Consulting

Telecoms in Europe 2015

Final Report

A Report for the Brussels Round Table

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The views expressed in this report are those of IDATE and LECG and do not necessarily represent those of the Brussels Round Table members individually or collectively.

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EXECUTIVE SUMMARY

How will we communicate with our peers and share information in 2015? What kind of services will be proposed to us and by whom? Will Europe be a leading information society and what will its telecommunications industry look like in ten years from now? Which role will be played by regulation and public policy in building this future?

This report attempts to provide possible answers to these questions through a scenario approach (section 3) that draws upon a detailed analysis of the current state of the European industry (section 1) and its likely evolution over the next decade (section 2) with a focus on consumer-oriented services. The central role played by regulation on new infrastructure investments that are critical in shaping this future is discussed in the final section of the report.

The European telecoms paradox: best of times, worst of times?

The first section of the report explores the unprecedented paradox currently faced by the European telecommunications industry. Never has this industry been such a central contributor to the European economy and society at large. Yet, as epitomized by financial markets' cautious sentiment towards the sector, never has the industry's short to medium term outlook appeared so challenging.

Telecommunications is a central contributor to the European economy and society

Telecom service and equipment segments are increasingly contributing to the European economy and its growth. In fact, over the past five years, they have contributed more to Europe's GDP growth than IT (+4.3% per annum vs. +0.2%) and have been more dynamic than in the US (+0.9% per annum). They now account for nearly 3% of European GDP.

Furthermore, the telecoms sector is playing a central role in shaping a leading European information society. The massive and sustained investments in first generation broadband infrastructure have placed Europe at the forefront of fixed (#2 behind Asia for DSL) and mobile broadband (#1 for UMTS) adoption in respect to other regions.

Financial markets voice concern about the European telecoms sector

Yet, despite this contribution, investors have expressed a negative sentiment towards the European telecoms' sector over the recent period, resulting in severe share price underperformance compared not only to general stock indices but also to other telecom indices worldwide (-35% and -20% respectively since January 2005).

Relative to other regions, investors formulate three major concerns about Western European telecoms' current situation and its short to medium-term outlook: weakening volume fundamentals, severe deflationary pricing and increased regulatory scrutiny. These concerns are now exacerbated by investors' anticipation that both remaining growth drivers of the industry (mobile and broadband) will gradually lose steam.

The resulting low European telecom stock valuations are profoundly impacting the landscape which increasingly features pan-European expansion, cost-driven consolidation and public-to-private buyouts. Some of these trends are already negatively impacting investment and R&D patterns in the industry.

The sector outlook faces growth challenges

Over the past five years, growth of the European telecom services market has gradually eroded (from double digit rate to less than 4% in 2005 and expected below 3% in 2006), mainly due to the stagnation of the wireline sector, with the decline in fixed telephony being barely compensated by the growth in broadband access. The sector's engine for growth has resided in mobile services, which now account for over half of the industry revenues.

The short to medium term outlook for the industry's existing services is weak: an acceleration of fixed telephony decline, a maturing DSL access market, the mobile penetration saturation looming on the horizon and slower than expected 3G take-off all pave the way for further growth deceleration, and possibly deflation in some advanced European markets. Without the introduction of new monetizable services, the possibility exists of a revenue gap if price deflation is faster than the growth in usage of existing services.

Multiple forces create both opportunities and challenges for the European telecoms industry

The second section of this report discusses the multiple exogenous forces likely to shape the future of the industry over the next ten years. In addition to the key role of regulation and public policy discussed in the final section, three clusters of forces have been identified: end-user expectations and usage patterns, technology disruptions and evolutions; and globalisation transitions.

The combination of these multiple forces will impact the industry in five major ways including an expanded “co-opetition” arena (in which players are both partners and competitors), revenue model transformation and value chain reconstruction.

Changing end-user expectations, behaviours and usage patterns

Beyond a generalized end-user need for a considerable increase in network bandwidth, operators will be facing diverging communications needs. While younger users will favour multi-faceted (but hardly monetizable) electronic communications and drive service innovation, older people will demand technology simplification.

Beyond new consumer segmentations, operators will need to adjust to increasingly individualized consumption of communications and digital goods, requiring new marketing and commercialization approaches. These multiple evolutions will take place against a background of demand for ubiquitous mobility.

Technology improvements and disruptions

Multiple technology improvements and disruptions in telecoms (migration to all-IP, all-optical networking), media (content digitalization, high definition) and in other fields (e.g. computer processing, storage, nanotechnology, human-interface machines, power management) are enabling the creation of a wide array of new services. At the same time, technological change is reducing barriers to entry for both infrastructure and services.

Globalisation transitions

The next few years will see a complete reshuffle of regional balances and the emergence of some new mega telecom markets. By 2010 China alone will have more mobile and broadband subscribers than the entire Western Europe and nearly 3 times as many subscribers as the United States. The Indian user base will also be larger than that of the US.

This new world order has already produced visible effects with 4 of the top 10 mobile carriers in terms of subscriber base located in emerging regions and with Chinese vendors accounting for more than 7% of the worldwide infrastructure market. Benefiting from strong state support for local industry and broadband infrastructure development, these players will continue to transform the sector's economics and increasingly influence technology standards and directions.

Likely major impacts on the industry

As a result of these trends, we expect to see an expanded "co-opetition" arena as the industry's traditional borders become ever more blurred. In the longer run, communications' usage and purchases will be increasingly intertwined with those of other digital goods, thereby blurring the boundaries between traditionally isolated segments and expanding the addressable market far beyond traditional services (e.g. mobile TV, visiophony, ambient gaming).

Another key development will be the carrier revenue model transformation along multiple dimensions: new pricing schemes, larger service offerings with new end-user services, expanded wholesale strategies and new funding mechanisms (based on advertising) for services. A key question is whether this transformation will result in higher overall revenues for the industry.

A third critical impact will be a reconstruction of the industry's value chain as reduced interaction and transaction costs between the three traditional activities of a carrier (network infrastructure, products and services provisioning, customer management) create turbulence for the vertically integrated models of the industry.

Three possible futures for telecoms in Europe in 2015

The third section of the report presents three scenarios describing plausible outcomes for the European telecommunications industry by the year 2015. They can essentially be characterized as trap (Telepocalypse), intermediate (Convergence Compromise) and favourable (Evernet) outcomes in terms of addressable market size for the telecom service and equipment segments in 2015.

Each scenario was built upon a set of configurations for key variables derived from the major external forces and impacts identified in section 2 (and validated through a survey) as well as articulated around contrasted regulatory and public policy orientations.

The central role of regulation and public policy

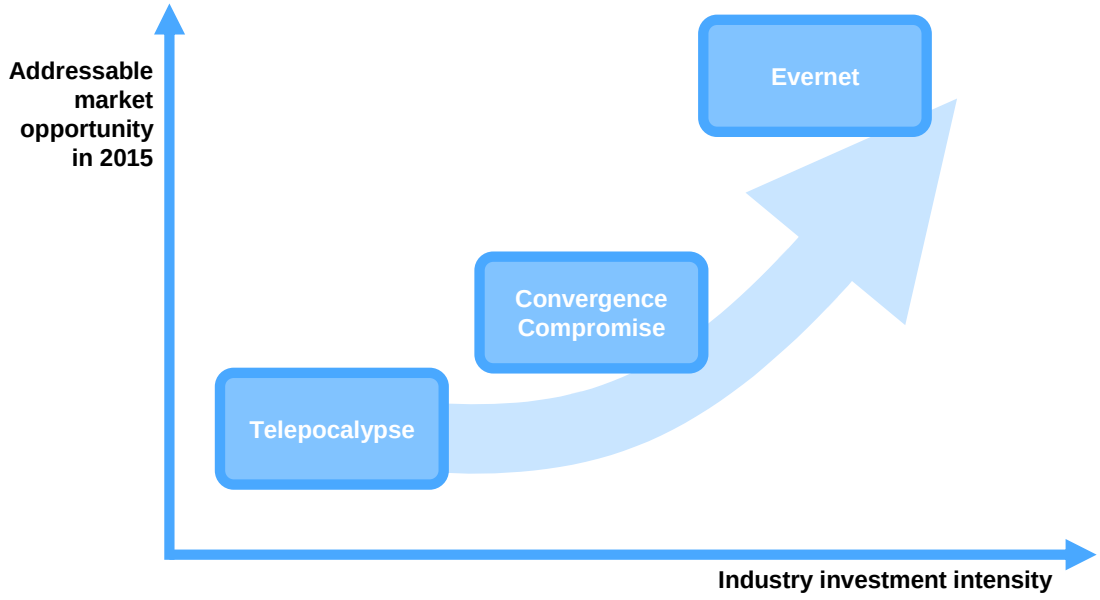
Beyond the influence of market-driven exogenous drivers, the three scenarios are deeply impacted by the regulation and public policies' role in shaping competition dynamics at both the application and infrastructure levels and influencing future investment behaviours.

The contrasted regulatory orientations considered range:

- from access at cost, to facilities-based competition for new infrastructures, and,
- from net neutrality, to tiered provisioning schemes for applications.

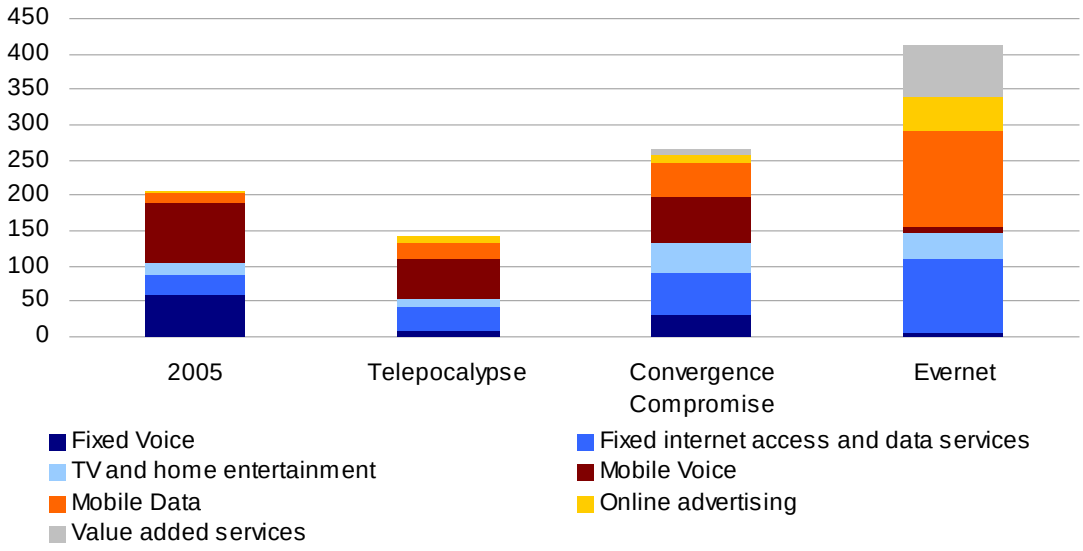
The key role played by active public policy through R&D funding programmes and the possible pan-European regulatory harmonisation are also considered.

Figure 1: Scenario framework



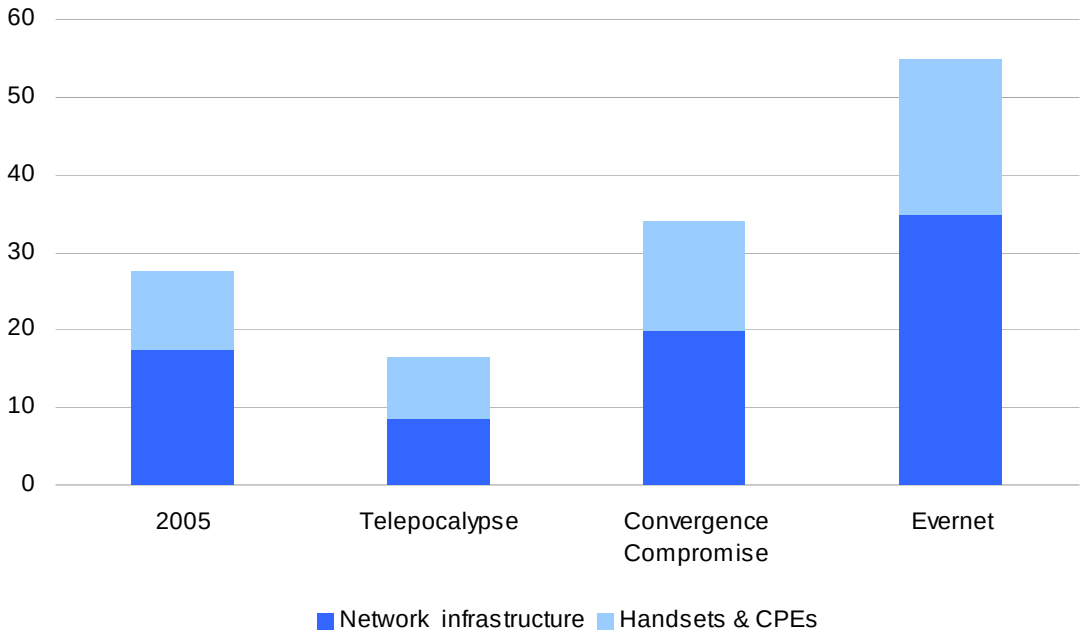
Source: IDATE

Figure 2: Europe-5 addressable service market size in 2005 and in 2015 per scenario
In EUR billions (2006)



Source: IDATE

Figure 3: Europe-5 addressable equipment market size in 2005 and in 2015 per scenario
In EUR billions (2006)



Source: IDATE

Telepocalypse

This first scenario considered results from a "Mexican standoff" situation between carriers adopting a wait-and-see attitude and delaying or cancelling new network investments while the regulatory framework enforces a strict access at cost policy for new infrastructures and adopts a net neutrality stance in favour of application-based competition.

In this scenario, online advertising-funded service proliferation decimates most fixed and mobile service revenue sources of operators that are not matched by a corresponding increase in connectivity revenues.

High speed broadband availability has modestly improved and is sporadic as fibre and HSxPA – deployments remain concentrated in the densest urban areas, essentially targeting the corporate market, while less populated areas rely on isolated initiatives of wealthy municipalities for broadband improvement.

Contracting industry-wide revenues trigger a competitive shake-out and transforms telecoms into a utilities-like industry with only a handful of large private cost-optimized operators and state-sponsored organizations surviving.

Convergence compromise

In this second scenario, tiered basic and premium converged applications coexist for the benefit of consumers while ensuring some service revenue streams in addition to connectivity revenues for operators.

High-speed fixed (fibre) and mobile broadband, fuelled by infrastructure competition in dense urban areas, becomes a reality while DSL coverage prevails across less populated areas.

The moderately growing market size produces contrasted strategic choices from operators to derive cost synergies: some focus on Pan-European consolidation and fixed/mobile integration whilst others turn away from application provisioning to become dedicated infrastructure providers.

This scenario occurs within a regulatory framework that largely continues to ensure retail-based competition through unbundling of non replicable legacy infrastructures across most territories while introducing facilities-based competition in dense urban areas and facilitating European harmonisation, traffic prioritization and commercial freedom for converged services.

Evernet

Newly enabled services, particularly in the business-to-business and public administration domains (e-gov, e-health, machine to machine) generate cross-sector productivity gains for the European economy while pervasive fixed and mobile visiophony and seamless multimedia communications produce far-reaching benefits for European society at large.

Broadband becomes a new fabric of European society with minimum 50Mbps access available everywhere thanks to strong infrastructure competition fostering the proliferation of multiple fibre and high broadband wireless access networks across large territories.

The expanded role of the communications sector creates ample growth opportunities for both infrastructure and application providers and produced a vibrant, dynamic and competitive European telecoms industry.

This scenario is made possible by (i) a proactive European public policy stance that encourages cross-industry collaboration on new application development and (ii) a regulatory framework which stimulates fixed and mobile broadband facilities-based competition and encourages massive new infrastructure investments across most territories.

Investment incentives

The concluding section of this report elaborates on the key correlation between regulation and investment in new infrastructures. This correlation is central to the likelihood of any of the three scenarios outlined, or close versions of them, coming into existence.

To aid consideration of these issues, a formal model was constructed, detailed in the Annex to this Report. In this model, regulatory policies for access services are taken into account by companies when deciding on investments to upgrade their access infrastructure. The model considers the impact on investment and consumer welfare of access-based regulation, and contrasts this with a situation in which competing infrastructure companies invest in the absence of such regulation.

Different regulatory approach when new investment is necessary

There is a fundamental difference in the interaction of regulation with existing, legacy, infrastructure on the one hand, compared to prospective new infrastructure on the other, for which new investment is necessary.

For legacy infrastructure bottlenecks consumer welfare is maximized by obligating access at cost. This ensures strong competition in the retail market, which benefits consumers, and there is by definition no negative effect of investment. In this sense, cost based access regulation has worked and was the best available regulatory policy for access to legacy assets.

For new investment a different picture emerges. In areas of urban concentration competition is likely to occur regardless, meaning that infrastructure competition can make regulation unnecessary. In less concentrated or rural areas a different situation arises, as the cost of investment rises. In this scenario a single company is likely to be deterred from investing in new infrastructure if cost-based access regulation promises to reduce or remove the value of that investment. At the same time, in the absence of such regulation, a single investor would have limited incentives to share that value with competitors, potentially reducing retail competition.

Policy implications from our model

Our model indicates an important policy trade-off:

- A policy of requiring access at cost can be expected to reduce investment.
- The model shows that such a lower level of investment can be detrimental to consumer welfare, especially if the investment is of very high value. In effect, there is a trade-off between lowering barriers to entry for retail competition and the extent of investment. In some conditions, as shown by the model, more investment is preferable to lower barriers to entry.
- The model finds that if there are two (or more) infrastructure competitors who invest in competition to each other, they create more investment and consumer welfare than a single firm which gives access to an infrastructure-less operator.
- The model also suggests there might be an important role for innovative co-operative models in which there is collaboration at the infrastructure level but then competition at the retail level. Such arrangements have emerged in other industries and might be expected to have benefits in telecommunications. We recommend this as an area for further consideration - future challenges are likely to warrant new arrangements.

INTRODUCTION: What a difference ten years make

How will we communicate with our peers and share information in 2015? Will Europe be a leading information society? What kind of services will be proposed to us and by whom? What will the European telecommunications industry look like in 2015? Which role will it play in tomorrow's increasingly globalized world?

In search of possible answers to these questions, the Brussels Round Table mandated IDATE and LECG to conduct a study on the future of the European telecommunications industry. The objectives of this study were fourfold:

1. Analyse the current state of the European telecom services and equipment sectors
2. Identify the medium and long term challenges faced by the industry
3. Determine the potential future of the European communications sector and the implications for the industry and society at large
4. Draw out major implications in terms of regulatory environment and public policy evolution

Any discussion regarding the evolution of an industry is ultimately always also a debate about desirable (and undesirable) futures and what can be done to help these come about (or not happen). In essence, examining or pondering the future can take four different forms: visions, trends, forecasts and scenarios.

Visions express a future course of development wished for by an individual or group, a desired set of circumstances that requires efforts to be focused consistently in order to be achieved. They essentially reflect a desired future course. They have the main advantage of being clear, concise and illustrative but suffer from being mainly driven by a monolithic insider consensus.

Trends are extrapolations of emerging processes rooted in the present and expected to impact the market. They have the benefit of being linear and deterministic but the drawback of hardly allowing for disruptive factors.

