Understanding the Dynamics of Broadband Markets

A comparative case study of Flanders and the Netherlands

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Abstract

The Digital Agenda for Europe sets out clear goals for providing high speed broadband to all its residents, but leaves the implementation of this plan to the individual Member States. Because of large economic, cultural and political differences, the roads to realizing these ambitious goals are varying in between these Member States. This paper investigates the dynamics of fixed broadband markets in two neighboring regions: Flanders, the northern part of Belgium, and the Netherlands. The historical developments in telecom markets in both regions are highly similar and resulted in both areas in a duopoly between the incumbent, operating DSL on the former telephone network, and one or more cable operators, using the DOCSIS technology to offer broadband on the former analogue television network. However, in the race towards realizing the Digital Agenda goals, it comes down to the small differences in between both regions: the existence of housing organizations in the Netherlands has led to quite some Fiber-to-the-Home deployment, whereas in Flanders, the traditional operators use evolutionary upgrades of both DSL and DOCSIS to realize the European targets.

Keywords: *Telecom infrastructure, market dynamics, regulation, broadband, DSL, cable, FttH*

1 Introduction

In Europe we share common arrangements as to the development of the European Union. For instance, we aim at an internal market without barriers and we share a common regulatory framework for electronic communications. Moreover, we have common objectives for the development of Europe, such as the realization of a ubiquitous broadband network across Europe, initiated as part of the 'Lisbon Agenda' in 2000 (EC, 2000), and re-stated as the 'Digital Agenda for Europe' in 2010 (EC, 2010). This Digital Agenda sets out clear targets for broadband markets: "By 2020, all Europeans should have access to internet of above 30 Megabits per second (Mbit/s) and 50% or more of European households should have subscriptions above 100Mbit/s."

However, the implementation of these shared objectives is delegated to the individual Member States. Recognizing that each Member State is different, for instance in terms of endowments, historical developments, institutional arrangements, the time of joining the EU and political realities, the approach towards realizing the objectives differs between countries and hence also the outcomes vary.

This contribution is capturing the dynamics of fixed broadband markets in Flanders, the northern region of Belgium, and the Netherlands, two leading countries when it comes to broadband development in Europe, based on two longitudinal case studies. As the first in-depth study of this kind, the study is descriptive and exploratory in nature. We provide a summary of historical developments of the telecommunications infrastructures in both regions, aimed at identifying the cultural, political and industrial traditions that have influenced the behavior of the actors in the telecom industry in the past and that may influence their actions in the future, and on how the different market players involved will act to realize the goals of the European Digital Agenda.

The broadband markets in Flanders and the Netherlands have three main features in common: (1) the *regime*, shared political and regulatory frameworks for electronic communications; (2) the *outcome*, they are both in the top of the league table on broadband penetration; (3) the *industry structure*, both have a high degree of infrastructure-based competition. However, there are also important differences: (4) the *role of the central and local government*, as well as (5) the *role of third party actors* such as housing corporations and construction firms. This paper will investigate whether exactly these – rather small – differences can explain the large divergences in the paths both regions follow to achieve the Digital Agenda targets.

This contribution is structured as follows: in section 2 we provide a short overview of the methodologies and frameworks used for the longitudinal case

studies of historical developments of the telecommunications infrastructures in Flanders and The Netherlands, which is presented in section 3. Section 4 focuses on the developments that led to the current broadband markets in a largely duopolistic setting.[1] Section 5 analyses the historical developments from a multi-actor point of view. This analysis is further used in section 6 to describe the possible paths that could (or should) be taken to achieve the Digital Agenda targets. Finally, section 7 concludes this paper and gives suggestions for further work.

2 Methodology

This contribution is aimed to capture the dynamics of fixed broadband markets in Flanders and the Netherlands. As a first in-depth study of this kind, the study is descriptive and exploratory in nature and therefore we apply a light theoretical structuring. Therefore, the frameworks and methodologies below are used implicitly.

To capture the developments in the two geographical areas we apply a longitudinal case study approach following the methodology by Yin (1989). To allow the features of the cases to be captured we have applied a so-called thick description of which a summary is included in this paper. To develop this description we have been guided by the concepts and models on industry development provided by Porter (1980) on industry profitability, being influenced by the bargaining power of buyers and suppliers, the threat of entrants and substitutes. Furthermore, the SEPT model by Wheelan and Hunger (1983) is used to capture the impact of external factors of socio-cultural and economic drivers on policy, regulation and technological developments. The dynamic market theory described by De Jong (1996), allows us to investigate technological developments, the number of firms in the market, the firm size and distribution, the degree of rivalry, the degree of collusion and the degree of cooperation; and De Wit & Meyer (2010), for the dimensions of the industry development path: expansion-contraction of demand, concentration-fragmentation of the market, convergence-divergence of business models, expansion-contraction of investments, vertical integration-fragmentation, horizontal integration-fragmentation and international integration-fragmentation.

In the comparison and analysis of the two case studies a multi-actor perspective has been applied following De Bruijn and Ten Heuvelhof (2008).

[1] In this paper we focus on the roles of the PSTN and CA-TV incumbents, the role of the other licensed operators in the development of broadband falls outside its scope.

3 Historical developments in telephone and CA-TV networks

In order get to a full overview of the historical developments and complete longitudinal case studies, we will begin our analysis at the end of the 19th century, when the first telephone networks were deployed. We will focus on the evolutions in both copper (telephone) and cable (CA-TV) networks, since both currently play an important role in the offering of broadband in the regions under study.

In this section, we will describe how private initiatives were soon taken over by local and national authorities, how monopolies long ruled, and how liberalization and privatization, triggered by the European Telecom Reform, aimed to introduce more competition and dynamic efficiency in telecommunications markets.

