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UBIQUITOUS NETWORK SOCIETIES

THE CASE OF THE ITALIAN REPUBLIC

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1 INTRODUCTION

Ever since Antonio Meucci¹ filed a patent caveat for a telephone device in December 1871, revolutionizing the daily lives of ordinary people, Italians have been amongst the most enthusiastic telephone users in the world and it is estimated that there will be 60 million mobile users by 2007^2 .

In recent years, major advances in ICTs, combined with the rapid growth of global networks, such as the Internet, have transformed businesses and markets, learning and knowledge-sharing empowered individuals and communities with new ways of doing things, and created significant wealth and economic growth in many countries. This revolution also means that public access to communications facilities no longer implies that the need to be physically located near urban areas where most information and production is generated. It has completely eliminated the constraints of time and distance.

The next goal is to realize a ubiquitous network society, in which people can access and exchange all information freely, at any time, from anywhere, and from any appliance through the use of broadband and mobile access, as well as intelligent home appliances and RFID tags that can access networks. Progress will not be linear and will require many different elements to fall into place; for this reason, substantial differences can be observed in the strategies adopted by the players in the Italian telecommunication market.

1.1 Why Italy?

Italy was chosen as an ideal case study and survey candidate, because it has one of the highest rates of mobile phone ownership in the world; the country currently ranks second in Europe in terms of mobile telephony penetration levels.³ fifth in total number of mobile subscriber worldwide and boasts one of the highest per capita short message service (SMS) usage rates in the world.

By 2006, digital terrestrial television, with its mould breaking, interactive and single-theme channels, will have replaced analogue television completely. Here, Italy will have a particular advantage, as the current level of cable infrastructure is lower than in many other European countries.

1.2 Scope and outline of the report

This analysis forms part of the background research for an International Telecommunication Union New Initiatives Workshop on "Ubiquitous Network Societies" (http://www.itu.int/ubiquitous/) to be held in Geneva, Switzerland from 6 to 8 April 2005.

In preparation for the Italy case study⁴, a total of thirteen of the most important players in the Italian telecommunication market were interviewed: Maurizio Gasparri, Minister of Communications; Roberto Viola, General Secretary of Italian Communications Authority; Mauro Paissan, Commissioner of the Italian Data Protection Authority; Guido Salerno, Managing Director of Fondazione Ugo Bordoni; Luigi Battezzati, Professor of Politecnic of Milan; Riccardo Ruggiero, Chief Executive Officer Telecom Italia; Tommaso Pompei, Chief Executive Officer of Wind-Infostrada; Marco De Benedetti, Chief Executive Officer, TIM; Pietro Guindani, Regional Chief Executive Officer of Vodafone; Silvio Scaglia, Chairman of Fastweb; Vincenzo Novari, Chief Executive Officer of 3 (H3G); Dario Calogero, Chief Executive Officer of Ubiquity; and Elio Lannutti, President of ADUSBEF. Furthermore, to provide an outside view, Mark Thatcher, Senior Lecturer from the London School of Economics (LSE) was also invited to contribute his opinions. These were incorporated as the "Survey on Ubiquitous Networks Societies: The Case of Italy."⁵

This survey has provided some very interesting and illuminating insights into the prevailing moods and expectations within the Italian telecommunication sector regarding the progress towards the ubiquitous network society in Italy. The respondents replied to the questions with great enthusiasm and were prepared to deal with the key issues in some detail, with the result that the information they provided proved to be extremely useful additional information for the Case Study Ubiquitous Network Societies: The Case of Italy.

The Italian case study is just one of four that explores the implications of a future ubiquitous network society. The other three will cover Singapore, the Republic of Korea and Japan. This ITU New Initiatives

workshop serves as a forum for telecommunication policy makers, national regulators, private sector participants, and academics, in which they can examine the impact of new technologies on the telecommunication industry and society in general, and deal with the issues of social inclusion, diversity, user-protection and security.

This report aims to outline the vision of the future ubiquitous network society in Italy. Section two provides an introduction to the country. Section three provides an overview of the ICT sector and describes the legislative and regulatory framework. Section four highlights the path to the Italian ubiquitous network society. The conclusion looks at the opportunities, challenges, risks and threats within the Italian ubiquitous network society and along the path leading towards it.

2 ABOUT ITALY: AN OVERVIEW

2.1 Geography, politics and demographics

Italy is truly a cradle of Western civilization, with one of the longest histories and richest cultures in Europe. Popular iconography describes the "*bel paese, dove 'l sì sona* - the beautiful country of the ringing" (Dante, Inferno, XXXIII, 80) as being shaped like a boot, set in the Mediterranean and surrounded by islands, the two largest being Sicily (measuring 25'426km²) and Sardinia (measuring 23'813km²). There are around forty medium-sized and smaller islands.⁶

The Italian Republic is a member of the European Union and shares land borders with Austria, France, The Holy See (Vatican City), San Marino, Slovenia and Switzerland.

Italy is divided into 20 regions, 103 provinces and 8'100 municipalities.

The 20 regions are: Abruzzo, Basilicata, Calabria, Campania, Emilia-Romagna, Friuli-Venezia Giulia, Lazio, Liguria, Lombardia, Marche, Molise, Piemonte, Puglia, Sardegna, Sicilia, Toscana, Trentino-Alto Adige, Umbria, Valle d'Aosta and Veneto.

Italy's land mass is 301'230km²; its population is nearly 55 million; it is a land where the traditional distinction between the north (with GDP per capita in line with the best EU performance) and the south – on its way to socio-economic development – is still valid when analyzing the features of the Italian marketplace. In fact, geography is very significant for Italy, as in many cases it has led to very different economies and markets. Around half of the population (more than 29.7 million - Jan. 2004) reside in the north.⁷ but it should be borne in mind that the most populous city is Rome (2'644'000), the capital, situated in the centre; the third city, Naples (with more than 1 million people), is in the south. About 1.3 million people live in the second city, Milan, the economic heart of the country. The age structure of the population is as follows (2004 est.). 0-14 years: 14 per cent (male 4 181 946, female 3'935'535); 15-64 years: 66.9 per cent (male 19'590'497, female 19'256'747); 65 years and over: 19.1 per cent (male 4'608'479, female 6'484'243). The annual population growth rate is 0.09 per cent.⁸

Ethnically, Italy includes small clusters of German, French, and Slovene-Italians in the north and Albanian-Italians and Greek-Italians in the south.

Italian is the official language but other languages are spoken; German in parts of Trentino-Alto Adige, French by a minority in Valle d'Aosta and Slovene by a minority in the Trieste-Gorizia area. The right to education is enshrined in the Italian Constitution and is obligatory until the age of 16; this law was enacted to fight illiteracy and the exploitation of minors.

The dominant religion in Italy is Roman Catholicism, the faith of more than 80 per cent of the people. However, the Catholic Church's role in Italy is declining: only about 25 per cent of Italians attend Mass regularly and a law passed in 1984 abolished Roman Catholicism as the official state religion and ended mandatory religious instruction in public schools. The constitution guarantees freedom of worship to the religious minorities, which are primarily Protestant, Muslim, and Jewish.



Figure 2.1: Italy at a glance

2.2 Political system

Following the institutional referendum of 2 June 1946, Italy ceased to be a monarchy and became a republic. The new Constitution, which entered into force on 1 January 1948,⁹ established the institutional principles. At the top of this system is the President of the Republic, who is the head of state and represents "national unity". The President of the Republic chooses the Prime Minister, whose status is *primus inter pares*, and the President also appoints the various ministers at the Prime Minister's recommendation.

Legislative power is entrusted to Parliament, which consists of two Chambers, both of which are elected every five years by universal and direct suffrage (women did not obtain the right to vote until 1946): the Chamber of Deputies contains 630 members and the Senate comprises 315 elected officials. Executive power is exercised by the government, which comprises the Prime Minister and the various ministers. A particularly important role is played by the Constitutional Court, which is made up of 15 judges, each of whom holds office for nine years, and is responsible for defending the Constitution at the highest level.

Drawing strength from its tradition and the respect it commands as a founding father of the European Union, Italy has contributed to some of the most important accomplishments in the organization's history. Having become a member of the United Nations in 1955, Italy has also been amongst the most advanced countries with respect to European integration, as demonstrated by the re-launch of the Community after the defeat of the European Defence Community (EDC), which saw the peninsula at the centre of some of its major steps forward: from the Messina Conference in 1955 to the Venice Conference in 1956 and the historic signing of the Treaties of Rome on 25 March 1957, which founded the European Economic Community and the European Atomic Energy Community. A founder member of the original European Coal and Steel Community (ECSC), which developed into the European Union (EU), Italy has long been at the forefront of European economic and political unification and, in recent years, has made many official policy changes, in order to be eligible to participate in European Economic and Monetary Union (EMU), which it joined in 1999. At the beginning of 2002, the national currency, the lira, was replaced by the single European currency, the euro.

2.3 Economy

During the last decade, the Italian economy has displayed a consolidated robustness and, has implemented key structural changes. Currently it is ranked as the world sixth- largest industrial economy and belongs to the Group of Eight (G-8) industrialized nations.

A predominantly agricultural country before World War II, Italy has developed a diversified industrial base, particularly in the north, which contributes significantly to the economy. In fact, after 1950, industrial development was so rapid that by the 1990s, industry contributed about 35 per cent of the annual gross domestic product and agriculture less than 4 per cent. Since 1992, economic policy has focused primarily on reducing government budget deficits and reining in the national debt, in order to meet the requirements of the Economic and Monetary Unions. According to the World Bank,¹⁰ in 2003, Italy's GNP was US\$1'101 billion, or US\$19'080 per capita, whilst the gross domestic product in 2004 was estimated at US\$1,55 billion, or about US\$26,700 per capita. In 2003, industry contributed about 28.9 per cent of the value of domestic output; agriculture 2.2 per cent and services about 68.9 per cent.

An ongoing problem of the Italian economy has been the slow growth of industrialization in the south, which lags behind the north in most aspects of economic development. Government efforts to foster industrialization in the south have met with mixed results. This capitalist economy remains divided into a developed industrial north, dominated by large corporations and an immense number of small and medium-size companies (SMEs) well known for their enterprising approach to business, and a less developed, welfare-dependent agricultural south, with 20 per cent unemployment. The main Italian industries are tourism, precision machinery, motor vehicles, chemicals, pharmaceuticals, electrical goods, food processing, footwear, ceramics, fashion and clothing.

The Italian economy is forecast to grow by 1.2 per cent in 2005. Consumer spending will become more stable, given a gradually improving economic environment. Meanwhile, business investment is expected to grow faster, along with the further improvement of the EU economy and a faster growth in foreign sales, the recent oil price hikes notwithstanding. Exports will be lifted by a stronger demand from other EU member states and the further recovery of the world market, despite a strong Euro.

The country has a total workforce of approximately 24.15 million (2004 est.). Unfortunately, unemployment, although a regional issue, remains a problem throughout the country; the overall national rate has been estimated at 8.6 per cent in 2004.¹¹

3 ICT SECTOR OVERVIEW

3.1 Basic Indicators

Italy boasts the world's sixth largest economy and is Europe's fourth largest market for information and communications technology (ICT). Despite the modest growth of the Italian economy, the country's telecommunication sector has performed well, growing by three per cent in 2004.¹² Technological innovation and early adoption have been the distinguishing characteristics of the Italian telecommunications market. Nevertheless, it is generally acknowledged that a host of different factors, particularly those rooted in society and commerce, have combined to drive Italy's ICT penetration levels from the earliest days of the global mobile market. Between 2002 and 2004, the Italian information and communication industry expanded from EUR 30'063 million to EUR 30'803 million.¹³ Some of Italy's ICT statistics are presented in Figure 3.1.

Figure 3.1: Italy's ICT statistics

A snapshot of the ICT industry in Italy.

Republic of Italy (2003)			Republic of Italy (2003)
Mobile Telephones			Internet	
Penetration rate	101.76		Users	18'500'000
Total	55.918.0		Users per 100	33.67
Growth rate (1998-2003)	22.2		Internal. Bandwidth (Mbits/s)	119'794.0
Fixed Lines			PCs (est.)	13'025'000
Penetration rate 48.40			Broadband	
Total	26.596.0		Total subscribers	2'200'000
Growth rate (1998-2003)	0.5		Subs per 100 inhabitants	4.00

Source: ITU World Telecommunication Indicators Database.

3.2 Evolution of the Italian market towards a ubiquitous network society

Several interesting and evolving scenarios have given the Italian ICT cause for optimism. These include the continued development of the mobile technologies, the extraordinary growth of broadband, the diffusion of digital terrestrial TV and the introduction of technologies like VoIP and RFID. If well managed and supported by the government, these could make Italy into a real ubiquitous network society, particularly as it boasts a well-established ICT infrastructure. Meanwhile, the government, the private sector and the R&D entities (universities, consortiums and events) have realized the importance of automating communication between people and making it easier; they have also recognized the potential of converged networks and related services.

3.2.1 Market Trends

The major reference point for the Italian ICT industry is Assinform,¹⁴ the Italian ICT companies' association. Since 1947, when it was formed as an association of office product manufacturers, Assinform has expanded, initially into Information Technology, and now represents the entire ICT sector; amongst its members are Italy's leading IT, telecommunications and content providers, as well as many multinational organizations. According to Assinform Report,¹⁵ as the Italian ICT market has grown over the past two years, especially on the telecommunication side (Figure 3.2), so the IT side has slumped. The growth in the telecommunication market owes more to the investment in telecommunication services and the projects implemented, than to infrastructure or hardware. This is because in the area of mobile service, for example, the huge demand for standard services, such as voice, has saturated the market during the past few years and the operators are now focusing on making their products and services better, trying to create new opportunities and offering new packages to attract prospective customers (Figure 3.3).

Figure 3.2: ICT Market in Italy

Progress of ICT market in Italy (millions of Euro).



Because of the high cost of intelligent handsets, such as smart phones, there has been no growth in network infrastructures and communication devices, although an increase in the sales over 2005 is foreseen. As the introduction of converged services inevitably involves the conversion to more functional devices, this could affect the move towards the ubiquitous society (Figure 3.4).





Figure 3.4: Telecommunication infrastructures and devices market

In Italy there are three major forces¹⁶ driving competition and playing a key role in the new digital world of convergence. First of all, the extremely high penetration and technological leadership in mobile telephony (by 2007, 80 per cent of Italian adults will be using mobile phones; the lion's share - 88 per cent - will go to GPRS/EDGE and 3G technologies, with penetration of 3G at 22 per cent, which is higher than the European average of 13 per cent). Secondly, the accelerated penetration and growth of broadband wire line access (by 2007, 27 per cent of European households and 21 per cent of those in Italy will have access to broadband, with the ADSL share being 70 per cent in Europe and 80 per cent in Italy). Thirdly, the planned phasing-in of digital terrestrial TV, which will completely replace analogue TV by 2006; this is the most important of the three driving forces. The advent of digital terrestrial TV will force the broadcasters to expand their range of offerings by introducing single-theme and interactive channels. Italy's lack of cable infrastructure will give the country a further advantage over other European countries. The development of the mobile phone elevated Italy to a lofty position in the European markets and the scheduled phasing out of analogue TV in 2006 will do the same. According to EITO, even by 2004, interactive digital TV (including satellite, cable and terrestrial) was reaching 32 per cent of Italian families, compared to the European average of 27 per cent. In 2007 this advantage will be maintained, bringing Italy's penetration to 57 per cent, compared with the European average of 44 per cent.

