

Emerging models of public-private interplay for European broadband access: evidence from the Netherlands and Italy

Alberto Nucciarelli^{^*}, Bert M. Sadowski[^], Paola O. Achard[#]

[^]*Department of Industrial Engineering & Innovation Sciences, Eindhoven University of Technology, Den Dolech, 2 - 5612AZ Eindhoven, Netherlands; A.Nucciarelli@tue.nl; B.M.Sadowski@tue.nl*

[#]*Dipartimento di Sistemi per l'Economia, Faculty of Economics University of L'Aquila, 67040 Roio Poggio, Italy; Paolaolimpia.Achard@univaq.nl*

**corresponding author*

Abstract

The paper examines the role and function of public-private interplay in the development of municipal initiatives in the broadband sector. The analysis of initiatives in the Netherlands and Italy shows how the interaction between public and private stakeholders can facilitate local broadband initiatives. This interaction has been vital in aligning the interests of different private and (semi-)public parties, in designing the network and in aggregating sufficient demand for broadband services. The comparative analysis examines the steps involved in these initiatives and the strengths and weaknesses of joint public-private activities. The paper shows that the challenge for cooperating stakeholders has been to foster further investment in the upgrading of the network and in the provision of advanced broadband services.

Keywords: municipal broadband networks, public-private interplay, The Netherlands, Italy.

1. Introduction

In the past two years, the European Commission (EC) has taken a series of steps toward better defining the role of next generation access (NGA) technologies in the context of regional economic development and as a means of reducing the digital divide in the European Union (EU). In its attempts to revive the i2010 initiative, the EC proposed in April 2008 in its Mid-Term Review that Europe needs to “shift up a gear” to lead the transition to NGA networks “while not slacking off in its efforts to overcome the digital divide” (EC, 2008a). In November 2008, the EC supported this view by considering broadband as an important part of the European Economic Recovery Plan (EC, 2008b)

to drive Europe out of the economic and financial crisis. Finally, in its Broadband Guidelines (EC, 2009a), the EC has taken a technology neutral and pro-competitive view on NGA networks while focusing mainly on their impact on underserved areas¹ in the EU. Even if these initiatives have been based on different perceptions about the effects of NGA on broadband markets and regional development, they show that the EC has become increasingly aware of the sense of urgency surrounding the implementation of these new network technologies².

The EC's increasing interest in the level of investments in the broadband sector has to be analyzed in conjunction with the European and the national regulatory and legislative environment. As the EU Competition Commissioner Neelie Kroes³ recently stated, there is a need for an appropriate regulatory and legislative framework, which should be able to promote NGA networks, encourage investments and strengthen broadband competition as well. NGA networks comprise a variety of technologies ranging from incumbent (xDSL and cable) networks as well as Fiber-to-the-Home (FttH) technologies, which should be able to provide high speed and capacity for future high definition contents⁴. The regulatory and legislative environment is able to influence or even determine, whether innovation and investments in NGA networks will flourish or wither. There has been an intensive discussion on the determinants of NGA networks (de Bijl & Peitz, 2008; Huigen & Cave, 2008).

¹ In the terminology of the EC, these underserved areas are comprised of "white areas" (with no pre-existing infrastructure) and "grey areas" (where only one broadband network operator is present) (EC, 2009a).

² Also European governments have developed national broadband plans to foster the adoption of new network technologies (see Digital Britain, 2009; France Numerique 2012, 2008).

³ European Commission (2008c).

⁴ There is a discussion on the actual speed for these different networks. The EC has initially defined the speeds for xDSL networks (with a minimum of 40 Mbps and 15 Mbps upstream), for cable networks (up to and beyond 50 Mbps) and for FttH networks (up to 100 Mbps and beyond) (EC, 2009a). However, the consultation process has also provided a number of different proposals to re-define these boundaries. Even if wireless technologies like WiMAX are not explicitly mentioned as an NGA network, there seems to be an agreement that wireless technologies provide complementary access (Huigen & Cave, 2008)

As investment in broadband networks has been diverse and driven by a variety of market and non-market parties, municipalities in some European countries like the Netherlands and Italy have taken the lead in orchestrating broadband initiatives in their region⁵. This has been due to the fact that: 1) incumbent cable and telecommunication carriers have been uncertain about the prospects of NGA networks in certain areas (Huigen & Cave, 2008); 2) there is an increasing demand for broadband services, in particular double- and triple-play services as well as higher network capacity in both urban and rural areas (Lewin, Williamson, & Cave, 2009); and, 3) local (and national) governments perceive broadband networks as a means of reducing the digital divide and stimulating economic development of regions (Cisco Systems, 2004; 2005; Lehr, Sirbu, & Gillett, 2006). In this situation, municipalities in some European countries have become a main investor in NGA networks⁶⁷.

Within the European Union, public-private partnerships (PPPs) have recently emerged to foster municipal broadband initiatives and especially to avoid market and public failures while financing and operating public services (Falch & Henten, 2008; Sadowski, Nucciarelli, & de Rooij, 2009). Driven by a variety of public and private stakeholders, these PPPs have been based on bundling of network implementation and operation, the transfer of some of the risks to private contractors as well as long-term

⁵ Data over fiber deployment by municipalities (IDATE 2008) show that the Netherlands and Italy belong to leading countries in Europe. There are just a few wireless initiatives by municipalities in Italy and the Netherlands. But this might change in the near future.

⁶ For FttH installations, the Commissioner Reding concluded that incumbent operators are not anymore at the forefront, but "they are now in third place, coming after both alternative operators and municipalities" (Reding, 2008).

⁷ For detailed analysis on US municipal broadband initiatives, their critical assessment and economic discussion see Bell, Jung, & Zacharilla, 2008; Gillett, Lehr, & Osorio, 2004; Settles, 2008; Tapia, Maitland, & Stone, 2006.

contracting between the parties involved. In order to reduce the risk of failure, PPPs had to (i) properly identify economic and social targets; (ii) effectively match the resources and competences of the different partners; (iii) design a network in line with the area's geographical constraints (also adopting the most suitable technology solution); and, (iv) define the expected demand and the services required. Even if there are also other variables affecting the supply and demand for broadband (Picot & Wernick, 2007)^{8,9}, we propose that these factors are crucial in defining the success (or failure) of municipal broadband initiatives in the Netherlands and Italy. The comparative framework allows to derive common elements emerging from the variety of PPP models affecting broadband development which have mostly been discussed within the spectrum of public utility versus market-based solutions (Falch & Henten, 2008; Sadowski, Nucciarelli, & de Rooij, 2009).

The paper briefly discusses the literature on PPPs and presents a comparative framework to examine PPPs in highlighting crucial stages of interaction between public and private stakeholders (Section 2). The framework is used to examine six different municipal initiatives in the Netherlands (Almere's UNet, Amsterdam's CityNet, and Nuenen's Ons Net) and in Italy ('Progetto Banda Larga' Brescia¹⁰, Firenze Wireless and Terrecablate Siena). It will be shown that the PPPs initiatives represent unique solutions to problems emerging in broadband markets in these countries (Section 3), and allow avoiding market and policy failures emerging from traditional forms of government

⁸ For example, the competitiveness of the national broadband market (namely, the number of alternative carriers as well as their specific firm strategies), the availability of public and private funding for local initiatives as well as the social characteristics of the country and the existence of a broadband technology.

⁹ See McDonough (2009) and Ehrler et al. (2009) for further analyses on the background and the justifications of the adoption of PPPs in the broadband sector.