3.1 Developments of copper networks: from private initiatives to a monopolist situation

3.1.1 The development of the PSTN in Flanders

The first introduction of the telephone in Belgium originated from the Belgian Parliament (1879), but the public became acquainted with the telephone thanks to the American International Bell Telephone Company (BTMC, 1982; Dienst Pers en Informatie, 1982), which built the first local telephone network in Ostend in 1886. The networks owned by this and other private organizations covered the densely occupied cities, but did not reach out to the rural areas. The State recognized the public value of a nation-wide telephone network and therefore invested in establishing a public company that received total control of the network.

With the consequences of the First World War, the Belgian authorities had to deal with great financial troubles and could no longer support the public telephone company. To avoid losing telecommunications facilities by the lack of financial means, a new company was founded: the RTT (Regie Telegraaf en Telefonie) in 1930. This public company received the monopoly over the whole telephone network, but was created as an autonomous entity, no longer depending on the funding provided by the government.

To repair the damages experienced during the Second World War, the State decided to intervene financially to give a boost to the telecommunications sector. While in theory the company was autonomous, in practice, the involvement of the State was never far away. This financial intervention of the State gave the RTT the possibility to invest in the development of its network. The booming economy at the time provided the opportunity for the Belgian population to subscribe to the telephone network. The growing demand of subscribers stimulated the RTT to

invest even more in its network (the expansion of demand led to an expansion of investment) – from 350 000 connections in 1946 to 1 049 000 in 1965 – making the Belgian telephone network one of the most developed and progressive at the time with a penetration of 33% of households (ITU, 2008).

Although the RTT was a successful company, its monopoly rights (not only on ownership and exploitation of the copper network, but also on the providing of services and equipment) made the telecom market in Flanders quite inefficient, as the RTT was not obliged or incentivized to offer the most innovative products at the lowest prices. In the 1970s, the number of subscribers ceased to rise exponentially, which revealed the inefficiency problems of the RTT. Customers (especially business subscribers) began to realize that the prices they were paying were too high. This awareness also rose in other countries and was the major cause for European-wide regulatory intervention.

3.1.2 The development of the PSTN in the Netherlands

The first application of the telephone in the Netherlands was in the form of an extension of the government owned telegraph system. The provision of a telephone service to the general public was left to private initiative. As an example, the City of Amsterdam selected the Nederlandsche Bell Telephoon Maatschappij (NBTM) and granted it the sole right to the installation of a telephone network, provided the company would honor all requests for a connection within its licensed area of operation (De Wit, 1998). The company established networks in 18 more cities, while other firms established networks in other towns.

Many of the local networks remained small and were suffering from underinvestment. This was an outcome of the license condition, stating that the municipality would obtain the network at taxation value at the end of the licensing period or the licensee would have to dismantle the network. In 1896, upon the expiry of the license, the City of Amsterdam decided based on public interest considerations to assume the exploitation of the network.

In 1904 a new law was enacted the ‘Telegraaf en Telefoonwet’, with as main principle the municipal exploitation of telephone networks, but with the option for the State to assume ownership in the ‘public interest’. From 1906 the state started to build and exploit new networks. The NBTM networks transitioned in ownership as of January 1913. The ‘nationalization’ was completed in 1927, with three exceptions: the networks in the three major cities – Amsterdam, Rotterdam and The Hague – receiving new licenses in 1921 and 1925. They were ‘nationalized’ as a result of the Nazi occupation in 1940. The number of telephone lines grew in an almost linear development to approx. 325 000 by 1940, to reach

1.5 million lines in 1965 equivalent to 12 percent of the population, or 48 per 100 households (Schuilenga et al., 1981; De Wit, 1998; ITU, 2008).

3.2 Developments of cable networks: private initiatives and the influence of the municipalities

3.2.1 The development of the RTV-cable network in Flanders

Distribution of television channels by cable networks originated in the USA in 1947. Belgium was the first country on the European mainland that established cable distribution networks in the early 1950s. The first cable lines were installed in large apartment buildings where the residents invested jointly in one antenna and distributed the signals using cable. Soon, some of those networks were combined into inter-municipal networks, sometimes with participation of private firms. The number of subscribers grew rapidly: more than 50% of the Belgian viewers had subscribed by 1976. By 1996, 38 cable companies with a total subscription base of 95% of the households, made Belgium the world's leader regarding cable penetration. Competition wasn't present at the time, since every cable company operated in its own geographical region.

The growing demand resulted in serious expansion campaigns during the 1980-1990s, thereby enhancing the quantity and quality of the offered TV-services. Starting in the 1990s, many companies merged in order to be able to keep up with the required investments. This resulted in a few big companies, geographically separated, operating the cable networks.

3.2.2 The development of the RTV-cable network in the Netherlands

Following early experimentation in the 1920s, Philips started experiments with electronic television in the mid 1930s. Television broadcasting on a regular basis was introduced in the Netherlands in 1951 and national coverage was realized in 1957.

Shortly thereafter the use of equipment for the central reception and distribution of the signal (CAI) were introduced, primarily by housing corporations in high rise buildings. These systems improved signal quality and reduced the need for individual antennas. The use of these systems officially was the prerogative of the PTT, having obtained the monopoly on the distribution of broadcasting signals. However, during the 1950s and 1960s the practice was condoned for practical reasons. In 1975, in a modification of the Telegraph and Telephone Law, the role of the cable networks was reconfirmed as aimed at distribution of RTV-programs, based on technical guidelines to be issued by the PTT. Integration with the telephone network was considered, but not pursued.

Through the Law the monopoly position of the PTT was replaced by a concession system, which allowed the legalization of the CAI-systems. Given that only one concession per municipality was made available, most local governments obtained this permission and, hence, cable networks became predominantly owned by the local governments. The exploitation of the networks was often delegated to the local/regional energy company or to private firms (Jelgersma and Titulaer, 1981; Schrijver, 1983; Davids, 1999; NLKabel, 2009).