Forecasts reflect the expect time for identifiable factors to develop and impact the market. They are widely used because they materialized quantified impacts and propose a progression path but often suffer from the insider bias and the absence of inclusion of factors external to the considered industry.

Scenarios differ from all of the other ways of examining in that they posit that the present holds the potential for more than just one future. They suggest several plausible future alternatives and help isolate the most uncertain variables likely to shape the various outcomes. They have the advantage of reflecting the field of possibilities and may suffer from being more driven by external factors than by players' strategies.

Bearing in mind the benefits and possible caveats to any prospective exercise, we opted for a **scenario-based approach** based on a methodology that involved four stages:

- **Diagnosis** of the current situation of the European telecommunications industry and the strategies of its players (section 1)
- **Analysis of the long term driving forces** that will shape the future of the industry **and their major impacts** on its structure (section 2)
- **Scenario development** based on a consultation with a group of sector professionals and **modelling** of each of the **three selected scenarios** for the 5 main European markets covered in the study (section 3)
- **Discussion on a future possible regulatory approach to governing new infrastructure investments and access to them** (section 4)

Our analysis covers the European telecommunications industry and includes all categories of **service providers** (integrated carriers, fixed and mobile operators, cable companies, unbundled operators and Internet-based communications application providers) and **equipment vendors** (network infrastructure, handset and CPE device providers) operating in Europe.

The **time horizon** for the study is **2015**. A decade from now means that the scenarios allow for prediction-building based on the current market structure and dynamics yet factor in the full-blown impact of new consumption and technology patterns.

The **geographic scope of analysis** is limited to **Europe** and the scenarios more specifically focus on its five main countries - **France, Germany, Italy, Spain, and the United Kingdom**. While ideally we would have wished to apply the results of our prospective analysis to each of the markets separately to reflect for the differences in competition structure, technology adoption or regulatory frameworks, the timing and magnitude of the project have forced us to considered the five countries as a unified whole.

While the past may not be a good indicator of the future for such a fast-moving industry as telecoms, a glimpse in the rear-view mirror should provide the authors with both the humility required in undertaking a prospective task of this kind and with some important lessons to be drawn on the nature of changes in this industry.

In 1995, fixed telephony was more or less at today's penetration levels in Western Europe while mobile telephony was in its infancy with 15 million subscribers across the 5 main European markets. The internet was still barely on the radar in Europe and drew 16 million users worldwide although it was at a tipping point with Netscape's initial public offering in the United States. While deregulation was playing a major role in structuring the nascent mobile market in Europe, it had marginal impact on the fixed segment. In the meantime, the equipment industry was still highly integrated vertically (with vendors providing both network infrastructure and handsets) and captive with single national suppliers providing single national incumbent carriers (e.g. Lucent, then known as the Bell labs, was still a subsidiary of AT&T).

This brief glimpse shows that **the telecommunications industry found ways to reinvent itself** and grow beyond a fairly saturated activity (fixed telephony) **by producing a new "endogenous" business** (mobile telephony) and **by nurturing an "exogenous" innovation** (the internet) whose potential had not yet been identified ten years ago.

SECTION 1: the European telecommunications industry's paradox

The European telecommunications industry currently faces a life-defining paradox. Never has this industry been such a central contributor to the European economy and society at large. Yet never has the industry appeared so vulnerable as underlined by financial markets' caution towards the sector.

This section highlights how the telecommunications industry significantly contributes to European economic growth and how it is fuelling an advanced information society. It then analyses financial markets' current cautious sentiment towards the industry and how it relates to the multiple growth, competition and regulatory transitions that have impacted the market.

1. Telecommunications is an important contributor to the European economy and society

1.1. Telecom increasingly contributes to the European economy…

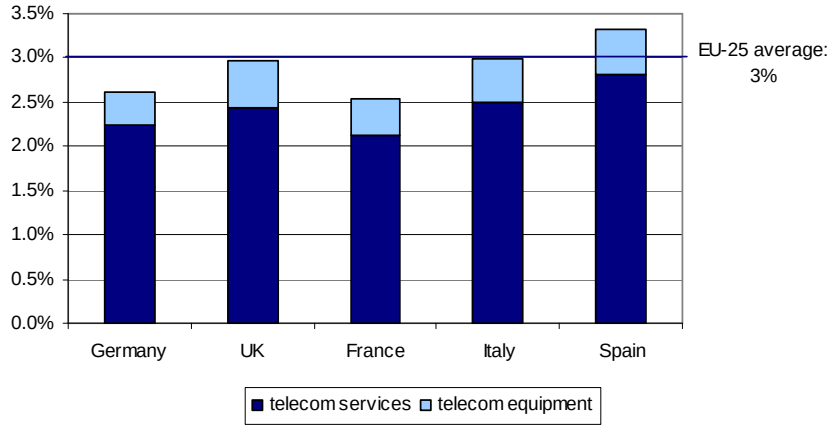
The telecommunications sector's contribution to the economy spans across the service (fixed and mobile telephony, data and image transmission) and equipment (LAN and WAN infrastructure, fixed and mobile handsets, software and related IT services) segments.

Dynamics and GDP contribution

Growth of European telecom markets have been significantly higher in the recent years than in the US (+4.3% per year during the 2000-2005 period vs. +0.9%) and their value, as a % of GDP, is just over 3% (compared to 2.8% in the US).

In 2005, Europe concentrated 28.4% of the world telecom markets, a percentage that is slightly lower in the equipment segment (27.9%) Overall, European telecom markets were valued at 322.9 billion EUR (270.4 billion EUR in services and 52.5 billion EUR in equipment), which represents 3.05% of the regional GDP with big discrepancies according to the countries. As a comparison, telecom markets in the USA represent 2.8% of GDP.

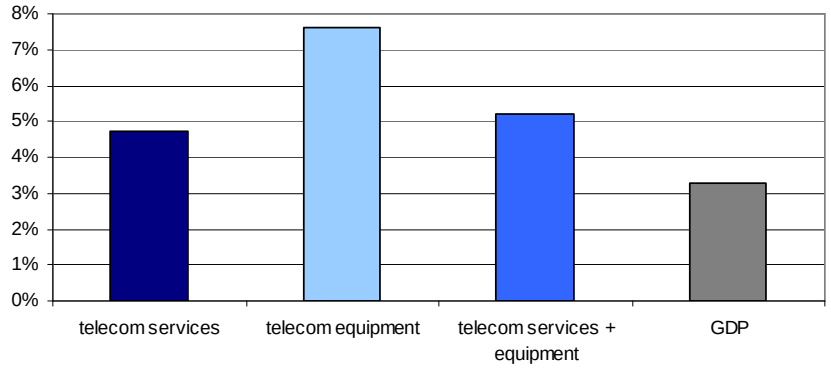
Figure 1: Telecom markets as a % of GDP in the major European countries



Source: IDATE

European telecom markets increased 5.3% in 2005 over the previous year (+4.7% in services and + 7.6% in equipment), which is just under the worldwide telecom market growth (+5.9%) but still over the US market dynamics (+4.7%). This progression was also above that of the regional GDP which increased 3.3% in 2005 (in current value).

Figure 2: Telecom markets vs. GDP growth in EU-25, 2005

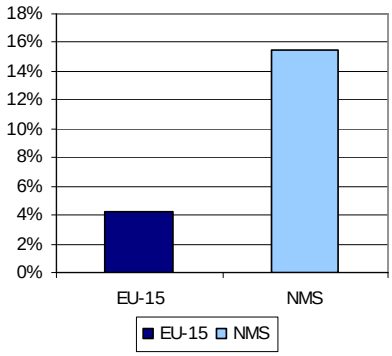


Source: IDATE and OECD

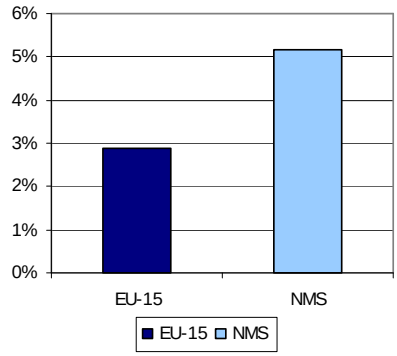
However, telecom market relative weights and dynamics are very different in Western and in Eastern Europe. New Member States' telecom markets only accounted for 8.7% of the total EU-25 telecom market but their growth has been 15.5% in 2005 while it was only 4.3% in Western countries and they account 5.2% of GDP (compared to 2.9% in Western countries).

Figure 3: NMS vs EU-15

Growth of telecom markets 2004-2005



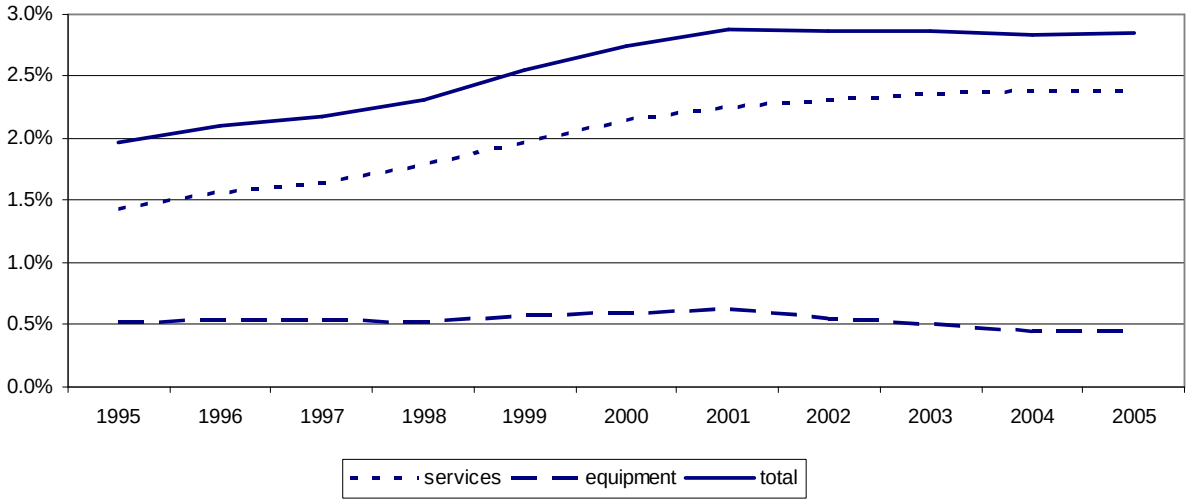
Telecom market as a % of GDP (2005)



Source: IDATE and OECD

The telecoms' sector contribution to GDP in Europe-5 has risen constantly from 2% in 1995 to a 2.9% peak in 2001and has since stabilized at 2.8%.

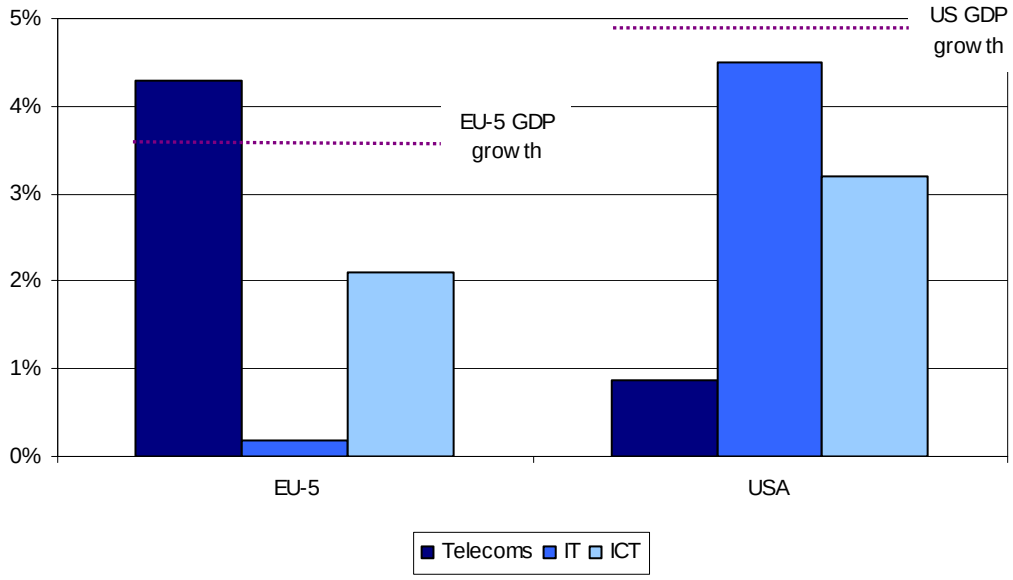
Figure 4: Telecom sector contribution to GDP in Europe-5,1995-2005



Source: IDATE and OECD

Over the past 5 years, telecoms have been the major driver for ICT market dynamics in Europe: In the EU-5, annual average growth rate reached 4.3% (ahead of GDP growth) while it was only 0.2% for IT. During the same period, growth of telecom markets was only 0.9% per year in the USA (well below GDP growth) but +4.5% for IT.

Comparison of telecom and IT market dynamics (CAGR 2000-2005)



Source: IDATE, OECD and Pierre Audoin Conseil

Employment and productivity contribution

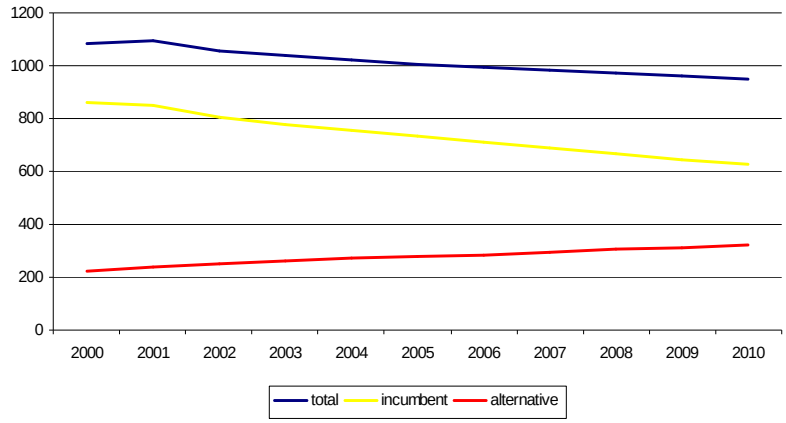
Direct employment is decreasing…

When considering their ICT investments, companies are aware of a growing need for the ability to manage existing solutions efficiently.

In 2005, direct employment in the telecommunications service sector in the EU-15 was estimated at 1 million people. In the 1990s, employment in the sector regularly increased and peaked in 2001 (1.1 milion). There has been since then an overall decline. Mobile telecommunications has been one area of strong employment growth. During the early 1990s employment in mobile communications compensated for some decline in employment in traditional activities. During the later years of the decade, when the mobile market became a mass market, it contributed to a resurgence of employment growth in the sector.

The downturn in the market in 2002, which followed the bursting of the ICT bubble on the stock markets in 2000, led to a net reduction in workforce through merger of operators, restructuring of equipment manufacturers and efforts of both to downsize their workforce and increase their operational margins. Incumbent operators have remained by far the largest employers in the telecommunications industry all over Europe (720,000 employees in the EU-15 at end 2005).

Figure 5: Telcos' employment in the EU-15 - Past trends and forecasts



Source: IDATE

Similar trends could be observed in the equipment sector as productivity is growing, imports are increasing and part of the manufacturing activities are going offshore.

… but numerous positive indirect effects

However, the sector dynamics could generate employment in related sectors (equipment vendors, IT and software firms, subcontractors, etc…). For instance a recent IDATE study shows that while French mobile operators' internal workforce is only 23,000 strong, the French mobile industry generates more than 200,000 jobs worldwide, including close to 100,000 located in France.

Furthermore, the spread of communication technologies, or of ICT more generally, creates greater and greater needs amongst the companies that use them and can generate new jobs. Because these are newly-created functions (most of them did not exist 20 years ago, or even 10 years ago for those associated with the web for instance) and which are in growing demand, the question of supply to meet demand naturally arises. The gap between initial training and on the spot requirements reveals a lack, in a great many cases, and even an absence of qualified personnel. This in turn is triggering the creation of professional training programmes.

Finally, another major trend in recent times has been businesses' outsourcing of their ICT functions – a process which enables them to enjoy more powerful and more flexible systems and which, more generally, is helping to rebalance growth of the ICT labour force between production and user sectors.

Diffusion's impact on productivity

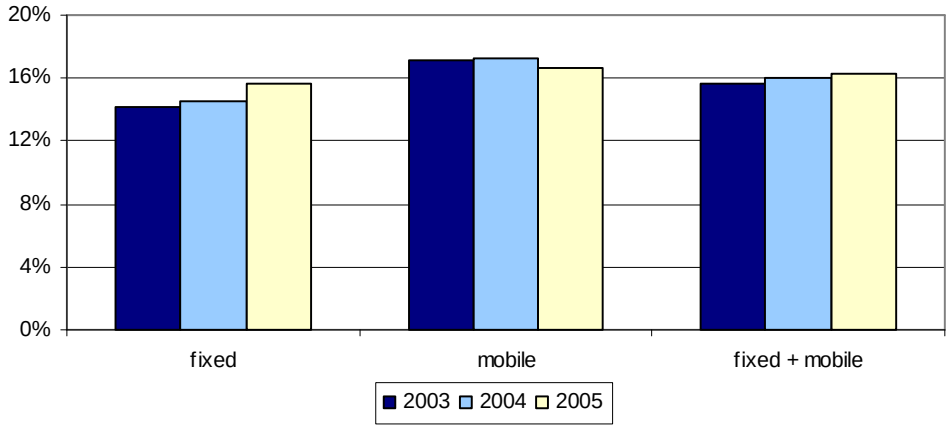
Progress of ICT usage also contributes to increasing productivity. We could find some evidence of this trend in the United States. Recent research work now paints a picture with ICT front and centre. According to the authors of these reports, technical progress has had the virtually systematic effect of lowering the price of ICT, which in turn has boosted the use of these technologies. The rise in labour productivity (+0.7% a year between 1995 and 2001 compared to 1973-1995) is thought to be two-thirds due to the rise in information technologies capital (+0.5 points), in other words to the dissemination of ICT and, the remaining one third, to the residual rise in overall productivity (+0.2 points) in the ICT production sectors. Compared to countries that are not ICT producers, the United States enjoyed annual gains of around 0.2 points. When cumulated over several years, the impact is considerable.

Investment contribution

Over the 2003-2005 period, telcos' capital expenditure reached 124.9 billion EUR in the EU-25 and 108.3 billion EUR in the USA, which account in both cases for 16.1% of revenues.

With telcos investing EUR49.3bn in networks and services in 2005 in Europe, the region accounted for 31% of global telcos' capital expenditures. CAPEX growth was close to 7% per year over the 2003-2005 period, higher than the telecom service market growth. In relative terms, CAPEX accounted for 16.2% of sales of telecom operators and service providers' revenues last year, compared to 15.7% in 2004. As a comparison, CAPEX accounted for 16.4% of sales in the USA.

