 120 million VoIP subscribers. There are different definitions for VoIP and Table-1 shows the number of VoIP subscribers worldwide based on the definition of the VoIP service that does not require a PC to operate. For this reason, Skype services are not included in the figure but PSTN-type services are included. From 2009

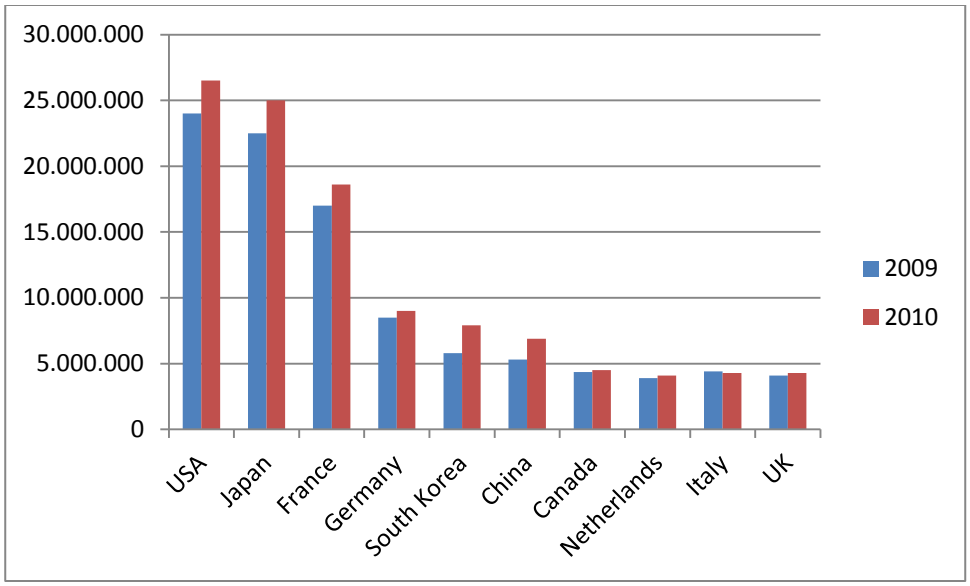
Q4 to 2010 Q4, VoIP subscribers increased in all the regions but the rate of increase was relatively low in more mature VoIP markets such as Western Europe (Bosnell, 2011).

Table 1. VoIP subscriber numbers by region, 2009-2010

Region	2009 Q4	2010 Q4	Year on year % increase
Asia-Pacific	29,102,717	33,890,259	16.45%
Eastern Europe	1,182,440	1,412,987	19.50%
Latin America	3,769,670	4,371,200	15.96%
North America	27,867,110	30,795,894	10.51%
South and East Asia	5,805,000	7,338,000	26.41%
Western Europe	39,248,238	42,656,731	8.68%
Grand Total	**106,975,175**	**120,465,071**	**12.61%**

Source: Bosnell (2011)