¹⁰ Brescia Broadband Project.

procurement. The cases have been chosen because of their structure and the viability of the underlying PPP model (Section 4). After looking at the role of public-private interplay within each initiative, future research directions are discussed (Section 5).

2. Public-private interplay fostering broadband

Recently, the economic literature has approached public-private partnerships (PPPs) using contract theory and firm theory¹¹ viewing them as a way to avoid market and public failures while financing and operating public services. Comparing PPPs to traditional ways of government procurement, it has been shown that PPPs allow a more cost-efficient bundling of facility and service provision as well as permit to specify the quality of service in advance (Hart, 2003). The reasons for bundling are attributed to technology and the impact of a good design on operating costs, to lesser extent to ownership (Martimort & Pouyet, 2008). The pattern of ownership of PPPs becomes decisive if contracts are incomplete (Hart, 2003) or public goods have to be allocated (Besley & Ghatak, 2001). In the latter case, it has been demonstrated that ownership should lie in the hands of the player with the highest valuation for the public good and that non-governmental organizations may be given property rights (Besley & Ghatak, 2001).

Recently the literature has also shown that PPPs can lead to failures (Daniels & Trebillock, 2002), which are partly rooted in dynamics of PPPs (Iossa & Martimort, 2008). In contrast to traditional forms of government procurement, PPPs include the following economic characteristics: (i) long-term contract, (ii) risk transfer, and (iii) the

¹¹ See Guasch, Laffont, & Straub (2006) and Bennett & Iossa (2006).

bundling of tasks typically involving the design, building, finance and operation of a project which are contracted out to a (consortium of) private firm(s). With PPP contracts aimed at the long term (typically lasting more than 20 years), future contingencies are difficult to foresee (Iossa & Martimort, 2008). As these features allow better defining PPPs¹² and identify failures in them, this literature has rarely been focused on evaluating different forms of PPPs based on their distinct institutional features.

Within the broader literature on PPPs (for a survey (Hodge & Greve, 2007)), approaches focusing on institutional features of PPPs have recently gained popularity (Koppenjan & Enserink, 2009; Nijkamp, van der Burch, & Vindigni, 2002). These approaches have been aimed at comparing PPPs by deriving institutional features from the distinct economic characteristics of PPPs. These approaches have focused, in particular, on the stated objectives of PPPs, the form of cooperation and risk sharing as well as the mutual contribution of different parties in terms of management and finance of PPPs (van Ham & Koppenjan, 2001; Fredebeul-Krein & Knobens, 2010). For our purpose, we define PPPs as characterized by i) long-term (not just short term) objectives for the provision of a specified type of public service in a given area; ii) are based on some form of risk sharing (and sharing of other activities); iii) involve one party (mostly the public entity) that performs the strategic role of identifying user needs; and, (iv) are rooted in the mutual contribution of competencies and resources for joint production. Based on these characteristics, the comparative analysis is able to move beyond the

¹² From the above it becomes clear that PPPs include more than Private Finance Initiatives (PFI) experiences in the United Kingdom and contracting experiences in the United States.

dichotomy (public utility models versus market-based PPP models) and can examine the different cases in a systematic and succinct manner.

2.1 Comparative Analysis

Figure 1 shows a conceptual model defining the four stages leading to the deployment of a municipal broadband network. Each level of the pyramid represents a stage that must be completed before the next stage is started. Once the top has been reached the entire process starts again with the option to expand, reduce or generally modify the implementation of the project.

please insert Figure 1 here

Identification of social and economic targets

At stage 1, stakeholders identify social and economic targets for the municipal broadband network also determining the nature of the infrastructure (the extent to which it includes public goods characteristics)¹³. In fact, decision taken at stage 1 can lead to extremely different ownership structures where the infrastructures can be assigned the value of a public good (e.g. Terrecablate) or not (e.g. Almere Unet) depending on the different valuation of the project given by the investors as well as risks sharing among partners¹⁴. By broadening the analysis by Mandviwalla et al. (2008), this first stage entails the identification of stakeholders' shared and competing goals and the matching

¹³ The definition of public goods characteristics for broadband infrastructure is important in order to apply a public utility framework to the PPP. Public goods are, in general, characterised by non-excludability (no one can be excluded from consumption) and non-rivalry (consumption by an individual does not reduce the availability of the good to others). The recent discussion has shown that managerial decisions in favour of a particular form of PPPs affect the degree of (non-)rivalry (e.g. for the allocation of different capacity to users).

¹⁴ See Besley & Ghatak (2001).

of key policy issues. Identification is based on the scanning of the main drivers responsible for the development of demand and supply. Demand and supply are investigated in order to grasp interrelations and clarify the mutual degree of interdependence. Analyzing how the path of implementation of a technology will impact on the structure of both demand and supply (Shapiro & Varian, 1999; Varian, Farrell, & Shapiro, 2004) is crucial when studying dynamic sectors. This issue can easily be considered as a core research problem in the broadband sector with respect to local initiatives, especially when aiming to understand whether the development of the market is based on:

- a) the development of the supply of products/services because of the recorded existence of growing demand (namely, a pull strategy where demand comes first and supply is expected to satisfy it completely); or
- b) the development of the supply of products/services aimed at generating a potential demand (namely, a push strategy where supply comes first and demand is expected to develop as a consequence) (Figure 2).

please insert Figure 2 here

The existence of a push or pull strategy affects the social and economic goals behind the broadband project. In fact, public and private stakeholders, when seeking to match their strategic vision for network deployment, must take into account the potential of e-government and e-health services and telecommunications services for business and private customers as these add to the value of the initiative increasing, for example, business attractiveness and customer satisfaction.

Identification and matching of core resources and competences

In the second stage, a matching of differing strategic visions (e.g. integrating a public utility-based approach with a more entrepreneurial attitude to broadband deployment) with key resources and competences (namely the know-how to build up, operate, maintain the network and provide services) takes place¹⁵. Accordingly, collaboration between public and private stakeholders commences, since strategic visions need to be transformed into real cooperation, especially with respect to the management of funding and risk sharing. Stakeholders seek to balance risks which depend on the applications that are being developed for the market.

The conceptual model takes here two different variables to analyze collaboration, namely ownership and layers. The first one (ownership) identifies the owner of the network as the stakeholder financing, for example, civil works and the deployment of infrastructures. The owner can sustain initial investments alone or can even share the costs with other public (e.g. national/local governments) or private (e.g. technology developers, cable companies) stakeholders but, in any case, it retains the ownership of the communications infrastructure. The second one (layer) identifies the layers where stakeholders are directly involved in the development, operation or management of the network. According to the Figure 3, the role played by actors varies according to the business model chosen to run the initiative.

¹⁵ It is important to clarify that the identification of core resources and competences implies recognizing what is core and what is mission-critical for stakeholders. In fact, core and mission-critical competences are managed by stakeholders directly while non-core and non-mission critical competences should be left to other actors. Moreover, non core but mission-critical should be out-tasked as should core but non mission critical.

please insert Figure 3 here

Network deployment

At the third stage of municipal network deployment, the stakeholders involved at the different layers of the network, including the provision of contents and services within a local broadband initiative, can be identified. The involvement of stakeholders differs depending on the source of initial funding, the business model adopted, the underlying technological infrastructure and the degree of involvement of (semi-) public institutions. The network deployment stage can be considered the stage at which resources and competences are implemented. In this stage, local governments and private investors act in accordance with their own vision, know-how and mission.