3.3 Telecom Reform

The involvement of the European Commission in the telecom sector in the 1970s follows naturally from the objective to create a 'common market' and increase economies of scale to meet worldwide competition. Moreover, next to being an important 'high tech' sector, telecommunications could be an important means for achieving 'economic unity' in Europe, and to bridge social and cultural differences.

So far, telecommunications services had remained firmly in the hands of the national operators, but this would change with the 1987 landmark document "Green Paper on the development of the common market for telecommunications services and equipment" (EC, 1987). The first and politically acceptable step in the process of liberalization was aimed at introducing competition at the service level, while the infrastructure could remain under monopoly control. However, "the Commission recognized that the gains in innovation, productivity improvements and price re-structuring would only come about through competitive entry in infrastructure, be it at a local level by up-grading cable networks or building new ones, or more immediately through alternative backbone investments" (Bangeman Group, 1994). By the end of 1994, the European Council officially recognized the principle of liberalization and it set January 1st, 1998 as the date "by which all remaining restrictions on service competition would be lifted" (Cawley, 2001).

In response to the Reform the incumbent operators were privatized, the market liberalized and competition emerged. RTV–cable networks were considered as one of the few if not the only alternative infrastructure that would provide for 'infrastructure-based' competition.

3.3.1 Response to Telecom Reform in Flanders

The directives stemming from the EC and the decreasing satisfaction of the Belgian customers made the authorities realize that change was needed. In March 1991, the proposals of the European Green Paper were incorporated in Belgian Law (België, 1991; Vlaamse Overheid, 1991), which led to the foundation of two institutions: Belgacom, an autonomous telecommunications operator with a

monopoly concerning the copper telephone network and BIPT (Belgian Institute of Postal Services & Telecommunications), a regulatory agency.

Belgacom was created as a successor of the RTT and subsumed the entire Belgian telephone network. The main difference between the RTT and Belgacom concerned the degree of monopoly. The RTT had the monopoly of exploiting the whole telephone network, while Belgacom only inherited the monopoly on the "public telecommunications".[2]

The EC liberalization directive obligated Belgacom to open up its network to new entrants starting from January 1998. The consequence of this liberalization was the emergence of many new OLO's (Other Licensed Operators) in the following years. This opening of the market related to the copper network stood in great contrast to the intense concentration of the market for cable networks. In the cable market, one specific public initiative: "Multimedia in Vlaanderen" in 1996 (Van den Brande, 1996; van Batselaer et al., 1997), set up by the Flemish government, initiated drastic changes. The main reason for this project was the importance to close the 'digital gap', but also other drivers – job creation and promotion of R&D in the IT sector – played their part. The major element of the project was the establishing of Telenet, set up to interconnect and ultimately unite the independent Flemish cable companies to achieve an interactive broadband network offering broadcast, telecommunication and multimedia services. First, Telenet operated next to other cable companies (UPC Belgium and Interkabel Vlaanderen), but due to acquisitions of those companies in 2006 and 2007 respectively, Telenet is now the only cable operator in Flanders.

The fragmentation of the PSTN market remained limited, as the new entrants had to combine the investments attached to the starting-up of a new company with lower prices and/or better products than the incumbents, because they had to overcome customer loyalty for the existing brands. With more firms on the market, the customers could play competitors off against each other while forcing down prices or demanding higher quality or more services.

3.3.2 Response to Telecom Reform in the Netherlands

The privatization process of the incumbent operator PTT did run in parallel with the European Reform debate and was triggered by concerns voiced by the

[2] The Law of 1991 classified public telecommunications as:

- construction, maintenance, modernization and operation of public telecommunications infrastructure;
- the exploitation of the reserved services (including telephone and telegraph service,
  provision of fixed links for third parties;
- the construction, maintenance and operation of the publicly accessible and on public domain located establishments intended for telecommunications.

business sector, which were reflected in an Arthur D. Little report in 1981. This report led to the appointment of the "Swarttouw Committee" and the "Steenbergen Committee", whose recommendations became input to the political debate, leading to the decision to transform the PTT into a separate legal entity, with initially the State as the only shareholder. The process was to be realized formally by January 1st, 1989.

In June 1994, the privatization process was initiated with an IPO. The company would obtain the right to issue preferential shares as a way to fence off a potential hostile take-over. The state would retain a so-called 'Golden Share', allowing the state the right of veto, which was deemed necessary to protect the 'public interest' (NRC, 1994). In 2003 the ownership by the state of the 'Golden Share' in KPN was being challenged by the European Commission and in the fall of 2006, the state sold its remaining shares in KPN, completing an institutional change process that was triggered 25 years earlier.

The EU initiated Reform, which required the transposition in national legislation, changed the position of the cable operators vis-à-vis KPN. They were allowed to interconnect their networks, a process that was realized mainly through optical fiber. The Reform also brought an end to the concession system and, hence, increasingly private entrepreneurship took hold of the cable sector as municipalities began to sell their networks. This consolidation process eventually led to two major cable companies, Ziggo and UPC (who essentially have monopolies in their territory) plus a few niche players.

Another consequence of the Telecom Reform was the establishment of OPTA (Independent Post and Telecommunications Authority of the Netherlands), the National Regulatory Agency in 1997. OPTA's mission is stimulating competition and protecting the consumer. OPTA is responsible for the implementation and enforcement of telecommunications policy (OPTA, 2011).