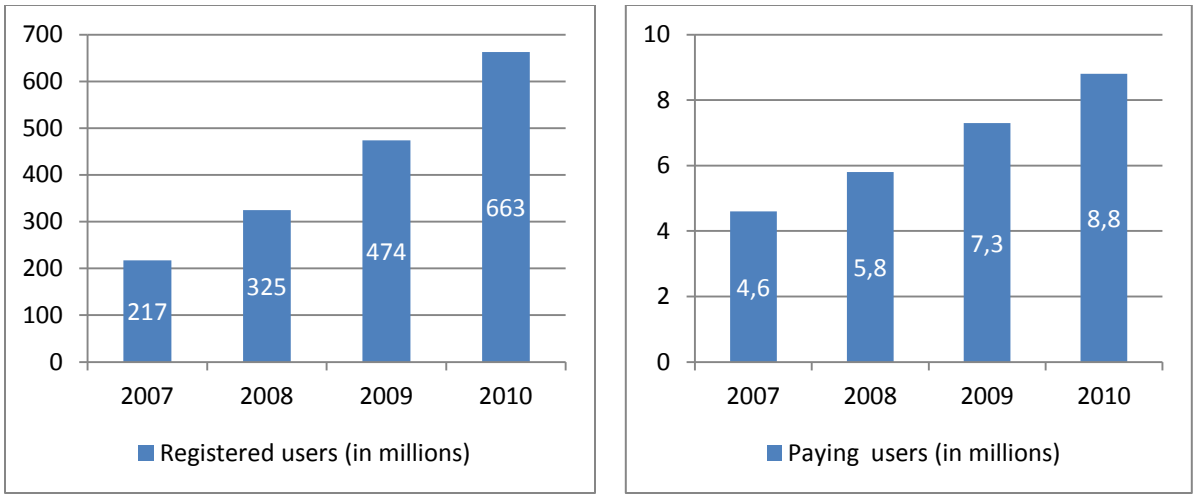
The USA was the leading VoIP country in 2010 with over 26 million subscribers. Most of these subscribers are the customers of cable companies, and also there are customers of VoIP-only providers and telecom companies that offer traditional PSTN services. Japan ranked second in the number of VoIP subscribers and there are over 24 million VoIP subscribers in this country. The country with the third largest number of VoIP subscribers is France, with over 18.6 million subscribers at the end of 2010. In France, new entrant operators started to provide VoIP services at the first years of VoIP and after a while, incumbent France Telecom was also relatively quick to launch its own VoIP products. These developments caused a shift from traditional PSTN to IP telephony. As Figure-18 shows clearly, these three countries continue to dominate VoIP, with the third largest market France having slightly more than twice as many subscribers as the next largest country market of Germany (Bosnell, 2011).



Source: Bosnell (2011).

Figure 18. VoIP subscribers in 2009 and 2010

Up to this point, the VoIP services that use IP technology to provide a PSTN-like service. But VoIP also includes internet telephony and Luxembourg-registered Skype is by far the most widespread of these services. Initially, the Skype communication were made through PCs, and then through a mobile network and Skype phones. Skype has provided some operational data for 2010, in an amendment to an S1 filing with the SEC. According to the data gathered from this SEC filing, Figure-19 shows the number of registered users and paying users for Skype since 2007. Both of its number of free and paying users increased significantly by 38% for connected users and by 19% for paying users. Its revenue also increased by 20% from $719 million in 2009 to $860 million in 2010 (SEC, 2011).



Source: SEC (2011).

Figure 19. Skype registered users and paying users (in millions)

4.2. IPTV

Internet Protocol Television (IPTV) is television and/or video signals that are delivered to subscribers or viewers using Internet Protocol (IP), but unlike the internet, it means delivery over a closed intranet. IPTV services are hosted on servers placed in the exchange, for this reason its quality of service is assured (OFCOM, 2011). It has many advantages for the operators such as providing services in less time, at a lower cost and to a larger market. By this way, operators have opportunity to bundle their services on the same protocols as internet. However, since IPTV will serve end-to end connection between customers and providers, it can create another challenge to providers that they are losing advertising which is one of main revenue source of them (Shin, 2006).

Table-2 shows the number of IPTV subscribers from 2011 Q1 to 2012 Q1. At end-March 2012, the number of IPTV subscribers worldwide stood at just over 65.6 million. Over the course of the year, IPTV subscriber numbers grew in every region, with growth rates ranging from 18% to 58%. Western Europe, which includes some maturing IPTV territories like France and

Belgium, experienced the lowest annual growth at 18%. Despite this, Western Europe remains out in front of all other regions in terms of total subscriber numbers, but this gap is being narrowed by Asia all the time (Point-Topic, 2012).

Table 2. IPTV subscribers (millions) by region, Q1 2011 – Q1 2012

Region	2011 Q1	2011 Q4	2012 Q1	Quarterly % Increase	Annual % Increase
Eastern Europe	2.5	3.63	3.95	9%	58%
South and East Asia	11.41	16.14	17.46	8%	53%
Asia-Pacific	8.08	10.17	10.89	7%	35%
Middle East and Africa	0.24	0.3	0.31	5%	29%
Latin America	0.24	0.28	0.29	6%	22%
North America	8.33	9.71	10.18	5%	22%
Western Europe	19.06	21.56	22.55	5%	18%
Grand Total	**49.87**	**61.78**	**65.63**	**6%**	**32%**