To provide municipal networks, a wide variety of PPP models have been developed across the European Union ranging from models in which municipalities act as initiators (full public control) to models in which they act as coordinators, to orchestrate market demand (managed service model). These models provide incentives for municipal networks (e.g. subsidies or passive infrastructures) based on the initiative of private entrepreneurs and citizens (community owned wholesale model). In the public utility model, the municipality offers retail services to consumers over infrastructure that it owns and operates (Terrecablate Siena). As this model requires resources and the provision of telecommunication services, only municipalities which have stakes in local utilities can participate in such model (usually with the whole start-up funding). In the managed services network, the municipality provides access to conduit or 'rights of way' and owns the physical infrastructure (dark fiber) (Almere, Amsterdam). Start-up funding mainly derives from an agreement within the PPP developed between the

municipality and other private investors. Communication services are provided by private companies. Therefore the tasks for municipalities appear simpler, as only wholesale customers have to be serviced (and not the mass market), but the tasks can be more complicated if the retail market is not large enough to sustain retail level competition (Lehr, Sirbu, & Gillett, 2006). The hybrid model with no open access represents a PPP form similar to the managed services network model, but lower risk (Figure 3).

The form of PPP has an impact on public and private funding at different stages of the broadband project. Therefore, the choice of technology is also a core matter and conditions the time horizon of the investment (and the alignment of partnerships along this horizon). For example, a fiber technology solution (e.g. Fiber-to-the-Home) implies a more investment-intensive project and has a longer payback period compared to other technological options such as the wireless network¹⁶. So, although both wired and wireless technologies are scalable, the fiber network allows for greater bandwidth capacity (OECD, 2008).

Provisioning of services

At the fourth stage, a variety of high speed services are provided by the network operator via the municipal broadband network. Based on the distinction between a pull and a push strategy within the broadband market, it is useful to identify the key strategies of local (sometimes in cooperation with national) governments deploying municipal broadband networks. A screening of typical and more representative

¹⁶ Even if wireless networks require backbones sufficient for high capacities, their overall cost structure is less effected by high sunk costs compared to different fiber options (OECD, 2008).

municipal and regional based initiatives operating in Italy and the Netherlands provides examples of pure pull and push strategies¹⁷. All local Italian initiatives examined¹⁸ were driven by increasing pressure for network capacity (e.g. massive use of Internet tools and websites like YouTube). This growing intensive use of available (broadband) networks has often been associated with the existence of a digital divide among Northern and Southern regions as well as among urban, sub-urban and rural areas in Italy. Customer demand for high speed Internet provided room for a pull strategy and many local governments (sometimes in collaboration with local stakeholders) initiated regional projects in rural areas (and a few city-wide) to bridge the digital divide and provide citizens with a high speed Internet connection. In the Netherlands, in contrast, push strategies were more prevalent based on demand aggregation. Accordingly, the form of broadband infrastructure chosen had to have the potential to foster growth of demand for high speed internet services. Based on this logic, the profitability of broadband networks has mostly been related to investment-intensive strategies carried out by Internet Service Providers (ISPs). Their marketing strategies are closely tied to the local government's aim of implementing six main categories of services: 1) health care (which could also be split into two sub-categories: care and cure); 2) education (incorporating dedicated services for schools and universities); 3) safety & security; 4) business services; 5) mobility & buildings; 6) smart energy grid (where Internet Protocols – IPs are used to control the energy generation and distribution system and the broadband is seen as the key factor enabling the intelligent network).

¹⁷ It is not suggested here that Dutch and Italian initiatives can only rely on push and pull strategies but it is argued that the most representative and typical examples on both markets are characterized by the predominance of a push and a pull strategy behind them.

¹⁸ Brescia Wireless, Firenze Wireless, Terrecablate.

3. The broadband sectors and municipal initiatives in the Netherlands and Italy: an overview

This section provides insights into the structure and development of the broadband sector in the Netherlands and in Italy and presents different case studies on municipal networks. Table 1 summarizes the main geographical, regulatory and legislative as well as market characteristics of these two countries.

please insert Table 1 here

3.1 The Netherlands

The broadband market in the Netherlands is one of the most developed in the world (EC, 2009b). The high penetration rate (36.2%) is the result of a combination of factors related, in particular, to infrastructure competition and demand characteristics.

Incentives to go online offered to households as well as companies, schools and universities using a broadband connection resulted in a high degree of interest in adopting Internet technology¹⁹. The central government developed specific projects (e.g. Personal Internet Page PIP Project) to encourage investment in the high-tech sector and facilitate the adoption of e-government services²⁰. In 2002 a relevant initiative was led

¹⁹ As reported by the European Commission (2009b), "the Netherlands is among the best performing ICT countries in Europe". This is supported by the second highest percentages of households with a broadband connection (74% with respect to an EU average of 49%), enterprises with a fixed broadband access (86% compared to an EU average of 81%), population using e-Government services (54% compared to an EU average of 28%). Thereafter, as described by the Dutch Ministry of Economic Affairs (2009), ICT is being used extensively also within educational institutions and 78% of secondary school as well as 74% of secondary vocational schools benefit of a fibre-optic connection. This is also partially due to the fact that some municipalities heavily invested. For instance, the Municipality of Amsterdam allocated €900,000 in 2008 to connect Amsterdam schools to the Broadband Network for Amsterdam Schools (BOA) (Dutch Government, 2008). Finally, foundations (i.e. Kennisnet), virtual knowledge networks (i.e. Kennisrotonde) and organizations (i.e. Surfnet) are implementing several initiatives to foster the adoption of ICT applications in education.

²⁰ Dutch local and central governments are encouraging digital government. In fact, on the one side the municipality of The Hague has been working on a Personal Internet Page (PIP) to enable entrepreneurs checking and reviewing procedures dealing with their business (Dutch Government, 2008). On the other side, some cooperating governmental agencies (e.g. Social Insurance Institute, Tax Authorities and the

by a National Broadband Expert Group (NBEG) to address the problem of underinvestment in the Dutch broadband sector. Considering the broadband infrastructure as an essential facility, the NBEG suggested the Dutch government to follow an "evolutionary" path to develop fibre-optic networks based on demand bundling and exploiting the collaboration between private parties and local governments. However, in 2004 the "Nederland Breedbandland" project, embedding the idea of a joint national broadband strategy, crumbled because of the lack of the consensus on the implementation of a "guarantee fund" to stimulate private investments in infrastructure projects.

Fierce competition among infrastructures has been an important factor in facilitating broadband penetration (Huigen & Cave, 2008). DSL connections are currently available in both urban and rural areas with a 99.9% while cable coverage is 91.3% in urban areas and 43% in rural ones. As KPN has been responsible for much of the DSL connections and currently has about 50% market share in fixed broadband lines, the Dutch telecommunication incumbent operator is currently moving towards the rollout of a NGA network (All-IP) based on fiber connections to the street cabinet. Furthermore, there are 12 cable operators offering double-play packages (fixed voice telephony and broadband), 7 cable operators providing customers with double-play packages (including television and broadband) while at least 8 operators offer triple-play products. In addition, there are local initiatives, which include housing corporations and other local stakeholders willing to invest in fiber networks.

Centre for Work and Income) have implemented the DigiD (Digital Identity) system (www.digid.nl). It allows to digitally authenticate the identity of any person, who has already been assigned of a Social Security Number, and consequently apply for transaction services via Internet.