This very promising situation will be a key factor in the establishment of the ubiquitous society, as the existence of the network infrastructure will greatly facilitate its spread. Another key element of the ubiquity mosaic is the growth in the offers for standard services. The third and most important aspect is the capability of the operators to provide services with "added value" (called VAS) to augment the basic functions of the service, thus integrating it into a converged operational environment and making it ubiquitous (any place, any time, with any object).

Meanwhile, the fixed world (broadband and related systems) has just finished consolidating its role as the driver of communication technology. It was not until 2004 that broadband and Internet services began to justify investment by the private sector, to provide tangible added value services. This does not mean that broadband producers lack innovation, rather that they are rather late entrants in the race towards ubiquity and have also been more affected by the nature of the various technologies involved – a mobile phone is easier to use and more intuitive than a fully equipped workstation with broadband access and several different applications running at the same time. The growth of value added services is more evident in the mobile market than the fixed market (Figure 3.5).

Figure 3.5: VAS Services in the Italian ICT market

Progress in VAS services offered (Millions of Euro).



3.2.2 Network Infrastructure and deployment in Italy

Communications are crucial to the development of the ubiquitous network society; this is acknowledged by all players in the Italian telecommunication industry and reflects one of the key objectives of the Italian government's broadband policy, which aims to give all Italian citizens the opportunity to participate in the global information society by stimulating secure services, applications and content based on a widely available broadband infrastructure.

For these innovative services to develop and expand through increased integration and interactivity, as well as greater use of multimedia channels, they will need telecommunication networks with ever-greater capacity (broadband).

The new network infrastructure and flat rate pricing ensure advanced connectivity services and are essential for spreading innovative processes, both directly in the ICT sector and indirectly, as an enabling factor for product and process innovation in Italy. The impact of the availability of advanced infrastructure on innovative processes for the various participants in the information technology field can be traced in different ways.

Firstly, the development of communication systems that improve the exchange and distribution of content and information increases the general propensity of the public (both individuals and households) to adopt innovative technologies and services, which will be delivered over the network itself, thus extending the range of opportunities. The impact for firms is twofold, as it concerns both process and product innovation. First of all, advanced infrastructures allow better interaction between the various company structures (the effect is even greater if these structures are situated in different locations) and between these structures and the rest of the world (customers, suppliers, partners, etc.). All this has direct repercussions on the effectiveness and efficiency of corporate processes and RFID technologies can also play a key role. The availability of a new "intangible" distribution channel (communications networks) also extends the firms' reference markets, generating new opportunities for growth. Furthermore, the new telecommunication networks make it possible to create new products and services, which can assist in the differentiation and diversification of the firms' activities, thus impacting product innovation directly. The characteristics of innovation in the new network technologies can also have an impact on business models, as shown by "always-on" technologies and flat-rate pricing (i.e. not linked to connection time) that are invading the Italian telecommunication market.

A fixed-line communications network can be divided into three main parts: backbones, area feeder networks and access networks. In Italy, the status of these three components differs significantly. Although optical fibre was initially the transmission medium of backbones, since the mid-1990s its use at the metropolitan area network level, including at the feeder level, has increased significantly.

According to the Broadband Observatory,¹⁷ the situation in March 2004 was characterized by an excess supply of optical fibre at the backbone level and fierce competition on the strategic links in the centre and north of Italy (Turin-Venice and Milan-Rome), which caused costs to fall rapidly.

The distribution of backbone systems broadly reflects the distribution of telephone lines, with nearly 50 per cent of fibre laid in regions in the north (the north accounts for 40 per cent of the surface area of the country and 45 per cent of the population). The average fibre density in the large northern regions is double that of the southern regions (Figure. 3.6).





Note: The fixed-line communications network is divided into three main parts: backbones, area feeder networks and access networks.

Source: Osservatorio Banda Larga - Between.

Italy was one of the first countries in Europe to see metro Ethernet appear as a broadband access service.¹⁸ At the access level, projects primarily regard the Milan-based provider Fastweb initiative, which is based on a powerful combination of fibre and xDSL technologies. It offers customers connection speeds of between five and ten Mbps, which is significantly higher than normal DSL networks. By the end of 2004, FastWeb's services were available in 14 major Italian cities. Business customers totalled 56'500 and residential clients amounted to 320'000, representing about 500'000 phone lines (March 2004).¹⁹

In 2002,²⁰ 13 operators received licences for regional Wireless Local Loop (WLL) and alternative access networks using point-multipoint radio systems are being constructed. Given the technical and economic constraints, WLL will probably be limited to business users in very concentrated areas, making it a complementary technology to other access systems.

The recent changes in the regulation of Wireless-Local Area Networks (W-LAN) will increase the pace of development of broadband connectivity solutions.

Satellite access, which can cover the entire country, is a different matter altogether; although there are interesting prospects for developing the potential of this technology using geostationary satellites in the Ka band (20/30 GHz), with a significant increase in resources for the return channel, this looks as if it will also be playing a complementary role, especially in the less populated areas. The current expansion difficulties are being exacerbated by the scarcity of band resources and also the costs, especially those of bi-directional systems (i.e. systems that do not use the traditional telephone line for the upload channel).

3.2.3 Penetration of broadband

In 2003 there were more than 2 million broadband subscribers (Figure 3.7), with one of the fastest growth rates in the world. At the international level, in 2003, Italy had moved up one position in the world ranking of countries according to the number of xDSL connections, rising to 9th place (ahead of Spain).



According an EU report in July 2004,²¹ there were around 3'500'000 broadband lines, 92 per cent of which were using DSL technology, with around 5 per cent using fibre and 3.4 per cent being satellite connections. With of one of the lowest monthly rentals in the EU (\in 8.3) and stringent regulation, the unbundling of the local loop (LLU) has proved an effective way for alternative operators to compete in providing broadband connections. The number of active unbundled local loop lines in July 2004 (697'530) was amongst the highest in the EU (and had doubled since July 2003) and almost 30 per cent of the new entrants' broadband retail connections were based on LLU. During the period July 2003-July 2004, the incumbent increased its share in the overall retail broadband market (from 63.8 per cent to 70.3 per cent) and in the ADSL market (from 73 per cent to 76.2 per cent). In October 2004, there were 1.6 million active 3G lines; if 3G connections are included, the incumbent's market share and the broadband penetration rate are, respectively, 55.9 per cent and 7.8 per cent. In 2003 the UMTS coverage (H3g only) was about 37 per cent of the population and 13 per cent of the surface. In 2004 the coverage provided by H3g has outpaced 60 per cent of population, in addition in May 2004 both TIM and Vodafone were able to offer UMTS services, covering about 30 per cent of population.

As regards mobile communications, Italy ranks second behind Luxemburg in mobile penetration in Europe and fifth in the total number of mobile subscribers in the world (Figure 3.8). The rapid growth of mobile services is largely because of the introduction of prepaid card services. In the year following the introduction of the prepaid card service in 1996, Italy's mobile penetration rate ranking among OECD member countries jumped from 12th to 8th and since then it has grown every year. The Italian market has one of the most dominant mobile players in Europe, namely Telecom Italia Mobile²² (TIM), with around 47 per cent market share and EBITDA margins of 54.5 per cent (in Q3, 2003), followed by Vodafone, Wind and H3g. The

entrance of a fifth mobile player into the Italian mobile market early in 2005 has already been announced; this will be I-mate, the world specialist in end-to-end wireless device solutions. This new player could change the Italian market by introducing new business models already implemented in other parts of the world.





One of the most important developments in Italy during recent years has been the fact that in 2003 the mobile market overtook the fixed market in terms of revenue (€16.7 billion compared with €16 billion)²³. In some cases this has taken the form of fixed to mobile substitution, in terms of the number of connections and the traffic volume. The rapid growth of Italian mobile communications has been confirmed by the penetration rate that is currently above 100 per cent²⁴.

Some effort has been made to re-start the competitive process; in June 2001, Italian mobile phone operators TIM, Vodafone, Wind, and 3 (H3G) reached an agreement on mobile number portability,²⁵ which enables customers to switch operators, whilst keeping the same number. This promotes competition within the market (Box 3.1).

Box 3.1: Number portability in Italy

Millions of Italian mobile users choose to keep their mobile numbers, when changing the operator.

For the first time, 3 (H3G) and Wind rate number one for the net number of acquired clients who have chosen to keep their phone number: in particular, the Mobile Video Company of the Hutchison Group, the Italian leader in the UMTS market, has registered a net positive balance of 21,726 units between clients acquired and those lost, even though it started the service 11 months after the introduction of MNP. Wind drops to second, while TIM and Vodafone have lost a total of almost 450'000 clients.

Since the introduction of Mobile Number Portability in Italy, a total of almost 2.8 million people have chosen to change their mobile operator, but keep their number.

Number Portability Distribution (April 2004)							
Operator	Mobile Numbers lost	Mobile Numbers gained					
3 (H3G)	0.6	7.3					
Tim	36.1	33.7					
Vodafone	29.7	24.1					
Wind	20.56	34.9					

3 has once again lodged an urgent application with the Communication Authority for an inter-operator price level

Communication Authority for an inter-operator price level of activations lower than the current $\notin 10.02$; the final zeroing still has to be carried out. To date, the total cost of allowing users to carry over their numbers is almost $\notin 2.5$ million.

Source: AGCOM.

In addition, for the first time, the incumbent mobile subsidiary's market share (in terms of revenues) has decreased to less than 50 per cent. The increasing uptake of mobile data services is expected to lead, in 2005, to a repeat of the good 2004 growth. Demand for MMS services is translated into positive spending in new handsets; although growth has been moderate over the last two years, it is expected to pick up in 2005, thus confirming the existing trend. It is also worth mentioning the subsidy initiative launched by 3,²⁶ which allows customers to buy the latest model UMTS mobile phone at a lower price. On the other hand, 3 utilizes the Sim lock system, which means that these customers are obliged to use 3 tariffs for an established period of time if they want to benefit from this offer.

3.3 Legislative framework

The AGCOM (Italian Communications Authority), based in Naples, is the regulator in the telecommunication sector while the Ministry of Communications has the responsibility of policy making in the sector.

The new regulatory framework²⁷ is found in the *Codice delle Comunicazioni Elettroniche*²⁸ (Electronic Communication Code), which entered into force on 16 September 2003.²⁹ The Italian Government has also recently passed a law on audiovisual markets (Gasparri Law n. 112/2004 of 3 May 2004³⁰), which contains, *inter alia*, the framework for broadcasting transmission networks. The same law also mandates the government to unite the existing regulations in a Radio and Broadcasting Code (*Testo unico della radiotelevisione*). In the meantime, the analysis of the above national provisions and their conformity with the new regulatory framework continues.

3.3.1 History of ICT regulation and policy

The alignment of telecommunication policies with EU standards provided the initial impetus for the reform of the Italian telecommunication market. The ongoing liberalization was assisted by the release of the 1987 "Green Paper on the Development of the Common Market for Telecommunications Services".

Until 1992,³¹ telecommunication services in Italy were provided either directly by the State, through the ASST (Telephone Services State Agency) and the Posts and Telegraphs Administration (PT), or indirectly through several concessionaires, such as SIP, ITALCABLE, TELESPAZIO, SIRM, and TELEMAR.

The Italian Government then decided to award the management of all telecommunication services to the concessionaires (Law No.58/92). When they subsequently realized that the division of telecommunication operations had weakened the overall development of the Italian telecommunication industry, the government merged all the concessionaires, with the exception of TELEMAR, into a single company, Telecom Italia.

In 1995, all telecommunication services except fixed voice telephony, mobile and satellite services and network installations were liberalized. Furthermore, in 1997, satellite networks and services were liberalized by Decree-Law 11 February 1997, No. 55. On 31 July 1997, the Italian Parliament enacted Law No. 249 on the "creation of the telecommunications National Regulatory Agency (AGCOM – *Autorità per le Garanzie nelle Comunicazioni*)"(see Section 3.3.2).

In November 1997, the Ministry of the Treasury privatized Telecom Italia by selling virtually its entire stake through both a global offering and a private sale to a group of shareholders, thus starting the full liberalization of Italian market. Since then, several new entrants to the Italian market have changed it completely. By 1 June 2003, there were 230 licences for PSTN network and/or service providers in the fixed voice telephony market. Alongside the incumbent, Telecom Italia, the major fixed voice telephony service providers are: Infostrada (owned by the National Electricity Co. [ENEL]), Fastweb, Tiscali, Albacom, and Tele2.

In the mobile market, Vodafone-Omnitel, the second mobile operator commenced services in 1995 and Wind, the third mobile operator, commenced operations in March 1999. Blu S.p.a., which obtained a licence as the fourth national operator on 4 August 1999, began providing a DCS 1800 service in the summer of 2000 but it finished in 2001. In addition, five UMTS licenses were awarded in November 2000 and in 2003 H3g entered the Italian market, also providing UMTS services. In 2004 the merger between Telecom Italia and TIM was announced and it should be completed by 2005.³²

3.3.2 The National Regulatory Agency: AGCOM – Italian Communications Authority

The National Regulatory Agency³³ was established in 1997 by ordinary law no.249 and became operational on 22 July 1998 as the regulatory body for the whole communication system, including:

- Telecommunications
- Broadcasting
- Press

This horizontal regulatory competency over the whole Italian communication sector gives AGCOM one of the most comprehensive regulatory roles in the European Union, with power in both the telecommunications and the broadcasting sector.

AGCOM is fully independent and has authority over all regulatory issues in the telecommunications sector. It acts as a regulator, ensuring equitable conditions for fair market competition and pursuing technological innovation, as well as supervising the control of prices, the introduction of new services and technologies and analyzing the market. It acts as guarantor, protecting the fundamental rights of all citizens, safeguarding pluralistic information and defending the copyright of audiovisual and software products. It also guarantees the protection of the fundamental rights of the operators, promoting and safeguarding competition in the telecommunication market, as well as applying anti trust rules in the field of broadcasting and organizing the Registry of Communications Operators. According to law no. 249³⁴ AGCOM shares the task of spectrum planning and allocation with the Ministry of Communications.

AGCOM has always focused on fostering long-term, facilities-based competition. In March 2000, Italy became one of the first countries to introduce local loop unbundling obligations; this required Telecom Italia to provide a wide range of services and options to competitors and to supervise the implementation step by step. AGCOM assumed the key role of local loop unbundling for broadband network deployment and forced Telecom Italia to provide DSL wholesale offers to alternative network operators and Internet service providers, with the aim of preventing the incumbent from pre-empting the emerging market. AGCOM has also introduced many additional regulatory provisions supporting broadband competition, such as the decision to admit ISPs to Telecom Italia's leased lines wholesale offer and DSL wholesale offers. In July 2002, AGCOM issued technical rules that opened up Telecom Italia's interconnection offer to ISPs, according to national law no.59/02.

Since the organization's inception, AGCOM policy has fostered the unbundling of the local loop, provided a stable regulatory framework, guaranteed bitstream and leased line access and developed a policy that does not discriminate amongst existing technologies, but does foster the development of alternative technologies, such as satellite, WLL and 3G optical fibre.

Competition in the market will ensure the continuation of the downward trend in prices that began at the start of the liberalisation process. Policies to facilitate interconnection, local loop unbundling, access by new operators, monitoring of charges (interconnection, wholesale prices of leased lines, etc.) remain a priority and are a key factor in supporting and facilitating the development of infrastructure and new broadband services.