Source: Point Topic (2012)

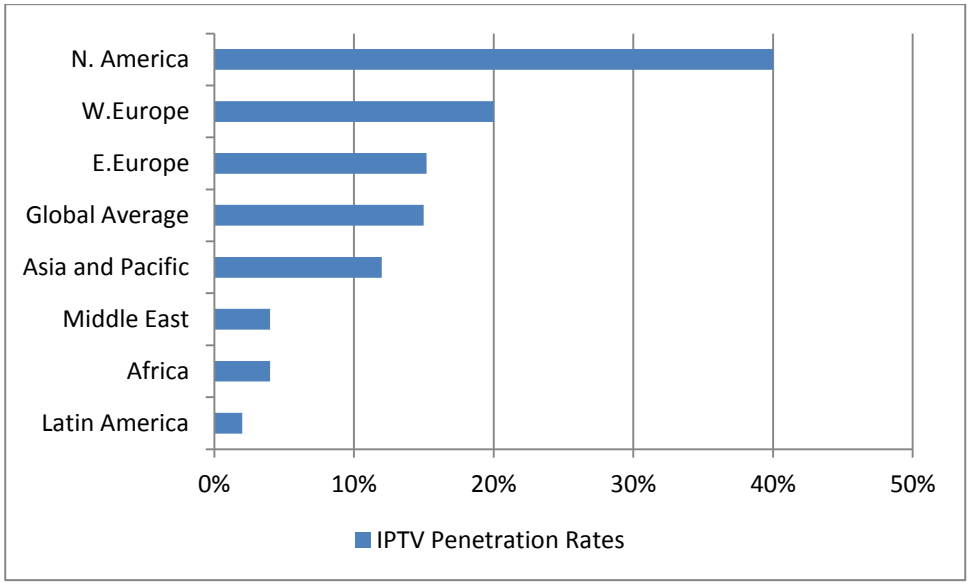
Higher bandwidth will help IPTV increase and both the US and France has high IPTV penetration rates. Table-3 shows the number of IPTV subscribers in leading countries in terms of subscriber numbers. In the US, more customers are shifting their video delivery to their broadband package (Point-Topic, 2012).

Table 3. Leading IPTV Countries by Subscribers (millions): Q1 2011 – Q1 2012

Country	2011Q1	2011Q2	2011Q3	2011Q4	2012Q1	% Growth in Year
China	11.93	13.4	14.88	16.42	17.61	48.00%
France	10.62	10.98	11.41	11.84	12.38	17.00%
USA	7.74	8.16	8.5	8.93	9.35	21.00%
South Korea	3.98	4.28	4.57	4.92	5.28	32.00%
Japan	2.87	3.09	3.35	3.57	3.81	33.00%
Germany	1.59	1.66	1.74	1.93	2.11	32.00%
Russia	0.59	0.77	0.97	1.24	1.45	145.00%
Belgium	1.03	1.09	1.14	1.2	1.25	22.00%
Netherlands	0.75	0.82	0.89	0.98	1.06	42.00%
UK	0.8	0.83	0.87	0.91	0.94	17.00%

Source: Point Topic (2012)

In terms of penetration rates, Figure-20 shows that North American telecommunication providers have succeeded in selling IPTV service to almost 40% of their broadband subscriber base. IPTV penetration of telcos' worldwide broadband subscribers reached 15% in Q1 2012, but there are different IPTV growth rates by region. Particularly in European regions and the US, there are mature markets and in these countries, prevalence of free-to-air service is a fact that affects telcos' IPTV strategies. It is very difficult to extend their customer base because of highly competitive markets in these countries (Telegeography, 2012).



Source: Telegeography (2012).