3.1.1 Almere UNet

Identification of social and economic targets

On February 26th 2006, Unet B.V. – a leading company in the Dutch broadband sector - chose Cisco Systems to "deliver ultra-high-speed (above 100 Mbit/s) broadband voice, video and data services over an optical fiber network to all public buildings and not-for-profit organizations throughout the city of Almere in The Netherlands". The aim of the project was to promote the Almere city region, attract new companies and foster economic development whilst at the same time implement internet based health care services and education programs.

Identification and matching of core resources and competencies

The municipality of Almere acted as initiator of the program investing in the passive infrastructure and attracting the attention of private investors (e.g. service providers, KPN), who were willing to invest in the active infrastructure and/or provide triple-play offers in city-wide emerging markets. On this basis, the municipality transformed its role of initiator into collaborative public-private interplay, which has been able to match different technical knowledge of private investors. After the initial investment phase, the local government attracted private investors and limited its role within the ownership to about 30% of the passive infrastructure. Within this managed service model, approximately 70% of the network is owned by private partners (which also manage routers and switches all over the active infrastructure) while KPN is responsible for the maintenance and access to the network. The project was financially supported by the local government, which established a public-private partnership to build an optical fiber, equal access network for the city in 2002. As a result, they created the Almere

Knowledge City and the Almere Fiber project attracted partners' investments (AT&T, BBned, Cisco, IBM, KPN, Nortel, etc.), which reduced the risks associated with the development of a capital-intensive project.

Network deployment

The Almere project is based on the deployment of a fiber network, which is able to provide public buildings with symmetrical broadband connections of up to 2 gigabit per second. It allows local government to experience relevant economies of scope linking public buildings with a fast Internet connection, improving efficiency and efficacy. At the same time, the deployment of a glass fiber network allows Cisco Systems to expand its business and enlarge its competences in municipal broadband networks.

Provisioning of services

Open access is considered the core feature of the Almere city-wide fiber network. Specifically, the structure of the initiative, which is based on the managed services model allows different content and service providers to exploit growing market potentials. The success of this initiative marks a significant break with the past and the strategy employed is not only scalable within the city itself but also exportable to other cities. The Almere model – although achieving a number of targets (e.g. wide convergence of economic and social targets, openness to competition, etc.) has a weak point, namely market reaction to the investment-intensive projects. In fact, despite the positive externalities expected (e.g. increase in the value of connected buildings), the demand for double or triple-play services is still unclear.

3.1.2 Amsterdam CityNet

Identification of social and economic targets

The vision of CityNet Amsterdam is to create an ideal living lab for innovative business, pushing economic activities in the urban area and promoting cohesion in one of the most multi-cultural cities in the Netherlands. However, social and economic targets of the initiative as well as the rationale behind the project underwent an in-depth investigation started in December 2006 by the European Commission (IP/06/1872). On December 11th 2007, the EC approved the project implemented by the municipality of Amsterdam and other private stakeholders, recognizing that the municipality itself participated in the municipal initiative according to the Market Economy Investor Principle (MEIP), i.e. on similar terms to a private party. Accordingly, the European Commission stated that State Aid rules are not applicable to the Amsterdam initiative.

Identification and matching of core resources and competencies

The municipality of Amsterdam and joint housing corporations keep 30% ownership²¹ whilst the Reggefiber increases its ownership up to 70%. Accordingly, while GNA partially owns the passive access network, the network is leased to BBned²² for a fee; and BBned must activate and provide transmission services as well as open and non discriminatory access for any service provider (Houthoff Buruma, 2007). KPN will provide services in open competition with other service providers from the Autumn of 2009²³. This proprietary solution, as well as the entry of KPN into the municipal broadband network initiative, is an example of the growing interest in municipal projects. The total start-up funding amounted to 18 million Euros (the municipality of

²¹ This shows minimal financial government participation.

²² 100% participation by Telecom Italia S.p.A.

²³ Key decisions within GNA can only be taken now with an 80% majority vote.

Amsterdam provided 6 million; 5 housing corporations, 6 million; ING Real Estate and Reggefiber, 6 million).

Network deployment

Aimed at connecting all 480,000 households and small & medium enterprises (SMEs), the rolling out of open access fiber network in Amsterdam began in February, 2009. The deployment of the network was pushed by the municipality, which has been working as an orchestrator to develop a partnership between public and private stakeholders. This partnership – limited to the deployment of the passive layer - was based on the start-up of a private limited company called Glassfibre Network Amsterdam (GNA)²⁴, which was made by the City of Amsterdam together with four housing corporations and private investors. Thereafter, an agreement between GNA and the joint venture of Reggefiber and KPN came into effect.

Provisioning of services

The Amsterdam initiative relies on the fact that municipality acted as an orchestrator by bringing private organizations together (which was defined by Cisco Systems (2007) as an Equal Access Model business model based on an orchestrated public-private partnership). However, the local government is not involved in the active network, services or pricing and the equal market terms (open access network) are able to stimulate several content and service providers. In fact, many business opportunities open up for private investors and incumbents, tempted by less uncertainties in the

²⁴ GNA is in charge of and responsible for the deployment and reuse of existing fiber infrastructure available in the city and rolling out fiber (FttH) in a scalable way (first 10% of the city) to provide broadband to the entire city of Amsterdam.

demand trend, especially in the long-term. This is also partially due to citizens becoming extremely interested in telecare, e-Health, teleworking and distance learning.

3.1.3 Nuenen OnsNet

Identification of social and economic targets

The Kenniswijk²⁵ programme initiated in 2002 by the Dutch Ministry of Economic Affairs sought to build on public-private partnerships to stimulate the development of ICT services and broadband infrastructure. Under the Kenniswijk programme, residents were eligible for a €800 subsidy (split into €500 for infrastructure and €300 for services). The subsidy allowed them to join the cooperative OnsNet, receiving a one-year contract for 100Mbps symmetrical Internet connection completely free of charge.

Identification and matching of core resources and competencies

Residents decided to transfer their subsidy to a private limited company called NEM B.V. The NEM was set up to operate the glass fiber network. Residents - who transferred their subsidy to NEM - could become members of a cooperative OnsNet. The aim was that Ons Net would receive 95% of the shares in NEM. This financial structure enabled Ons Net to achieve a penetration rate of fiber infrastructure of 97 percent within the first year of operation and the provision of triple play services (TV, Internet and Telephony) in the area. Even when paid service started in 2006, the penetration rate remained high at 75%. Ons Net offers open access to the network at layer three (service provisioning).

²⁵ Knowledge district.

Network deployment

The OnsNet network was deployed in the whole Nuenen community connecting all the houses. The subsidy scheme allowed the implementation of a community-owned model, which is a unique example within the examined Dutch and Italian markets. However, as problems with financing of “Ons Net” emerged in 2006, the private installation firm Reggefiber stepped in, in return for receiving a majority share in NEM. That meant in effect that the Nuenen residents are no longer the owners of the network.

Provisioning of services

Initially, there have been favorable conditions for each service provider (SP) willing to offer services over the network. NEM negotiated contracts with SP while the customer enters into an agreement with NEM Nuenen B.V. for the use of the glass fiber network and with the service providers for their services (Kramer, Lopez, & Koonen, 2006). Though such a model is able to solve any uncertainty related to demand evolution (in fact, it is mainly based on a demand aggregation initiative), the possibility of scaling-up the project has been limited. The cooperative “Ons Net” has been less successful in developing advanced services despite user feedback committees have been utilized to define new service applications. These services in areas like e-health and e-learning are still at an experimental stage.