4 Development of broadband in a commercial and technical duopoly

Although the European Telecom Reform aimed at introducing more competition by allowing new entrants to compete on the copper network, it mostly resulted in a competitive duopoly between the incumbent operator (Belgacom in Flanders, KPN in the Netherlands) and the cable operators (Telenet in Flanders, Ziggo and UPC in the Netherlands). This section will describe the evolutions and most important events in the development of broadband (internet), while focusing on the tit-for-tat competition between copper and cable. A summary of the most important events for both the incumbents and the cable operators is given in the figures below. Important to mention here is that, although this paper focuses on the development in fixed broadband markets, we also include a timeline for

mobile communications because all operators offer quadruple play services (including television, internet and fixed and mobile telephony).[3]

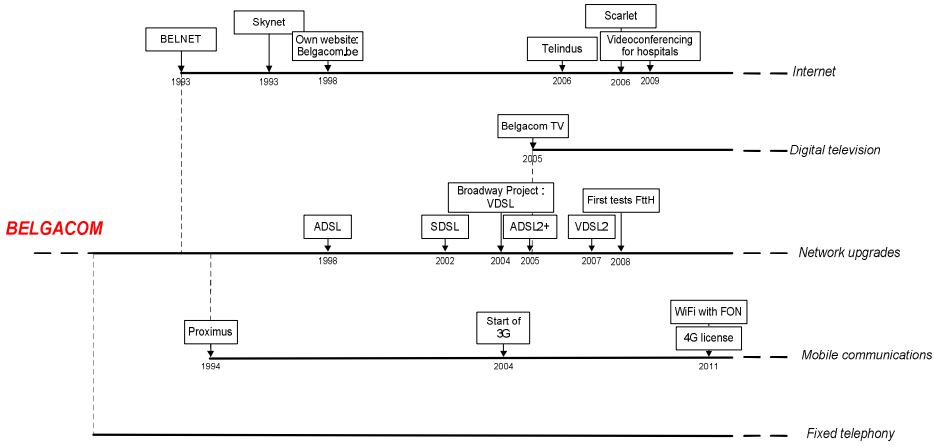

Figure 1: Overview of developments in the PSTN network of Belgacom

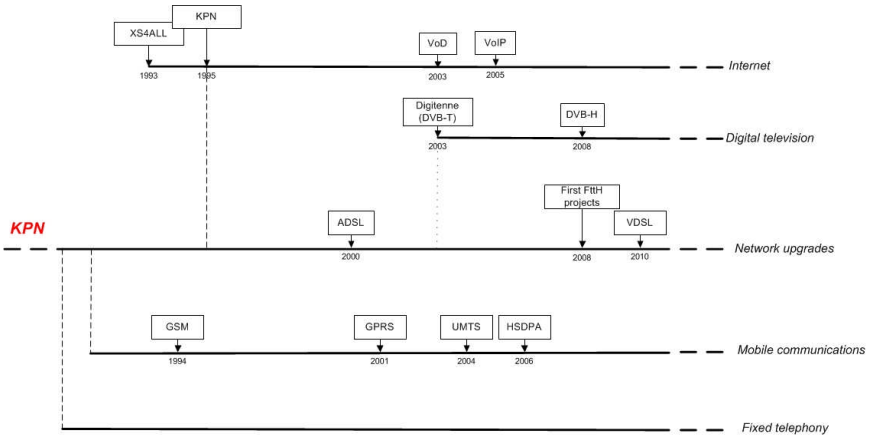

Figure 2: Overview of developments in the PSTN network of KPN

[3] Telenet offers mobile services in collaboration with mobile operator Mobistar, owning the license. Ziggo and UPC teamed up and acquired a license in the 2.6 GHz band to build their own mobile network.

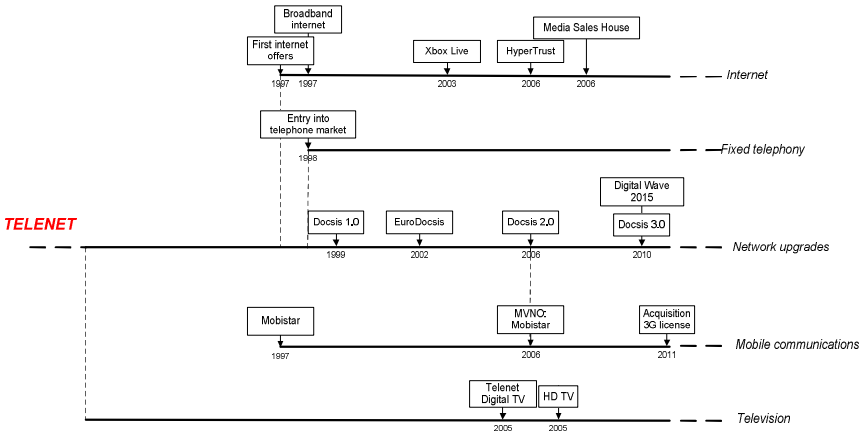

Figure 3: Overview of developments in the cable network of Telenet

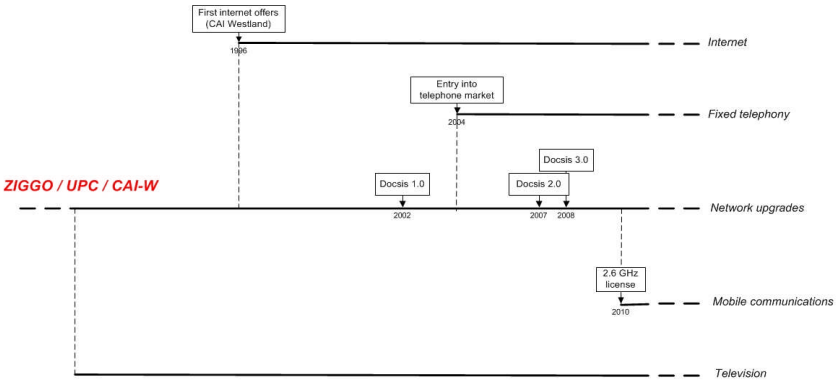

Figure 4: Overview of developments in the cable networks of Ziggo and UPC

4.1 Development of broadband by Belgacom and Telenet in Flanders: a competitive duopoly

The introduction of the Internet in Belgium was realized by the research centers, who wanted to provide their researchers with the possibility to connect to powerful remote computers. The first narrowband (64 kbit/s) network was operational in 1993 by BELNET (BELNET, 2010). Belgacom entered the internet market in 1996 with the acquisition of Skynet, a company providing internet services founded in 1995.