In the market there is a broadly positive consensus on AGCOM's implementation of the regulatory framework and during the past two years, AGCOM has introduced some important pro-competitive regulatory measures; for example, the *ex ante* replicability test for the incumbent's retail offer. Nevertheless, operators and consumer associations have expressed some concerns about the slow pace of AGCOM's decision-making process in some areas. The delay in analyzing the market has created problems for operators, not only because of the consequent uncertainty about the new regulatory framework, but also because it has held back the definition of various existing regulatory obligations that had not yet been fully implemented; this has been acknowledged as one of the reasons why the ubiquitous network society in Italy has not yet been achieved. After several years' confusion over the allocation of tasks between AGCOM and the Ministry of Communications, a final agreement was notified to the Commission in July 2004, under Article 3 of the Framework Directive. Furthermore, in January 2004, AGCOM and the National Competition Authority signed a cooperation agreement; this regulated the general consultation mechanism, in particular market analysis and spectrum trading.

3.3.3 Scenarios and policies for the Italian ubiquitous society

The Italian Government is committed to making Italy a leader of the digital age; modernizing the country through the widespread use of new information and communication technologies, in both the public and private sectors. The government also aims to boost the country's competitiveness by accelerating the spread of the online economy and developing a model of the information society based on innovation and knowledge that both improve the quality of life and prevents exclusion³⁵ (Figure 3.9).



To achieve its goal the government has implemented several financial incentives, such as: contributing to digital TV (EUR 150 per household) and broadband access (EUR 75 per household)³⁶. The Budget Law for 2003 contains a provision for reducing the cost of buying or renting the equipment needed to access these networks. A subsidy of EUR 75 is available to individuals or legal persons (limited liability companies, stock companies, partnerships limited by shares, and associations, foundations, specific committees and public entities) who buy equipment for transmitting and receiving data on the Internet via broadband. The government made the sum of EUR 31 million available for the year 2003; this was equivalent to around 410'000 broadband connections and the uptake was rapid. This provision was proposed again for the Financial Bill of 2004 to the tune of EUR 30 million.

Other initiatives taken include:

- *Stimulating government use*: the SPC (*Sistema Pubblico di Connettività*) is the network that connects public administrations; currently around 20 per cent of public administration offices have broadband and a target has been set to take this to over 80 per cent by the end of 2005;
- *Connecting schools*: the objective is to have PC and ADSL access in 70 per cent of the 11'000 schools by the end of 2005.

3.3.4 Minister for Innovation and Technologies

The role of the minister and his department is to steer, coordinate and encourage action by other branches of the central administration, with the aim of defining specific projects, action plans and programmes to deploy information technologies, thus bringing more effective and efficient services to citizens and businesses and enhancing the economic, social and cultural conditions in the country.

A large part of the strategy has been focused on the private sector, with the following objectives:

- Support of development and diffusion of ICT amongst small and very small companies;
- Digitalisation of industrial districts;
- The South of Italy;
- Infrastructure deployment (broadband);
- Legislative measures.

Through the Ministry for Innovation and Technologies, the government has directed its efforts towards setting up and directing each initiative within a general scheme of action.

In 2001, the Ministry for Innovation and Technologies and the Ministry for Communication established a Broadband Taskforce³⁷ to monitor the rate of broadband network implementation and evaluate proposals for action (Box 3.2).

Box 3.2: The Broadband Task Force Report

In November 2001, the Broadband Task Force, with the active contribution of operators, local administrations, trade associations and experts, issued a report and submitted it to the ministries for their approval. The report opens with a new definition of broadband: "...the technological environment that permits the use of digital technologies at maximum level of interactivity..." This open notion, which does not refer to a specific technological situation, appears to be particularly suited to a changing scenario and it also overcomes the divergent broadband definition approaches adopted so far, anticipating the forthcoming Italian ubiquitous network society.

The report underlines the need for a virtuous circle of expansion, with a range of broadband services and applications increasing the demand for higher bandwidth and encouraging further investment in infrastructures. It emphasized the role the government ought to play in addressing and supporting the demand for, and supply of broadband. However, the public approach that has been envisaged should be applied indirectly and selectively; the government should focus on stimulating demand (in both the public and the private sectors) and supporting private investment. With these guidelines in mind, the Task Force outlined a range of actions:

- a) The promotion of new network deployments, optimising the use of public resources and complementing the private sector with selective actions. The government can play an important role by proposing first-level regulation and administrative actions, which minimise uncertainties for operators and foster the use of different technologies (WLL, satellite) to overcome geographical constraints.
- b) Fiscal incentives for operators and end users can support both the supply and demand sides.
- c) The aggregation of public demand with a "central purchasing system" has been envisaged as a means of supporting the supply side.
- d) The development of public digital services and digital educational programmes could increase the digital needs of citizens and support the demand side.
- e) Continuous, in-depth monitoring of the effectiveness of public initiatives, especially in terms of geographical distribution and the range of technologies available.

The report confirmed the importance of sector regulation, identifying competition in the access market (in a broader sense, including the provision of leased lines and the regulation of rights of way) as the key issue for the broadband case.

Source: Task Force on Broadband Communications.

One of the taskforce's key recommendations was the reduction of digital divide. Such was its importance, that early in 2002, the taskforce became a permanent committee to coordinate and direct broadband initiatives; one of its key goals was the diffusion of broadband infrastructure. The new body's strategy³⁸ foresaw two lines of action: firstly, incentives to encourage investment in the infrastructure; and secondly the stimulation of demand by developing digital content and online innovative services. Sviluppo Italia (the National Agency for Enterprise Development and Investments) has been tasked with developing digital content, services, applications and broadband infrastructures and bridging the digital divide and infrastructure gap that penalizes the southern regions. To do this, the government and Sviluppo Italia have

cooperated in the creation of two agencies to promote and roll out broadband services and infrastructures; these are *Innovazione Italia* and *Infratel Italia*³⁹ (Box 3.3).

Box 3.3: Innovazione Italia

A company that supports regional and local initiatives.

Innovazione Italia – a company entirely owned by Sviluppo Italia – was set up by the Ministry for Innovation and Technologies (MIT) to achieve the Information Society's objectives. The company supports regional and local innovative initiatives and promotes consistency with regards to the rollout of the Information Society and e-government. Innovazione Italia's objectives, projects and activities have been established in collaboration with the Ministry for Innovation and Technologies, and technical aspects and standards for projects are defined together with the National Centre for Informatics in the Public Administration (CNIPA).

Innovazione Italia's objectives include:

- Projects under the research programme for the Information Society and within the Broadband Programme to increase demand, and implementation of plans for the development of the Information Society (Committee of Ministers for the Information Society);
- Identification and evaluation of innovative initiatives to supply high added-value public services in collaboration with regional and local administrations and private operators. The company also acts as an incubator for new business initiatives in the high-tech sector;

Support initiatives by Sviluppo Italia, making the most of overall resources and competencies to achieve objectives. *Source:* OECD, Working Party of the Information Economy, Digital Broadband Content Panel, Paris, 3 June 2004.

3.3.5 Bridging the Italian divide - Coverage of under-served areas

The digital divide in Italy covers both urban and rural areas and even in the most developed parts of the country there can be areas where the private sector has no interest in building up the infrastructure necessary for broadband services; this is because of low-density population, market potential, mountainous regions, etc. An interesting example would be the fact that in Italy more than 15 per cent of the population live in areas known as *comunità montane* (mountain communities), which have specific infrastructure needs. It has been estimated that without a public initiative, around 6 million inhabitants would risk being denied broadband services ("long-term digital divide") (Figure 3.10).

Recent studies on the take-up of Broadband⁴⁰ throughout the country reveal that Italy is behind schedule compared to most other EU countries, and that the South is lagging even further behind. A vicious circle exists, with the private sector uncertain of the return on their investment and the consequent lack of infrastructure hindering the development of applicative multimedia services, as well as the demand for high-speed connections. This leads to a reduction, especially in the South, in the opportunities for the development of an economy based on new communication technologies.

Italy's National Executive "Broadband" programme intends to break this vicious circle, create suitable circumstances to make the investments profitable and reach a balanced development of both infrastructure and services; to do this, it is pursuing the following lines and objectives:

- the role of public demand;
- public connectivity system: guarantees the exchange of information among all Public Administration System (central and local government), citizens and enterprises, with high-quality security;
- stimulation of private demand, in particular through incentives for the use of digital and IT devices;
- facilitate the creation of infrastructure.

A five-year strategy for broadband development in southern Italy was launched; it was co-ordinated by Sviluppo Italia and cost EUR 193 million, 60 per cent of which was public money. To monitor the development of broadband coverage in 2002, the Ministry for Innovation and Technologies and the private sector joined forces to establish a three-year "Broadband Observatory" project.

Figure 3.10: The long term digital divide in Italy



Note: The segments in the pie chart correspond to the south and the islands (SI), the north-west (NW), the north- east (NE), and the centre(C).

Source: Italian Broadband Observatory, 29 September 2004.

The project started in 2002 with the aim of monitoring the development of broadband in Italy in terms of: coverage (with different technologies: xDSL, fibre optic, wireless local loop, etc.), broadband offering (residential and non residential services and number of service providers), demand (consumer, business, public administrations), local models (regions, municipalities), technology (costs analysis and technological scenarios) (Figure 3.11).

Since then, a range of new initiatives aimed at accelerating ICT infrastructure coverage and increasing ICT uptake has been introduced; these include the broadband incentive to increase uptake of high-speed connections more widely across the economy.

Towards the end of 2003, the Ministry for Innovation and Technologies and the Ministry for Productive Activities launched their "Action Plan for ICT Innovation in Enterprises"⁴¹ that promotes the adoption of ICT in Italy through the close coordination of the ministries involved. The action plan funds the projects as follows:

- EUR 126 million has been allocated for e-government and information society projects, such as public . access centres for integrated online services: e-health projects and local e-government initiatives in small and medium-sized towns.
- EUR 150 million has been allocated to support demand for the development of broadband in the fields of e-learning in schools and the promotion of ICT in industrial districts.

The aim is to develop major national projects more rapidly and roll out large-scale policies (e.g. the development of e-medicine) and increase the support offered to businesses, especially SMEs. These projects will complement others linked to the diffusion of e-government that are being implemented by both local and central administrations, and are helping to make federalism more efficient.

Figure 3.11: The evolution of digital divide in Italy

Monitoring the development of broadband in Italy.



3.3.6 Ministry of Communications: current and upcoming ICT initiatives

In September 2002, decree no. 198/2002 finally set out clear and common rules for network installation activities at the national level. A few provisions deserve to be highlighted: the definition of a fast authorization procedure (with short response times by local administrations and a silent procedure system); the central role of the Ministry of Communications for the coordination of digging activities and the promotion of civil infrastructure sharing; the harmonisation of the level of digging fees imposed by the local administrations and a prohibition on them imposing any additional burden for digging activities; provisions enabling the construction of vertical ducts in new buildings. The operators have greeted the decree enthusiastically, although some local administrations have expressed constitutional concerns. In April 2002, another of the guidelines' regulatory interventions was turned into reality; Law no.59/2002 allowed ISPs to access to Telecom Italia's Interconnection offer as well, seeking operational rules from AGCOM.

In 2002, the Ministry of Communications awarded WLL licenses, according to the general framework set out by AGCOM. The auction raised around 35 million euros for the public budget and ensured a potential national coverage by at least two operators. As regards the indirect approach, e-government initiatives can play an important role, since they can stimulate the demand for new services and applications by both final consumers and public administration.

The government asked local administrations to submit their digitalization projects by June 2002; these were aimed at making savings of around 50 per cent over the traditional systems. These projects have been financed, for no more than 50 per cent of their total costs. Around 400 projects have been submitted, covering about 90 per cent of the population. As the total value of projects submitted has been estimated at approximately EUR 1'200 million, and the first round of financing has been reduced to EUR 120 million, the Ministry has selected 138 projects to be financed in the first round.

Other noteworthy actions for e-government⁴² include the opening, in June 2002, of the new government website; the start up of an electronic ID (with a target of 1,5 million ID cards issued by 2005 and total national coverage by 2006) and digital subscription projects. These objectives should be verified and possibly reassessed, considering the amount of money that will be devoted to the e-government issue by the State budget.

3.3.7 Broadcasting Policy

These days, the digital revolution is the dominant factor in the convergence scenario of broadcasting, telecommunications and new information technologies; because of this, digital terrestrial television (DTT) will play a leading role.

Together with UMTS and fixed broadband access, DTT is highlighted in the e-Europe 2005 action plan⁴³ as one of the three main access platforms to the information society. The Italian government fully shares this view as can be clearly gauged from the legislative initiatives and regulations that have been already implemented to develop DTT in particular and broadband in general.

The transition from analogue to digital broadcasting⁴⁴ started in Italy in 2004 and, because of its broadcasting environment, has proved to be a very challenging process; for example, the terrestrial spectrum in Italy is almost completely occupied and there are currently around 700 local and 11 national broadcasters.⁴⁵ The peculiarity is that the majority of these do not have a licence and have been occupying the frequencies on the authority of a decision taken by the Constitutional Court in 1976, which ruled that the monopoly of public service broadcasting was not justified at the local level. Only in 1990, after the situation had settled down, was a systematic Broadcasting Act introduced. Because of this, there is no spare capacity to allocate to existing broadcasters or new operators for them to start up simulcast of existing programmes and new digital terrestrial services. Nevertheless, the transition to digital is seen as important, for two main reasons:⁴⁶ firstly, it will enable the reallocation of the spectrum and secondly, it will lead towards the convergence of services delivered via the TV set, thus bridging the digital divide and turning the e-society into a reality, which could finally herald the advent of the Italian ubiquitous network society.

Digital Terrestrial Television Infrastructure

In Italy⁴⁷ broadcasting has traditionally been through free-view analogue terrestrial frequencies. Satellite was introduced just 10 years ago and pay-television operators do not have a very large market share (at present only Sky Italia is active, with about 3 million subscriber accounts). The traditional Italian broadcasting operator is a dual-purpose entity, which provides content to be broadcast and owns the network on which such content is broadcast. Previous regulations did not allow for terrestrial operators to split these activities.

However, digital terrestrial television has introduced a different concept; network operators can now operate separately from content providers. These entities can be two separate enterprises, bound to each other by service and capacity agreements. Such distinctions weaken operators' vertical integration, which has characterized the analogue television scene and favours the access of operators to the market. The above distinction gives consumers a wider choice of programmes and promotes integration with other communication sectors, such as publishing and Internet activities.

The New Broadcasting Act⁴⁸

During the past two years, the Italian Parliament has dedicated much time towards the media, focusing in particular on two main issues: on the one hand, a law and regulations have been drafted to regulate the transition to digital terrestrial television, and on the other, a great deal of time has been spent discussing the need for a new Broadcasting Act to redefine, in the new convergent context, the role of public service broadcasting.

According to a European law (Law 66 of 2001), all television broadcasting must be digital and all citizens of the European Union must be able acquire a device able to convert or broadcast digital signals. In Italy, the law for putting into force and disseminating digital terrestrial television are contained in the "Gasparri Law", which was finally passed on 3 May 2004 and provides for the shutdown of analogue terrestrial television by 2006.