However, the entry of Reggefiber into the ownership structure had consequences with respect to the emergence of new service applications (which are still only experimental), the entry of competitive service providers (which did not take place) and the definition of open access (which now is at layer one). In other words, Ons Net now represents a

privately owned vertically-integrated model with low incentives for service level entry (Sadowski, Nucciarelli, & de Rooij, 2009).

3.2 Italy

As reported in EC (2009b), in Italy the fixed broadband penetration (19%) lacks behind when compared to the EU27 average (22.9%). DSL is the most broadly implemented technology and the 68.3% of broadband subscribers access speed is above 2Mbps while the internet-connected households are among the lowest in the Europe (47% compared to the 60% of EU27). Thereafter, also indicators of Internet usage (e.g. weekly and daily use of the Internet, e-banking, watching web TV and listening to web radio) generally display a lower propensity to use e-services than in the EU27²⁶. This acts as constraint for the deployment of new networks and reduces the economic interest of companies in investing in long-term and financially intensive plans. Recent estimates by Telecom Italia put the required investment to bring the remaining 65% of the population online at 6.5 billion Euros. Furthermore, the cost of introducing FttH (Fiber-to-the-Home) and FttB (Fiber-to-the-Buildings) technology as well as extending VDSL to keep 80% of the population connected is estimated at 15 billion Euros (Agcom, 2008). Demand for broadband services appears quite low in comparison to these investments. Demand suffers from limited incentives (i.e. subsidies) for schools and universities as well as small and medium businesses and local governments. However, the slow adoption of new broadband technologies is mainly the consequence of the incumbent's reluctance to

²⁶ However, the situation displayed by e-Business indicators shows a usage of applications and tools higher than the average EU27. Also the percentage of enterprises using e-Government applications is higher than the average EU27 data (82% compared to 68%). In 2008, the Italian Government launched a framework initiative called "New strategic plan for the innovation of the Italian Government" to foster the adoption and the accessibility of e-Government services also by Internet not-familiar users.

invest in fiber networks because of a) geographical constraints and low population density (i.e. the overall low population density impacts significantly on the scale of the investment)²⁷, b) low demand for broadband services for which a fiber network is required such as TV on demand and videoconferencing, c) scarce resources for risky and long-term investments, and 4) weak regulation policies aimed at stimulating competition between infrastructures (e.g. cable, copper, fiber). Up until 2003 Telecom Italia invested heavily by bidding for the UMTS license²⁸ and in the deployment of a core fiber network (a Next Generation Access Network called T-bone²⁹) and as a result of their investment in the broadband market, Telecom Italia has approximately 23 million fixed access customers of which approximately 300,000 are related to fiber technologies and 10 million to DSL. However, investment in broadband markets has been limited as Telecom Italia is uncertain about large capital-intensive investments in the fiber under the current regulatory regime. Major expectations rely at the moment on the "Programme for infrastructural broadband coverage", which was recently launched by the Italian Government in coordination with Italian Regions. This programme aims at increasing the capacity of access networks (with both fixed and mobile technologies) and providing the 99% of the population with a broadband connection by 2012.

3.2.1 'Progetto Banda Larga' – Province of Brescia

Identification of social and economic targets

Dr. Raffaele Gareri, chief information officer of the province of Brescia stated that the Province of Brescia has moved from a rich manufacturing and agricultural tradition

²⁷ A population density of 197.6 inhabitants per squared kilometer has a strong impact on the possibility of deploying a capillary network covering all the populated areas.

²⁸ High demand for mobile connectivity was expected at that time (Assinform, 2007).

²⁹ The name T-bone derives from its shape as it is formed by two main networks: an East-West one from Mestre to Turin and a North-South one from Milan to Naples.

towards a more service-orientated business model. With the main target of reducing digital divide in a wide rural area and sustain the presence of companies in the province, the Province of Brescia has chosen not to act as a "commercial enterprise, but rather to work alongside the private sector, co-coordinating different interests and helping them to share a common focus" (Raffaele Gareri in Cisco Systems, 2006).

Identification and matching of core resources and competencies

As a consequence, the Province of Brescia in close relationship with Cisco IBSG identified suitable partners for a public-private partnership, to build the physical infrastructure (sharing risks and potential market opportunities) and operate it³⁰. While the Province of Brescia owns 100% of the network, at the end of a public tender, Megabeam Italia S.p.A. was chosen as service provider for 15 years. Megabeam Italia S.p.A. is also responsible for maintenance and access (layer 2b in Figure 3) while pays a yearly fee to the Province of Brescia for using the network as sole service provider.

Network deployment

Cisco's mesh technology provided broadband solutions to over 120 towns (210 in the second phase of the project) spread out over the entire mountainous province including one of the largest industrial areas in Italy (automotive and mechanical engineering)³¹. A scalable and easy to deploy solution was implemented consisting of a town-to-town fiber backbone linking at least two public buildings (e.g. municipality, medical centers, and schools). Then several mesh access points, which build a flexible wireless

³⁰ The ownership of the network remains with the Province of Brescia.

³¹ Before the Province of Brescia set up the wireless project, discussions with telecommunication carriers had taken place. However, due to the low population density, geographical constraints and uncertain revenues even in the long-term, no action was taken.

infrastructure and help reduce dependency on a wired network, provide broadband connections to private customers and companies. It is forecasted that the initial investment of 2 million Euros will provide a financial return of 139 million Euros in the first six years of operations³².

Provisioning of services

This means that the main targets of the local initiative: to reduce the digital divide (through access to online mobile services) and encourage the settlement of new companies in the area (especially in the service sector and the industrial district by achieving substantial economies of scale in electronic procurement) can all be achieved. The reduction of the digital divide in a mostly rural area and the stimulation of economic activities make the 'Progetto Banda Larga' of the Province of Brescia one of the leading experiences in the Italian scenario. However, criticalities may derive from choices dealing with stage 3. The adoption of a hybrid model with no open network excludes competition from alternative service providers leading to potentially higher prices and less attention towards issues such as the quality of services (e.g. upgrading of the network).

3.2.2 Firenze Wireless

Identification of social and economic targets

In 2006, the Province of Florence joined SENSEable City Consortium³³. This partnership was created to develop and share critical resources and knowledge for those (public and private) stakeholders willing to deploy in a broadband project. In order to

³² An initial estimation made by Cisco Internet Business Solutions Group (IBSG) showed a Return on Investment (ROI) of 8.1 million Euros in the first five years of activity (Cisco, 2006).

³³ <http://senseable.mit.edu>

build up one of the most ambitious and forward-looking projects in the broadband sector, a Charter of Florence was issued in 2006. As a best practice document, it contains directives for the development of the broadband initiative, focusing on the strategic goals of public institutions and local authorities (it also contains the political rationale for the project, local development benefits and financial viability and sustainability).

Identification and matching of core resources and competencies

Firenze Wireless is structured as a Sole Private Provider where: 1) the network is completely public, owned by the Province of Firenze, which will finance 80% of the project; and 2) network management is provided by the winner of a public tender for a period of 10 years. The winner (the service provider who also operates and manages the network) will pay 6% of the yearly revenues to the Province of Florence.

Network deployment

The network will be based on a Hyperlan technology connecting different cities and villages within the province and on a series of WiFi connections. These will be spread up within the cities and villages themselves in order to allow a wide connectivity for both private and public use. A public-private partnership was set up between the Province of Florence, Infracom Italia, Siemens, Selex, Multilink and Amtec to deploy a wired-wireless network (130 kilometers of fiber plus Hiperlan 5.4Ghz and WiFi 2.4GHz connected to 23 point of access - PoP).