Figure 6: CAPEX as a % of revenues

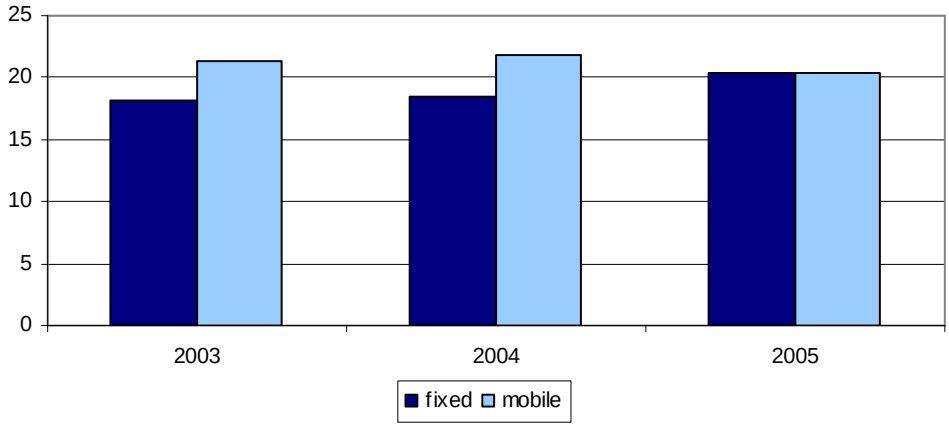


Source: IDATE

As for markets, we can observe gaps according to segments and countries. In the early 2000s, CAPEX were significantly higher in mobile networks than in fixed networks. It is still an evidence in Eastern countries but there has been a shift in Western Europe and, in 2005, expenditure in fixed networks could record the same level as expenditures in mobile networks (20.6 billion EUR invested in each segment). Over the last year, CAPEX growth was 10% in fixed networks and only a bit more than 4% in mobile networks.

Figure 7: Fixed vs Mobile: CAPEX rebalancing in Western Europe

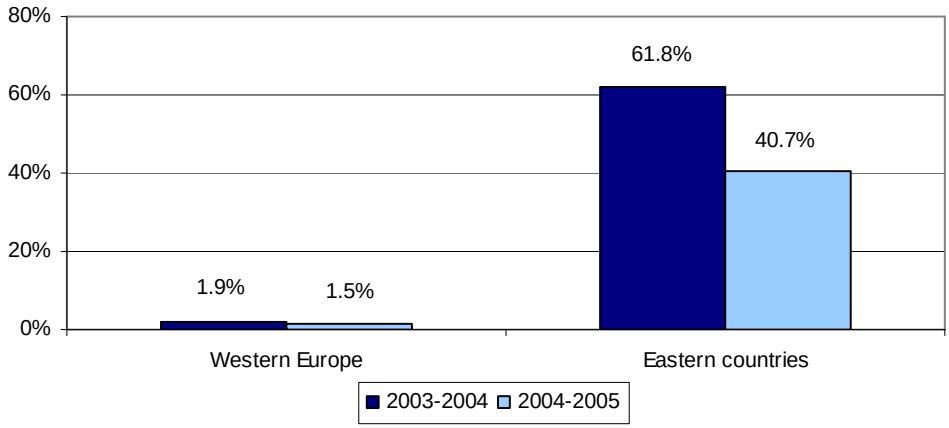
(amounts in billion EUR)



Source: IDATE

In terms of dynamics, differences are even greater according to the region. CAPEX growth was over 40% in Eastern countries in 2005 (over 60% in 2004!) while it was only 1.5% in Western countries (1.9% in 2004). In relative terms, CAPEX represented 20% of sales in Eastern countries and 15.6% in Western countries.

Figure 8: Eastern countries vs Western Europe: CAPEX growth



Source: IDATE

1.2. …and has deep impact on European society

Central role in the development of information society: technology take up (mobile, broadband)

The development of the information society requires the deployment of new technological platforms which can facilitate access by everyone, irrespective of their geographical location, to the same opportunities in the knowledge-based economy.

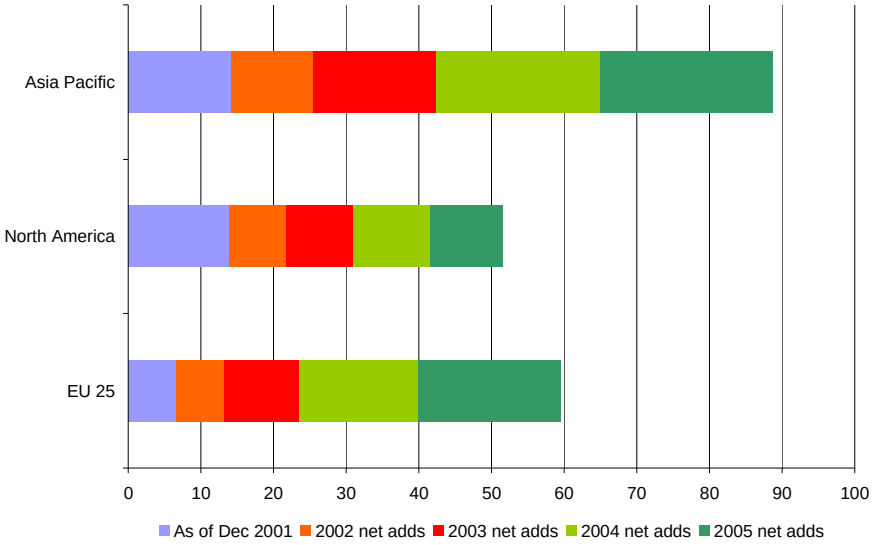
i2010, the recent Commission's initiative towards a European Information Society, places particular emphasis on broadband. In that respect, Europe is well advanced and should capitalize on its good position. In particular, the EU25 has overtaken North America as the second largest in terms of broadband subscribers.

As far as fixed broadband access is concerned, Europe as a whole has a well established position, despite important gaps between countries. On average, broadband penetration reached 14.6% (14.6

connections per 100 inhabitants) at end 2005 in EU-15, ranging from 1.4% in Greece to 26.6% in Denmark. This is progressing very rapidly: +150% between beginning 2004 and end 2005.

Figure 9: Broadband subscriber bases

In millions

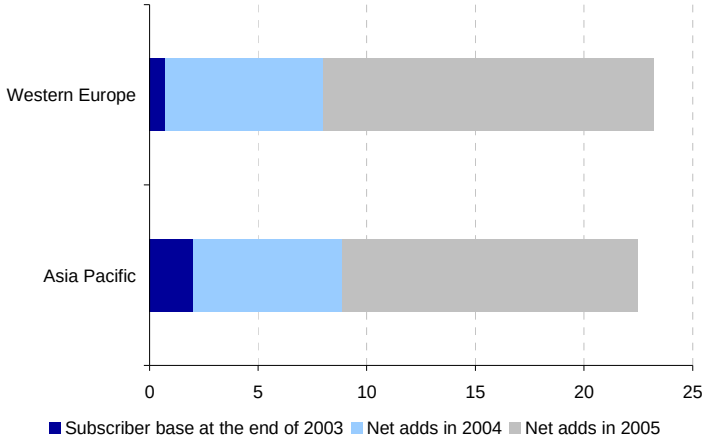


Source: IDATE from national regulation authorities

While mobile broadband take-off has been slower than initially expected, Europe has become the leading region for UMTS commercial deployment with more than 23 million UMTS subscribers at the end of 2005 in front of Asia Pacific although the latter region still leads mobile broadband with an additional 19 million CDMA EV-DO subscribers.

Figure 10: UMTS subscriber base evolution per region

In millions

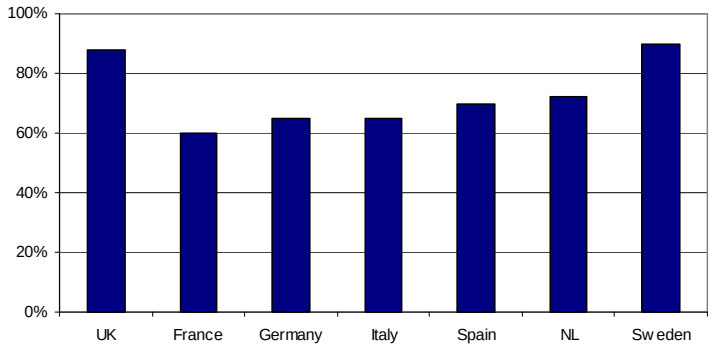


Source: IDATE from national regulation authorities

This performance has been enabled by the substantial investment efforts made by mobile carriers to offer significant 3G coverage of the population in all main European countries.

Figure 11: 3G coverage in selected European countries at end 2005

As % of total population



Source: National regulation authorities

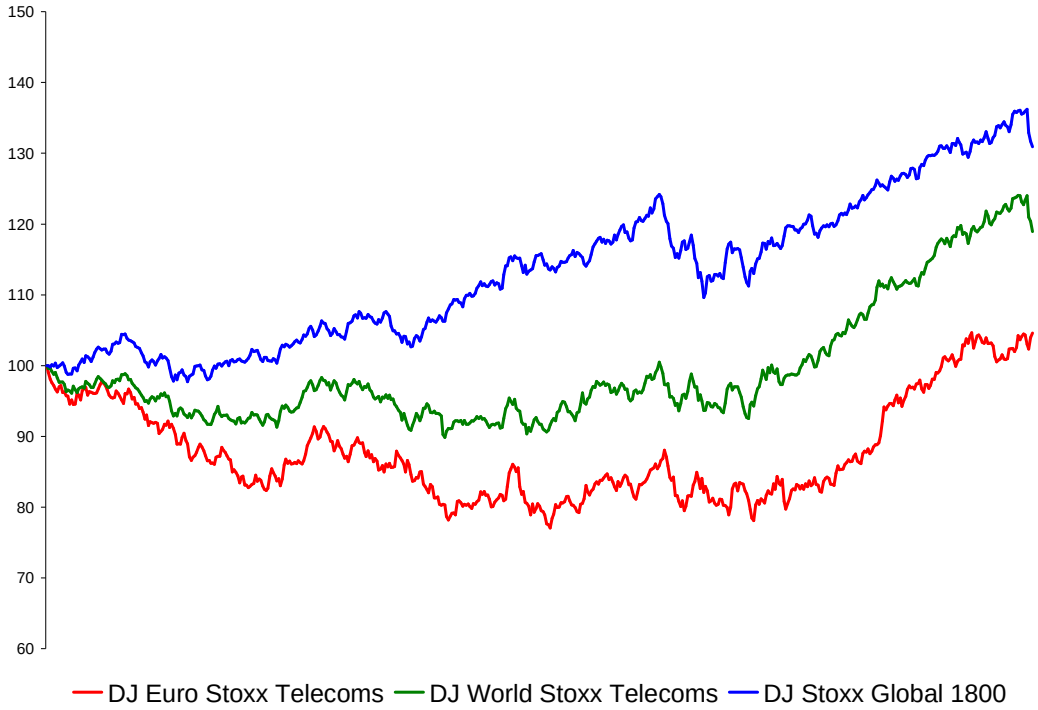
2. Public financial markets are concerned about the industry's outlook

"The European telecom sector faces many challenges: market maturation, deflation, regulation and competitive risk." This is the introductory assessment of a Bear Stearns research report published in September 2006. It well reflects public markets' highly cautious sentiment towards the telecom sector's current situation and its short to medium term outlook.

2.1. A deeply-rooted scepticism towards the European telecoms sector…

This negative sentiment began to spread in early 2005 when the financial and mainstream press began to discuss some of the emerging competitive threats such as Skype, epitomized by The Economist's cover and front page on "How the Internet killed the phone business". Since then, the DJ World Stoxx Telecoms index lost 12% compared to the reference DJ Stoxx Global 1800 industrial index. The underperformance was even more severe in Europe during the same period with the DJ Eurostoxx Telecoms loosing more than 25% lost compared to the industrial index (and 13% compared to the worldwide telecoms index).

Figure 12: Compared stock index performances : January 2005 to February 2007



Source: Stoxx

The underperformance in Europe may partly be attributed to the strong performance of other parts of the world with robust growth in emerging regions and first synergy benefits being reaped from the consolidation that occurred in North America. Nevertheless, the magnitude of this underperformance illustrates deeper-rooted concerns about the European telecommunications industry that go back before Skype.

Relative to other regions, investors formulate three major concerns pertaining to Western European telecoms' current situation and short to medium-term outlook:

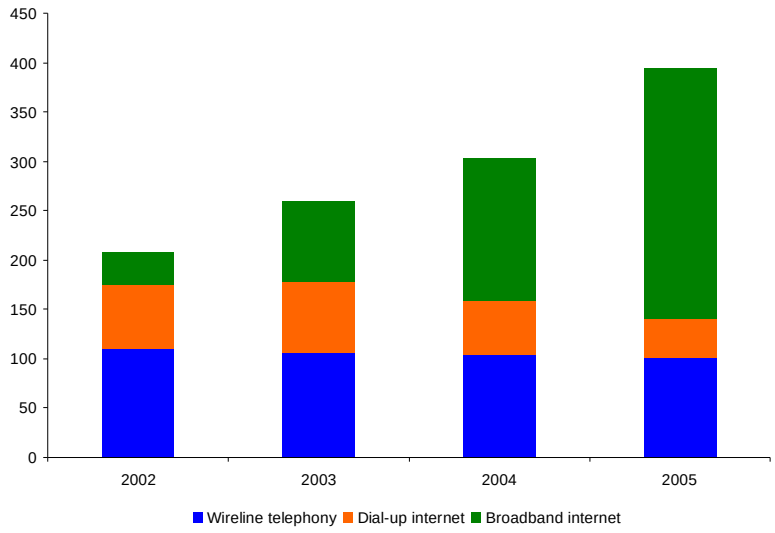
1. **Degrading volume fundamentals** with accelerating fixed line loss and reduced minutes of use for fixed voice while cellular subscriber base saturation is looming
2. **Deflationary market pricing**, due to intense competition and disruptive technologies, that has particularly impacted revenue per minute in mobile telephony and is now extending to fixed telephony with the coming of age of VoIP
3. **Increased regulatory scrutiny** with imposed tariff cuts on SMS, roaming and termination rates

Since 2001, the industry has lost more than EUR21bn in revenue opportunity from the combined effects of these trends although this has been largely offset by growth in mobile subscriber base and in broadband. Nevertheless, the concerns are now exacerbated by investors' anticipation that both remaining growth drivers (mobile and broadband) will gradually loose steam.

Furthermore, this concern of the financial community occurs at a time when the investment requirements of operators are great to cope with an ever expanding traffic capacity not matched by any revenue expansion. In France alone, traffic minutes have doubled and traffic volumes have grown eight-fold between 2002 and 2005.

Figure 13: Traffic volumes on fixed networks in France, 2002-2005

In billion minutes



Source: ARCEP

2.2. …leads to a profoundly reshuffled landscape

The market caution towards European telecoms and the resulting low valuation have led to record-breaking Mergers and Acquisitions (M&A) activity. Both operators seeking to "sell" a growth story to financial markets and private equity funds interested in reasonably priced cash generating assets have participated to the buoyant M&A activity, with nearly 100 billion Euros spent since early 2005. Pan European expansion (e.g. Telefonica/02, France Télécom/Amena), cost-driven consolidation (e.g. NTL/Telewest, Numéricable/Noos) and public-to-private-buyout (e.g. TDC, Tim Hellas, Eircom…) have equally contributed to reshuffling the European industry landscape.

Table 1: Main mergers and acquisitions in Europe since early 2005

Buyer	Target	Deal size (in EUR billions)
Telefónica	O_2	24.0
Telecom Italia	TIM	14.5
Orascom	Wind	12.1
Apax, Permira, KKR, Blackstone	TDC	8.2
France Télécom	Amena	6.4
Oger Telecom	Turk Telecom	5.3
NTL	Telewest	5.0
Vodafone Group	Telsim	3.7
Téléfónica	Cesky Telecom	2.9
TeliaSonera	Turkcell	2.5
Babcock & Brown	Eircom	2.4
ONO	Auna	2.3
Liberty Global	Cablecom	1.8
Iesy	Ish	1.6
Telekom Austria	Mobiltel	1.6
Apax, Texas Pacific Group	TIM Hellas	1.4
NTL	Virgin Mobile	1.3
EQT Partners	Kabel BW	1.3
Numéricâble	Noos	1.3
Deutsche Telekom	Tele-ring	1.3

Source: IDATE

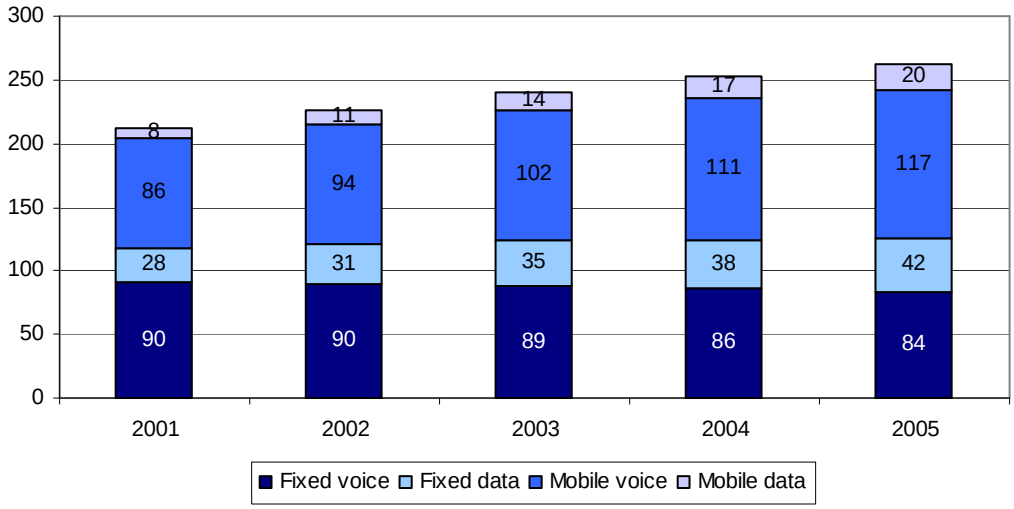
This reshuffling is not without any consequence on the industry structure. The cost synergies sought within expansion and consolidation transactions and the strategic objective pursued in leverage buyouts (repay financing debt over 5 to 7 years) are impacting the investment and research patterns which typically require long term payback horizons.

3. Telecom revenue growth is gradually eroding in Europe…

Over the past decade growth of the European telecom services market has gradually eroded, mainly due to the stagnation of the wireline sector. Mobile services have been the major engine for growth of the sector, but are also now running out of steam, and the slowdown trend is accelerating. As mobile services now account for over half of the industry revenues, the slowdown poses a serious challenge about the sector's capacity to generate additional revenues in coming years.

Figure 14: Telecom services revenues in EU-25, 2001-2005

EUR billions



Source: IDATE from national regulation authorities

In the European Union (EU-25 perimeter), revenue growth has fallen from double-digit rates at the end of the 1990s to less than 4% in 2005 and less than 3% expected for 2006. For the largest five markets, referred to as "Europe-5", growth went down from 6.5% in 2001 to 3.8% in 2005. In 2006, it is estimated at 2.1%.

In terms of revenues the undeniable proliferation of new services has not translated into high growth rates for the sector:

- Fixed voice revenues, which still account for nearly one third of total telecom service revenues in 2005, have fallen by an average 2% per year since 2001. With an estimated 10% annual growth rate in value between 2001 and 2005, wireline data services (including revenues from internet access) have barely compensated for the decline of fixed voice. As a result, total revenues in the wireline sector have increased by less than 1.5% a year between 2001 and 2005.
- In the mobile sector, competition has intensified as markets are nearing saturation. Although usages have developed through increased traffic and new data services, growth has gradually eroded. Reduction in ARPU and slower growth rates in subscriber bases have generated a gradual slowdown in revenue growth. In 2005, it was estimated at 7%, 3 points less than in 2004. Voice services still represent 85% of revenues in the mobile services industry.