Art.1, "Application framework and aims," reads: "This law identifies the main principles which form the structure of the national, regional and local radio and television system and upgrades it to the advent of digital technology and the convergence process between radio and television and other personal and mass communication fields, such as telecommunications, the press, even electronic and Internet in all its applications." It continues: "Included in the application framework of this law are broadcasts of television programmes, radio programmes and data programmes, even with conditioned access, as well as the supply of associated interactive services and conditioned access services on terrestrial frequencies, via cable and

via satellite." It states that the purpose of this law is to provide a new set of principles to update the television broadcasting system, taking into account the introduction of digital media, convergence and the Internet. All television and radio broadcasts (terrestrial, cable and satellite) fall within its scope of application, together with interactive services and pay-television services provided in connection with such broadcasts.

The new act tries to redefine "public service," both in terms of programming obligations and of the mission of a PSB company in the digital era. The act also states what kind of programmes the public broadcasters will be obliged to produce and broadcast: the details (the number of hours, etc.) will be re-defined every three years in a contract between the PSB and the Minister, drafted on the basis of guidelines issued by AGCOM.

More remarkably, for the first time, PSB will be subject to accounting separation. Annual fees paid by viewers to finance public service broadcasting will be used solely to fund public service programming, as defined by the contract. In addition to programming obligations, the legislator has assigned PSB the task of encouraging the transition to digital terrestrial. The digital network must have national coverage (80 per cent of the population) by 2005 and achieving this will be extremely challenging.

The "frequency trading"

As the 112/2004 "Gasparri" law came into effect it brought significant innovations to the world of television, both local and national. Over the next few years the transition to digital transmission technology, which was already anticipated by the 66/2001 law, and has been confirmed by the 112/2004 law, will revolutionise the value chain and business models so far consolidated in the television sector. The law takes into consideration another situation peculiar to broadcasting in Italy, namely that there is no capacity for the simulcasting of digital and analogue. As administrative tribunals protect the prerogatives of local broadcasters in maintaining the use of the frequencies, there is very little chance of changing the situation. Because no digital plan has been adopted, there is no accurate estimate of how many channels and services will be available in the new digital context. Given this, the only way to push small local channels to give up their capacity was to allow broadcasters to trade their frequencies. This will allow national broadcasters (cable, satellite and terrestrial) and consortiums of operators to start up digital programmes with the acquired capacity.

In this scenario, local television companies will play a prominent role and, by integrating their current business of television broadcasting with that of telecommunications network operator, they will be able to exploit interesting new opportunities. Using their own digital broadcasting networks, local companies will also be able to transmit content for third parties and supply interactive services, as well as managing t-government applications in collaboration with the other local authorities, pursuing new business models and exploiting their investments to the full.

The safeguard of pluralism

To guarantee pluralism and stimulate competition, the regulation reserves one third of the broadcasting capacity for local content providers; national networks will also be allowed to carry local content, in order to encourage local broadcasters (more than 700 operators in Italy) to find an agreement with the (mainly national) network operators and free up their frequencies, in exchange for a portion of a multiplex. Most local broadcasters in Italy will not have the financial resources to switch to digital and will, therefore, become mere content providers carried on national networks. Some of the most important local broadcasters are trying to reach an agreement to create their own local networks. Moreover, a content provider may not be granted authorization for free-to-air or encrypted broadcasting, which would allow it to broadcast more than twenty per cent of national digital television programmes. The *ex-ante* threshold has been set on content providers.

By 2004, the authority had issued rules aimed at guaranteeing access to content providers that were neither directly nor indirectly related to network operators and principles, in order – when resources are not sufficient to satisfy all reasonable requests by content providers – to guarantee access to broadcasting capacity by all content providers on a non-discriminatory basis.

4 THE PATH TO ITALY'S "UBIQUITOUS NETWORK SOCIETY "

4.1 Concepts: an overview

This chapter will assess the status of the technologies and describe the projects already carried out by the major Italian players to achieve a ubiquitous network society.

In recent years, the concept of ubiquitous networking has become an increasingly important aspect of the ICT strategies of several countries and governments. Since its creation, in 1988, almost all R&D entities, as well as the private and public sectors, have been exploring the possibility of implementing the ideas driving ubiquitous networking. At the same time, the term "ubiquitous" has started appearing in ordinary newspapers, magazines and corporate advertising and its use has become increasingly diverse. Starting with the ubiquitous network and ubiquitous computing, it now includes the ubiquitous information society, the ubiquitous revolution and the ubiquitous solution.

The original definition of "ubiquitous" was made by Mark Weiser,⁴⁹ a researcher at Xerox, who identified and articulated a new computing paradigm, which consisted of a context-aware concept, in which computing capabilities are incorporated everywhere and linked, automatically generating the optimal operational status.

From the above definition, ubiquitous networking must be seen not as an individual ICT, but as a total, comprehensive ICT paradigm. Sometimes, the term "ubiquitous" is treated as a synonym for "mobile internet with cellular phone," or is placed in the same category as digital home appliances with communication capabilities. During the last two years, there has been a tendency to call anything using electronic tags "ubiquitous". The ubiquitous network does not refer simply to such individual ICT elements, but is a single, integrated ICT paradigm, which covers a full range of key elements, from network infrastructure and digital equipment to digital platforms; it represents the environment for ICT utilization.

Japan, which is one of the most important incubators and implementers of the paradigm, has provided us with a meaningful definition of "ubiquitous". This defines the ubiquitous network as an environment for ICT utilization, where "a network is connected at any place, any time and with any object". It defines the ubiquitous network from the user perspective, rather than referring to individual ICT elements. In this sense, ubiquitous networking is not something that will be achieved merely through the spread of specific ICT elements, such as 3G mobile communications or wireless and broadband access, rather it represents a very big change, involving the entire social system; from legal frameworks, to usage practices.

To clarify the above concept and understand how the Italian system is positioning itself in relation to ubiquitous, it is worthwhile delving deeper into the real meaning of "at any place, any time and with any object". The first aspect, "at any place," represents the capacity to access and use a specific IT service through different access technologies and physical devices. The use of Internet has shortened the distances and practically redrawn the geographic maps, enabling communication between continents with a simple click. However, this advantage disappeared as soon as the user got up and left the PC.

The introduction of the new communication technologies has led to a new way of communication, which enables a user to be connected to a network without using a PC. These technologies include Bluetooth, wireless LAN and related protocols (IEEE802.11), electric power line networks (Internet connections using existing electric lines), RFID (Radio Frequency Identification), network cameras, car navigation systems. Making full use of these technologies should enable access to specific services "at any place," thus reducing the total cost drastically. At home, at the office, from the airport, in the stadium, in a vehicle or simply when walking, a user is able to connect to the ubiquitous service.

The second aspect relates to connecting "at any time," meaning that the service must be "always-on". With the spread of broadband technologies and the recent introduction of digital TV, the concept of having a service available at all times is becoming real. However, even if 24X7 dedicated access is provided from a carrier perspective, "always-on" connections mean nothing to users who are not physically in front of their PC. To enable connections "at any time," access must be possible "at any place" and on an always-on basis. The third and final aspect refers to connections "with any object". The ubiquitous network enables the use of a wide variety of non-PC equipment, such as cell phones, game machines and car navigation equipment, in addition to the desktop and laptops. Whilst this improves connections between people, the next step will require a better connection between people and objects.

Digital home appliances with communication capabilities and network cameras will play a big role in satisfying the more sophisticated needs of users by connecting people with devices such as refrigerators, DVD recorders, audio and light systems. These technologies will allow the user to reduce or even eliminate the barrier imposed on the use of the devices by the necessary learning process, making available human-object interfaces that everyone will be able to handle. These are the three fundamental elements to identify and classify a service as ubiquitous. Over the past two or three years, several governments, including those of Japan⁵⁰ and the Republic of Korea,⁵¹ have been creating a much more focused ICT strategy, implementing, with some success, the concepts of ubiquitous networks. In these countries most of the enabling technologies (e.g. broadband and mobile Internet) are well established and have eased the passage towards a potential ubiquitous environment.

Italy, on the other hand, is just starting to introduce such technologies; and with encouraging results, especially on broadband, although they still lag behind the above countries. This means that the concept of ubiquitous is still perceived as an emerging paradigm that will certainly be implemented in the future, but only when the enabling technologies are so common as to require the next level of integration and interaction (Box 4.1).

Box 4.1: Reconfigurable Ubiquitous Networked Embedded Systems (RUNES)

Project to expand and simplify ubiquitous computing.

A consortium of European scientists has been created to enable the billions of electronic devices in everyday use to be networked together for use in several different environments. The main activity of the consortium has been the implementation of RUNES, a project funded by the European Community with the participation of 22 partners form Europe, Australia and private companies like Kodak and Ericsson. Italy is contributing through the Polytechnic of Milan and University of Pisa.

The RUNES project aims to expand and simplify existing and future networks of devices and embedded systems and will create a standardized computing infrastructure that can adjust itself to various environments and different demands placed upon it.

RUNES aims to assess and overcome barriers to the exploitation of these technologies and to create standards that make it easier for programmers to develop practical and profitable applications. One of the project's main outcomes should be adaptive and intelligent middleware systems.

Source: www.ist-runes.org

4.2 Towards ubiquitous services: where we are now?

4.2.1 Broadband (fixed lines)

For the business and consumer clients in Italy, broadband is characterized mainly by DSL technology, with an evident increment of Fibre and Wireless, provided at the moment by just two operators (Fastweb and Colt).⁵²

The offer is very fragmented; for a few years, all operators have included DSL access with their products and services packages, either through unbundling solutions or wholesale offers of the incumbent, where pricing schemes for alternative operators are established by the Communications Authority (AGCOM).

The market price is dropping by the day; every month new types of offers are being made, in an attempt to integrate standard DSL services, such Internet access and e-mail, with some value added services, or giving more bandwidth for the same price. For example, Telecom Italia announced an increase (for the same price) of the entry-level bandwidth for its DSL offer from 256Kbps to 1.2Mbps. The operators, and in particular the market makers, have identified in broadband access the opportunity to capitalize on their investments, reaching huge number of potential customers coming from narrowband and ISDN.

It is, therefore, important to differentiate the offer, with respect to the competition and the end users, by enriching the standard offer with value added services, especially in family and retail markets, in order to reduce the costs of the infrastructure. This is because, in Italy, broadband is still seen as the enabling technology for the access to and use of more integrated and interactive services. This will make it easier for the companies willing to implement and distribute services oriented to a possible convergence voice, data, video; in other words to deploy ubiquitous services.

Many important initiatives have been taken, covering almost all elements of broadband technologies, especially convergence. Fastweb for instance has decided to build a business model based on fibre. This strategic direction has allowed the company to differentiate the offer, creating a valuable alternative to standard ADSL (Box 4.2).

Box 4.2: Fastweb and MEF (Metro Ethernet Forum)

The "fibre" company focuses on metropolitan fibre cabling, adding value to its broadband services.

Using Ethernet over fibre links, FastWeb is delivering true broadband services, including video on demand, at a time when most people's experience of broadband consists of ADSL, which typically runs at one-twentieth the speed that many of FastWeb's customers are enjoying. What's more, FastWeb has created a successful business model whose ARPU (Average Revenue Per User) is much higher than that of a simple bit-provider. In other words, by combining services with connectivity using modern Metro Ethernet technologies, the company has demonstrated the true value of Metro Ethernet networks.

Services being delivered include video on demand, telephony, video conferencing, VPNs and of course, Internet connectivity. None of this would be possible using simple Ethernet. Instead, Metro Ethernet technologies allow faster, flexible service scalability, economic services with lower engineering and support costs. FastWeb has proved that Ethernet has moved beyond being just a local area technology.

With demand for data bandwidth continuing to grow to support applications such as distance learning, imaging and video and storage area networking, enterprise IT managers have realized that traditional data services based on legacy technologies, such as private line, Frame Relay, and ATM, are inadequate. That is because these technologies are hard to scale, operationally complex and slow to upgrade.

Metro Ethernet technologies deliver higher, more scalable and flexible throughput, all at a much lower overall cost, bringing advantages for consumers, enterprises, and service providers alike. FastWeb's commendable installation demonstrates how the future looks, today.

Source: www.telecomtv.com/vzine/ ethernet/docs/FastWebSidebar.doc

Telecom is instead focusing on service integration and convergence, launching a portal (Rosso Alice)⁵³ for its customer community, containing a wide range of integrated services (music, games, films) trying again to aggregate services that in the future will be accessed independently of the device connected. In particular, Telecom has developed and put on the market two interesting applications oriented toward convergence, which, in terms of innovation, could raise expectations for the introduction of ubiquitous services in Italy. The first one is related to broadcast movies on ADSL (Box 4.3).

Box 4.3: TV and Cinema on ADSL

Telecom Italia moves towards multimedia services, providing cinema and TV over ADSL.

Telecom Italia, in collaboration with Warner Bros and Microsoft, is focusing on integrating multimedia services using its broadband solution. Two services have been developed and delivered:

• TV over ADSL - Microsoft has launched the pre-release of Microsoft IPTV (television on IP protocol). The initial phase will involve only a subset of Telecom clients (in particular Alice service customers). Starting from the beginning of 2005, around 1'000 customers will be able to use TV over ADSL.



Cinema over ADSL – A two-year deal has been signed between Telecom and Warner for the distribution of
more than 100 movies each year via the Rosso Alice broadband portal. From 1 December 2004, all ADSL
users have been able to purchase new movies, as well as library titles. These are available in streaming mode
for 24 hours after their purchase and will be geo-filtered to ensure that they are available only to Italian users.

Source: Telecom Italia, www.itportal.it

The second one is related to integrated telephone services and ADSL, extending the capacity on the client premises, allowing the customer to use several lines for voice and broadband (Box 4.4).

Box 4.4: The Home Phone Gets Personal

Telecom use ADSL network to offer every member of the family their own telephone and personal number for phone calls and SMS and MMS messaging,

The home telephone continues its evolutionary progress. After the introduction of Aladino, the fixed videophone, Telecom Italia's "fixed-line revolution" is gathering pace and transforming the home phone. The latest development enhances innovative phone features by upgrading the phone line itself.

The brand new Alice Mia option routes normal phone calls over the broadband Internet. This makes it possible to "carry" up to six telephone numbers into the home, and assign a personal number and telephone to each member of the family.

Leveraging the full potential of broadband, it is now possible to make up to three phone calls at the same time over a single phone line – one call routed over the traditional line, to ensure service in an emergency – plus up to five ADSL connections, including Wi-Fi coverage.



Phones can also be used as an intercom network between different

rooms. Alice Mia can handle up to three phone calls and five ADSL connections at the same time, at speeds from 640 kbps/256 kbps.

Source: Telecom Italia.

These examples show how the Italian ICT private sector is moving towards convergence in a realistic and quantifiable way. As operator interest in VoIP has increased during the past three years, some other initiatives have been taken in this field. This communication medium is well known in the market; it is a technology that allows voice transmission over the Internet using the IP protocol. The signal is digitalized, divided into packets and sent over the network. The receiver device reconverts the packets and transforms them into audio format.

When traditional circuit switching is replaced by packet switching, the obvious advantage is the drastic reduction of the infrastructure investments, since all communications use Internet, meaning lower costs for the final customers, especially for long distance calls.

VoIP is already seen as an important element in achieving the "Triple Play"⁵⁴ offer, namely the integration of voice, video and data. In particular, Fastweb has based all its offers on VoIP, rolling out services in an integrated manner. The company provides both business and residential customers with a complete, integrated system for the optimized simultaneous use of telephone, video telephone, Internet and video services on-demand. FastWeb's services are now available in 14 major Italian cities, including Bologna, Genoa, Milan, Naples, Padua, Rome, Turin and Venice.