Flanders discovered the opportunities of broadband internet competition in 1997. In July, Telenet finished rolling-out an extensive backbone in fiber of about 600 kilometers in order to connect the individual networks of the different cable companies and replacing the amplifiers all over the network with bidirectional versions to allow broadband traffic in both directions. The first broadband connections were installed in August 1997, using Telenet's HFC (Hybrid Fiber Coaxial) architecture.

The introduction of broadband internet over the copper network followed with the execution of a pilot project for the testing of ADSL (Asymmetric Digital Subscriber Line) in 1998. Because of the success of the project, Belgacom Skynet was one of the first operators worldwide to commercially introduce ADSL in April 1999.

These evolutions led to the current situation in Flanders: a duopoly between Belgacom and Telenet, both taking up almost half of the market share, leaving only a few percent for other operators. Both upgrade their network gradually, but they are not inclined to take on high-risk investments (Lannoo et al., 2006). Figure 1 and Figure 3 give an overview of the gradual upgrades of both networks. Mid 2011, Belgacom offers to residential users a maximum download speed of 30 Mbit/s and a maximum upload speed of 4.5 Mbit/s, while Telenet's limits are at 100/5 Mbit/s (down/up) (Telenet, 2010a; Telenet, 2010b; Belgacom, 2009; Belgacom; 2010; Boonefaes, 2006; Cable Labs, 2011).

To face the competition, both Belgacom and Telenet expanded their range of services (Figure 1, Figure 3). Currently, both Belgacom and Telenet are quadruple play operators, offering broadband internet, fixed and mobile telephony as well as digital television (Telenet, 2011; Wikipedia, 2011). Important to mention here is the share that digital television takes up in the internet bundles. Of all internet bundles offered (on a Belgian scale), about 80% includes digital television (BIPT, 2011). Telenet acquired a license for DVB-T broadcasts in Flanders in 2010, but this service hasn't been commercialized. At the moment only a free terrestrial broadcasting service (customers can get this service just by buying a digital antenna) is available in Flanders offering the channels of the public broadcaster VRT.

Belgium is one of the leaders of the market when it comes to coverage of ultrahigh broadband; according to Akamai Belgium ranks 10 globally with average data rates observed of 6.1 Mbit/s and ranks 6 on peak data rates observed of 26.7 Mbit/s (Akamai, 2012).

4.2 Started by the academic community, followed by KPN and the cable operators: broadband development in the Netherlands

Analogously to Flanders, the academic community played a leading role in broadband development in the Netherlands. The Dutch government acknowledged the impact of microelectronic technologies on employment, which led to publication of the "Informatica Stimuleringsplan". This plan included initiatives and funding to promote ICT usage in higher education. The academic community responded and obtained governmental support (€140 million) for the development of a multi-year project plan, that was released in 1985 by the coordinating committee "Samenwerkende Universitaire Rekenfaciliteiten" (SURF). The data networking services to the universities and academic research centers were to be provided in cooperation with the incumbent telecom operator PTT (now KPN). In 1987 SURFnet1 started to connect all 14 universities using Datanet1, the packet switched network operated by the PTT. Updates followed in quick succession and by 2002, SURFnet6 connected 170 institutes (approx. 500 000 users) with backbone and access connections up to 20 Gbit/s, based on the TCP/IP-protocol.

In 1993, the Hack-Tic[4] community established XS4ALL, the first dial-in internet access provider open to the general public (Hack-Tic, 1993). Initial access to the internet was through dial-up connection using the telephone network, the data rates available starting at 1200 bit/s to increase to 56 kbit/s. In 2000, the first ADSL connections were provided by Demon using the network facilities of BabyXL Broadband (since 2002 part of Tiscali) and by XS4ALL, providing data rates of 512/64 kbit/s (downstream/upstream) and 1024/256 kbit/s respectively (XS4ALL, 2001; Meerman, 2004).

KPN is now the leading provider of ADSL under multiple brand names, in part acquired through consolidation (Het Net, Planet, and XS4ALL). Moreover, other ADSL providers make use of the local loop owned by KPN through unbundling (e.g., BBned, Tele2). Gradual upgrades (towards VDSL, see further) allowed offering more and more bandwidth to the customer. Now, KPN is offering services up to 50/5 Mbit/s (down/up).In 1996 CAI Westland, a cable network operator in the western part of the country, was the first cable operator to provide internet access, using the DEMOS-1 system of DeltaKabel Telecom at a data rate of 115 kbit/s against a flat rate (Verbree, 1997; Wikipedia, 2010). Later, the major cable network providers became internet access providers: UPC using the Chello

[4] Hack-Tic was a magazine advertised as being aimed at 'techno-anarchists' that started to appear in 1989 (Hack-Tic., 2003).

brand name, Casema under the French Wanadoo brand, and Essent Kabelcom using @Home (the latter two later merged under the new name of Ziggo).

While the Internet Protocol supports the distribution of video signals, the Internet is not ideally positioned for broadcasting TV signals in real-time. To facilitate infrastructure based competition on the basis of Triple-play offerings, i.e. television, telephony and internet combined, KPN, in a consortium with broadcasting entities, obtained a license for nationwide terrestrial distribution of digital radio and television signals (DVB-T). The required radio spectrum had become available after the shut-down of analogue TV broadcasting, the so-called Digital Dividend. In 2003, the service was launched under the name 'Digitenne'. Meanwhile, KPN has obtained 90% of the shares and is the monopoly provider of digital terrestrial TV broadcasting (KPN, 2009; Wikipedia, 2009). From 2005, the major broadcasting stations started to use the Internet as an alternative distribution channel, to offer delayed viewing of their programs (e.g., www.uitzendinggemist.nl).