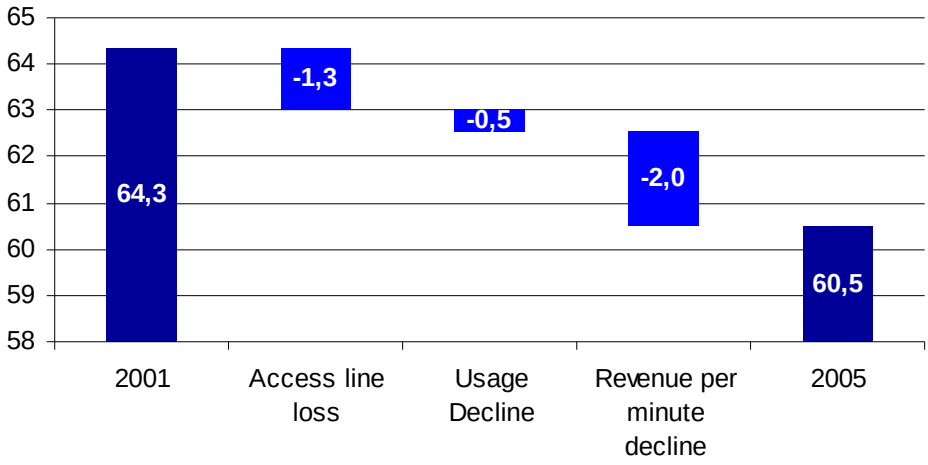
Growth has been more sustained in the new Member States, reaching 4.5% in 2005. Many of these countries represent opportunities for growth in the future, in particular in the area of broadband services. However mobile services are already very well developed in these countries with density rates close to West European average. ARPU in the mobile sector have continuously decreased and have remained much lower than in the West European part of the EU (15 EUR per month against 27 EUR). In addition the weight of the 10 new markets in the total EU market is limited, with only 7% of total revenues in the EU in 2005 and a little more (9%) in terms of net additional revenues.

3.1. The attrition of the fixed voice market is accelerating…

As other developed economies, Europe is experiencing a structural decline in the fixed voice market. In 2005, growth of fixed telephony in terms of revenues was negative or only slightly positive across all European countries.

Within Europe-5, the fixed voice market has declined 5.9% between 2001 and 2005. This decline resulted from pricing pressure, access line losses and fixed line usage decline.

Figure 15: Europe-5 fixed voice market evolution 2001-2005 (in EUR billions)

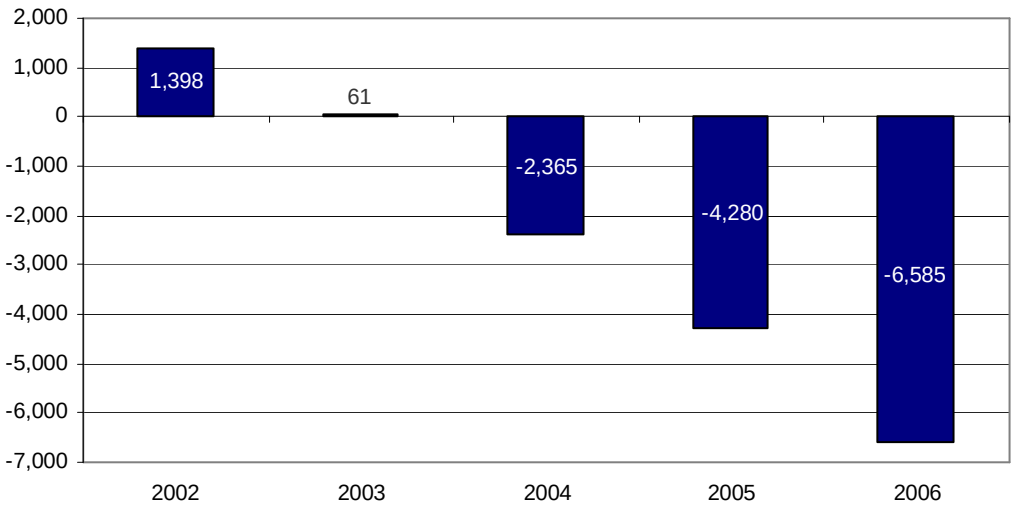


Source: IDATE

Fixed line loss is now generalised and accelerating across Europe

The total number of fixed exchange lines in the European Union fell by 1% in 2004 and by 1.8% in 2005 to stand at 233 millions at the end of December 2005. Almost all EU countries have registered a fall, in some cases sharply, as in Norway, Finland, Sweden. Only three EU countries have seen an increase in the number of lines, albeit small (Ireland, Slovenia and Poland).

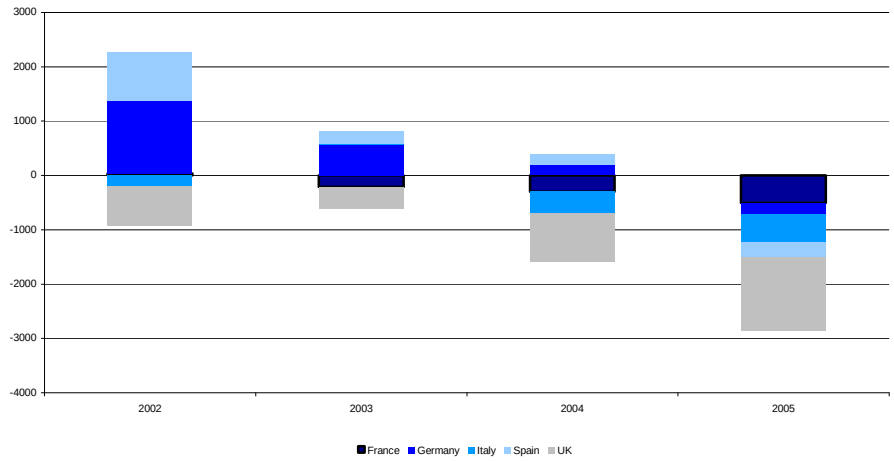
Figure 16: Fixed line net adds in EU 25, 2002-2006 (in '000s)



Source: IDATE from national regulation authorities

Although situations within Europe-5 were contrasted until 2004, all 5 countries now post negative fixed line net adds. They together lost over 2.8 million fixed access lines in 2005, accounting for 63% of total of the total line losses during the year in the EU25 (ie slightly less than Europe 5's 70% weight in the fixed line installed base).

Figure 17: Fixed line net add breakdown per EU 5 country, 2002-2005 (in 000s)



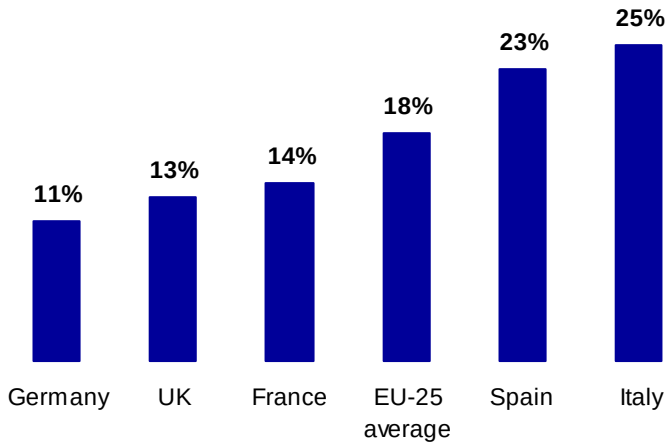
Source: IDATE from national regulation authorities

The reduction in exchange lines has likely resulted from two factors:

- **dial-up to broadband migration** of Internet subscribers, which has led customers to cancel second lines subscriptions for Internet access. In addition, spreading out of DSL has contributed to a reduction in ISDN subscriptions since 2003/2004. The impact has been more or less pronounced according to countries.
- **fixed-mobile substitution**: as an increasing number of households opt for a "mobile-only" solution. A survey published by the European Commission indicates that at the end of 2005, 18% of EU households had only mobile phone access with a lower average proportion within Europe-5 estimated at 15%

Figure 18: Mobile-only households

Households having only mobile phone access as percentage of total households, end 2005



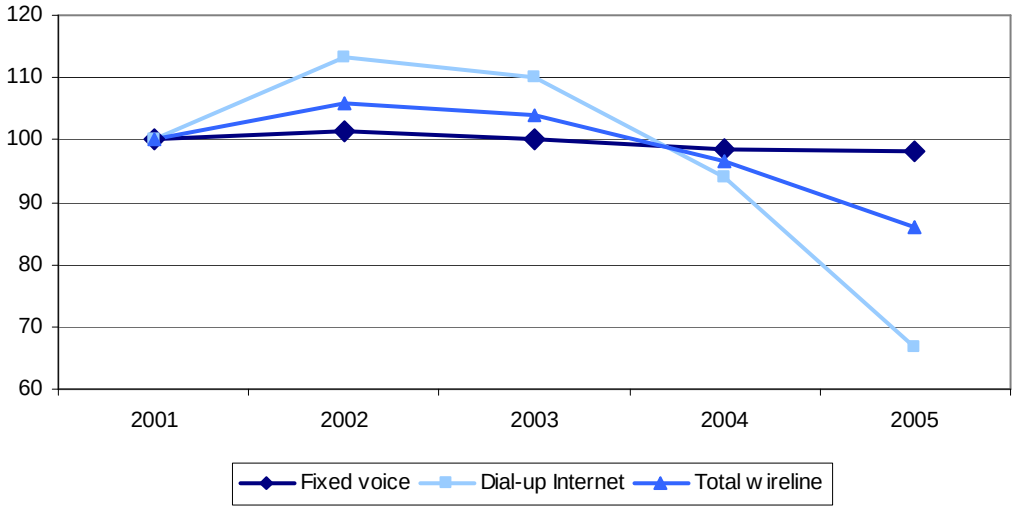
Source: European Commission, Special Eurobarometer 249, July 2006

Fixed telephony use is stagnating

Fixed line usage measured as the average number of "billable" minutes of use for fixed telephony and dial-up internet has declined 14% between 2001 and 2005. This decline was exclusively driven by the decline in dial-up internet usage while fixed telephony usage has been fairly stable and even edged up slightly in 2005 with the multiplication of fixed and flat rate plans. Nevertheless, this observation needs to be balanced with the fact that the fixed line is increasingly used for always-on broadband access connection and thus renders usage metering less relevant.

Figure 19: Europe-5 fixed line minutes of use, 2001-2005

Base 100 in 2001



Source: IDATE

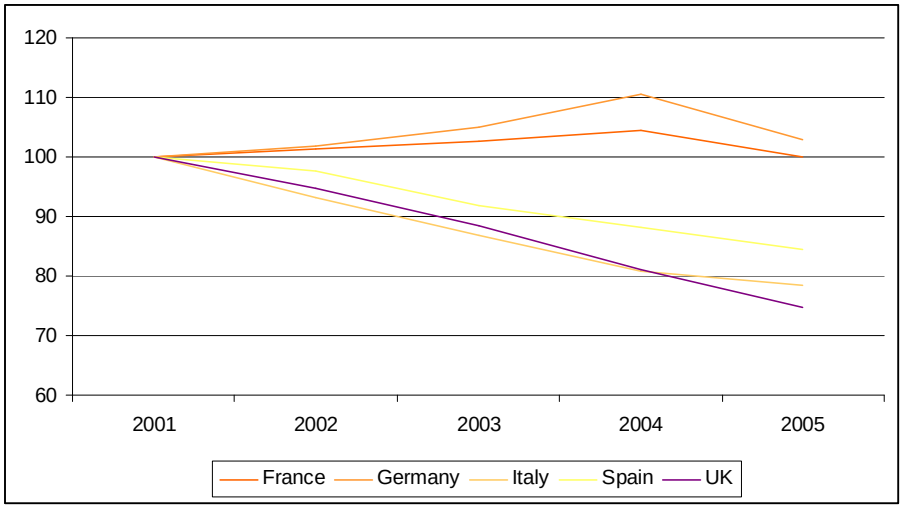
Fixed voice pricing pressure is exacerbated

Decrease in tariffs has been the second highest contributor to the fixed voice market decline in Europe. In the EU-25, fixed telephony expenses per user fell by 1.1% per year between 2001 and 2005 on the residential market and by 2.1% in the business segment while telephony call volumes were flat. Within Europe-5, the price erosion was steeper both on the residential (-1.3% per annum) and the professional (-2.4% p.a.) segments over the same time period. This decline was the result of substantially lower usage costs not compensated by the rise in subscription costs that occurred in most countries. Presently, subscription costs account for approximately 55% of users' monthly wireline telecom expenditures in Europe-5.

National disparities have been significant until 2004 with markets like France and Germany seeing average tariffs increase but the VoIP and competitive pressure have since early 2005 pushed all markets in negative territory.

Figure 20: Annual cost of fixed telephony for a typical residential user

in EUR/PPP per month, base 100 in 2001



Source: OECD

What impact for VoIP?

VoIP has now become pervasive across Europe with more than 8 million subscribers in the EU-25 as of March 2006. The latest evidence suggests that VoIP could have a positive impact on fixed line access and on fixed traffic, but it is likely to accelerate the decrease in revenues. France offers an interesting case as it is the European country with the highest number of VoIP subscribers; at the end of March 2006, there were over 4 million VoIP subscribers, against 33 million subscribers of traditional fixed telephony. The total number of fixed telephony subscribers had increased, due to VoIP expansion. Data for the 1st quarter of 2006 also showed a reversal in volume calls downward trend with a slight increase in the fixed telephony traffic (VoIP included), against a decrease for the same period one year before. However the decrease in call revenues remained stable (at -12%) between the 1st quarter 2005 and the 1st quarter 2006. Although it is still early to depict longer-term trends, the French case shows the possible impact of VoIP with positive consequences on volumes (number of subscribers, millions of minutes), but no effect in terms of revenues.

3.2. …barely compensated by the strong growth in broadband

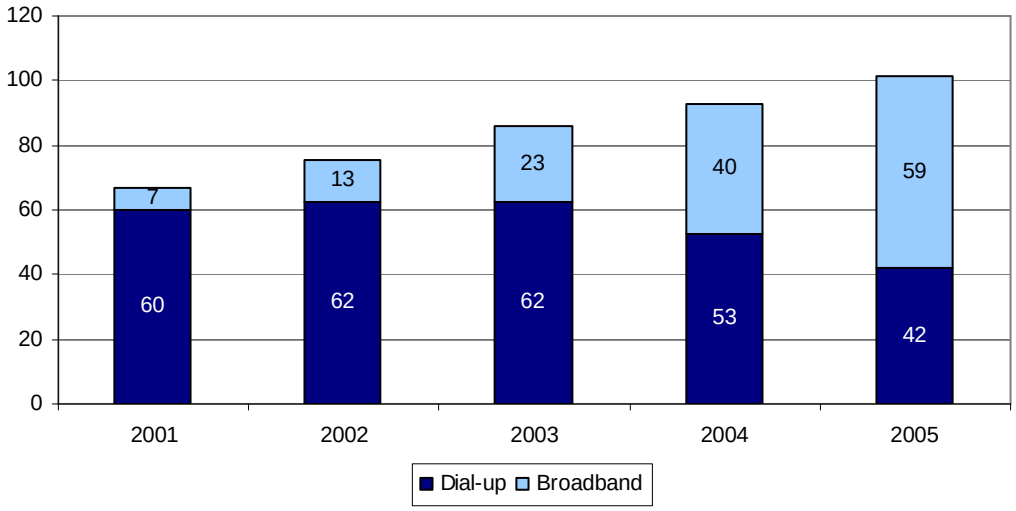
These negative trends in fixed telephony have been barely compensated by the internet access development, and broadband in particular. Between 2001 and 2005 Internet revenues more than doubled to reach 22 billion EUR, 95% of which generated in EU-15 markets. The expansion of the broadband subscriber base has fuelled the increase in revenues. Its impact on revenues has been partly limited by the parallel decrease in dial-up Internet revenues (subscriptions and communications). The fall in tariffs, through enriched bundles, price reductions and promotions, has indeed permitted to create a mass-market. Recent trends indicate that the downward pricing trend is continuing as competition intensifies to gain and retain customers.

Over the past few years the European Union has reduced the gap with the USA, Japan and Korea in broadband development. In 2005, the total number of broadband subscribers in the European Union increased by 19 millions to stand at 59 millions at the end of the year. Average density (number of subscribers per 100 inhabitants) reached 13% at the end of 2005, up from 8.8% a year before. In the EU-15 countries, broadband penetration stood at nearly 15%. The Western part of the EU caught up with the USA, and got closer to the Japanese penetration rate (16%).

Migration from dial-up to broadband connections fuelled the expansion of the broadband access market. In 2005, the number of dial-up subscribers fell by 20%, and by the end of the year broadband accounted for nearly 60% of Internet subscribers.

Figure 21: EU-25 dial-up and broadband subscriber bases, 2001-2005

In Millions



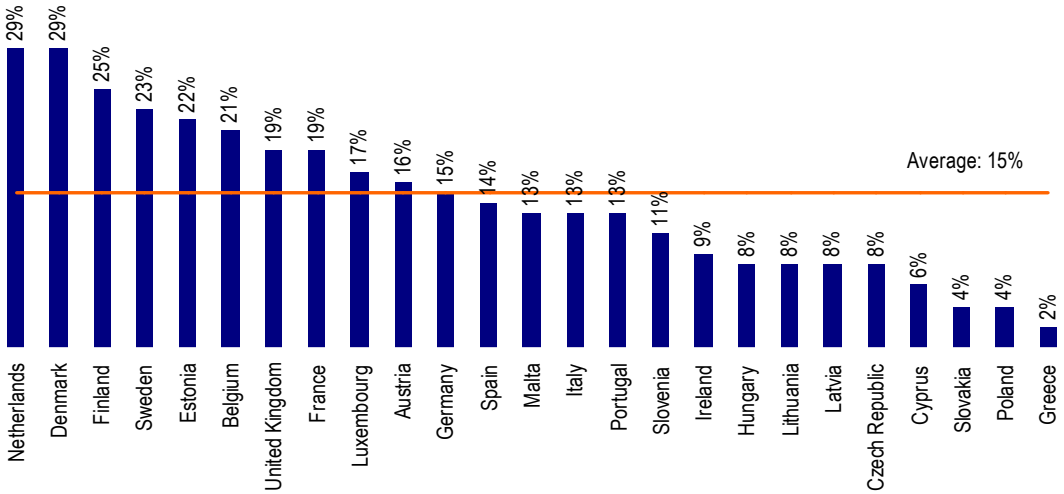
Source: IDATE from national regulation authorities

Significant disparities in broadband development remain across European countries. With a 29% penetration rate at mid 2006, the Netherlands and Denmark are the unquestionable broadband leaders in the EU, followed by Finland, Sweden and Estonia. The gap between Nordic countries and other Western countries has gradually widened over the past few years, from 3 points at the end of 2002 to 9 points at the end of 2005.

In the 10 new Member States, broadband is still in its infancy and far from being a mass market as is now the case in the EU-15. Average density in the 10 countries stood at 5% at the end of 2005. However the market saw a significant development with the number of subscribers rising from 2 millions in December 2004 to 3.6 millions in December 2005. In addition the development of the broadband market in Estonia (with a 22% penetration rate) and Slovenia (11%) is comparable to EU-15 markets.