Provisioning of services

In terms of service provisioning, the aim of the initiative is to develop an integrated communications environment to provide customers with both e-government and commercial services. As in the Brescia case, the Firenze Wireless initiative is leading efforts to reduce the digital divide within Italian rural areas. Though the PPP has been able to attract private investors sharing the economic and financial risks of the project, doubts about the long-term consistency of the hybrid model with no open network still remain. However, the project itself presents good potential in terms of scalability since residential customers and business may be attracted by new broadband services and wide connectivity.

3.3.3 Terrecablate Siena

Identification of social and economic targets

Terrecablate³⁴ is a publicly owned carrier, which participated in the Terrecablate consortium (made up of the Province of Siena, 36 municipalities and 3 mountain communities of the Province of Siena). It launched the "Società Terrecablate Reti e Servizi S.r.l.", a fully publicly-owned telecommunications carrier, in November 2005. The consortium proposed itself as the local telecommunications carrier and with its own network (mixing differing technologies such as fiber, DSL and ULL on existing Telecom Italia last mile), Terrecablate provides Internet services to public offices, companies and private customers in the Province of Siena in order to stimulate private investments and reduce the digital divide in the area.

³⁴ (www.terrecablate.it)

Identification and matching of core resources and competencies

The consortium Terrecablate is owned by the municipality of Siena (18%), the Province of Siena (18%), three mountain communities (6%) and all the other villages that joined the initiative (58%). The entire project itself - developed in accordance with the Service of General Economic Interest (SGEI) principle - is not compatible with the existence of a public-private partnership since it is intended to be entirely funded with public money. This is consistent with the idea that a Full Public Control Model provides no room for PPP though the deployment of the network can be outsourced to telecommunications companies.

Network deployment

The main network is based on the integration of a Synchronous Digital Hierarchy (SDH) infrastructure and an IP/MPLS (MultiProtocol Label Switching) backbone. The connection of public offices (i.e. municipal offices, schools, public buildings, etc.), private customers and companies is achieved with the Unbundling del Local Loop, new xDSL network and Gigabit Ethernet technology, depending on the connection requested. Specifically, Terrecablate through the Terrecablate consortium has been able to deploy a wired-wireless network where a fiber bone connects main villages around the Province and xDSL and/or radio connections enable connectivity in semi-urban areas.

Provisioning of services

Through a Full Public Control Model, it aims at maximizing access to connectivity within a rural area guaranteeing with its public ownership 100% commitment towards

public interests (namely, the provision of e-government services, assistance for the elderly as well broadband connectivity to private customers and companies). The project Terrecablate aims to bridge the digital divide across a wide area without opening the network to alternative operators. This has two main consequences: 1) the absence of alternative service providers (no open network); and, 2) technology is adapted to customers' needs (mainly fiber to companies, DSL for residential customers and wireless for users in rural areas).

4 The initiatives within the conceptual model: lesson learned and criticalities

Based on the conceptual model, initial differences between the municipal broadband initiatives in the Netherlands and Italy become apparent, as the municipal networks in Almere, Nuenen and Amsterdam represent (different forms of) PPPs whereby the Brescia, Firenze and Siena are closer to the traditional public utility model (Table 2).

please insert Table 2 here

Table 2 shows furthermore that initiatives by Dutch municipalities are essentially city-wide while the Italian initiatives are deployed in larger regions aiming at the coverage of whole provinces. In addition, the PPPs in the Netherlands and Italy have used different technologies. While fiber-based networks have been used by municipalities in the Netherlands, combined solutions which have been fiber-based with wireless extensions have been applied in the Italian regions. This also reflects some of the core differences in the main scope of the projects (i.e. avoiding market failure in the Dutch

cases and decreasing digital divide in the Italian's). Finally, there are distinctions between the PPPs in Almere UNet and Amsterdam CityNet in contrast to the PPPs in Brescia and Florence. In the first two cases, a PPP model has been used to deploy a city-wide network to correct for market failure while public utility model has been applied to reduce digital divide in the latter two cases.

As mentioned before, the case studies have been chosen to cover four possible business models covering the range between the public utility model to a market based models, which have been implemented by local governments together with private investors to deploy broadband networks. Commonalities and differences of these different models are summarized in Table 3, which summarizes most significant features of each initiative and excludes all the information (e.g. quality of services, details and costs of maintenance) not increasing the definition of the specific case study.

please insert Table 3 here

As shown, in the public utility model, the risk of the entire project has to be taken by public entity, which deploys the network by anticipating targets of public interest (e.g. bridging the digital divide, providing e-government services). In the market based models, in contrast, public funding is usually accompanied by private funding (e.g. Amsterdam CityNet, 'Progetto Banda Larga' Brescia). The interplay of public and private actors usually takes the form of a PPP in which mutual financial contribution is crucial. By matching public and private funds the market risk is spread over different stakeholders. Each stakeholder (i.e. the local government, incumbent, and service provider) takes over a specific risk related to the activity it decides to finance (e.g. civil

works, technology development, provision of services). This allows the distribution of financial and operating risks between the stakeholders, for instance local governments finance civil works and take on the risk related to the concession and conditions of 'rights of way', service providers invest in the development of services and take on the risk related to demand uncertainty.

5. Final remarks and future research

The analysis of Dutch and Italian broadband sectors has shown how the interaction of public and private stakeholders can facilitate the adoption of differing business models, which can then be adjusted to address specific economic, financial, geographical and social issues. More specifically, the paper has utilized an institutional perspective to compare different cases taken from municipalities in the Netherlands and Italy. In contrast to traditional forms of government procurement, PPPs can be used to allocate costs and risks in order to make the initiatives sustainable (especially in financial terms) even with major demand and technology uncertainties. Thereafter, commercial risks are mostly allocated to contractors, which are demanded to deploy the network and operate it. This point shows how the bundling of risks and the long-term contracting between stakeholders represent core issues within PPPs in the broadband sector,.

In describing the role and function of public-private interplay in broadband development, the paper uses a conceptual model to compare the different local and regional initiatives. The model distinguishes between four main stages in order to identify the strengths and weaknesses of joint public-private activities. By identifying the resources and competences brought into the interplay by public and private actors,

the rationale behind the deployment of the network and the interaction among local governments, incumbents, technology providers and service providers can be understood. In each initiative, stakeholders sought the most sustainable method of allocating internal risks (such as concessions and conditions of 'rights of way') and external ones (such as the level of demand) inherent in the project. In some cases (i.e. Amsterdam CityNet, Almere UNet) interplay has been a means of starting a local initiative, to aggregate stakeholders' resources and competences and to allocate risks. In other cases (i.e. 'Progetto Banda Larga' Brescia, Firenze Wireless and Terrecablate), interplay has been the solution to answer an increasing pressure for network capacity. Thereafter, although Dutch projects are scalable, they show high uncertainty in the evolution of the demand since the willingness of customers to pay for double or triple-play services still is unclear. In the Italian cases (i.e. 'Progetto Banda Larga' Brescia, Firenze Wireless) public-private interplay attracts public and private investors, reduces the digital divide and encourages the economic development of a region, but does not resolve doubts concerning the long-term consistency of the hybrid model with no open network. Lastly, the public-private interplay within no or limited scalable projects such as Nuenen OnsNet or Terrecablate Siena resolves uncertainty related to evolution of demand but are not easy to replicate because of specific economic, financial and social constraints.