Other entities are focusing on VoIP and offering this service as stand alone, or integrated into standard offers, as Fastweb is doing. The box below summarizes the state-of-the-art of VoIP in Italy (Box 4.5).

It is clear that broadband is growing rapidly; most of the market players are investing and trying to provide new and more integrated services. Nevertheless, the offer is still not homogeneous and lacks the standard business model necessary to align the services being offered. This aspect is very important for achieving the ubiquitous society; if all players go in different strategic directions, the necessary coordination of the implementation and distribution of ubiquitous services could prove difficult or even impossible.

Box 4.5: VoIP grows in Italy

Several companies, and not only those in the technological sector, aim at VoIP to reduce the costs and create an alternative for mobile voice.

In addition to Fastweb, Telecom has also started to provide VoIP services. One of the biggest newspapers in Italy, *La Repubblica*, has given its on-line customers the opportunity to make a call via Internet using VoIP.

The trend is very encouraging and VoIP could really become the main communication media for voice traffic, but not the only one. The natural integration with the IP protocol enables the extended use of VoIP, (e.g. video conferencing).

The numbers are eloquent;⁵⁵ according to research conducted by Databank in 2002, 14'000 Italian companies were using VoIP; by December 2004 the number had risen to 50'000 and in 2006, the forecast is 85'000. The Ministry of Communication explains that at the beginning of 2004 only 5 per cent of families using PCs and Internet connectivity were using the network for telephony. The trend is that in 2008, VoIP could become the most used Internet functionality.

Forrester Research estimates that in 2006, 10 per cent of voice traffic will be on Internet; by 2013 the migration will be almost finished. In 2020 the traditional phone calls will no longer exist. *Source:La Repubblica.*



As a final example, it is worth mentioning the efforts of the Italian railway company (*Ferrovie dello stato*) to build the first "Broadband-interactive train,"⁵⁶ together with Alenia Spazio, a satellite construction company. This project shows how convergence, and so the ubiquitous approach, can be applied to any sector and not just to ICT related areas (Box 4.6).

Box 4.6: Italy experiments with broadband solutions on trains

FIFTH is a programme of the European Commission developed entirely in Italy and assigned to an industrial consortium led by Alenia Spazio, with Trenitalia as a partner.

FIFTH will experiment multimedia services like digital television, Web TV and Internet on high-speed trains using a broadband satellite as the main means of communication. During their journey, passengers will be able to view some digital TV channels, enriched with interactive content and information, and will be able to surf the Internet from their own PCs, read or send e-mail and contact colleagues and customers; in short, they will be able to carry on working as if they were in the office. Each train will be equipped with a beam-scansion antenna and a sophisticated gateway able to handle the TV programmes and Internet access.

FIFTH goes well beyond a simply Italian context, will also function at a European level to promote the use of trains, on which passengers often pass many hours.



With the successful conclusion of the validation, the programme should now move on to the construction of an initial prototype on an ETR500 train an engineering system that gives the passengers access to the services has been requested.

Source: Ferrovie dello stato.

The integration between human transport (in this case trains) and broadband services opens the door to a huge variety of possibilities, eventually allowing travellers to be connected at any time, independent of the physical location (at any place). This concept can be applied to virtually any means of transportation (cars, aircraft, boats, etc).

4.2.2 Mobile computing

The Italian mobile communication market is characterized by a high rate of service penetration and today the market is very mature, with four official operators providing voice services in a strong competitive environment, and many minor operators providing other type of services.

After a boom in the 1990's, the voice market is now almost saturated and the focus of the operators is moving towards added value services, to maintain and reinforce their market position. There is still a related growth in the activation of mobile lines and requests for voice services (Figure 4.1).

The assignment of UMTS licenses and the evolution of technologies that facilitate the convergence mobile-Internet, have raised great expectations and provided new and interesting opportunities for producing and deploying "mobile services". However, one important consideration is the deployment of the UMTS network, the infrastructure for which has not been prepared and set up homogeneously⁵⁷.

Figure 4.1: Mobile Lines and users

Progress of mobile lines and SIM cards: "flat rate and pre-paid cards in million units".



Note: The value 58.9 refers to the activated lines. Source: Assinform Report, 2005.

Some areas, especially in the south, cannot yet be reached by this kind of service, whilst others, especially in the north, have benefited from a complete set of the services provided by the operators. This approach, could limit the diffusion of ubiquitous networks, since the network backbone that should enable the services to be used might not be ready (Box 4.7).

Alongside the big players, new companies have been created, concentrating their business on information and marketing services, leisure, software application, public utility services; this is to avoid competing on voice and creating a new market, in which the operators can integrate the standard voice and simple messaging offer (SMS) with a more interactive and extended one.

Box 4.7: Coverage of UMTS Services in Italy in 2003

It is true that in Italy, UMTS is a relatively new communication technology and that the law of the market tends to give priority to the more developed areas (in the Italian market structure, this would be the north). The initiatives carried out by the operators show that the penetration of UMTS will soon be sufficient to allow the end users (wherever they are) to use ubiquitous services.



Source: Broadband Observatory, 2004.

The 30 main entities present in the market are divided into the following three categories⁵⁸:

- The four official mobile operators (TIM, VODAFONE, WIND, 3);
- Around 15 Wireless Application Service Providers (WASP);
- Around 15 Mobile Internet portals.

The first category represents over 97 per cent of the mobile communication market in Italy; these are big companies, often present on the international market as well.

All of them have acquired a UMTS licence, but only one (3, of the H3G group) provides mobile services based solely on this technology. The others are still providing services based on GSM and GPRS, with the exception of TIM which has implemented a "transition" technology called EDGE that is a type of technological gateway between GPRS and UMTS. 3 made a big and risky strategic choice, providing mobile services over UMTS only, but the ROI (return on investment) and the ARPU (average revenue per user) proved to be the winning move. 3 has been providing additional services (such as video telephony) since the beginning, acquiring discrete work experience and knowledge, which could prove a great advantage in such a competitive environment (see the example below, of the initiative taken during Christmas 2004).

Box 4.8: Christmas religious message on videophone *The message of the Pope in real-time*

At Christmas 2004, for the very first time, the usual religious ceremony performed by the Pope could be followed using a mobile. Technically, it was a real-time streaming implemented by H3G (3 in Italy). Its customers were able to see the Pope celebrating mass directly on their mobile devices. This is a typical example on how using UMTS, a user can access a specific service from different locations and using different devices (radio, TV, mobiles).



Source: 3 (H3G Group).

The other operators need to perform migration policies and elaborate adequate business models, enabling them to provide, as soon as possible, UMTS based services to gradually write off the investment made in purchasing UMTS licenses. During the past year, the four operators have invested resources in promoting UMTS services.

In June 2003, Wind signed a partnership with NTT Docomo for the excusive distribution in Italy of "i-mode" a UMTS framework, which includes the distribution of ad-hoc handsets for UMTS integrated services. From January 2004, Wind has been able to provide its customers with a huge range of mobile added value services, encapsulated in over 200 sites, accessible through i-mode devices simply by clicking on special buttons.

In March 2004, TIM announced the launch of services based on EDGE technology, to be operational from June 2004 for business clients and from December 2004 for all TIM clients. As mentioned above, this technology complements UMTS, as it is based on almost the same protocol, which works with a similar bandwidth (200Kbps) and allows some typical UMTS services (such as video streaming, MMS, Internet and e-mail). This strategy will allow TIM to start distributing added value services and prepare the smooth migration to a full UMTS operational environment.

In May 2004, Vodafone officially launched its UMTS offer in Europe; in Italy it was launched in December 2004. Through "Vodafone Live!" the service portal accessible with UMTS devices, Vodafone is able to provide UMTS services to its customers.

In April 2004, 3 launched a UMTS Data Card, called Fast Mobile Card 3, which allows the use of notebooks, as they are connected to broadband lines. This facility provides Internet access using the UMTS network (where covered), or GPRS in roaming modality.

WASP also represents an interesting category of mobile services offer. There are around 15 companies operating in the Italian market, most of them small and medium-sized and operating only in Italy.

Their customers are mainly the official carriers and big companies, sometimes end users and their offer can be summarized as follows:

- Entertainment; services targeted on young customers, such as games, ring tones, logos and recently, Mobile TV;
- B2C (Business to Customers); services implemented by system integrators and software development to enable integration using mobiles for applications such as mobile banking, mobile booking, m-payment and so on;
- B2E (Business to Employee); in this case, the user is not the client but the professionals working in the company and the applications developed are more related to Mobile Office (using the mobile as an office automation tool), sales force automation, including solutions to integrate mobile devices, PDA and notebooks.

The third category refers to M-portal, or mobile-portals. They are mainly international companies, characterized by offers to integrate Internet-Mobile services. They act as system integrators to allow added value services to be accessed via mobile devices. As shown above, the mobile communications market is moving faster than other sectors, mainly because of the big boom in mobile voice services.

Today's mobile market is too full for further investment in voice; the operators cannot bring in new customers (in Italy everyone has a mobile) and so prospective clients can only be taken from other providers. In this competitive environment, only new and easy-to-use services can convince a client to choose one operator over another. The UMTS will allow this new market to grow, consolidate the operational environment and introduce new types of services, which can be regarded as ubiquitous (Figure 4.2).

Figure 4.2: Ubiquitous mobile

How the mobile can implement the ubiquitous concept

The players have invested heavily in the implementation of the convergence mobile-Internet, and this is the first step in extending this integration with the other big networks (digital TV, and broadband).

Below are some examples of the new types of service:

- M-information; information services including news, weather, sport, lottery results, stock exchange, tourism, traffic information.
- M-entertainment; leisure services, such as screensavers, games, ring tones, videos and audios.
- M-banking and M-trading, where clients can access their bank account directly from the mobile and perform on-line transactions, etc.
- Tele-check in, where users can check in for flights using the mobile phone.
- Mobile-booking, where users can book goods and services (mainly via SMS) and make the related payment.

Source: "Larga Banda e TV digitale: la convergenza diventa realta," ANFoV, 2004.

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In particular, in the area of mobile banking, a banking institute in Italy (Banca Intesa),⁵⁹ in collaboration with one of the most advanced ubiquitous oriented companies (Ubiquity),⁶⁰ has deployed a full set of banking services, using different technologies and devices. From the very beginning, Ubiquity has built a strong knowledge of new media platforms, designing and realizing solutions for the digital new media: mobile phones, PDA, interactive digital TV, corporate Intranet/Extranet and in the web marketing, the application management and the outsourcing services.

The innovative approach of such a company has been to develop and implement solutions maintaining their independence from technology vendors, both hardware and software, as well as from telecom operators, and wireless and wireline, always developing services that would be easy to use independently of both the network and the device the users have chosen.

This joint venture has proved a winning strategy, implementing banking services using one of the bestknown communication tools in Italy (the cellular phone), eliminating possible technological barriers, but at the same time offering (with the modular approach) services to advanced and technology oriented customers (Figures 4.3, 4.4).



Figure 4.4: Functions for advanced users

The world's first Mobile Banking using MMS in the world, for complete and personalized financial information.



For more advanced customers, investors and clients willing to get acquainted with the new technologies, Banca Intesa offers a full set of services, available in multichannel mode, and accessible by several devices (WAP mobiles and PDAs) to be able to execute banking transactions and operations in complete autonomy and from anywhere.



Source: Banca Intesa.

The degree of user satisfaction shows how the modular approach is a winning strategy in providing services, but at the same time indicates the need to build services according to the needs of the customer, aiming to use familiar technologies. Moreover, statistics show that most users appreciate the ubiquitous concept behind the banking service, which allows them to get connected from everywhere and at any time using devices that can be interchangeable. For mobile booking and m-payment, the city of Turin⁶¹ has started a pilot project to evaluate the possibility of automating the parking procedures to reserve and pay for parking places (Box 4.9).

Box 4.9: Parking in Turin? Easy, if you have a mobile!

Turin and other cities experiment with "ubiquity parking", using mobile computing to pay and reserve parking places.

Turin is one of the first cities in Italy and Europe to introduce the possibility of mobile computing for parking.

The system is very easy: the user has to have a mobile and a smart card called Park Card; with an SMS, it is possible to activate the parking and the payment is automatically charged on the card, so avoiding cash payment.

The system is called Telepark and it has been adopted by Turin and other two cities in Italy. It is valid for the 55'000 parking places of the so-called blue zone (payment-based parking).

The mechanism for the use of Telepark involves the purchase of a smart card and its activation, via SMS, to a specific number, or by calling a call centre. Once the card has been activated, a set of specific commands appears, and the duration of the parking is entered simply by typing letters on the mobile. *Source:* Il Sole 24 Ore.



4.2.3 Digital TV

2004 has been the year of the take-off of digital terrestrial TV. Currently, twenty programmes are available at the national level; 80 per cent of the population have at least one multiplex and 250'000 decoders have been sold, taking advantage of the contribution financed by the Italian government.⁶²

The terrestrial analogue television that we have been using for 50 years is based on the correspondence frequency-programme, which means that, the broadcasting of a new programme (or channel) requires the setting-up of a dedicated infrastructure, composed of radio bridges, transmitters, and antennas. It is a typical vertical market, in which the company that has acquired the authorization to broadcast the signal is in charge of producing, transporting and distributing it through a specified, assigned frequency. Without any agreement with the broadcaster, the end user can access the television service via a normal TV device.

With a DTT, a dedicated network built to broadcast a channel and adequately integrated with computing devices to compose and modulate the signal, is able to broadcast several television programmes and services at the same time. The transmission of the signal is in accordance with DVB (digital video broadcasting), a core of technical regulations, promoted by the European Commission to standardize the broadcasting of the digital signal at the European level.

For the reception of the signal, the end user must have a "set-top-box," or simple decoder, to convert the digital signal into an analogical signal displayable on a standard TV.

As already stated in Chapter 3, according to the Italian regulations and the new technological operational framework, the role of the broadcaster, the entity entitled to produce and distribute the content is replaced by separated figures:

- Content providers, in charge of producing the programmes and the palimpsest;
- Network operators, owners of the distribution infrastructure and designated to the broadcasting of the content produced;
- Service providers, who enable the end users to have transparent access to the content through the infrastructure.

Furthermore, the implementation of interactive services using the remote control to execute operations and commands has already been foreseen; the decoder will interact with services made available by the content providers accessing a telecommunication network (e.g. Internet) for data exchange. This modality is called "return channel" or "interactive channel".

In 2001, the Italian Government approved the regulation governing the progressive conversion of all television systems to DTT; the government planned an experimental phase and set the final switchover date

as 31 December 2006. At the same time, AGCOM identified the new value chain model for DTT market separating the roles and the players (content providers, network operators and service providers).

The DTT is developing a particular moment in the life of telecommunication; GSM and GPRS services are now consolidated, Internet services are mature and the customers are starting to accept culturally different ways to access and pay for online and electronic services. Furthermore, DTT with interactive services (interactive DTT) has a lot of advantages that facilitate its diffusion and acceptance: it is easy to use, we are familiar with TV sets and there are a huge number of them in the population. This conjures up the vision of an environment, in which the convergence of DTT with the other networks and related services is not just desirable but also necessary. DTT can incorporate the Internet world, especially in relation to public utility services, inaugurating a T-Government era (Box 4.10).

Box 4.10: RAI experiments with interactive and T-government services

Italian public television is investigating the potential of DTT implementing and delivering I-TV (Interactive TV) and a possible approach for T-government.