Figure 22: Broadband density rates in the EU-25 countries, July 2006

Number of broadband subscribers per 100 inhabitants

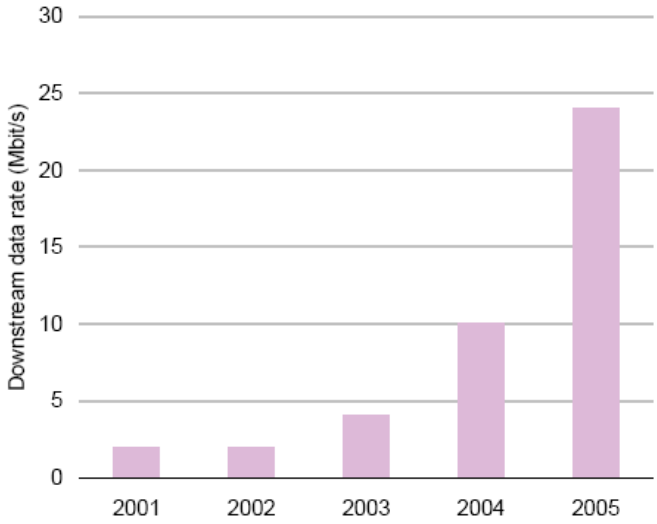


Source: EU Commission

Along with customer base expansion, the broadband market has seen a swift development in service availability and quality. In many Western European countries, DSL is already available to over 90% of households. However, broadband availability varies widely across Europe, due to differences in local loop length and network quality. Technology changes have also allowed a rapid increase in the data rates available in the mass market. European operators have just begun to offer VDSL services in certain urban centres, with potential download speeds of up to 52Mbps. However the widespread roll-out of FTTx networks has hardly begun in Europe as it requires huge investments.

Figure 23: Trends in broadband data rate in Europe since 2001

Maximum broadband data rate available to the mass market at a reasonable price in at least two EU countries



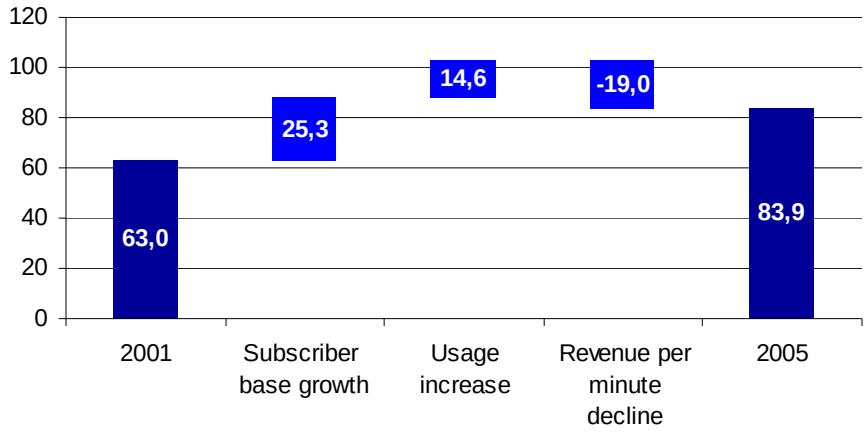
Source: Analysis

3.3. The mobile sector's growth is decelerating

Mobile services, which have acted as the main growth engine in the telecom service industry over the past decade, are now showing signs of slowdown. Although density rates have continued to rise, despite reaching 100% at the end of 2005, growth will likely depend less and less on subscriber growth and more and more on usage and tariff trends. In this area, there are serious reasons for doubt. Migration to 3G has been slow so far and ARPU have declined under intensified competition. In addition, regulators have shown increased scrutiny in the mobile sector, taking action or threatening to take action to reduce tariffs in termination rates, roaming rates and, as in France, SMS tariffs.

Figure 24: Europe-5 mobile voice market evolution 2001-2005

(in EUR billions)



Source: IDATE

While mobile customer bases have continued to grow at a sustained pace in most EU countries, growth in revenues has gradually reduced over the past few years. In the EU-15 countries, growth rate of mobile services revenues gradually fell from 11% in 2002 to 7% in 2005. The slowdown was the most significant in Germany and Belgium (where growth rate stumbled at 3%) and in Sweden (with a very slight increase in revenues).

Gross revenue per subscriber (including termination revenues) decreased by 3% on average in the EU 15 countries in 2005, and by 9% in the new Member States. Mobile revenue growth has thus primarily relied on the increase in customer numbers. As mobile markets have reached saturation, price competition has intensified. The entry of "3" as a new operator has further strengthened competition in Italy, Sweden, and the United Kingdom, as the operator has fought to create a new customer base using promotions and price cuts. Increase in data usage has helped sustain mobile markets across Europe, but has largely reflected increase in SMS usage. The overall level of non-SMS data has remained small given the growing number of end-user terminals equipped with multimedia capacities. In addition regulators have intervened in many EU countries to impose a reduction in the charges paid by other operators for terminating calls on mobile networks, which has also affected mobile network operator revenues.

Table 2: Mobile ARPU in Europe-5

Average mobile revenue per subscriber per month, in EUR (includes termination revenues)

	2001	2002	2003	2004	2005	04/05 growth rate
France	31.6	32.1	33.1	33.5	33.3	-0.8%
Germany	30.9	29.0	28.4	27.9	26.0	-6.8%
Italy	25.2	25.9	26.7	26.4	25.7	-2.4%
Spain	29.1	28.8	29.0	30.7	31.4	2.5%
UK	26.6	27.0	28.3	28.9	27.7	-4.0%

Source: IDATE and national regulation authorities

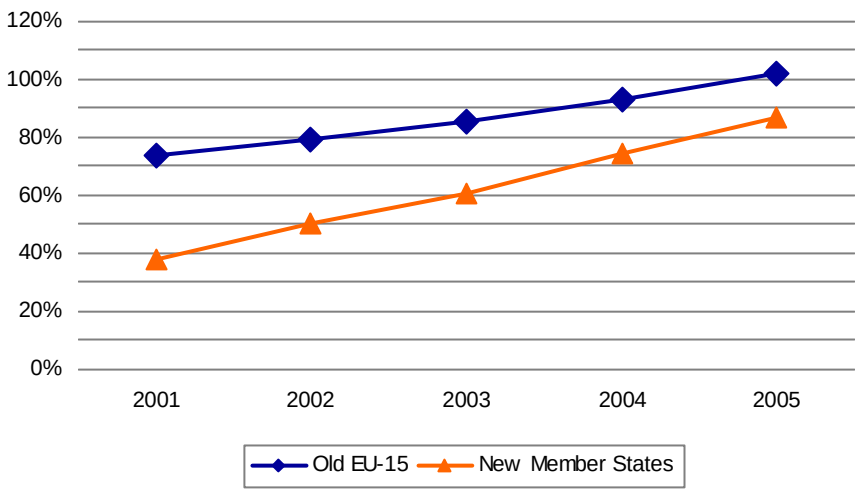
Subscriber base growth has peaked

The mobile market momentum has been primarily driven by subscriber base growth. In December 2005, EU mobile network operators reported a combined customer base of 456 millions, up 45 million compared to the end of 2004. Average mobile density rose from 90% of population at the end of 2004 to 100% at the end of 2005. The gap between the EU-15 countries and the 10 new Member States shrunk from 36 points at the end of 2001 to 15 points at the end of 2005. Some of the new Member States (Czech Republic, Estonia, and Lithuania) now record mobile density rates over 100%.

Despite already high level of penetration, the EU mobile market has not shown any evidence of reduction in volume growth. At 11% the annual growth rate of mobile subscriptions was stable compared to 2004. Mobile telephony subscriptions have continued to grow at a sustained pace, including in countries which the highest penetration rates. In Italy, in the United Kingdom, in Ireland, and in Greece, customer base grew by more than 10% in 2005 although mobile density had already reached 100% by the end of 2004 in these four countries. Yet, the modest customer base growth recorded in advanced countries such as the Netherlands and Sweden (less than 3% in 2005) and the reduced combined 2G/3G subscriber net adds in major European markets seen in 2006 all point to a near market saturation.

Figure 25: Mobile penetration in the EU, 2001-2005

Number of mobile customers as % of population

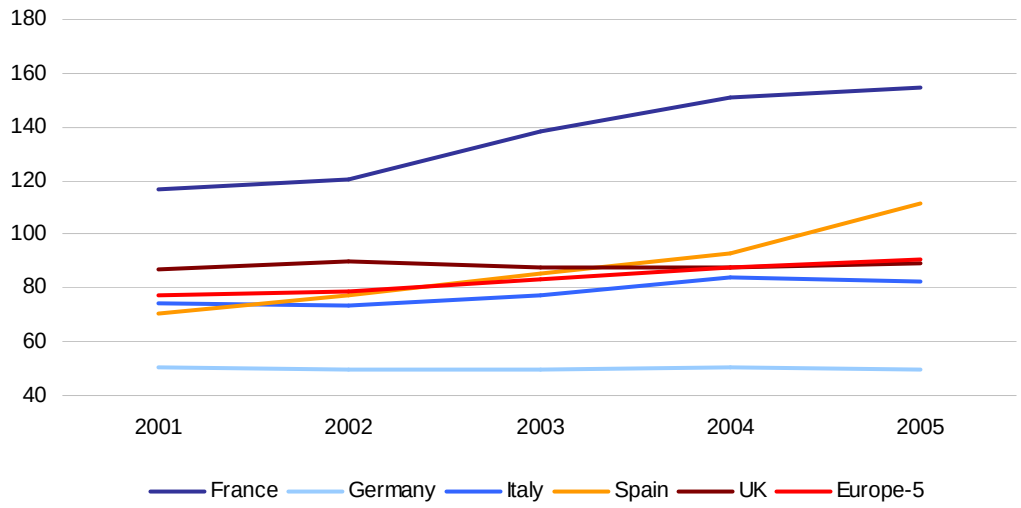


Source: IDATE, Telecoms in Europe, 2006 Edition

Usage increase shows no signs of slowing as pricing decreases

Average mobile usage (measured through monthly minutes of use) has increased 5% per annum over the 2001-2005 period in Europe-5 with wide disparities between countries.

Figure 26: Europe-5 monthly minutes of use per user, 2001-2005

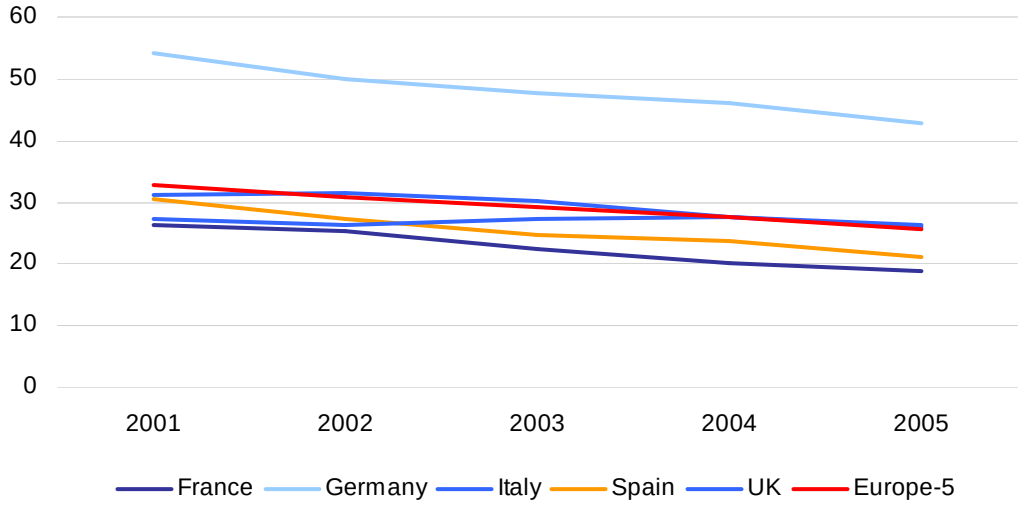


Source: IDATE and national regulation authorities

The sustained increase in usage can largely be attributed to the decrease in pricing observed in the multiple fixed or flat rate offerings (for on-net traffic) across Europe. As a result, the mobile voice revenue per minute has decreased 18% between 2001 and 2005 on average across the 5 main European countries.

Figure 27: Europe-5 mobile voice revenue per minute, 2001-2005

In Euro cents



Source: IDATE and national regulation authorities

Improving customer profitability remains uncertain

Network operators have endeavoured to switch customers from prepaid offers to postpaid contracts to reduce churn and increase ARPU. National markets show strong differences in the proportion of prepaid customers, which ranges from only 6% in Finland to 90% in Italy. This strategy has met varying degrees of success across countries: there has been hardly any change in the United Kingdom and in Italy, whereas prepaid share has fallen significantly in France. For the whole of the EU, there has been little change over the past three years. Prepaid share has remained around 61-62% in the EU-15 countries, and has reached this same level in the new Member States following several years of increase.

Table 3: Prepaid share in mobile customer bases in the EU, 2001-2005

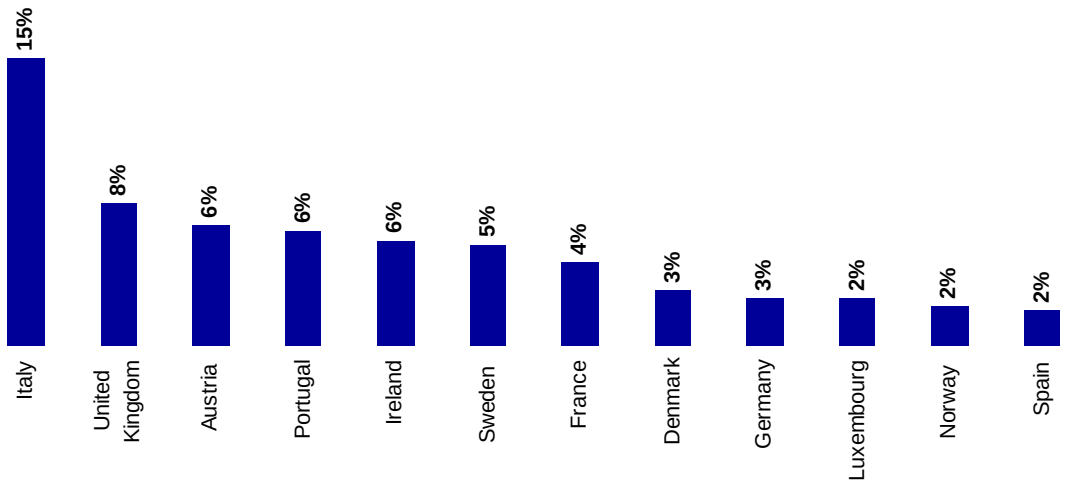
	2001	2002	2003	2004	2005
France	48.7%	43.8%	40.8%	38.0%	36.1%
Germany	55.9%	53.0%	51.4%	50.6%	49.6%
Italy	89.3%	88.2%	90.6%	90.9%	90.9%
Spain	67.6%	62.2%	57.5%	59.0%	58.0%
UK	67.6%	68.3%	66.9%	66.8%	66.3%
EU-15	62.3%	60.4%	61.4%	61.6%	61.1%
New Member States	58.5%	57.3%	59.4%	62.1%	61.3%
Total EU-25	61.9%	60.0%	61.1%	61.6%	61.1%

Source: IDATE from operators data

The 3G market opportunity slowly materializes

Despite significant progress, the EU mobile market has remained far behind Japan and Korea in the development of 3G services. In the EU-15 countries, where most operators with a UMTS licence have launched 3G services, the proportion of 3G in customer bases stood at only 5% at the end of 2005, and 10% in June 2006. In Japan, the proportion reached 32% in December 2005 and 42% in June 2006. However 3G accounted for nearly 40% of the mobile subscriber net additions in the EU-15. Italy (with a 15% proportion of 3G in customer base) and the United Kingdom (8%) were the most advanced 3G markets.

Figure 28: Share of 3G in mobile subscriber base, end 2005



Source: IDATE from operators and national regulation authorities data

4. Competition intensifies across all market segments

4.1. Competition in the fixed telephony is gradually expanding from long distance market to access

Over the past few years the decline in incumbents' share in the fixed telephony market has reflected the higher share of customers using services from alternative operators. The introduction of carrier pre-selection in the early 2000s in the EU-15 countries has allowed customers to route their calls through an alternative operator while still using the access line provided by the incumbent. In addition the use of calling cards and the development of peer-to-peer VoIP have diverted further traffic from the incumbent operator, in particular for international calls.

The share of incumbent operators in the fixed telephony market across Europe-5 has substantially fallen since 2001 although disparities still remain due to later introduction of carrier preselection on some markets.

Table 4: Incumbent operators' market share of fixed call volumes in Europe-5, 2001-2005

	2001	2002	2003	2004	2005
Germany	67.2%	61.1%	54.8%	49.7%	47.2%
France		79.7%	76.3%	72.0%	65.2%
Italy					72.2%
Spain	82.4%	75.8%	73.1%	69.7%	66.5%
UK	62.0%	62.0%	60.0%	55.0%	55.0%

Source: Bundesnetzagentur (Germany), IDATE estimates based on ARCEP and operators publications (France), Telecom Italia (Italy), CMT (Spain), OFCOM (UK until 2004). 2005 figure in the UK is an estimate.

Access competition is still relatively weak in Europe with only 8% of subscribers using direct access from an alternative operator (through a cable line, a fully unbundled line or other means of access) in September 2005 according to the European Commission. Denmark and the United Kingdom, where direct access by alternative operators is largely based on cable access, reported the highest competition degree, with respectively 20% and 18% of subscribers using direct access from an alternative operator. Although small, the market share of alternative operators in the direct access has grown significantly in the recent period due to expansion of full unbundling and in some cases implementation of wholesale line rental. This is the case in France where the number of fully unbundled loops increased by more than 1 million within one year to stand at 1.58 million at the end of November 2006 (with France Télécom reporting a total of 32 million exchange lines). Wholesale line rental has been implemented in a few countries, which enables new entrants to provide single billing services to their customers.

The intensification of competition in the fixed market has led some regulators to remove obligations on the incumbent operator. The regulators in Finland, Sweden, Austria, Denmark and the Netherlands have found that the market for international calls is competitive, and have consequently removed retail level obligations in these markets (Austria only for residential users, and Denmark only for business users). In the United Kingdom, OFCOM relaxed controls on BT's retail prices as direct result of its positive assessment of BT's wholesale line rental product at the end of 2005. That was followed in August 2006 by abolition of all controls limiting rises in the price of calls and line rental for BT customers.

4.2. Near saturation on mobile markets has spurred competition

As market reaches saturation in terms of subscriber density, operators are increasingly fighting for acquiring and retaining customers. Portability and entry of service providers have also played a role in increasing competition.

Competition in Europe's mobile market has increased sharply over the past two years. As the market is nearing saturation, with average density reaching 100%, operators have fought harder to gain and hold customers. In addition, entry of a new operator in some countries following 3G licence allocations, MVNOs' arrival in the market and the implementation of number portability have further fuelled competition.

3G licence allocations did not radically alter the state of Europe's mobile markets, with the notable exception of countries where Hutchison Whampoa was allocated a licence (Austria, Denmark, Ireland, Italy, the UK and Sweden). Aside from Ireland, where it did not launch services until 2004, Hutchison has managed to gain market visibility through aggressive tariffs.

In northern Europe, Germany and the UK, mobile virtual network operators (MVNOs) have managed to grab a sizeable share of the market, but are still largely absent from other markets, having been unable to sign commercial agreements with network operators. At the end of 2005, the share of MVNOs in the retail mobile market was estimated at 22% in Germany (which includes resellers and not pure MVNO), 10% in the United Kingdom and in the Netherlands; in France, MVNOs account for a small part of the subscriber base but for more than 10% of the gross subscriber adds on the postpaid segment.