The developments have resulted in the Netherlands assuming a top-tier position in the penetration of broadband within Europe; according to Akamai, the Netherlands ranks 4 globally with average data rates observed of 8.2 Mbit/s and Amsterdam being the leading city in Europe with 9.5 Mbit/s. On peak data rates observed The Netherlands ranks 9 globally with 25.0 Mbit/s (Akamai, 2012).

5 Flanders and the Netherlands: alike but different?

The previous sections described the historical developments of broadband markets in two neighboring regions: Flanders and the Netherlands. It is remarkable how many similarities can be found. The differences, however, are more subtle, but definitely not of less impact. Based on a multi-actor analysis, this section will investigate these similarities and differences into more detail, to see how they have influenced the developments in the past and how they could be of influence in future developments.

Table 1 gives an overview of the key players in the different periods that led to broadband for both regions. Throughout the history of both the PSTN and CA-TV network, we see the emergence of the same actors in both countries. The first telephone and television networks were installed by private undertakings, but soon, public interest considerations made public parties invest in those networks. The subtle difference here is to be found in the role of municipalities and housing organizations in the Netherlands. In Flanders, municipalities only played a role in the first period of cable deployment, and housing organizations just don't exist. In both cases, the decreasing satisfaction of the (business) customers, in combination with the imminent European Reform, made the countries decide to privatize their

incumbents. KPN is fully privatized, while the Belgian government still holds the majority (50% +1) of shares in Belgacom.

Table 1: Multi-actor analysis for the historic developments towards broadband markets

		First initiative	Large-scale deployment	Telecom reform	Duopoly situation
Flanders	copper	Private companies	Government	Belgacom and OLO's	Mainly Belgacom (50%+1 state ownership)
	cable	Residential initiatives	Municipalities	Telenet	Telenet (private, monopoly on cable)
Netherlands	copper	Private companies	Municipalities and government	KPN and OLO's	Mainly KPN (private)
	cable	Housing corporations	Municipalities	UPC and Ziggo	UPC and Ziggo (private)

The market for broadband has become characterized by a techno-duopoly in both countries, consisting of KPN and Belgacom, providing broadband services on a national basis using the PSTN, and the cable providers, Ziggo and UPC in the Netherlands – Telenet in Flanders, using the CA-TV network. This techno-duopoly has led to well developed networks in the Netherlands and Flanders assuming a top-tier position in the penetration of broadband in Europe

Remarkable also in both countries, is the evolution of both types of networks. First initiatives were always taken by private entrepreneurs; large-scale deployments were strongly coordinated and influenced by public authorities, who intervened because of public interest considerations. While the Telecom Reform obligated the copper operators (Belgacom and KPN) to open up their network through local loop unbundling and bitstream access, the geographically split cable networks were, at the same time, united into large region-wide companies. Both paths were followed with one common objective: the creation of more competition in the telecommunications sector, which is in line with the European guidelines.

6 What about the future? Evolutions and upgrades needed to reach the Digital Agenda targets

Offering of a fast and reliable broadband connection in a common market has been one of the key action points of the European Commission for some time now. The first real change was triggered by the publishing of the Green Paper in 1987, now all eyes are focused on the goals for 2020 as described in the European Digital Agenda. Several targets are listed, but the main focus lies on "offering at least 30 Mbit/s to all households in Europe by 2020, with 50% or more subscribing to over 100 Mbit/s". This paragraph will analyze the existing broadband situation in both regions, and look into the possible paths to achieving this Digital Agenda, while taking into account the roles the different key actors played in the past.

6.1 Evolutionary DSL and DOCSIS upgrades in Flanders

Flanders is characterized by the techno-duopoly between the DSL network of Belgacom and the DOCSIS network of Telenet, and this is reflected in both players' strategies. The moment one actor upgrades his network to be able to offer higher bandwidths, the other will soon follow. The same tit-for-tat competition holds for services, e.g. Telenet launched its digital television offer only a couple of months after Belgacom did. This constant jockeying for more market position is visualized in Figures 1 and 3.

Telenet was the first to commercially introduce internet applications, but soon lost market share to the incumbent Belgacom. During the last couple of years, however, a new trend is observed in the duopolistic setting: Telenet gaining gradually more market share (OECD, 2011). An explanation can be found in the offered bandwidth: the DOCSIS 3.0 technology is able to offer 100 Mbit/s download speed, while the maximum theoretical speed offered through the VDSL2 implementation of Belgacom is 30 Mbit/s, although the price charged for these offers is comparable. The next paragraph will give some more explanation about the different upgrades of both Belgacom and Telenet over the last couple of years, and indicate the paths both companies will most likely follow in the future.

6.1.1 Belgacom

The need for additional bandwidth made Belgacom explore the opportunities of fiber within the scope of the Broadway Project that was launched in 2004. This project aimed at upgrading its network to a combined copper and fiber network. The goal is to connect the street cabinets using optical fiber (the so called Fiber-to-the-Cabinet, FttC) and to roll out a VDSL platform between the street cabinets and the end users. The VDSL technology was commercially introduced on 2nd November 2004 and by investing € 103 million in 2006, a VDSL coverage of

45% was reached by the end of that year. By 2009, a total investment of about € 500 million had led to the deployment of 14 000 km of fiber, connecting 17 000 street cabinets leading to an FttC-coverage of about 70%. Thanks to the early investments in the Broadway project and the ranking of the VDSL2-coverage (2nd place in Europe in 2009), Belgacom received the "2009 Innovations Award" from Global Telecommunications Business (Belgacom, 2004; Belgacom, 2009).