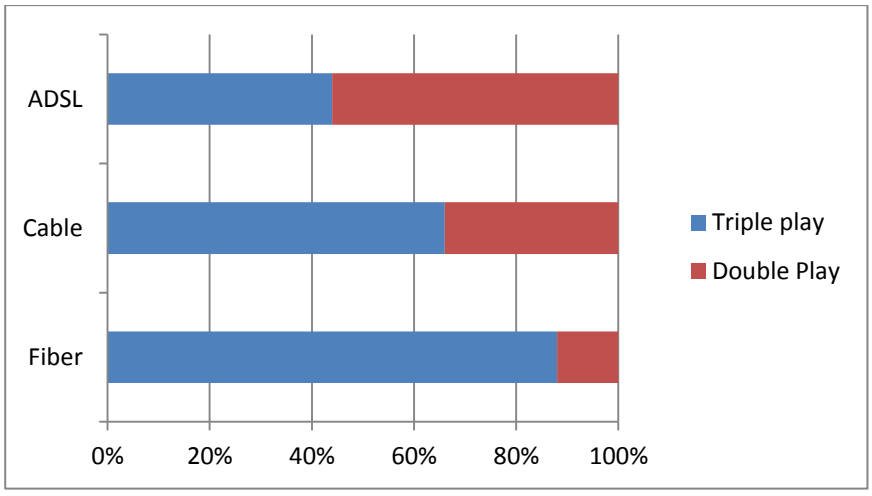
Figure 20. IPTV Penetration Rates, Q1 2012

4.3. Multiple-Play

An increasing range of suppliers are now offering consumers the option of purchasing more than one communications service. A wide range of operators, such as AT&T, Comcast, Deutsche Telekom, British Telecom, and NTT, are now offering triple play. The evolution of market makes an increasing number of market players to feel compelled to offer such a bundle (Schilkea and Wirtzb, 2012).

According to data from a research about triple play (Bughin & Mendonça, 2007), bundling is used by a large majority of providers. Their research shows that 72% of the access providers offer at least one form of double play bundle and 64% also offer a triple play sourcing of telephony, internet and video. Bughin & Mendonça (2007) also state that combinations offered by the providers contain broadband internet (100%), voice (82%) and television (45%) in the bundles.

Based on the OECD (2006a) survey titled "Multiple Play: Pricing and Policy Trends", among 87 providers in the 30 OECD countries, 48 providers in 23 countries have triple play offers and these triple-play offers are available on all main types of wired infrastructure: telecommunication lines, cable and fiber. A further 10 providers in 9 countries offer double-play packages of broadband and video over cable television networks. The remaining 29 firms in 21 countries offer double-play services of (voice and data) over ADSL. Based on the technology, multiple play offerings can be seen in the Figure-21.



Source: OECD (2006).

Figure 21. Multiple-play offerings, by technology, September 2005

Although there are many multiple play offerings in the market, those are mostly accepted as a part of a middle term business model. In the long run, it is anticipated that all the access technologies will be consolidated into one IP network for each operator. It will allow users to access same content and services from one company over a variety of technologies (OECD, 2006).

When we look at the driving forces behind the introduction of multiple-play services, we see that there are different motives for different types of market players. A few reasons are summarized below.

For telecommunications firms, steep decline in voice prices and associated revenues due to the increasing competition from new entrants and VoIP providers decreased the revenues of these firms. ADSL services offered by telecom companies partially offset these revenue losses but broadband prices are also under the price pressure because of increasing competition in the broadband market. Similarly, cable operators are also under the price pressure because of increased competition from satellite service providers. They also try to increase their revenue by offering multiple play bundles, especially internet services by making use of the return path capabilities of copper and fiber where they have an advantage compared to satellite operators (OECD, 2006). In general, industry observers have identified telcos' wireline and cable's analog video as saturated businesses and high-speed data and wireless voices as the growth products (Olmsted, 2011).

Besides increasing average revenue per use, multiple-play also brings the operators the advantage of consolidating billing services, reduced network cost and branding economies of scale. It reduces advertising, customer-acquisition and other marketing costs, because all the services can be advertised together under a single brand (Economist, 2006). Moreover,

subscribers that have more than one service of a provider will not be willing to change his/her operator. For example if a customer is happy with television services of the operator, he/she will hesitate to change broadband service provider. It is claimed that the inclusion of broadband, wireless, and multichannel video has helped stabilize sales and support customer loyalty for telcos and moreover, customer demand for such value added services created higher average revenue per user (Lee, 2008).