Mobile number portability has been introduced in most EU countries (except for a few among new Member States). The numbers of ported numbers doubled in 2005, but still only represented 6% of all mobile subscribers in the EU. Portability has had a major impact in only a handful of countries. Aside from prices, procedures and delays required for porting a number account for the massive disparities that still exist between the different EU countries.

Table 5: Competition in mobile services markets in the EU (2005)

Country / zone	Number of network operators	Top two mobile operators' retail share	MVNO subscribers (in millions)	MVNO cumulative market share	% of ported numbers
Germany	4	74%	17.4	22.0%	0.8%
France	3	82%	0.3	0.6%	1.2%
Italy	4	73%	0.0	0.0%	7.8%
Spain	3	76%	0.0	0.0%	14.6%
UK	5	49%	5.3	7.7%	8.3%
Total / average EU-25	4	72%	26.2	5.7%	5.9%

Source: IDATE

4.3. Unbundling and cross platform competition have fuelled broadband expansion

Incumbent operators hold solid positions in the broadband market but face increased competition. There are wide disparities across Europe in the level of Infrastructure-based competition. As DSL has driven broadband growth (including in countries with cable operators), development of wholesale offers and unbundling have played a key role in the development of competition

Incumbents' market share has steadily declined in recent years. At the end of 2005, incumbent operators held 47% of the retail broadband market in terms of subscribers, down from 55% at the end of 2002. Within the DSL segment, incumbent operators supply 82% of the lines and provide service to 58% of retail customers.

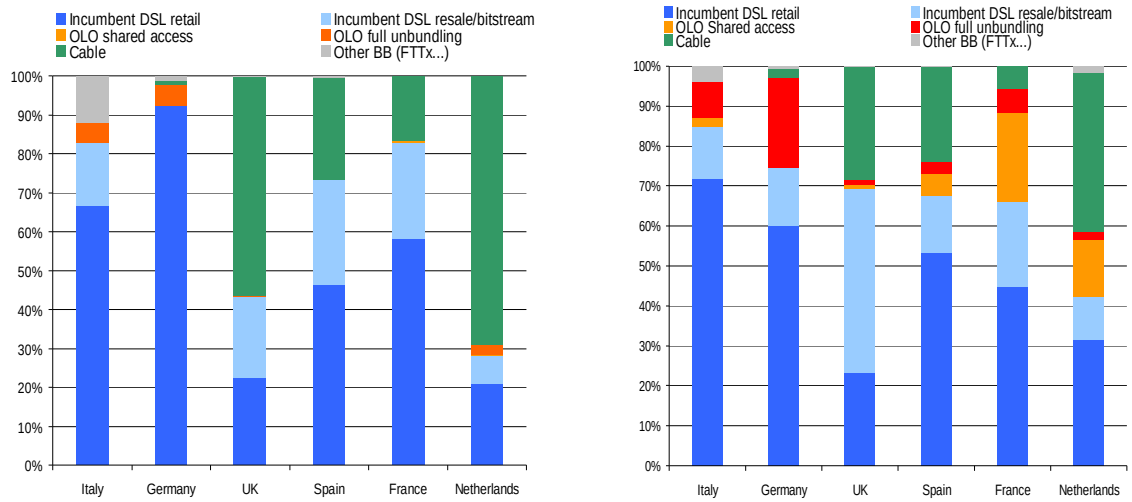
Increased competition has likely played a decisive role in the take-up of broadband in Western Europe since 2003. Competition in broadband can be measured both at the infrastructure level and at the service level. On the whole, there is little facilities-based competition in Europe, with DSL accounting for more than 80% of broadband connections. As the broadband market strongly relies on the network of the incumbent operator, the capacity of alternative operators to get access to this network has been a key in competition development.

The availability of cable broadband services as an alternative to DSL varies widely across Europe. Cable is used in urban centres of many countries to provide TV services, but many networks still require costly upgrade to offer broadband services. In some countries, however, cable networks provide competing and widespread broadband access. That is the case in the United Kingdom, Sweden, the Netherlands, Belgium, and Denmark, where cable accounts for more than 18% of the broadband market in terms of connections. Consolidation among cable operators has taken place in several other markets (in particular France, Germany, and the United Kingdom). This is likely to reinforce the capacity of cable operators to invest in their networks, strengthen their market visibility, and thereby challenge telcos in the broadband market.

Wholesale DSL products of incumbent operators, including bitstream access and unbundling, have allowed other service providers to compete at the retail level. The recent period has seen a significant shift of new entrants from resale and bitstream to local loop unbundling, which allows much stronger differentiation with the incumbent retail product. In 2005, the number of unbundled lines (used for DSL) doubled to stand at 8.5 million. On average, unbundled lines represented 18% of DSL connections at the end of 2005, compared to 8% at the end of 2003. In terms of net additions in lines, the increase in the number of unbundled lines well exceeded that of wholesale lines in 2005, which was not the case in 2004. However unbundling has expanded at a very different pace across Europe. At the end of 2005, unbundled lines accounted for roughly 30% of the DSL base in France, Sweden and the Netherlands, but for less than 5% in the UK (where progress is nevertheless swift following intervention from the regulator), in Ireland and in Belgium.

In Eastern Europe, where broadband markets are still in their infancy, incumbent operators enjoy very strong positions and are now rolling out DSL investment plans. Alternatives to DSL are also emerging (cable modem and wireless solutions such as WiMAX). Unbundling is available in most countries, but its application remains very limited, due to tariff conditions and difficult technical requirements for its implementation.

Figure 29: Broadband competition structure evolution in Europe, 2002-2005



2002 **2005**

Source: IDATE

SECTION 2: Medium and long term driving forces and possible impacts for the industry

The next ten years should bring about at least as many landslide changes to the telecommunications industry as the ones experienced in the past decade which saw the mobile and unexpected internet revolutions. Numerous technology disruptions, evolutions in end-user expectations, behaviours and usage patterns, regulatory and public policy issues as well as globalisation transitions will shape the future of the industry. While some may be influenced by, or the result of, competition dynamics, many of them are to a large extent shaped by exogenous factors and will impose themselves on all players. As such, these disruptions and transitions constitute challenges which can represent threats and/or opportunities for existing players, ultimately shaping the new playing field of the European telecoms industry.

This section first explores four clusters of forces likely to shape the future of the industry over the next ten years. It then assesses the possible impacts of these forces on the industry dynamics and the strategies that players are likely to deploy in response.

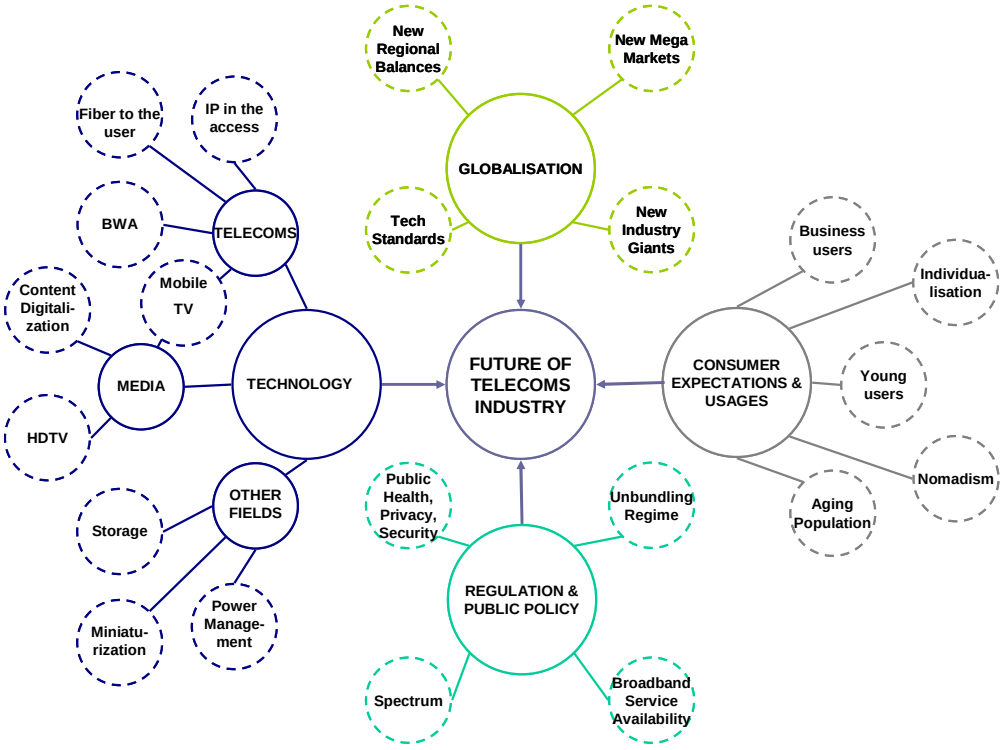
1. Multiple driving forces will shape the future of the European Telecoms industry

More than ever before, the telecommunications industry is shaped by multiple determinants belonging to very different fields but webbed in a complex interconnected system. These forces can broadly be grouped in 4 clusters:

- End user expectations, behaviours and usage patterns
- Telecoms, media and other fields (storage, processing …) technologies
- Globalisation
- Regulation and public policy

As the pace of change accelerates across these multiple fields, assessing the future of the industry requires a thorough assessment of each of the forces at stake and their likely impact.

Figure 30: Clusters of forces shaping the future of the European telecommunications industry



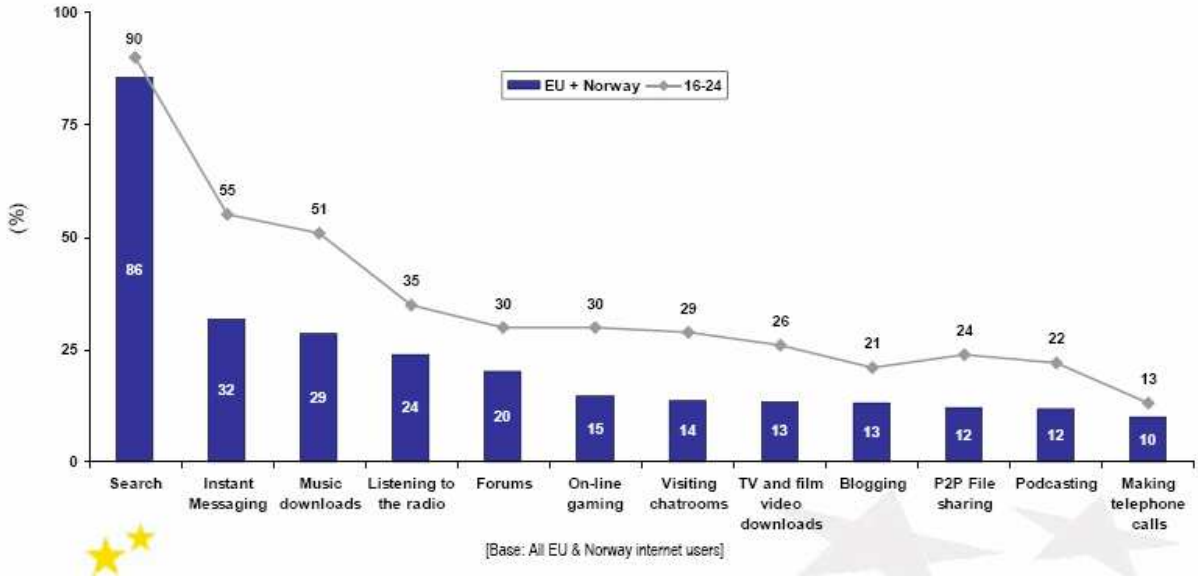
Source: IDATE

1.1. Changing end-user expectations, behaviours and usage patterns

Younger users will continue to fuel the proliferation of open services …

The younger generation has massively adopted the latest technologies from the Internet and is driving some of the major online service innovations such as YouTube and MySpace. Youth consumption of Internet services is more diversified, as they engage more easily in new free services (web 2.0, podcasting, video sharing on Internet, peer-to-peer). While their interest for a given service may at times appear short-lived as they can easily switch very rapidly from one service (and fad) to another, they will play a central role in fuelling a permanent innovation in new services.

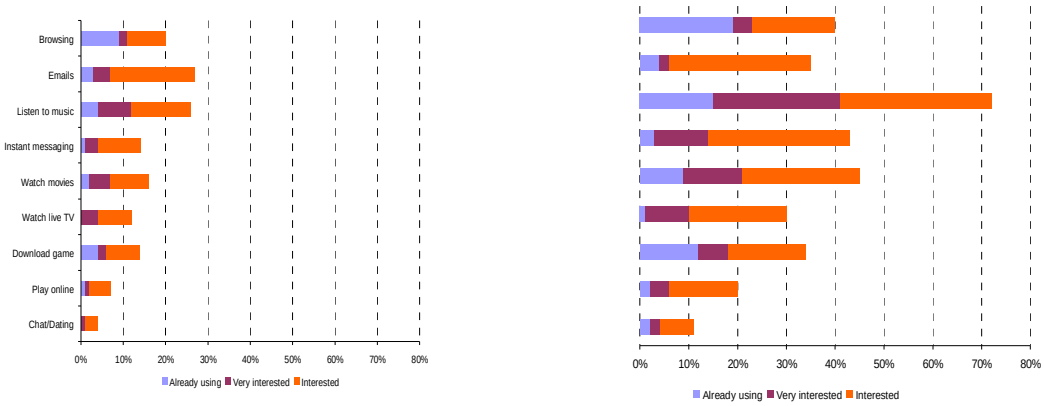
Figure 31: Fixed Internet Usages in Europe



Source: EIAA Mediascope 2005

This appetite for innovation may spell new opportunities for telecom carriers as underlined by the young generation's substantially higher usage rates for mobile data services such as web browsing, music downloads, TV or movie watching, gaming…However, younger users' limited brand loyalty and primary interest for high network-effect services will add further pressure to telcos' traditional "walled garden" and limited interoperability service approach.

Figure 32: Compared mobile data service usages in France



Overall population **15-24 years old**

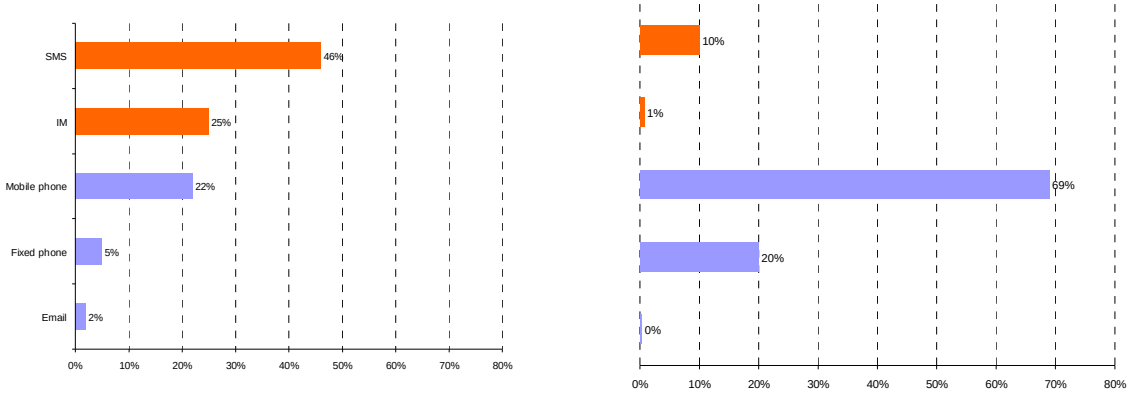
Source: IDATE

…and favour a multi faceted DIY communications experience

The younger users are also showing very different communications usage patterns compared to today's mainstream customer base.

Although they are in general intensive communications users, they have adopted multi-faceted highly contextual communications tools depending on whom (friends or parents), how (text or voice) and where they are "calling". Being very tech-savvy and rejecting a "one service fits all" mantra, they seem to favour a "do-it yourself" approach to communications where they mix, match and adjust the tools and devices that best suit their changing lifestyle. Furthermore, their multitasking behaviour also transforms their approach to communications from a purposeful, dedicated and isolated act to a pervasive, always-on social networkability where features like presence and location become at least as important as voice.

Figure 33: Preferred communications tool of the younger generation in France



To communicate with friends **To communicate with parents and family**

Source: IDATE

Because these behaviours are in part determined by a limited purchase power, they have so far essentially benefited for free services on the fixed Internet (instant messaging) and "cheap" services on mobile (SMS). Nevertheless, this "no-frill" attitude may require carriers to rethink their product offering and provide new DIY basic offerings at lower prices, based on alternative business models and pricing schemes.

Furthermore, these new communications attitudes are very likely to largely carve out tomorrow's mainstream requirements that carriers will need to address as these young users grow up and become their main customer base.

No-frill products for younger people

TDC launched at the end of the summer 2006 a youth product targeting the 18-28 age group (and not accessible for others). The new product is called TDC Netway and is a double play of broadband access and broadband telephony. KPN launched a similar offering for mobile in the Netherlands with a sub-brand (Simyo).

This product is based on surveys indicating that most young people prefer to handle all technical issues themselves when they buy their phones and broadband connections. They know what to do and they are mostly concerned with getting the cheapest and fastest solution.

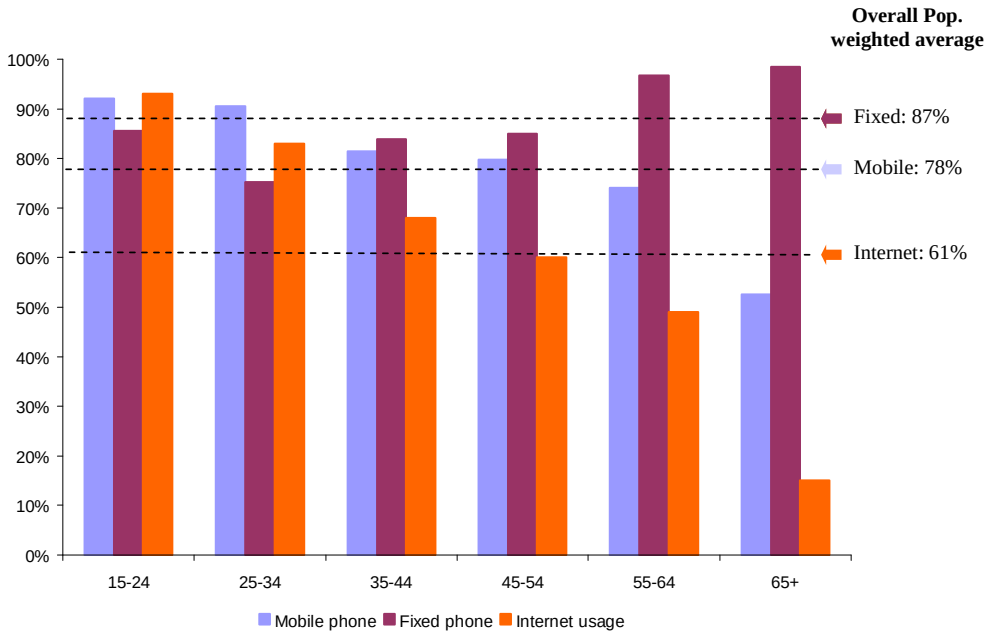
TDC Netway has been designed to match those specific needs. Customers get a 1 Mbps connection and broadband telephony with free talk to Danish landline numbers round the clock. The product can only be ordered on the Internet and there is no assistance from a technician and no support. The price is very low compared to other offerings in Denmark (DKK 328 per month), and there are also no establishment fees. Finally, there is no minimum period of engagement.