Future research should concentrate on the investigation of a wider number of case studies in order to prove how the conceptual model can easily be taken as a general framework for the analysis of local broadband initiatives, especially when the aim is to understand the interplay between public and private stakeholders. Furthermore, a more

detailed analysis of financial strategic plans behind the business models is needed. This will allow to pay greater attention to main PPP characteristics by stakeholders willing to start-up a local initiative. Three more issues will also be looked at: the first, the link between the deployment of broadband networks and economic incentives which can hamper the start up of several municipal initiatives, (mainly because of the risks associated with uncertainty of long-term investments); the second, the financial viability of local scalable projects and whether they can be evaluated with financial tools (e.g. real options), which are able to bring flexibility to the fore; and, the third, the impact that different policy directives in EU countries can have on market penetration and positive network externalities. This will provide regulators and local governments with a framework for identifying the main drivers for generating economic and social benefits.

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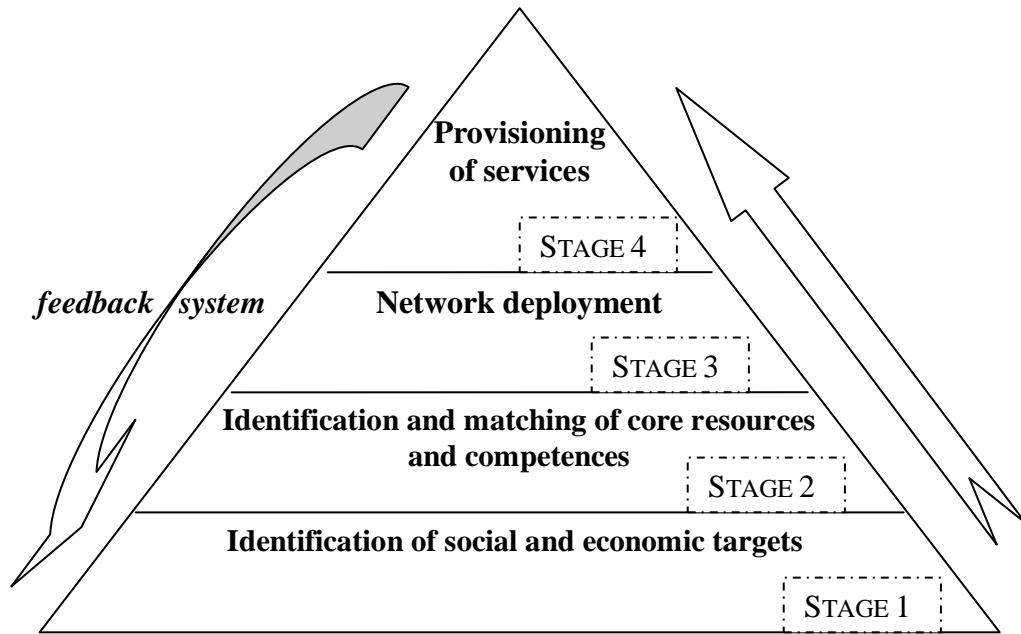


Figure 1 – The conceptual model for municipal broadband network deployment

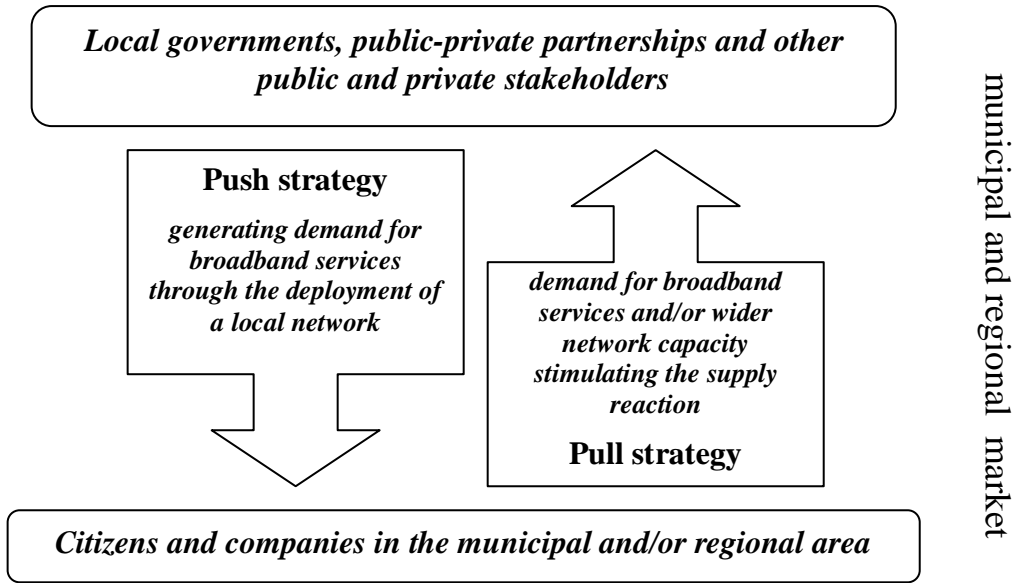


Figure 2 – Push and pull strategies behind local initiatives.

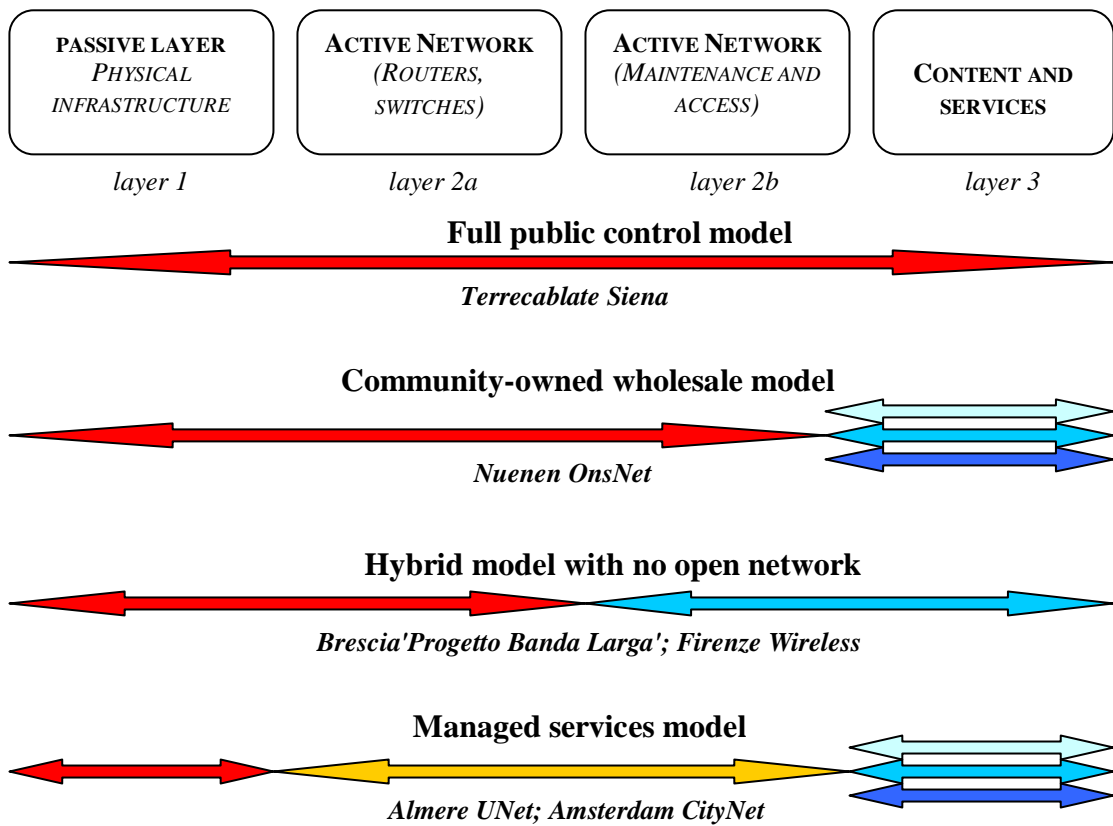


Figure 3 – Business models and PPP in observed Italian and Dutch local initiatives. Our elaboration of the models by Villa (2006) and Cisco Systems (2007).