5. Conclusion

The communications, media and IT markets are undergoing a fundamental transformation. Convergence of these three industries can be witnessed everywhere. Convergence can be accepted as the result of technological drivers such as technological change, digitization and the Internet and socio-economic drivers such as liberalization, regulation and globalization. Firms in these industries are pushing into new sectors and changing their value chains in order to provide multimedia services. The potential for competition is increasing due to the substantial growth caused by convergence. Convergence also results in more diverse and innovative services. As the impact of convergence becomes more pervasive, the pressure on telecommunication, media and IT firms to change increases. There are many factors that will shape the transition such as new value chain, firms' skills and resources, regulations and corporate strategies. As the industry evolves and matures, firms will position themselves vertically and horizontally in the changing environment depending on their specific resources and core competencies. In this thesis, recent market developments were reviewed to form a basis for the convergence analysis.

The vision is promising; however there are some steps to migrate from the current environment to the target vision. As a first step, service providers consider bundling and business

integration before true technology convergence. There are many examples of offerings and intentions in this direction. Second step may be an end-to-end IP network which will increase cost efficiency and enable new service delivery. Lastly, once networks are unified by IP, true service convergence becomes realistic and convergence reaches its full financial potential for operators. Convergence into a single network may result in a new converged operator as well as new operator relationships that will allow operation of services across multiple domains. In a converged environment, eventually there may be a horizontal market consolidation, vertical market consolidation, or most likely a mixture of them.

Even though there are similar motives for all the market players to pursue the benefits of convergence, there are also some different aspects for each sector and each firm. Fixed telecommunication operators are facing a huge challenge because of the subscriber erosion over the last few years. Decreasing prices in the mobile telecommunication services because of increased competition and increasing availability of cheap broadband services such as VoIP are the two key factors that affect the fixed line market. Many non-traditional providers such as cable operators are now providing VoIP services that are drawing customers away from fixed telecommunication operators. These challenges enforced the fixed line operators to take aggressive steps to keep their subscriber base. They have upgraded their networks to provide new services and decreased the prices to compete with rivals.

On the other hand, in recent years, demand for mobile telephony services has increased tremendously. The gap between fixed telecommunication services has widened day by day. However, mobile telecommunication operators have faced some other challenges such as market saturation and falling prices because of increased competition. The result is a decline in monthly average revenue per user. As growth rates slow, they had to customize their services in order to

keep their profitability. They have focused on data services and they have upgraded their networks to enable providing broadband services. Now, mobile internet is a major revenue source for mobile operators but even mobile internet is becoming insufficient income source and they are seeking new and more advanced services to increase profitability.

Broadband internet is the key element of the developments in telecommunications, media and IT industries. The competition in this market is increasing gradually and by this way, consumers are benefiting from lower prices, higher speeds and a variety of products. all the market players in the electronic communication industry accept broadband internet as a way of new revenue source and product differentiation.

The traditional TV value chain is also challenged by internet based TV, internet based advertising, innovative features of video recorders, new expectations of consumers in customizing their consumption and sometimes illegal peer-to-peer downloading. Content providers also became an important player in the market and they started to provide value added services to the end users, either via websites or other broadcasting channels. In the wireline world, the content providers have established a strong position where the network operators are mostly limited to being the bit-pipe providers. Moreover, Internet Protocol Television (IPTV), the convergence services of television and Internet, is being rapidly developed around the world.

As a result of this increased competition, most market players started to address outside their traditional services in order to increase average revenue per user and expand their customer base. They started to offer new service bundles by combining previously separate offerings. Companies that traditionally offered stand-alone services have been changing their strategy to one that provides service bundles. However, the realized benefits of such a strategy highly dependent on consumer acceptance of the bundles.

To sum up, the ability of the service providers to respond rapidly to market demands and opportunities is a vital skill in this process. Their success and profitability of the firms depend on how fast they deploy new value added services. These new and innovative services will strengthen the customer loyalty and drive subscriber growth. As the number of customers demanding any kind of services anytime anywhere increases, the need of service providers to a common service delivery environment increases. Global market changes over the past few years have established a framework that will cause all existing service types to converge into a single network.

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