RAI, as public service, has adhered to DTT and deployed two multiplexes for a total of 10 channels. Furthermore, profiting from the potential of the return channel, it has prepared a strategy for I-TV and T-government.



As regards I-TV, some of the services, such as interactive news (see below), are already available to the end users,

However, the most interesting aspect is related to T-government, which could be a key element in narrowing the digital divide and are already considered to be part of the public service mission.

Within this context, its integration with electronic smart cards (Electronic identity card and National Services Card, for more details see paragraph 4.2.7) has been foreseen.

Their use is a typical example of ubiquitous services, where available resources can be accessed from everywhere at any time and with any object (cards will ensure interoperability using the same file system for authentication and the same format for personal data).

Some applications have been already implemented aggregating services from different providers.



Source: RAI - Centre of Research and Technological Information.

Interactive DTT can constitute a common platform for the distribution of electronic services integrating broadband for the provision and deployment of the return channel, an interactive environment where services already available on Internet can be accessed with a TV and the remote control, allowing for a plurality of the providers (Network, content, services).

To support this ubiquitous vision of DTT, some new standards and technical regulations are to be implemented and almost ready to be deployed. The DVB-H,⁶³ (Digital Video Broadcast – Handheld), the latest evolution of DVB, aims to provide access to broadband services "at any time" and "at any place," through small terminals. This technology can complement the mobile communication network, due to its convergence with broadband and the predicted use of small devices (comparable in size and weight to a

normal cellular phone). It has already evaluated with good results the possibility of producing multi-standard terminals DVB-H/UMTS.⁶⁴ The UMTS network then can provide the return channel, so making available interactive services that can be accessed by DTT via terminals DVB-H.

4.2.4 Wi-Fi

When the Communications Ministry⁶⁵ promulgated Wi-Fi access last year, it was immediately perceived as the "hot new thing" for those mobile users demanding immediate access to e-mail and the Web. A world bristling with thousands of hot spots was forecast, but so fa, reality has fallen short of expectations.

After one year, the ministry began issuing Wi-Fi licenses to Internet providers, so Italy is lagging behind much of Europe. The regulation offers the opportunity to install networks, such as Radio LAN, to supply the public with access to electronic communication services on a band with a frequency range of 2.4 to 5 GHz by a simple authorization. Retailers who intend to offer the public Wi-Fi services must present the Communications Minister with a request to that effect, which gives the retailer the right to set up the service immediately, whilst respecting the conditions indicated in the regulation.

To avoid interference with other services and use the permitted broadcast power, the authorized subjects must respect the National Frequency Distribution Plan technical operating rules for using 2.5 and 5 GHz bands. This is because the frequencies used are collective and not assigned exclusively to each operator, as in the mobile telephone system.

The regulation also governs the use of Wi-Fi equipment for the public, spots open to the public and areas with high public attendance. Among the places chosen for the use of Wi-Fi are hotels, bars, restaurants, shopping malls and fast food chains, where people can have the opportunity to connect to the Internet with broadband wireless access.

The regulation also demands respect for security rules and the integrity of networks. It asks the retailers to use an identification code for users who access the public network. The installation of the Wi-Fi network should be set up in line with the principle of non-discrimination between the Radio LAN system and the other competing technology.

About 35 licenses have been issued so far, to companies ranging in size from Telecom Italia, to very small companies such restaurants and Internet cafes. Unfortunately there is no massive penetration of hot spots in Italy, which means that finding a hot spot can be difficult. Access points are mostly located in top range hotels, major airports and railway stations, Internet cafés and shopping centres.

Under Italian law, all users wishing to access a wireless network must register with a provider, and payment – which can be calculated in terms of time online, downloaded bytes or a flat fee – can be made with a prepaid card or credit card. One problem with this is that the various service providers do not have commercial agreements that allow roaming between companies. This means that access via a provider bought at Rome's Termini railway station cannot be used at Milan's Malpensa airport, which may be covered by another provider. Moreover, some industry experts are very concerned about the disregard for Wi-Fi security. Almost all Italian access points are open; they are not encrypted, which means that data is easily intercepted.

The brief analysis above is a snapshot of a very unstable environment, possibly not sufficiently consolidated to welcome and support the desirable convergence between wireless networks and the other infrastructures. This does not mean that potential ubiquitous services cannot also be accessed through Wi-Fi; it seems that, according to the current status, Italy has been a little late setting-up and making the consequent investment in wireless. However, the big companies and most of the R&D entities are not endorsing the delay caused by this situation and are moving to identify the more effective technical solutions, at the same time identifying what might be the appropriate business model to put in place.

The following section summarizes, in highlight form, how the ICT sector, including R&D is reacting to this situation, aligning their current services and integrating the infrastructures already deployed with Wireless. Telecom Italia plans to increase the number of its hot spots from 200 to 1'500 and, to increase its Wi-Fi potential in Italy and abroad, it joined the Wireless Broadband Alliance,⁶⁶ which comprises 18 of the world's biggest providers, including British Telecom, T-Mobile US and T-Mobile International. Telecom Italia and TIM, the wireless arm of Telecom Italia Group, have also extended their dominant position on Wi-Fi, between them having more than 70 per cent of the active hotspots. Motorola Inc., Global Telecoms Solution

Sector (GTSS) announced that it has worked with TIM to provide an end-to-end Wi-Fi solution. Motorola's Wi-Fi system is part of the corporate wireless service portfolio, which TIM offers to the enterprises throughout Italy.

Motorola was chosen by TIM to co-design, deploy and support a hybrid Wi-Fi system for private, as well as public Wi-Fi users within the enterprise. The private network provides wireless Internet and intranet access to employees, while the public network gives wireless Internet access to visitors, such as consultants, suppliers and customers. Users can benefit from broadband speed connectivity without the need for a wired connection. TIM chose the system proposed by Motorola because it could be integrated easily into TIM's existing user authentication solution (SIM-based authentication). Motorola is also specifically responsible for providing the Wi-Fi hardware and software and managing the installation, deployment and ongoing maintenance of the system at TIM's customer sites. The system Motorola designed is divided into three areas: the radio network, which includes Wi-Fi access points and cards; the core network, which includes routers and firewalls; and cabling, which will be provided by TIM. Vodafone, which does not have its own hotspots, is building several partnerships with minor companies (owners of the remaining 30 per cent of the installed base), in order to roam the traffic.

The Ugo Bordoni foundation (FUB) has coordinated an experimental phase (between March 2003 and February 2004), with the participation of most of the operators and Cisco Systems, to evaluate the possibility of building a Wi-Fi multioperator⁶⁷ infrastructure, a wireless network where different services (by different operators) were provided, using the same hotspots and access points. This important pilot project has proved and actually implemented the concept of integrating different authentication and authorization procedures, aggregating the accessible services into one single infrastructure.

4.2.5 Domotics

Domotics enable home-wide automation and communication for appliances; equipment enables distributed and remote control of domestic applications, from inside and outside the home. Automation, communication and shared-use of appliances in a home environment is the real challenge to imagination and life style.

Domotics integrate the various technologies present in the house, in order to offer a high degree of functionality and security and reduce installation and consumption costs. Moreover, they represent a big challenge and the opportunity to use converged services.

During the last few years, domotics have expanded their original scope, integrating additional functions, in line with technological evolution. It is now possible to control the functioning of doors and windows remotely, thus helping old and disabled people, as well as regulating energy consumption.

Some of the most important companies, especially the home-appliance producers, have released devices able to improve the level of automation even in the kitchen; for example, washing machines controlled by mobiles, able to choose the most appropriate washing programme automatically, ovens that download recipes from the Internet, refrigerators that inform the user if a specific item is missing, (by reading the bar code).

This new frontier is represented by interactive screens and displays, to bring together, in a single control device, all the controllable appliances, and schedule their activation and deactivation; also to connect to the Internet and write e-mail, etc (Box 4.11).

In reality, the "smart-house" is not really that; the main principle is that home-appliances and services are not isolated and stand alone, but operate as part of an integrated environment, in which "coexistence" and convergence are the key aspects. Thanks to the use of new communication technologies, and possible new standards, the user can have all the necessary tools to keep the house under control, in an automated manner, thus creating a personalized environment, in which all systems work together to improve the quality of life. The uplink to the Internet could also change our way of working, introducing "telework" and optimizing the time spent in the office (where physical presence is not necessary).

Box 4.11: Bticino implements MyHOME

The company has integrated a unique control system into the management of the house.

Bticino, a home control appliances production company, has released a domotic and teledomotic system to control the house called MyHome remotely.





With a mobile and via internet (through the service My home web) it is possible to activate or deactivate electronic elements in the house using a fixed or mobile phone (dialing a specific number with related codes) or using a PC with Internet access.

It is also possible to monitor the current situation in the house through video surveillance systems, accessible via







Internet. The web site has a member area, with the images of the house. Everything inside the house can be controlled by an interactive touch screen display.





An interesting experiment has been conducted by a partnership of various companies, which has tried to create an intelligent house, with state of the art domotic systems (Box 4.12). However, despite the progress, the market has not yet taken off, essentially because a lack of standardization and communication between the different domotic solutions. Therefore, the number of domotic technologies present could make their use more complicated rather than easier.

This is very relevant to ubiquitous networks, since one of their most important aspects is convergence, not only of the services, but also in relation to the communication media used (e.g. transmission protocols). The key players have not yet coordinated a possible standard approach and the present regulation is not adequate to cover domotic issues.

Box 4.12: The first domotic district is born

Joint venture between different providers to implement high technology network connected domotic houses.

Four of the major companies in Italy AEM, Bticino, EuroMilano and Fastweb have joined forces to build the first domotic residential area, in Milan.





For the very first time, Italy is proposing an innovative real estate where technology and convergence are the main drivers; the apartments will have an integrated domotic control system implemented by Bticino to control the functioning of home appliances and infrastructure devices such as lights. Fastweb will provide broadband access, with services like TV on demand and high speed Internet access. AEM will implement teleheating. A real intelligent house, completely integrated, that can be "administered" in a converged manner. *Source:* www.domotica.it

4.2.6 **RFID**

Radio frequency identification (RFID) is a method of storing and retrieving data remotely using devices called RFID tags. A RFID tag is a small object, which can be attached to, or incorporated into a product. RFID tags contain antennas to enable them to receive and respond to radio-frequency queries from an RFID transceiver (Box 4.13).

Box 4.13: RFID tag

There are two main types of RFID tags: passive and active.

• Passive RFID tags do not have their own power supply; the minute electrical current induced in the antenna by the incoming radio-frequency scan provides enough power for the tag to send a response. Owing to power and cost concerns, the response of a passive RFID tag is necessarily brief, typically just an ID number (GUID). The lack of its own power supply makes the device quite small. There are even commercially available products that can be embedded under the skin. In 2004, the smallest of these commercially available devices measured just 0.4mm × 0.4mm, and was thinner than a sheet of paper; such devices are practically invisible. Passive tags have practical read ranges that vary from around 10mm up to around five meters.



• Active RFID tags, must have a power source, and may have longer ranges and larger memories than passive tags, as well as the ability to store additional information sent by the transceiver. At present, the smallest active tags are about the size of the average coin. Many active tags have practical ranges of tens of meters and a battery life of up to several years.

Source: Battezzati, Luigi (2003), RFID - Identificazione automatica a radiofrequenza, Hoepli.

As passive tags are much cheaper to manufacture and do not depend on a battery, the vast majority of RFID tags in existence are of the passive variety. In 2004, tags cost from US\$0.40 each; however, to make widespread RFID tagging commercially viable, they would have to be produced for less than US\$0.05 each. However, the chip manufacturers' supply of integrated circuits is not sufficient and demand is too low for prices to come down soon. Analysts from independent research companies, like Gartner and Forrester Research, agree that a price level of less than \$0.10 per unit is achievable only in 6-8 years.

There are four different kinds of tags commonly in use and these are categorized by their radio frequency: low frequency tags (from 125 to 134 KHz), high frequency tags (13.56 MHz), UHF tags (868 to 956 MHz), and microwave tags (2.45 GHz). UHF tags cannot be used globally as there are no global regulations governing their use. An RFID system may consist of several components: tags, tag readers, tag programming stations, circulation readers, sorting equipment, and tag inventory wands.

The purpose of an RFID system is to enable data to be transmitted by a tag, which is read by an RFID reader and processed according to the needs of a particular application. The data transmitted by the tag may provide identification or location information, or specifics about the product tagged, such as price, colour and date of purchase. The use of RFID in tracking and access applications first appeared during the 1980s and it quickly gained attention because of its ability to track moving objects. As the technology is refined, so more pervasive, and invasive, uses for RFID tags become likely.

In a typical RFID system, individual objects are equipped with a small, inexpensive tag, which contains a transponder with a digital memory chip that is given a unique electronic product code. The interrogator, an antenna packaged with a transceiver and decoder, emits a signal activating the RFID tag so that it can read and write data to it. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal; the reader then decodes the data encoded in the tag's integrated circuit (silicon chip) and the data are passed to the host computer for processing.

In Italy the RFID concept has had a mixed reception, since its acceptance and use tends to affect sensitive issues such as privacy. Several companies, other than R&D entities, evaluated the possibility of introducing RFID tags, and today there are two main areas of activity producing interesting RFID applications:

- RFID tags on products, which is related to the identification and management of productive cycles, what in economics is called the "supply chain," not only facilitating the logistic productive process, but also providing information on the whole development cycle of the product, from the production to the distribution to customers;
- RFID tags on people, to allow the identification of an individual any time and at any place. Here the privacy aspect plays a big role, although in our current social structure, tracking people has become increasingly normal and even natural. The use of RFID in this area is more related to health care (e.g. the monitoring of patients to enable timely medical intervention).⁶⁸

Several pilot projects have been started on product-based RFIDs, specifically in the field of Italian fashion, one of the most developed markets. Benetton and Prada, to mention just the largest, have tried to introduce RFID tags to monitor the sales of their products, to handle their stock and to draw up marketing campaigns for various specific products, according to the input from the RFID tags. Unfortunately, Italian public opinion did not agree with these experiments, regarding the life cycle product as the intrusive monitoring of individuals. Only Prada has managed to introduce RFIDs in some ateliers, but in only in the USA and not in Italy.

A more successful approach has been the use of RFIDs on products and the complete elimination of any possible interaction with human beings. Examples of how RFID has penetrated the Italian production system include stock management, automatic production of invoices through systematic reading of product tags, controlling the life cycle of consumer products (expiration date of milk or juices, etc.), intelligent distribution of luggage at the airport according to a specific flights and the classification of animals Not only has this improved the performance of the industry, it has also, and perhaps more importantly, made people's lives easier.

The use of RFID technology has been adopted mostly by small and medium-sized enterprises, rather then the big multinational companies; furthermore, RFID is being used mainly inside the production cycle, to improve operational procedures. The re-engineering processes in small and medium-sized companies is surely less invasive, according to the amount of planning and implementation activities to be carried-out, than a in big company, where branches and factories are located worldwide, but it indicates also the potential that medium-sized enterprises represent in the Italian economy, especially in the adoption of new technologies. Big companies often do not want (for political and organizational reasons) to change consolidated, but sometimes obsolete, operational processes.

An interesting use of RFID has been the integration performed by Tappetifici Radici⁶⁹ (a carpet manufacturer) in their stock and shipment management (Box 4.14).