…while ageing population may aspire to less complexity in communications

Except for pay TV, the telecom market for seniors is still under-developed. Wealthier but less tech-savvy than the rest of the population, seniors will account for a growing proportion of the European population as life expectancy increases. They are more interested by simple plug'n'play products. They are also generally ready to pay more to get some quality service and/or comfort.

The senior market thus represents a major growth opportunity, as their mobile equipment and internet usage rates are well below the rest of the population.

Figure 34: Compared equipment and usage rate per age segment



Source: IDATE

Their reason for non-consumption is not generally the price but that the product appears to have very limited interest for them or is perceived to be too complex. While appropriate targeted marketing may help bridge the gap with the rest of the population in terms of mass market service adoption, the older population will also see the need for richer dedicated services, in particular health related (e.g. emergency devices or remote medical monitoring).

When more is less

Vodafone launched in mid 2005 Vodafone Simply, a new, easy to use mobile service which has been designed for customers who only want a mobile phone with voice and text services. With these offerings, it can address both low-tech consumers and non-consumers that would have turned down other options because of high complexity. At a time when cell phones are letting users do more tricks, from video calling to downloading digital music, these devices have no camera, no browser and hardly any icons. Instead of being sleeker and cooler than ever, the phone is ordinary-looking.

The company surveyed 5,000 Europeans about what they wanted from a cell phone and got stunning responses from the 35-to-55 year old group. One-third, for example, said they didn't know how to tell when they had received a text message. Some thought the envelope icon that signals a message meant their phone bill had arrived.

Following this feedback, Vodafone partnered with Sagem to develop two phones. Both phones have large screens with legible text and symbols, as well as three dedicated buttons for direct access to the most frequently used services: the Main Screen, Contacts and Messages. A button on the side of each phone controls ringer volume and a switch locks the key pad. In addition, on-screen instructions in plain language help customers master the phone quickly and easily.

Both phones offer a voice mail service designed to work like a standard home answering machine. The Messages button on the phones lights up to notify the customer when a call or text has been received. To listen to or read the message, the customer just needs to press the Messages button. In addition, the Vodafone Simply service offers a missed call notification service. If a call is missed, or a caller does not leave a voice message, the customer receives notification on-screen.

Consumption is increasingly individualized …

With the development of the mobile phone but also of multi-equipment in the household (TV, PC), usage is increasingly defined and driven by individuals rather than by the household or the family. The user can now make personal choices about his consumption with individual devices, but also of his time budget allocation, as the consumer becomes more empowered with time management tools (PVR). Personalization has even become a market itself.

As a result, there might be less of a market opportunity for products (except commodities) and services with a mass market potential, as users are harder to reach. **Telcos will need to adjust their model to potentially address hundreds of niches** and make a u-turn from their traditional mass market approach centred on a few packaged products. With new habits, there should also be a need for more user-centric services and devices, that allow (easy) customized configuration.

Telecom players could benefit from a more granular segmentation to identify unfulfilled needs and underserved markets as well as optimize their activities portfolio. But it will require taking into account new paradigms, especially for integrated operators who think of households for fixed and of individuals for mobile, in a context of fragmented family structures. Reaching a potential customer might for instance require new communication approaches, as consumers will use more fragmented media and seek more customized offerings. Young people (huge consumption, no money) and seniors (more quality, less technology) could be seen as just sub-categories of this segmentation trend.

Segmentation could even reach the level of **customization**. With enhanced profiling and crossed data mining, telcos can push and recommend services (for instance à la Amazon) to the customers that show the highest potential of being interested. Through paid subscriptions, telecom players have already access to precious data like demographics and localization, which is so far underexploited (compared to the less precise IP address localization), and which could be leveraged in opt-in schemes yet to be defined with the willing subscribers while ensuring privacy.

Nomadism and hypermobility will become the new norm

Time spent away from home (or away from the office) is increasing, as commuting has taken a significant share of the time budget. British people spend for instance 1h30 a day travelling, which represents about 30 minutes more than what French people do (source: Eurostat - 2006). Urban development has also laid out a very fragmented organization of the potential activities (business, leisure) requiring more mobility. Nomadism is therefore getting more and more part of the way of life of many people.

The mobile phone probably best epitomizes this trend of nomadism as a key enabler. It has received a wide acceptance in just a few years and has changed fundamentally the telecom landscape. The capacity to use basic telco services (voice, Internet), or more advanced ones (mobile TV), in nomadic situations or even in full mobility is more and more expected, especially by business users. Many telcos have taken initiatives to offer anywhere anytime connections. **Carriers will need to address the mobility market**, even when they are only engaged on the fixed playing field. This may translate

into the acquisition of infrastructure (cellular, DVB-H or BWA), but it could also be realized by wholesaling or partnering.

Telcos going wireless

As wireless becomes an increasingly required offering in the product portfolio of a telecom player (individual needs, nomadism), fixed operators are deploying different strategies to complement their offerings. Some have entered into wireless by acquisition and development of infrastructure like Softbank in Japan for cellular (acquisition of a new 3G licence and of Vodafone Japan operations) or Free in France for Wimax (national licence from Altitude Telecom).

But numerous players have taken very different initiatives without direct involvement in infrastructure. Costs implied are higher and potential rewards are more limited, but risks are also significantly reduced. Some players still want to offer their own solution and use wholesale services from telcos with infrastructure (BT, Neuf, etc…). Others have designed exclusive co-branded partnerships. For instance, in Austria, UPC and One provide a bundle with broadband on cable and mobile phone in Austria. Vodafone and Fastweb have designed similar offerings in Italy.

Beyond voice or Internet access, this growing demand for nomadic and personal consumption represents a major challenge for the telecommunication industry in terms of content customisation and portability and service continuity, as customers expect to be able to access their contents on the go and from various devices. Those seamless transfers of content could be implemented from a central local or online storage point or between terminals.

To offer this continuity experience, connectivity between networks has to be developed between the household devices and the mobile devices. Notably, interconnection of fixed and mobile Internet access networks may be limited by the mobile operators "walled-garden" strategies and proprietary portals. Content and services have also to be customised to be handled by devices which have very different characteristics (screen size for instance).

Costs to reach a specific device could skyrocket with fragmentation of the devices markets. Portability from one device to another device will therefore increase the need for dominant standards, either imposed by a player or developed by the industry itself. For example, current Digital Right Management (DRM) systems that protect the right holders' assets lack inter-operability, which limits the benefits for the customer and indirectly encourages illegal content downloading through peer-to-peer networks.

1.2. Technology forces

1.2.1. Telecoms

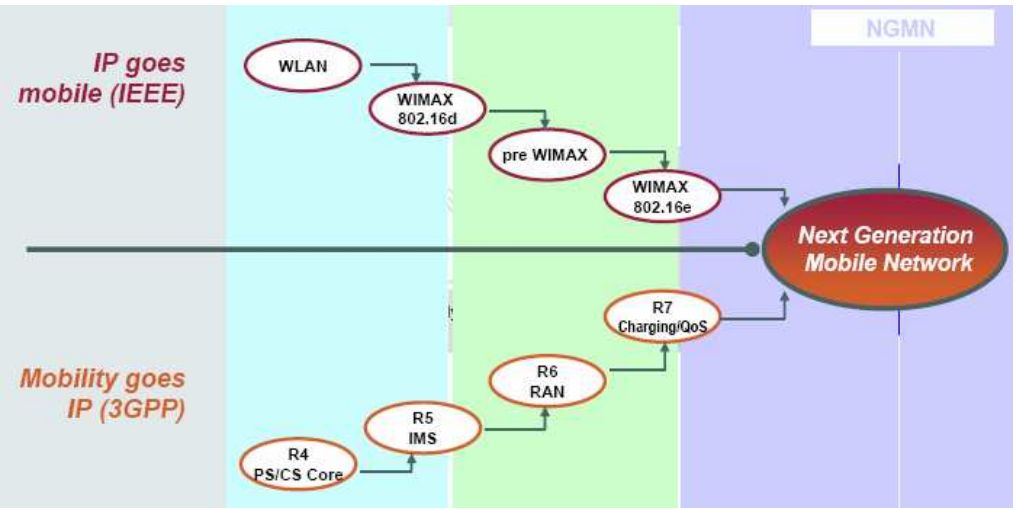
IP's increasing role as the central protocol in telecoms has just begun altering both network and service provisioning economics

Historically, networks were built to provide a certain type of services (e.g. voice on PSTN or television on cable). This complete compartmentalisation of network services began to break down in the 1990s as the growth of dial-up Internet created a new use for telephone lines beyond basic voice. In order to compete on this nascent market, cable companies soon developed technologies to provide high speed access to the Internet over their own lines.

Simultaneously, telecom operators and equipment vendors worked together to improve the Internet Protocol (IP), initially designed as a best effort transport protocol for data communications, with the introduction of MPLS (Multi Protocol Label Switching), to become **a carrier-class protocol capable of transporting in an agnostic way every traffic type** (including voice) with an acceptable quality of service and in latter editions security enhancements (IPv6). IP provides therefore a single model for access network and trunk network operation running a single protocol with only one form of switching, making it a less complex and less costly infrastructure.

While IP is now the norm in most telecom operators' backbone networks and progressing down their metropolitan wireline networks, its next frontier will be to become pervasive across any last mile network (copper, coax, radio…) to enable ubiquitous access to any service. For mobile networks which are today the least advanced in this migration, IP's progression will simultaneously be fostered by its generalisation in mobile core networks with UMTS Release 5 and by the evolution of alternative all-IP wireless technologies which are becoming increasingly mobile.

Figure 35: Path to a next generation mobile network



Source: Siemens

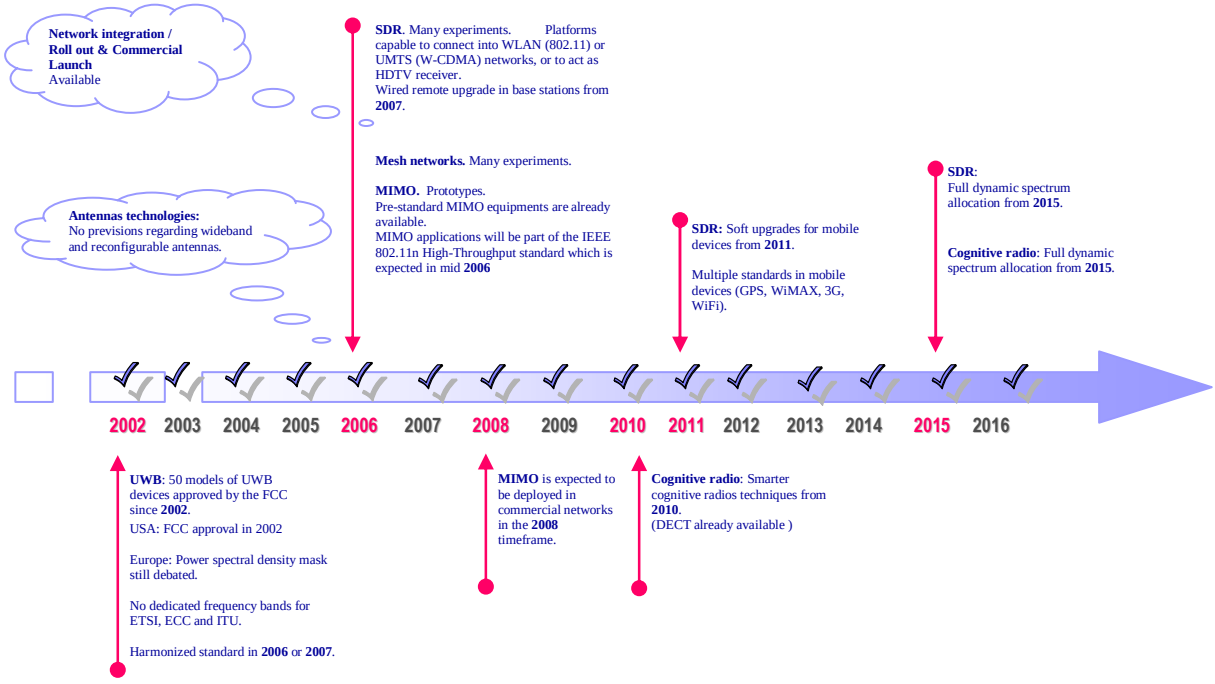
IP is completely agnostic about the overlaid services it enables. IP-based networks offer an opportunity to **carry numerous and different services over a single network**, sharing the same bandwidth. This implies that the cost of distribution of a service or an application can be mutualised and therefore significantly reduced.

Broadband bottlenecks on wireline and mobile networks can be alleviated

New telecom technologies have been developed to provide more bandwidth for the end-user. On fixed networks, multiple improvements are on the roadmap to extend the capabilities of the copper (ADSL2+, VDSL, VDSL2) and coax (digitalization) plants to up to 50Mbit/s for consumers situated close enough to the central office. The introduction of fibre to the curb or all the way to the premises based on GPON or EPON technologies should enable offerings up to 100 Mbit/s for downlinks.

Wireless has also benefited from numerous improvements, enabling new opportunities for existing technologies (HSDPA) and accelerating the **rise of numerous technologies** with very different characteristics in terms of coverage and bit rates. Other wireless technologies, designed sometimes as complementary offerings, have emerged and can provide alternative to cellular with similar services. WiFi hotspots have for instance spread to be used in major nomadic situations (hotel, airport, bars, cafes …) and also at home. The progress in available mobile bandwidth will be further fuelled by multiple radio and antenna technology improvements like software designed radio (SDR), cognitive radio and MIMO antennas.

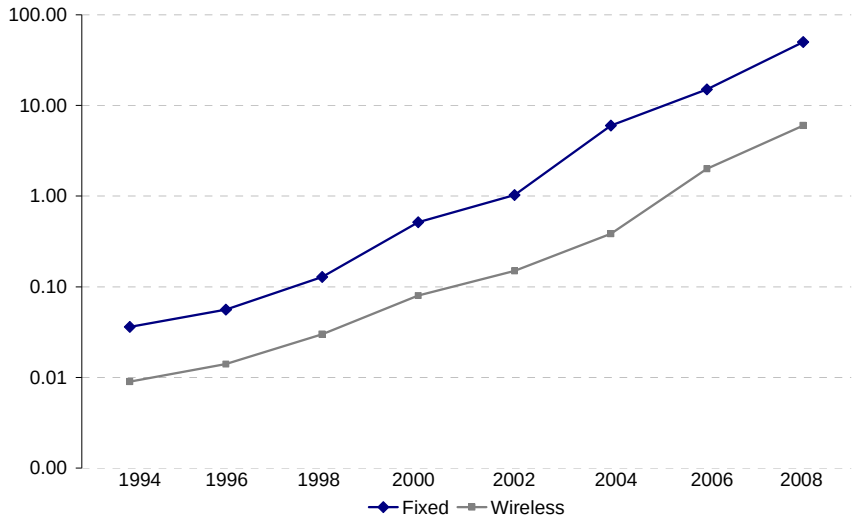
Figure 36: Roadmap of mobile-related technologies impacting end-user bandwidth 2002-2016



Source: IDATE

Figure 37: Evolution of the average maximum bandwidth available to the end-user across territories

In Mbps

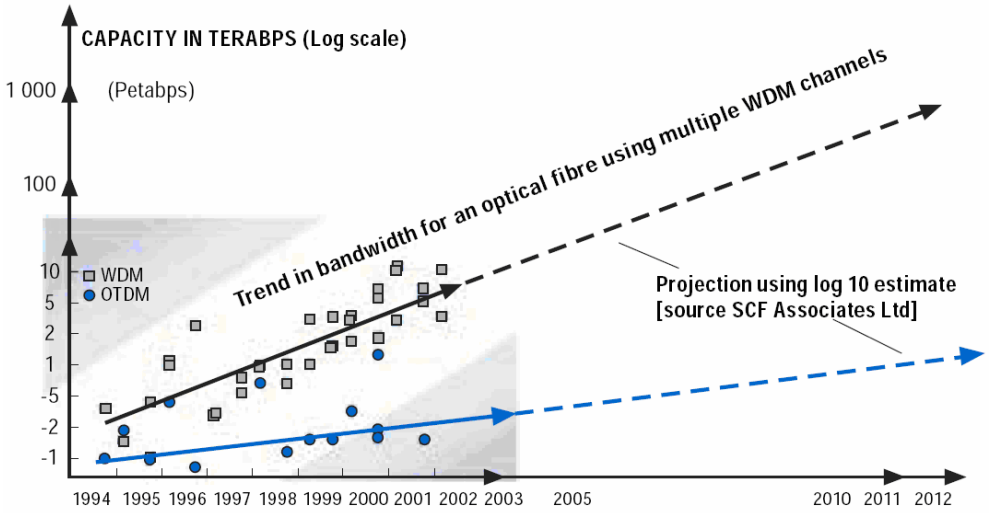


Source: IDATE

Progress in optical multiplexing will enable close to infinite transport capacity to match the ever expanding traffic requirements

The progress in optical networking has paved the way for a close to infinite transport capacity as more traffic can be transported over a single optical link through wavelength division multiplexing (WDM).

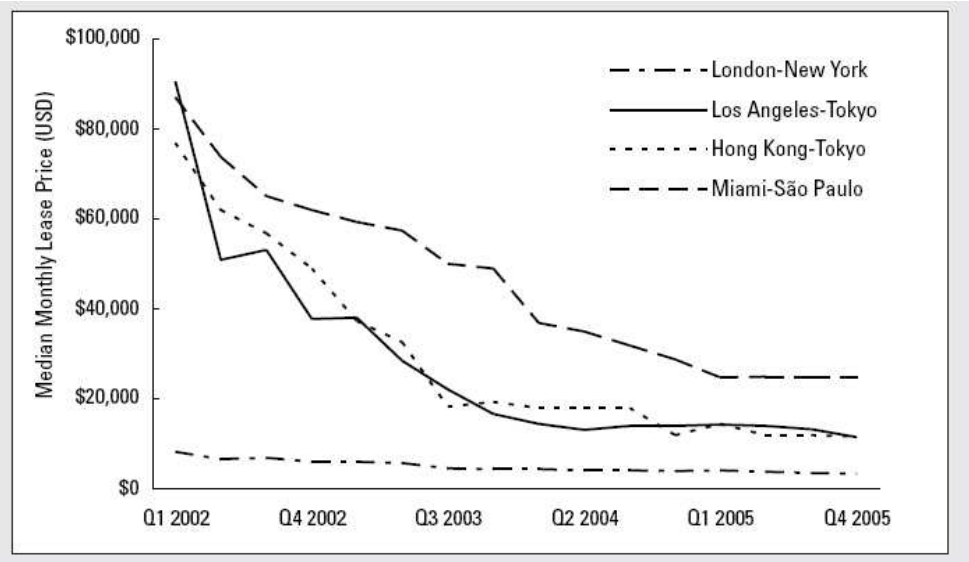
Figure 38: Capacity projection for WDM and OTDM fibres



Source: EC IST Optimist

This expanding transport capacity should continue at an accelerating pace as WDM becomes cheaper through Coarse WDM technology, definitely anchoring the telecommunications industry's new challenge in monetizing abundance (rather than pricing capacity scarcity in traditional telco economics) with further massive price drops.