Currently, Belgacom is further deploying VDSL2 to all its customers, having reached a national coverage of 78.9% by deploying over 16,000 km of fiber to connect 20,000 street cabinets, aiming for 85% by end 2013. On the other hand, Belgacom recognizes the limitations of VDSL2, and therefore already communicated their "Get to fast, faster" strategy (Belgacom, 2011). In a partnership with Alcatel-Lucent, Belgacom aims at maximizing the VDSL2 throughput by using the new state-of-the-art vectoring technology. VDSL2 vectoring is a noise-cancelling technology that will allow to use VDSL2 at its theoretical speeds, which will lead to bandwidth capabilities of 100 Mbit/s and beyond to be transmitted on copper cables. Belgacom opts for this upgrade, because it will bring faster broadband to the end-consumer in a fast and cost effective way.

Apart from vectoring, other technological upgrades on VDSL are possible to boost bandwidth capabilities. In VDSL bonding, two physical twisted pairs to each customer are used instead of one increasing data rates to approx 166%. Phantoming adds a third – virtual – twisted pair cable, which would increase data rates further. Combining all options (bonding, phantoming and vectoring) would allow the DSL network to offer data rates up to 300 Mbit/s, subject to the length of the sub-loop (Alcatel-Lucent; Alcatel-Lucent, 2010). Belgacom communicated this strategy to achieve the goals set out in the Digital Agenda to the European Commission (EC, 2011). They furthermore comment that the Commission should assure "technological neutrality when considering investments in broadband infrastructure in view of reaching the Digital Agenda". They state that the focus lies too much on Fiber-to-the-Home, while the developments made by Alcatel-Lucent clearly indicates that the targets can also be reached with gradual VDSL upgrades.

Even though Belgacom's focus for the coming years remains VDSL, Belgacom decided to investigate Fiber-to-the-Home (FttH). The first tests bringing the optical fiber into the living room of the customer, were executed in Rochefort in 2008 and extended to Sint-Truiden and La Louvière in 2009 (Belgacom, 2009). Currently about 2500 Belgian families and small-scale companies are connected to the internet through fiber. However, because economic ways to fully exploit the

possibilities of fiber are not yet recognized, FttH has not been commercially introduced.

6.1.2 Telenet

Since available bandwidths offered by Telenet nowadays are much higher than those of Belgacom, the urge to upgrade towards FttH is less. In March 2010, Telenet launched 'Digital Wave 2015', a project aiming at improving the existing network over the next five years, with an investment sum of about € 30 million every year. They are currently expanding their Docsis 3.0 technology to all customers, and keep on increasing the available bandwidths by reducing the size of their Service Areas (those parts of the network that connect the end-customers to the first local collection point through the use of coaxial cables). Plans for deploying fiber to each home were however not communicated so far.

6.1.3 Conclusion

As can be seen in Figure 1 and Figure 3, both actors indeed make the necessary investments to keep up with technology demands. However, neither of them is showing initiatives to undertake the big investments necessary for the deployment of a new infrastructure in the last mile (Fiber-to-the-Home or –Building). Their market position in the Flemish market is quite stable and there is no internal or external driver that would push them towards taking the risk of investing in a network that they probably would have to open up in the near future. While other licensed operators have played an important role in the early development of broadband, largely through resale and unbundling, this competitive force is absent in a VDSL environment. Hence, in the situation of an unchallenged duopoly the risk of tacit collusion occurring increases, with as the likely outcome high prices for consumers. As a conclusion, we can state that the Belgian telecommunications market is dynamically efficient to some extent, but neither of the dominant players has a need to innovate to escape competition.

6.2 DSL and DOCSIS upgrades combined with initiatives for FTTH from municipalities and housing corporations in the Netherlands

In the Netherlands, the same techno-duopoly as in Flanders is found between KPN (DSL) and Ziggo and UPC (DOCSIS). By the end of 2005, KPN announced plans to migrate its network to All-IP. The transition is considered necessary to remain competitive in broadband, to realize cost reductions and to replace the network that is considered reaching its end of life. Next to the upgrade of the core network to IP, the plan implies an upgrade of the feeder network to Fiber-to-the-Cabinet. With the shorter copper loop, broadband services using VDSL with data rates of up to 50 Mbit/s are becoming feasible. The 'competition in the market' of

course also influences the cable operators, and the ‘race on speed’ is still continuing with for instance, UPC increasing the download data rate to 120 Mbit/s for its premium subscription offer in Amsterdam (NRC, 2008), and Ziggo announcing the upgrade from DOCSIS 2.0 to 3.0 (De Vries, 2009).

However, the speed battle is fought differently in the Netherlands. While in Flanders, there are no clear initiatives for FttH deployment, in the Netherlands, several different parties seem to recognize its opportunities, and diverse strategies are used to be able to start with FttH deployment. This section will therefore focus on FttH, because exactly these developments emphasize the differences between both regions.

6.2.1 First initiatives

In 1991, the first Fiber-to-the-Home (FttH) trial is carried out in The Netherlands, by the PTT in Amsterdam. The objective was to obtain operational experience. In 2003, KPN launched the ‘Deltaplan Glas’ initiative. The plan was aimed at realizing a fiber network covering 80% of the homes by 2010 for a total investment estimated at €8 billion, based on collaboration between the government and the industry at large (KPN, 2003). However, the lack of support from the CA-TV operators to cooperate with KPN in one network roll-out, and the subsequent lack of support in Parliament brought this idea to an end.

The first real FttH project was, in line with the first broadband project, developed by the academic institutions under the brand of SURFnet, which provided 15 300 students in the major universities with fiber access by November 2001 through their Fiber-to-the-Dormitory projects (Weeder and Nijland, 2002). After this project, other actors recognized the opportunities of FttH.