Box 4.14: Tappetifici Radici adopts RFID and Wireless for stock management

To solve problems in identifying merchandise to be shipped to its customers, Tappetifici Radici's EDP centre has implemented a solution based on RFID, wireless and bar codes.

The main issue was the limitation of the bar code, which did not enable the direct identification of the products in stock and those to be shipped. The personnel assigned to the warehouse used to spend lot of time identifying and taking out the specific product, loading it on a vehicle and sending it to the expedition sections.

To solve the problem, almost all products present in the warehouse have been tagged with RFID devices that are able to communicate wireless to a central repository, giving indications on their position on the shelves.

The vehicles have been equipped with wireless cards and 20cm screens to communicate with the central repository and locate the required element instantly.

In this way, warehouse personnel do not have to spend time identifying what is in stock and what has to be sent for, as they have all this information in real time and, with the use of Wireless, this is accessible from any part of the factory.

Source: www.rf-id.it

Even some religions have realized the importance of optimising their procedures (Box 4.15).

Box 4.15: Vatican library adopts RFID

Implementation of RFID technology for the library.



RFID, the library is finding misplaced books more quickly, maximizing floor space with frequently requested items and streamlining the inventory process. Previously, administrators closed the library for an entire month each year to verify its contents, manually cross-referencing what was found on each shelf against the library's collection database. When the RFID project is completed, the Vatican estimates that checking the inventory will take only helf a day. Each RFID tag inlay stores the individual book or document's catalogue data

The Vatican Library in Rome, home of nearly two million books, manuscripts and other items, has adopted radio frequency identification (RFID) tags to identify and manage a significant proportion of its extensive collection. Using

against the library's collection database. When the RFID project is completed, the Vatican estimates that checking the inventory will take only half a day. Each RFID tag inlay stores the individual book or document's catalogue data on a specially designed 'library friendly' tag that prevents damage to the item. The printed tags also include visible text, allowing for faster labelling.

When new data are added to an item, the record in the library's collection database is updated simultaneously via wireless communication using a handheld reader and software management system. This integrated system allows the library personnel to obtain the real-time status of every single book; it also provides the visitor with useful information, such as the estimated return time for a specific item, and whether or not it is present. *Source:* www.theregister.co.uk

The development of RFID systems applicable to people has been slower; this is because of its implications for individual privacy. However, one area where the application of RFID technology is universally acceptable is health care. In Italy health is considered to be an extremely important issue.

Numerous scandals and problems in the National Health Service have greatly reduced people's trust in the system and research in this field could usher in more positive interaction between the people and the government. An interesting project⁷⁰ to verify the feasibility of introducing tags into the human body for disease-monitoring purposes has already been implemented (Box 4.16).

Box 4.16: VeriChip: "Technology that cares"

Italy evaluating VeriChip health care application.

VeriChip is a sub-dermal, radio frequency identification (RFID) device that can be used in a variety of security,

financial, emergency identification and other applications. About the size of a grain of rice, each VeriChip product contains a unique verification number that is captured by briefly passing a proprietary scanner over the VeriChip. The standard location of the microchip is in the triceps area between the elbow and the shoulder of the right arm. The brief outpatient "chipping" procedure lasts just a few minutes and involves only local anesthetic followed by the quick, painless insertion of the VeriChip. Once inserted just under the skin, the VeriChip is inconspicuous to the naked eye. A small amount of radio frequency energy passes from the scanner energizing the dormant VeriChip, which then emits a radio frequency signal transmitting the verification number.



The principal investigator, Dr. Giorgio Antonucci, presented the study's protocol to the Italian Ministry of Health and has received approval to proceed. The study is designed to observe the VeriMed(TM) technology function during care provided to patients whose medical conditions impede the transmission of vital information to the hospital's medical staff. Patients will be given the opportunity to utilize the VeriMed(TM) technology to provide their personal identification information and recent medical history. Dr. Antonucci and his staff are expected to begin patient enrollment in the programme immediately. It is anticipated that the objectives of the study will be achieved within six months, at which time the findings will be presented to the Italian Ministry of Health. *Source:* http://www.cybertime.net

Clearly RFID can be identified as a key enabling technology for the creation of ubiquitous services; they can be incorporated into any network and will provide information on the status and physical location of the object in question. A strong and feasible integration can be seen also in respect to domotics, the science applied to information and communication technologies for more comfort and convenience in and around the home is another key enabling technology.

RFID and domotics can be integrated to build a home infrastructure, in which a central unit controls and manages the inputs and data provided by RFID tags installed on any home appliance (such as stereos, washing machines, lights, PCs and telephone lines) automating and controlling their use remotely. In this respect, Merloni,⁷¹ one of the most important Italian home appliance companies, has succeeded in integrating RFID and domotics bringing the full automation of domestic appliances one step nearer (Box 4.17).

Box 4.17: RFID and Domotics



Merloni implements intelligent home appliances.

Merloni Elettrodomestici is the first manufacturer to bet big on RFID. The company will unveil a new line of appliances that have RFID readers, which enable the machines to communicate with objects.

The line includes a refrigerator, oven and a washing machine. Antennas will transmit signals to products with embedded RFID transponders and retrieve important information about the product. The smart appliances will go into commercial production next year.

And while very few of today's

products have embedded RFID tags, Merloni clearly believes that many soon will and it wants to be a leader in the field.

The washing machine will read intelligent labels in clothes and retrieve information about the size, colour and type of fabric, as well as washing instructions. It will warn homeowners if they have placed items that should not be washed together into the machine. A colour screen can display messages, like: "This is the first washing [for this pair of jeans]. It is advisable to wash them separately."

The refrigerator is designed to track each item's expiry date and display information about its nutritional value. It can even provide recipes for dishes that can be prepared with the ingredients in the fridge. And the oven will automatically set cooking and baking times and temperatures based on instructions from tags.



Lab ID of Bologna, Italy, worked with Merloni on the project for five months. It developed special low-power (200 milli-watts) readers and small antennas for the appliances. The readers operate at 13.56 MHz and are compliant with ISO 15693 and ISO 14443A and B. Lab ID says the readers can read from and write to 600 different transponders in 10 seconds.

Source: http://www.rfidjournal.com

4.2.7 Public utility services

The Italian Government, together with ISPs and telecommunication companies, has invested a lot of energy in establishing policies to enable services to be provided in an integrated manner.

By harmonizing local and central administration ICT infrastructures, in a federated network with common authentication and authorization modalities, the government strategy has aligned itself with the basic concepts of ubiquitous.

The capillary presence of connectivity is necessary to guarantee the complete and efficient interoperability of back-office elements within the different administrations. The RUPA (*Rete Unitaria Pubblica Amministrazione* – United Network of Public Administrations) ensures this presence and is the public sector instrument for providing e-government services.

The RUPA consists of a network that provides 34 Mb/s and can be regarded as an intranet between central offices and local administrations, providing better integration in terms of accessibility, in addition to simplifying and harmonizing standard procedures. Furthermore, its use could extend the services provided by the Italian Government, ensuring their access in a converged manner, using several different access modalities (broadband, UMTS, DTT), thus moving toward the concept of u-government.

To support RUPA, a project has been implemented that aims to create a Centre of Excellence to ensure the penetration of services at local level and enable the interchange of experience, best practices and possible new operational models. Another interesting project has been started to aggregate on-line services and migrate others in an on-line fashion (Box 4.18).

The final objective is to ensure a single, distributed access point to all available services. To do this, it will also be necessary to introduce personal identification instruments that could enable convergence towards a

unique standard where the distribution and management of the services provided is shared, applicable in all national territories and economically sustainable.

Two different identification models⁷² have been foreseen; the CIE (*Carta d'Identitá Elettronica* – Electronic ID Card) and CNS (*Carta Nazionale Servizi* – Services National Card).

Box 4.18: PEOPLE project, a road to a virtual municipality

Fifty-four cities experiment with the whole migration to online services.

The aim of the Ministry for Innovation and Technologies is to modernize the burocratic and very articulated Italian administrative system through the online migration of most of the services from the traditional ones (such tax payment or health certificates) to the newest services.

Right now, 55 per cent of Italian net surfers are accessing governmental web sites, compared to 50 per cent in Spain and the UK and 40 per cent in Germany. Most of the Italian administrations, from local small cities to big ministries, have a portal, sometimes with the possibility of interacting directly and in real-time with the governors, a very first step toward the e-democracy.



In line with the approach of the Ministry, 54 city administrations have started a project called PEOPLE (*Progetto Enti Online Portali Locali E-government* – Project On-line Portal for Local E-government)

Twenty million euro is the initial budget allocated to this activity, the aim of which is to create a national service to facilitate and speed up the execution of administrative procedures, such as the payment of local taxes, the issue of authorizations and concessions and school subscriptions.

Each section is coordinated by a different city:

- Genoa has implemented a virtual office to pay taxes;
- Bologna has created an online mechanism to execute online payments;
- Modena has coordinated the development of a system to have information of construction plans, housing, traffic information;
- Siena has implemented an online register of births, marriages and deaths.

The new portal will be placed inside all institutional sites of the cities involved in the project *Source:* <u>www.panorama.it</u>

Electronic ID Card

According to Italian Government sources, the distribution of the new national ID card has started in a number of the 56 Italian communities scheduled to be activated under the programme. The government's publicly stated plan to issue up to two million cards in 2004 puts Italy at the forefront of European countries, in terms of providing their citizens with secure, durable ID documents.

The CIE is a smart card allowing the holder to be identified "on sight" and is designed to permit transparent and easy exploitation of e-government services supplied by the Italian public administrations. The CIE achieves two important security goals: it makes electronic transactions very secure, because it adopts sophisticated authentication techniques (challenge/response, asymmetric cryptography) and also saves the user from having to remember a huge number of user-IDs, passwords and PINs.

The project started with a testing phase that ended in 2001; during this phase, around 100'000 CIE were issued. The second phase is about to start and within five years, all citizens will have an Electronic Identity Card, which will replace the traditional ID card.

The CIE is built on a laser card optical memory card platform, which includes a one megabyte optical stripe, to which a contact IC chip is added in Italy. The optical memory provides visual and automatic card authentication; a non-alterable audit trail of events (each digitally signed) in the card manufacturing, registration, activation, distribution, and issuance processes; a portable data "vault" containing each citizen's demographics, colour photograph, digitized signature and other biometrics; with back up should the chip fail.

Services National Card

The CNS represents a standard to access services provided by the public administration. It is a microprocessor card, with almost the same features as the CIE, but with different security elements (e.g. holder picture, holograms produced by the government to verify its authenticity). This simplification enables the use of easier and more flexible systems for distributing such cards, possibly delegating their production to a third-party, thus making the market more open and competitive. The CNS is an instrument to be identified on the network and through the introduction of the electronic signature will enable the holder to submit official documents and the government to provide certificates. These two elements will be completely interoperable, and the ownership of one will allow the user to access the services available through the other (with the necessary authentication alignment).

Another task of the information society is to strengthen e-learning policies and procedures. This initiative involves public schools, universities and public administrations, and aims to introduce alternative methods of acquiring knowledge, whilst at the same time providing the opportunity to study "at any time" and "in any place". Distance learning can bring Italians closer to ICT and educate users on the content provided and also in the use of IT tools.

The initiative has had positive results in connecting public entities to Internet resources via broadband and wireless access. At the end of 2003, following the e-Europe framework, 80 per cent of Italian schools were connected via broadband, 50'000 new PCs introduced and 8'000 multimedia labs established.

In health care too, the government has carried out important initiatives; telemedicine, as an ICT application for long-distance diagnosis and care, has an important role in allowing users to perform health-check and therapy in a ubiquitous manner (i.e. not being present in the medicine cabinet).

In particular, initiatives have been started to:

- identify the baseline in providing health assistance;
- create an integrated network of e-health and social services for the more critical and high risk potential patients (old people, chronic invalids and the disabled);
- the redesign of hospital networks and the creation of Centers of Excellence;
- The strengthening of the emergency number system.

An interesting initiative will be implemented to centralize and aggregate emergency numbers⁷³ (Box 4.19):

Box 4.19: Unique emergency number

One emergency number to access different type of services.

A national multi-channel "Contact Centre" will be set up to ensure access to all emergency systems through a unique national number (112 replacing 113 for Police, 112 for Carabinieri, 115 for Fire Brigades, 118 for E.R, etc). The system will guarantee immediate coordination between the entities involved, ensuring an efficient and prompt service to the end user.



Source: "Strategie e politiche per la banda larga in Italia".

4.3 The convergence process; a key element: current state and predicted evolution

Convergence in telecommunications involves different services reaching the user irrespective of the communication medium. Thanks to convergence, it is possible to separate the service provided from the technological vehicle used to transport the information and to aggregate several contents on the same medium. In accordance with the definition of ubiquitous, convergence makes the provision of a specific ICT service "from any place" and "with any object" easier. Convergence is the result of a complex work of definition, aimed at sharing communication media to transfer different types of information and it must be seen and investigated at different levels.

Transport network convergence is defined as the transportation of information independent of the physical medium and protocol used. In Italy, and generally in the state of the art of the backbone infrastructures, this kind of convergence has already been achieved, harmonizing the backbone switching via gateways, and from the protocol point of view following the de-facto standard of the TCP/IP protocol, after the Internet explosion.

In terms of access network convergence, the current situation seems to exclude the standardization of the access modalities (wire line, wireless, narrow and broadband, etc.). The access methods are different from one another, and the operators have invested so much in setting up their access networks that is counterproductive to rethink them in a converged manner; the economy of scale in providing access to the services imposes the coexistence of the access technologies used.

Instead, there is a strong interest in envisioning convergence in terms of the terminal used; this can be divided into three:

- Convergence at the level of access technologies, requiring multi-access terminals (GSM, UMTS, fixed, mobile, wireless);
- Network level convergence, end-to-end, already reachable for all terminals using the same protocol (specifically IP);
- Convergence at the transport-session-application level, already present today on the PC-based terminals, growing on TLC terminals (fixed and mobile phones), and foreseen for new generation terminals such as palmtops, pocket PCs, UMTS devices.

But the most important aspect of convergence is laying on the services provided, which means identifying opportunities for integration at the upper layer of the data exchange. This means ensuring the total interoperability of the services on the transit from one infrastructure to another, as well as guaranteeing compatibility on the implementation of the different solution proposed, through a common middleware to be used by everyone (as happened for Java Beans and Active X controls).

To obtain such convergence, the physical network should be overlapped by a logical one, composed of service nodes able to communicate with one another and with the terminals. The network will become a unified infrastructure, driven by a standard transport protocol (identified in the IP) and a "global resource" that performs the transfer/control/management of the information and the streaming of the service in question (Figure 4.5).



An additional benefit of this vision of converged network solution is its staying power. It is widely acknowledged by the communications industry and industry analysts as a whole, that the Internet Protocol is the universal transport medium of the future. The adoption and migration of vendors to the use of IP as a transport medium for data, voice and video applications reinforces this vision of the future.

An interesting application related to the possible convergence based on IP has been conducted by Cisco and University of Messina⁷⁴ (Box 4.20).

Box 4.20: Ubiquity University

Cisco collaborates with University of Messina for the integration voice-video-data.

Cisco has announced the adoption by the University of Messina of structured cabling and devices for wireless connectivity that will enable the convergence of voice, data and video. The infrastructure, based on Cisco AVVID (Architecture for Voice, Video and Integrated data), will allow the integration of voice video and data using the same IP network. The University will be able to provide multimedia services like videoconferencing, video elections, and on-line consultation of didactic material and the electronic management of students' progress through a single integrated network infrastructure.