Information		Netherlands	Italy	
Geographical information	<i>area (km²)</i>		41,526	301,338
	<i>population (2009)</i>	<i>total</i>	16,500,596	60,067,554
		<i>urban</i>	65.8%	48.4%
		<i>sub-urban</i>	32.0%	38.0%
		<i>rural</i>	2.2%	13.6%
<i>pop. density (km²)</i>		396	199,3	
National broadband initiatives		Nederland Breedbandland (2004)	e-government 2012 plan and Programme for infrastructural broadband coverage (both <i>ongoing</i>)	
National broadband penetration		36.2%	19%	
Infrastructures	<i>coverage (urban areas)</i>	<i>DSL</i>	99.9%	99.8%
		<i>cable</i>	91.3%	-*
	<i>coverage (rural areas)</i>	<i>DSL</i>	99.9%	81.7%
		<i>cable</i>	43%	-*
	<i>incumbent DSL</i>		44.9%	59.7%
	<i>entrants DSL</i>		16.4%	36.7%
	<i>cable</i>		37%	0
	<i>FttH/B</i>		1%	2.7%
<i>others</i>		0.7%	1%	
Subscribers	<i>total</i>	5,855,000	11,283,000	
Municipal (regional) activities		e.g. Almere UNet, Amsterdam CityNet, Nuenen OnsNet, Wireless Leiden	e.g. Brescia Wireless, Firenze Wireless, Terrecablate Siena, Lepida S.p.A and Infratel S.p.A. (Emilia Romagna)	

Table 1- Geographical and broadband market comparative analysis. Sources: CEU, 2008d; 2009b; IDATE, 2007. (* no cable infrastructures available)

<i>Initiative</i> <i>Stage</i>	Almere Unet	Amsterdam CityNet	Nuenen OnsNet	Brescia 'Progetto Banda Larga'	Firenze Wireless	Terrecablate Siena
Identification of social and economic targets <i>(Stage 1)</i>	Attracting companies and residents; creating opportunities for our citizens in the field of communication, health care and education	Encouraging competitiveness ; economic growth and social cohesion in a multicultural city; creation of ideal living lab for innovative business; increase the value of real estate	Creating a living experimental environment; improving the business environment and attracting companies in the area	Reducing digital divide; sustaining business presence	Reducing digital divide; attracting business activities	Reducing digital divide; attracting business activities; improving e-government services
Identification and matching of core resources and competences <i>(Stage 2)</i>	<u>Ownership and risk sharing:</u> 30% Municipality, 70% private investors. <u>Layers:</u> Municipality (1), KPN (2a and 2b), service providers (3)	<u>Ownership and risk sharing:</u> 30% Municipality and housing corporations; 70% Reggefiber. <u>Layers:</u> Municipality (1); BBNet (2a and 2b), KPN and other service providers (3)	<u>Ownership and risk sharing:</u> 100% N.E.M. B.V. <u>Layers:</u> OnsNet Nuenen (vertically integrated)	<u>Ownership and risk sharing:</u> 100% Province of Brescia <u>Layers:</u> Province of Brescia (1 and 2a), Megabeam S.p.A. (2b and 3)	<u>Ownership and risk sharing:</u> 100% Province of Florence <u>Layers:</u> Province of Florence (1 and 2a), winner of public tender (2b and 3)	<u>Ownership and risk sharing:</u> 100% Consorzio Terrecablate (18% municipality of Siena, 18% Province of Siena, 6% mountain communities, 58% other villages joining the Consortium) <u>Layers:</u> Terrecablate (from 1 to 3)
Network deployment <i>(Stage 3)</i>	<u>Start-up funding:</u> n.a. <i>implementation by private contractor</i>	<u>Start-up funding:</u> 18 million Euros <i>implementation by private contractor</i>	<u>Start-up funding:</u> 11.2 million Euros <i>implementation by private contractor</i>	<u>Start-up funding:</u> 2 million Euros <i>implementation by local government</i>	<u>Start-up funding:</u> 5.5 million Euros (plus 20% funded by the winner of public tender) <i>implementation by local government</i>	<u>Start-up funding:</u> 85 million Euros <i>implementation by local government</i>

<p>Provisioning of services (Stage 4)</p>	<p><u>Network operation:</u> KPN</p> <p><u>Criticalities and opportunities:</u> demand for triple-play services uncertain and unpredictable; high expectations for e-government, e-health, teleworking</p>	<p><u>Network operation:</u> BBNet</p> <p><u>Criticalities and opportunities:</u> demand for triple-play services uncertain and unpredictable; high expectations for e-government, e-health, teleworking and distance learning</p>	<p><u>Network operation:</u> OnsNet Nuenen</p> <p><u>Criticalities and opportunities:</u> limited uncertainty related to scalability of services to triple play; uncertainty with infrastructure scalability</p>	<p><u>Network operation:</u> Megabeam S.p.A.</p> <p><u>Criticalities and opportunities:</u> demand with a low degree of uncertainty; uncertain scalability of services to triple-play</p>	<p><u>Network operation:</u> private service provider (winner of public tender)</p> <p><u>Criticalities and opportunities:</u> demand with a low degree of uncertainty; uncertain scalability of services to triple-play</p>	<p><u>Network operation:</u> Terrecablate</p> <p><u>Criticalities and opportunities:</u> demand with a low degree of uncertainty; triple-play services for Small Office House Office (SOHO) and residential customers but uncertain scalability of services to triple-play for public administrations and private companies</p>
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Table 2 – Broadband initiatives within the conceptual model

Table 3 - Comparing broadband initiatives in The Netherlands and Italy. Source: our estimations. (*expected)

<i>Initiative Feature</i>	Almere Unet	Amsterdam CityNet	Nuenen OnsNet	Brescia 'Progetto Banda Larga'	Firenze Wireless	Terrecablate Siena
<i>area (km²)</i>	248.77 (city-wide initiative)	130 (city-wide initiative)	18.48 (city-wide initiative)	4,800 (province-wide initiative)	3,514 (province-wide initiative)	3,870 (province-wide initiative)
<i>population</i>	187,000	761,395	19,780	400,000	1,000,000	261,894
<i>technology</i>	fiber (up to 2 Gbit/sec)	fiber (up to 10 Gbit/sec)	fiber (up to 100Mbit/sec)	mesh wireless (up to 8Mbit/sec)	HiperLAN 5.4Ghz backbone and WiFi 2.4GHz (up to 10Mbit/sec)	fiber network based on IP/MPLS (MultiProtocol Label Switching) backbone and Synchronous Digital Hierarchy (SDH) infrastructure. (xDSL network also used) (up to 1Gbit/sec)
<i>business model</i>	Managed services model	Managed services model	Community-owned wholesale model	Hybrid model with no open network	Hybrid model with no open network	Full public control
<i>coverage</i>	~15%*	~10%*	90%	90%*	n.a.	90%*
<i>starting date</i>	2002	2003	2005	2005	2005	2002
<i>open access</i>	yes	yes	yes	no	no	no