6.2.2 Central government initiatives

In the translation of the Lisbon Agenda into national policy the Dutch government emphasizes the access to a high quality broadband infrastructure (Ministerie Economische Zaken, 2004). In 2000, the Ministry takes the initiative to create “Kenniswijk” (Knowledge Quarter), a real-life environment to ‘test the consumer market of the future’. The all-fiber pilot in the city of Neunen, involving 7 500 households in an area representative for the Dutch population, is part of the “Kenniswijk” project (Kools and Serail, 2003). Based on the “Breedbandnota”, which recognizes the various perspectives of market parties in relation to the roll-out of broadband, the prevailing policies can be summarized as shaping favorable preconditions for broadband development (Ministerie Economische Zaken, 2004).

6.2.3 Municipalities

In 2001, the City Council of Amsterdam, observing ad-hoc plans being made for the deployment of fiber by private parties, places the topic of fiber networking on

the political agenda, being concerned about a possible 'digital divide' emerging in the city. A second reason for involvement is the wish to channel the related digging activities to reduce the level of inconvenience to the public.

To address the issues properly, the Council commissions an investigation. The resulting report, issued in 2002, concludes that the 'market' will most probably not deliver an 'open' infrastructure, nor fiber connections to every home and enterprise in Amsterdam, within the next 15 years (Weeder and Nijland, 2002). Considering the economic and social importance, the Council decides on the implementation of a city-wide FttH project, with as cornerstone a Public Private Partnership. The PPP would implement an open access passive network infrastructure, supporting service level competition (Weeder et al., 2003). Subsequently, the city establishes a limited liability company Glasvezelnet Amsterdam (GNA) in 2006, in which the municipality participates for 1/3, the four housing corporations for 1/3, and investors for another 1/3; each for €6 million (Citynet, 2009). This enables the first phase of implementation, 40 000 connections, to start in 2006, subject to approval by the European Commission, which is granted December 2007 (NRC, 2007).[5]

By 2004, out of the top-30 cities in The Netherlands, 29 had plans or were in the process of realizing fiber networks to connect governmental buildings, 23 had plans for Fiber-to-the-Business and 15 for Fiber-to-the-Home (Linssen, 2005).

6.2.4 The emergence of a new actor: Reggefiber

While the infrastructure competition between KPN and UPC/Ziggo has led to high broadband penetration and is leading to increasing data rates, the competition has not led to FttH deployment. A new actor that will reshape the scene emerges when the private equity firm Reggeborgh starts the fiber company Reggefiber in 2005, triggered by installation requests from housing corporations. In its business approach, Reggefiber takes a long term perspective on fiber deployment, applying a real estate model. The objective is to reach 2 million households by 2013, based on the principle of a passive infrastructure with open access (Reggefiber, 2009). In 2006, Reggefiber becomes one of the investors in the Citynet project in Amsterdam. To link the various FttH projects Reggeborgh acquires fiber backbone provider Eurofibre in 2006. In 2007, KPN and Reggefiber announce their cooperation in providing FttH to 70 000 households in the city of Almere, near Amsterdam (Almere Kennisstad, 2007).

The emergence of Reggefiber as a third player changes the market dynamic, as the initiatives by municipalities and housing corporations are not isolated any

[5] It should be noted that UPC, the regional cable operator, has contested the fiber network plans of the municipality in the Courts, at national and European level, albeit, in vein.

more but become linked. It appears that Reggefiber is taking the ‘first mover advantage’, and is changing the ‘rules of the game’ forcing the incumbent infrastructure players into services competition. Hence, the strategic move by KPN, to create a joint venture with Reggefiber taking a 41% share in the venture in May 2008, should not come as a surprise (Olsthoorn, 2008). As of the first quarter of 2011, the status of FttH deployment is: 568 000 homes passed, 451 000 homes connected and 217 000 active subscribers. This implies a take rate of 38%, against an average in Europe of 15%, reflecting a smart marketing and deployment strategy being applied (Stratix, 2010).

7 Conclusions and future work

At first glance Belgium and the Netherlands are two countries that are similar in many respects, including their rankings in the broadband league tables. It is only when one takes a closer look, that significant differences become visible. Historical differences in the development of the telephone network are reflected in the development of broadband networks, the same type of actors re-appear. It is the deeper understanding of the market dynamics that provides a glimpse on future developments, on how the two countries may realize the Digital Agenda targets and beyond. The analysis shows commonalities in terms of the importance of the techno-duopoly, realized largely through market forces in the Netherlands and through a helping hand of the Flemish government in Flanders. While the duopoly is being challenged in the Netherlands by municipalities and an entrant firm, the duopoly in Flanders is largely unchallenged. This could be explained by the non-existence of housing corporations in Flanders, who clearly took the forefront in the Netherlands. Furthermore, there is the political divide in Belgium (a federal government for the entire country, and regional government for Flanders and Wallonia separately), which makes channeling government aid less straightforward.

In the interest of society in general and the broadband user in particular, a good balance between the interests of the supplier and the buyer will need to be assured. Where the invisible hand of the competitive market falls short, it may require the visible hand of the government to assure welfare continues to increase and consumer surplus is not eroded through monopolistic rent seeking behavior.

Following this first exploratory case study approach and the initial findings outlined above, topics for further research include an assessment of the role of other licensed operators in the development of broadband, the role of the regulators and obtaining a deeper understanding in the differences between the role of municipalities in Flanders and The Netherlands.

Acknowledgement

This contribution is a first publication in the context of a broader joint research-annex-book project involving academic research efforts aimed at capturing the dynamics of broadband markets in 11 European countries. Furthermore, this research was funded by a Ph.D. grant of the Agency for Innovation by Science and Technology (IWT).

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