This solution will facilitate the interaction between the different services making access by the users easier. *Source:* www.cisco.com

The global network will be completed by interconnecting several access and transport technologies, such the IP infrastructure, mobile and wireless networks, broadband, cable and fibre networks, television networks and infrastructures built around users' premises (home networks). The next generation network will be characterized by billions of terminals, with "always-on" functions permitting the convergence of applications and services using new enabling communication media.

In light with vision, the IP protocol plays a major role in integrating and harmonizing the access and transportation of the information. However, the requirements prompting its creation have been already been overtaken; it can now be used by the majority of the devices connected and, according to the technical specifications, a fixed number of elements can be connected at the same time. The demand for IP addresses will continue to grow; as early as 2003, the number of addresses had almost reached one billion. A redesign of its structure has to be evaluated, providing a bigger addressing space, and consequently increasing the potential number of connectable objects.

The Internet Engineering Task Force (IETF) has identified a possible approach and several studies and pilot projects have been initiated to overcome the limitations. The technical details are out of the scope of this case study, but some clarification is certainly required. Today, the maximum number of addresses assignable to a specific entity or user is less than 3 billion. This is because the structure of the IP address foresees the use of 4 octets (for a total of 32 usable digits – from here the definition of IPv4). As the IT world uses binary language (1 and 0), the calculation is easy: the total number obtainable is 2 to the power 32 (apart from some reserved-range networks allocated for research and other purposes).

An extension of the available IP addresses is represented by the IPv6 initiative, aimed at making a much bigger number of addresses available, so allowing more devices to be connected, with a clear advantage in terms of presence on any network. Italy has also been initiating some interesting research activities (Box 4.21).

Beyond the technological view of convergence and, in a broader context, the development and transformation of the content market is the result of the tendency of the media world to integrate with the other ICT sectors, as part of a convergence process. This evolution can be due to the quick development of the broadband technologies (wire line and wireless, the progressive digitalization of television with the consequent introduction of digital terrestrial TV and the stronger perception of the potential on mobile computing.

These aspects have motivated the operators (broadband and mobile) to extend and enlarge the market strategies towards the creation of new multi-service devices, more complete than a simple PC, to penetrate the market better and stimulate greater demand amongst customers.

A few years after the introduction of access technologies more advanced than simple dial-up, Italy is emerging as one of the most reactive countries, having a national offer of broadband, in particular fibre, able to support high quality multimedia and business integrated services. It is also true that at present, not more than three or four providers are investing in and actually providing converged services, but in view of the success obtained, this could serve as a very strong stimulation for the others, especially those that already have expertise in fibre and backbones and have deployed them.



At the same time, the TV operators, who are vertically integrated, have started to recognize and use the advantages coming from a long analogical period re-capitalizing the investments in getting as many customers as possible and repositioning strategically within the digital market. This main advantage of this process is that it does not depend on geographical distribution (as was the case in the analogical world), as there is a direct relationship between digitalization and globalization. The analogical elements represent a barrier against integration and convergence. Given this, Italy can be regarded as a pioneer exploring new frontiers.

Digital television facilitates the distribution of contents traditionally belonging to broadcasting, in other words in modality "one to many," with the addition of interactive content typical of telecommunication environments (Internet, integration data, video, voice one the same communication channel).

This aspect not only provides interesting opportunities for the customers, who are able to use innovative technologies at very low costs, but also determines the separation between the technology used and the product distributed. The convergence market defines the technological opportunities (which systems for which technology? Which services to be provided independently by the technology used?) but also the competition for the control and maintenance of areas of the market, the definition of strategies to consolidate the players (through acquisitions and joint ventures) and the development of business models related to several new visions and the expertise of the operators and their position on the supply chain.

The availability of advanced infrastructures, such as broadband and UMTS, is the basic requirement for the development of convergence, in particular on the content side, due to their capacity to integrate the information exchange flow both quickly and efficiently. One of the most interesting phenomena associated with this is the tendency to consolidate and aggregate the content. This is motivated by the possibility of

acquiring a potentially competitive advantage once innovative and high performance infrastructures have been set up to handle and control, at the global level, a client portfolio that is increasing in size, because it provides services that are usable anywhere, at any time and using different terminals.

The multiplatform, multiservice approach seems to be the winning strategy, because it can guarantee potentially universal access by the content provider, so meeting the users' needs in terms of portability, mobility and customer classification (business, home users), as well as creating the scenario, in which the ubiquitous society can become a reality.

4.3.1 Protecting data in Italy's ubiquitous network society

Italy's new data protection code came into force on 1 January 2004.⁷⁵ The Code is unique, in that it brings together all the various laws, codes and regulations relating to data protection introduced since 1996. As mentioned above, many objections and concerns have been raised relating to privacy and the invasion of people's lives, but, at the same time, new technologies, such as RFID, do offer us excellent opportunities to improve the quality of our lives. These mini-chips are becoming smaller and cheaper every day and can be read at a distance. The main privacy concern about the tags is that individual consumption patterns can be tracked and traced by any outsider with a reader, especially when the individual purchaser is identified via a loyalty-card. To address these concerns, in December 2004, the Italian data protection authority (*Garante della Privacy*) opened a consultation⁷⁶ on privacy issues related to RFID tags, loyalty cards, digital TV (pay per view etc.) and video-telephoning.

Moreover, on 26 February 2004, after a long debate, the government introduced a law modifying the provisions governing personal data protection legislation for data retention for the purpose of crime detection. This has led to the introduction of a "minimum" data retention period of 24 months for telephone traffic, which can be extended for another 24 months in the case of crimes against electronic systems and for information related to organized crime or terrorism.

5 CONCLUSION

Italy has always been amongst the leaders in the advance towards the ubiquitous network society and, with its people being amongst the most enthusiastic users of the new communication technologies, it will continue to be so. Although the truly ubiquitous network society has not yet been achieved, and will require the continued and concerted effort from all the players involved, great progress has been made, and there is every reason to be optimistic.

Particularly significant progress has been seen in the fields of integration and convergence and much of the credit for this goes to the strength of the Italian mobile technology sector and its related services. The Italians have also been particularly successful in carrying out the strategic re-positioning of the players towards broadband. Digital terrestrial broadcasting has been another area in which Italy has led the field and its continued introduction over the next few years will certainly overcome some of the current technological and geographical constraints. RFID and Domotics, are likely to act as incentives to ensure the achievement of a fully integrated services-network. If all these factors maintain their momentum and all the players continue to pull together, the spread of an Italian ubiquitous network society will surely be greatly facilitated.

The social implications of the ubiquitous networks are enormous; as well as improving the lives of the existing users of the new communications technologies, they will also reach out to include hitherto marginalized people including those living in remote and inaccessible areas of Italy, increasing their knowledge and with it, their social power and quality of life. The future is bright: technological development is fast and unpredictable and the pace of advancement towards the truly ubiquitous network society is breathtaking.

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- ⁵ Information about the Survey on Ubiquitous Network Societies: The Case of Italy can be found at: http://www.itu.int/ubiquitous.
- ⁶ See http://www.cia.gov/cia/publications/factbook/geos/it.html
- ⁷ See <u>http://www.cia.gov/cia/publications/factbook/geos/it.html</u>
- ⁸ http://www.cia.gov/cia/publications/factbook/geos/it.html
- 9 See http://www.appliedlanguage.com/country_guides/italy_country_introduction.shtml
- ¹⁰ World Development Indicators, The World Bank, 2004, <u>http://www.worldbank.org/data/wdi2004/</u>
- ¹¹ See <u>http://www.imf.org/external/country/ita/index.htm</u>
- ¹² Assinform Report, 2005 (Italian only), <u>http://www.assinform.it/aree_sx/pubblicazioni/index_rapporto_ict2000a.htm</u>
- ¹³ Assinform Report, 2005 (Italian only)
- ¹⁴ Assinform Report, 2005 (Italian only), <u>http://www.assinform.it/english_version/_profilo_eng.htm</u>
- ¹⁵ Assinform Report, 2005 (Italian only), <u>http://www.assinform.it/aree_sx/pubblicazioni/index_rapporto_ict2000a.htm</u>
- ¹⁶ European Information Technology Observatory (EITO) Report, 2005
- ¹⁷ See <u>http://www.osservatoriobandalarga.it/</u> (Italian only)
- ¹⁸ See <u>http://www.innovazione.gov.it/ita/intervento/normativa/pubblicazioni/osservatorio_permanente_nov04.shtml</u> (Italian only)
- ¹⁹ See <u>http://company.fastweb.it/</u>
- ²⁰ See <u>http://www.comunicazioni.it/it/</u>
- ²¹ European Electronic Communications Regulation and Markets, 2004, <u>http://europa.eu.int/information_society/topics/ecomm/all_about/implementation_enforcement/annualreports/10threport/index_e_n.htm</u>
- ²² Developing the multimedia mobile market, The Netsize Guide, 2004, <u>http://www.netsize.com/?id=5&sid=1</u>
- ²³ European Information Technology Observatory (EITO) Report, 2005
- ²⁴ ITU Internet reports: The Portable Internet, ITU, 2004
- ²⁵ See <u>http://www.pec-forum.com/reti/servizi_mobili_Italia.htm</u>
- ²⁶ See <u>http://www.tre.it/servlet/ContentServer?pagename=FixedPortal/Page/Template02&pgname=EXPLORE3</u>
- ²⁷ See <u>http://www.agcom.it/norme_.htm</u> and
- ²⁸ See http://www.itu.int/ITU-D/imt-2000/documents/MoscowApril2004/Presentations_pdf/Day%203/3-1-3_Savi.pdf
- ²⁹ See http://www.itu.int/ITU-D/imt-2000/documents/MoscowApril2004/Abstract%20and%20Bios%20pdf/3-1-3_ABSTRACT.pdf
- ³⁰ See http://www.venice.coe.int/docs/2004/CDL(2004)092-e.asp
- ³¹ See http://www.ics.trieste.it/Documents/Downloads/df2151.ppt
- ³² See http://www.company.tim.it/delivery/showfile/0,,7936,00.pdf
- ³³ See http://www.agcom.it/eng/e_intro/e_intro_.htm
- ³⁴ See <u>http://www.agcom.it/L_naz/L_249.htm</u>
- ³⁵ The Government's Guidelines for the Development of the Information Society, June 2003.
- ³⁶ See <u>http://europa.eu.int/information_society/eeurope/2005/doc/all_about/broadband/com_broadband_en.doc</u>
- ³⁷ See <u>http://www.innovazione.gov.it/ita/intervento/banda_larga/task_force/documenti_pdf/sintesi_eng.PDF</u>
- ³⁸ See http://www.innovazione.gov.it/ita/news/rapporto_largabanda_2004.shtml (Italian only)
- ³⁹ Infratel is responsible for the development of broadband infrastructures throughout the country.

⁴⁰ Osservatorio Banda Larga, Lo sviluppo della banda larga e i costi per annullare il digital divide, Roma, 29 September 2004 (Italian only), <u>http://www.osservatoriobandalarga.it/</u>

- ⁴¹ See <u>http://www.innovazione.gov.it/ita/comunicati/2003_07_15.shtml</u> (Italian only)
- ⁴² See <u>http://www.comunicazioni.it/en/index.php?IdPag=4&IdCom=366&Anno=2005&Mese=&Blk</u>=
- ⁴³ See <u>http://europa.eu.int/information_society/eeurope/2005/index_en.htm</u>
- ⁴⁴ See <u>http://www.dgtvi.it/consumer_info/</u> (Italian only)
- ⁴⁵ See <u>http://www.agcom.it/eng/reports_docs/resp_reg.htm</u>
- ⁴⁶ See <u>http://www.digitag.org/events/broadcast_seminar_madrid/Alberico.pdf</u>
- ⁴⁷ See Il digitale terrestre locale fra nuovi scenari e opportunità di investimento. (Italian Only)
- ⁴⁸See <u>http://www.governo.it/GovernoInforma/Dossier/ddl_comunicazioni/legge.pdf</u> (Italian Only)
- ⁴⁹ Murakami, Teruyasu (2004) "Ubiquitous networking: business opportunities and strategic issues", No. 79, Nomura Research Institute, <u>http://www.nri.co.jp/english/opinion/papers/2004/pdf/np200479.pdf</u>
- ⁵⁰ See <u>http://www.itu.int/osg/spu/ni/ubiquitous/</u>

¹ See http://news.bbc.co.uk/1/hi/world/europe/2956240.stm

² See <u>http://www.worldreport-ind.com/hi-techeurope/mobiles-italy.htm</u>

³ ITU Internet reports: The Portable Internet, ITU, 2004, <u>http://www.itu.int/osg/spu/publications/portableinternet/</u>

⁵¹ See <u>http://www.itu.int/osg/spu/ni/ubiquitous/</u>

- ⁵² Larga Banda e TV digitale : la convergenza diventa realta', ANFoV, 2004, <u>http://www.anfov.it/rapporto/docs/rapporto2004.pdf</u> (Italian only)
- ⁵³ See <u>http://www.rossoalice.it/alice/home.htm</u> (Italian only)
- ⁵⁴ How FastWeb succeeded in launching innovative broadband telecommunications services. Fastweb, 2004
- ⁵⁵ See <u>http://www.repubblica.it/2004/h/sezioni/scienza e tecnologia/voip/voicefut/voicefut.html</u> (Italian only)
- ⁵⁶ See http://www.ansa.it/infrastrutturetrasporti/notizie/rubriche/ferrovie/20041119161133163281.html (Italian only)
- ⁵⁷ Larga Banda e TV digitale : la convergenza diventa realta, ANFoV, 2004 (Italian only)
- ⁵⁸ Larga Banda e TV digitale : la convergenza diventa realta', ANFoV, 2004 (Italian only)
- ⁵⁹ Progetto Intesa online Mobile, Banca Intesa, 2004 (Italian only)

⁶⁰ See <u>http://www.ubiquity.it/</u>

- ⁶¹ See <u>http://www.ilsole24ore.com/fc?cmd=art&codid=20.0.781291829</u>
- ⁶² Mucci, Alberto, Il digitale terrestre accende i motori, I quaderni di Telema, No. 219, August 2004 (Italian only)
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- ⁶⁴ About Broadband in Italy, Fondazione Ugo Bordoni Ministero Innovazione e tecnologia, 2004
- ⁶⁵ Decreto Ministeriale di regolmentazine dei servizi Wi-Fi ad uso pubblico (Italian only)
- ⁶⁶ See <u>http://www.t-mobile.com/company/pressroom/pressreleasepopup122.asp</u>
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- ⁶⁸ Battezzati, Luigi (2003), RFID Identificazione automatica a radiofrequenza, Hoepli (Italian only)
- ⁶⁹ See <u>www.rf-id.it/casehistory/logistica.htm</u>
- ⁷⁰ See <u>http://www.cybertime.net/~ajgood/medchip.html</u>
- ⁷¹ See http://www.rfidjournal.com/article/articleview/369/1/1/
- ⁷² OECD, (2004), Working Party on the Information Economy, It Policy Questionnaire
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- ⁷⁴ See <u>http://www.cisco.com/global/IT/solutions/pdf/case_messina.pdf</u>
- ⁷⁵ See <u>http://www.garanteprivacy.it/garante/doc.jsp?ID=1030925</u>
- ⁷⁶ See <u>http://www.garanteprivacy.it/garante/doc.jsp?ID=1078227</u> (Italian only)