Figure 39: STM-1 monthly leased line price



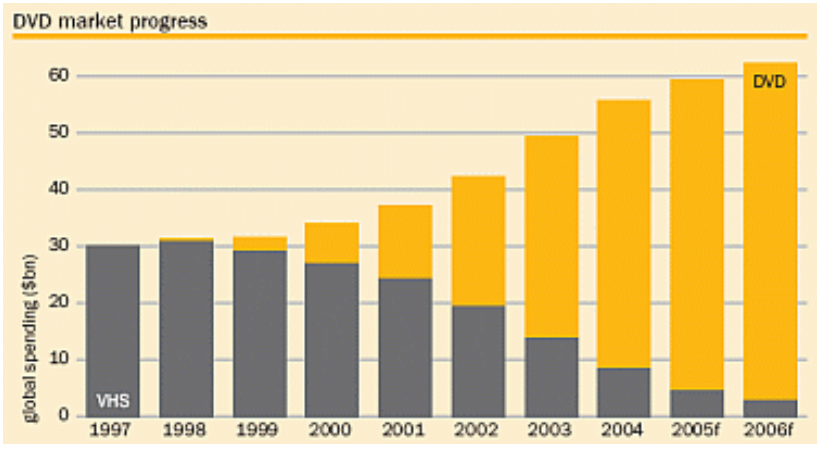
Source: Telegeography

1.2.2. Media

The increasing digitalization of content heralds a new paradigm for the production of services

The digitalization of the content and telecom services is now in full development. Its impact has swept across multiple applications like TV and voice, or services like VHS, with rapid phasing-out of the legacy solutions.

Figure 40: DVD and VHS worldwide market evolution



Source: Screendigest

Table 6: Worldwide Music Industry Revenues, by segment 2005-2010 (millions)

	2005	2006	2007	2008	2009	2010
Total music revenues	31,000	31,465	31,937	32,576	33,227	34,058
Total digital music revenues	1,085	2,832	4,152	6,515	9,968	11,920
Mobile music revenues	434	1,274	2,076	3,909	6,479	7,748

Note: Some benchmark data used for 2005 from the International Federation of the Phonographic Industry (IFPI); Warner Music Group SEC 10K and 10Q filings, 2005-2006

Source: eMarketer, May 2006

Because single digital chips can process **several applications**, digitalization precipitates the end of the "one device, one application" paradigm (e.g. voice for phone, video for TV, etc …), while providing **expanded capacity through compression or multiplexing** and far higher network reliability.

Digital delivery allows for a richer set of services to be offered to consumers on a same device, thanks also to the development of digital standards for content (JPEG, DivX, Mpeg 4, MP3…) and for communication services (email, SMS, SIP…). They can even be integrated more easily together to provide new services.

Digital information marginal cost is almost nil even for physical products (DVDs, CDs). Major breakthroughs in compression technologies and significant drops in storage costs also allow for a reduction of the application/service production cost. Some recent advances (like High Definition for TV and DVD) might require for now more resources and imply more costs, but they will follow ultimately the same path to price reduction.

Besides, standards have brought easier and faster interoperability between services from different providers, even given numerous separate DRM systems. This more open market can help achieve more scale, adding even more impact on production.

Table 7: Compression advances in music industry

Format	Encoding quality similar to CD	Data size for 1 audio minute	Number of songs/CD	Audio minutes/ CD
Wav (uncompressed)		~10Mo	~17	70
MP3	192 kbps	1.4 Mo	~125	500
AAC	96 kbps	720 Ko	~250	970
WMA	128 kbps	1 Mo	~175	700

Source: IDATE

TV and video are going high definition…

High definition services bring three major benefits to customers: a larger picture format/ratio than 4:3, namely 16:9, several digital channels for sounds and a better quality picture. High Definition is being introduced on the market both through DVD players (with the competition of the Blu-Ray and HD-DVD players) and TV channels (with extensive line-ups of HDTV channels available on cable channels in the United-States). In Europe, TV operators follow a more cautious path, but significant launches of HD channels have already taken place.

HD services' deployment in the United-States

High Definition Television (HDTV) is now a reality in the United-States since all networks – terrestrial, cable and satellite – offer a majority of their programmes in HD.

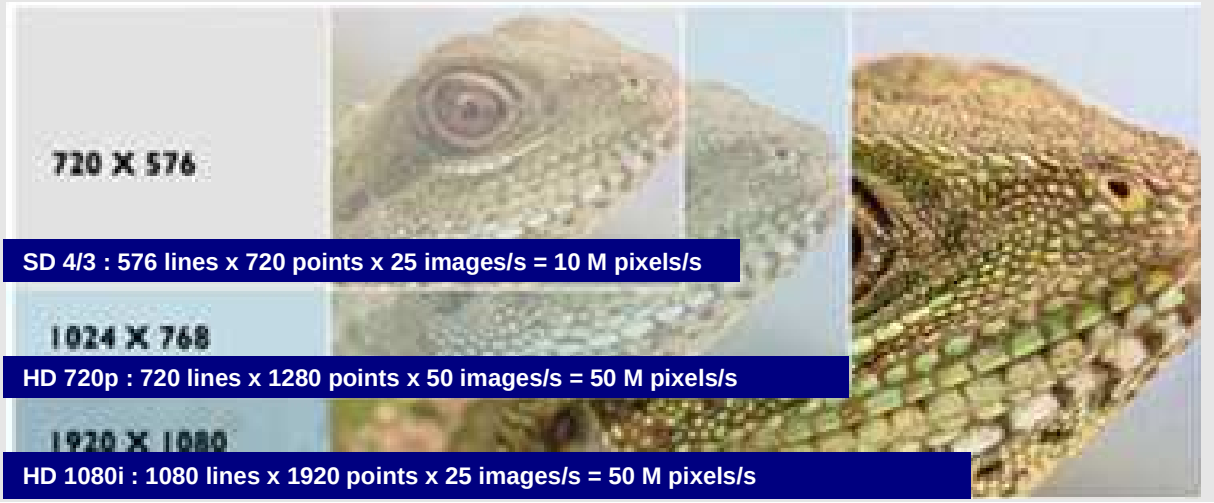
Currently, the top networks broadcast most of their prime time line-up in high definition, whereas 19 million US households have HDTV (or 17% of US TV households) in January 2006 but only about a half actually received HD contents.

National cable and satellite channels have dramatically increased their HD offers too. As of 1999, Time Warner Cable launched HBO HD, a channel that currently broadcasts 80% of its scheduled programmes in high definition. In the same logic, Fox Sports offers more than 1425 hours of HDTV a year through its local TV service FSN HD.

Another sign of the HD's expansion in the United States is the creation of new paid platforms dedicated to HD: aside from the HDNet package launched in September 2001 and the DIRECTV's HD offer available since summer 2005, one could mention the VOOM satellite services launched in autumn 2003 by Rainbow DBS and bought by EchoStar in early 2005. Because of its financial troubles (only 46,000 subscribers in the first quarter of 2005), this fully HD platform has reduced its offer from

forty to fifteen new channels specially designed for HD broadcast. On the user end, 97 million US households were passed by cable HDTV service in June 2006.

Furthermore, HD is no longer the national US channels' prerogative. Indeed, in late 2005, DIRECTV launched local channels in high definition and currently covers 42 cities, representing 62% of US TV households. Dish Network has been offering the same service since February 2006, transmitting local HD channels in 24 cities and planning to reach more than 50% of US TV households with local HD at end 2006.



HDTV impacts all sectors of the Telecom-Internet-Media area:

- Pay-TV operators expect additional ARPU and decreased churn rates;
- Consumer electronics manufacturers will draw substantial revenues from the replacement of the television sets, the set-top-boxes and the DVD players.
- High Definition doubles or quadruples the bandwidth needed to distribute live video, depending on the encoding protocols used. Moreover, customers tend to receive simultaneously two different channels. Finally, during the migration period, most channels are simulcast both in standard television and in high definition. xDSL based networks and cable networks could face strong technical limits to address the High Definition television and video services, whereas satellite benefits from more capacity. HDTV is therefore one of the main drivers for the roll-out of FTTx networks.

…and mobile

Mobile TV is still in its early stages today but will play a major role in European telecommunications, and worldwide in the short to medium term as usage patterns for TV and mobile shift towards personalized consumption and user-generated content.

There are three main emerging technologies which have good potential to make the mobile TV market viable:

- Cellular-based broadcast/multicast (typically MBMS) that uses UMTS spectrum and network to complement ongoing unicast evolution (HSDPA),
- Terrestrial based broadcast (typically DVB-H) that reuses broadcast network topology (typically DVB-T) with densification to deliver urban and indoor coverage,
- Hybrid based broadcast (typically DVB-SH standard) that combines geo-stationary for satellite nationwide coverage and a network of low power repeaters, co-located with mobile base stations, to offer urban and indoor coverage

A likely scenario in our view entails usage seamlessly blending these networks depending on the type of content (live TV, VoD, interactive gaming…) and the location (home, office, car or other transports) where the content is accessed from.

Although potential revenue sharing schemes between operators and content providers are still under early consideration, the overall market in our view holds some strong potential that can benefit all parties involved.

Table 8: Mobile TV and VOD revenues in EU-5, 2006-2011

(million EUR)	2006	2007	2008	2009	2010	2011
France	25	34	206	409	618	846
United Kingdom	20	65	162	346	624	967
Germany	13	40	109	246	476	766
Italy	45	118	249	484	828	1 169
Spain	6	21	49	118	269	517

Source : IDATE

Convergence between broadcast and point-to-point network architectures?

Linear television has been and is still transmitted mainly through three major networks, terrestrial broadcast, cable and satellite, with varying market shares between countries. Several evolutions tend to blur the frontier between the specific TV networks and the other telecommunication networks.

- Confronted with the competition from xDSL based triple play service offers, cable networks implement IP protocol and point-to-point architectures to distribute broadband internet access and IP telephony;
- The distribution of non-linear video, namely video-on-demand services, also implies a degree of point-to-point architectures.

The situation for cable networks in Europe

Cable deployment levels vary significantly in Europe with two opposite groups of countries:

- Widespread cable access in Benelux (95% of TV households in Netherlands, 95% in Belgium and 90% in Luxembourg), Germany (58%) and Scandinavia (65% of TV households in Denmark and Sweden) but ageing network infrastructures (deployed in the early 60's in Benelux).
- Limited cable deployment in the United Kingdom (13% of TV households), Spain (8%) and France (15%) with up-to-date infrastructures (built in the 80's).

European cable operators have been facing low levels of profitability, due either to low levels of ARPU (in northern Europe, cable viewers pay a cheap subscription only for access services (around 10 EUR a month)) or penetration rates (in countries such as the UK, Ireland, France, Spain, Portugal where cable distributes an exclusive pay-TV). Under intense competition from ADSL operators, these cable operators have experienced a period of restructuring, which slowed down the upgrade of networks and the deployment of new services.

Cablecos appear now in a position to leverage their installed subscriber base and are beginning to launch triple play services, becoming a direct competitor of ADSL providers. Such services represent a main stake for the cable development since both networks are positioned on similar geographic zones, namely cities. However, cable still remains considerably behind ADSL on the internet broadband access market with a 15.9% market share versus 82% for ADSL at end 2005. As regards this topic, the current European situation is far different from the United States where the cable has a very high penetration rate and enjoyed a 58% market share on the internet broadband access market in June 2005.

However, there is no evidence that all TV networks will fully migrate to IP:

- Both broadcast satellite and terrestrial networks can hardly activate a return path to implement Broadband Internet access.
- Satellite and possibly terrestrial broadcast networks will rather favour PVR-based solution to roll-out near-video-on-demand services. Moreover, in the long term, transmission of thousands of channels could build as an alternate scheme to VOD.

- In most countries, satellite/terrestrial networks will retain a significant market share of television transmission in the medium term.
- Broadcast architectures appear to be robust to support linear television both in terms of cost per served household and quality of service.

Service operators may also combine different networks to serve linear television, on the one hand, and on-demand video, on the other. Video and television services over mobile phones will possibly follow this scheme, combining a terrestrial and/or satellite network for linear television, and the UMTS network for on-demand video.

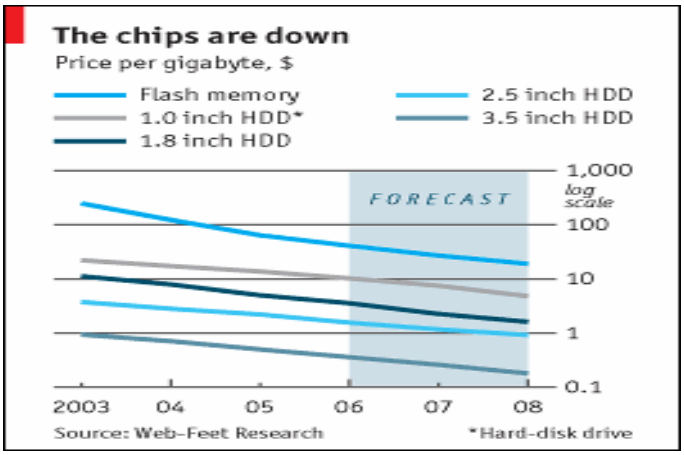
1.2.3. Other technology fields

Progress in processing and storage capacity, as well miniaturization, pave the way for a proliferation of connected edge devices

Significant breakthroughs have changed the scope of functionalities that can be managed by one single device. Moore's law, based on the observation that the **network processing power** doubles every eighteen months, is not expected to hit limits related to physics before 2017 according to Gordon Moore himself.

Similarly, Kryder's law should continue to hold with **storage density** progressing at around 12x the rate of processor performance; as a result, average hard disk storage by 2010 on a typical PC will grow to between 1 and 2 Tbits (vs. 100 Gbits currently for an entry level PC)

Figure 41: Memory gigabyte pricing evolution 2003-2008



Source: Web Feet Research

Nanotechnology should enable breakthrough improvements in miniaturization and radically smaller form factors for communications devices. In conjunction with new virtualized or externalized input (keyboard) and output (display) human machine interfaces (e.g. virtual keyboards and screens, rollable displays, video goggles…), nanotechnology should alleviate the current miniaturization limits seen for mobile devices.

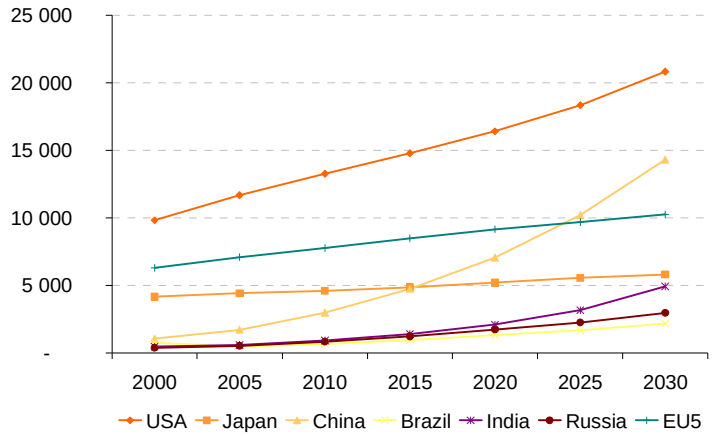
Energy management and the progress in portable batteries in particular will also be critical. Ongoing research around portable fuel cells in particular should alleviate the current issue with energy density of batteries not improving as quickly (+8% per year) as the power requirements of new mobile devices (+25% per year).

1.3. Globalisation transitions

The next decade will see a complete reshuffle of regional balances and the emergence of some new mega telecom markets…

According to macro-economists' consensus, China's gross domestic product should exceed that of Japan by 2015 and surpass the aggregate GDP of the 5 largest European countries by 2025. Other markets like India, Brazil and Russia also hold huge long term growth potential.

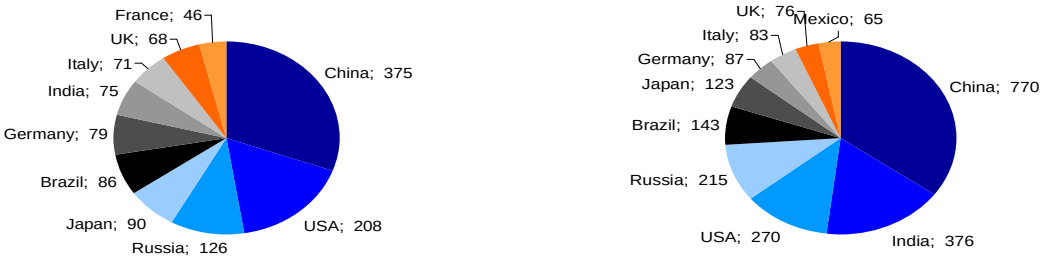
Figure 42: GDP evolution forecast per major region 2000-2030 (in USD billions)



Source: Goldman Sachs

This new world order will produce its visible effects much earlier in telecoms and particularly on its fastest growing segments: mobile and broadband. The worldwide mobile subscriber base is expected to grow from 2.1billion at the end of 2005 to 3.9bn by the end of 2010. The weight of Western Europe will fall from 20% to 13% of the total mobile subscriber base while North America's share will fall from 10% to 7%. China alone will have more subscribers than the total Western Europe and nearly 3 times as many subscribers as the United States which will also be surpassed by India.

Figure 43: Top ten mobile markets worldwide 2005-2010

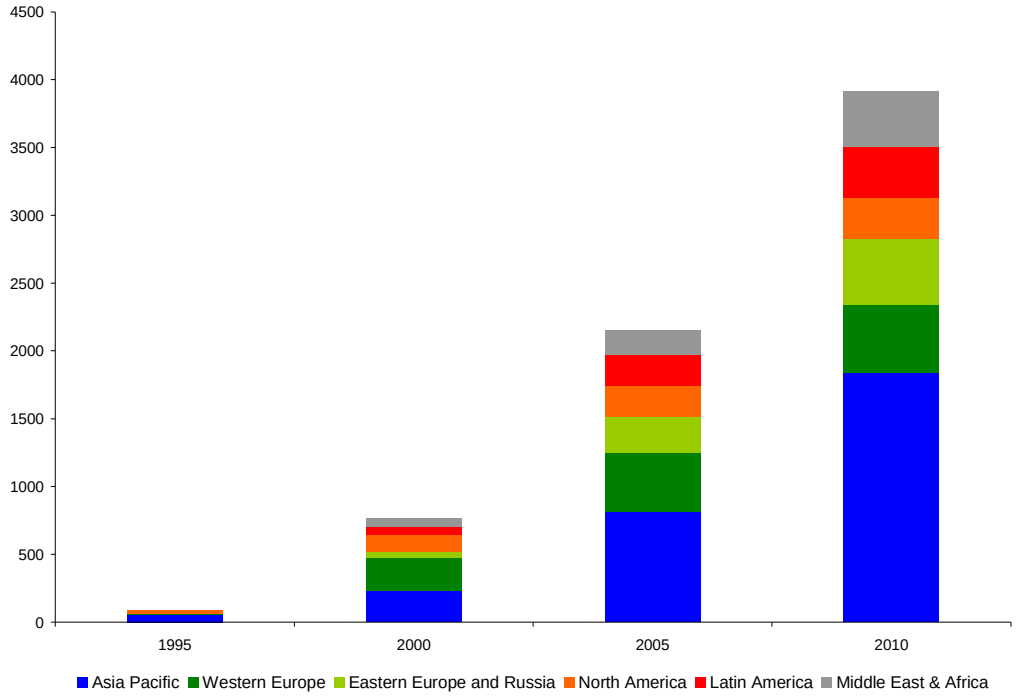


2005 **2010**

Source: IDATE

The shift won't be as dramatic in broadband with Western Europe's share of worldwide subscribers eroding from 35% to 26% over the 2005 to 2010 period as countries like India are further away from mass market uptake than in mobile. Nevertheless, China alone will also exceed Western Europe's total number of broadband subscribers and represent nearly 3 times that of the United States.

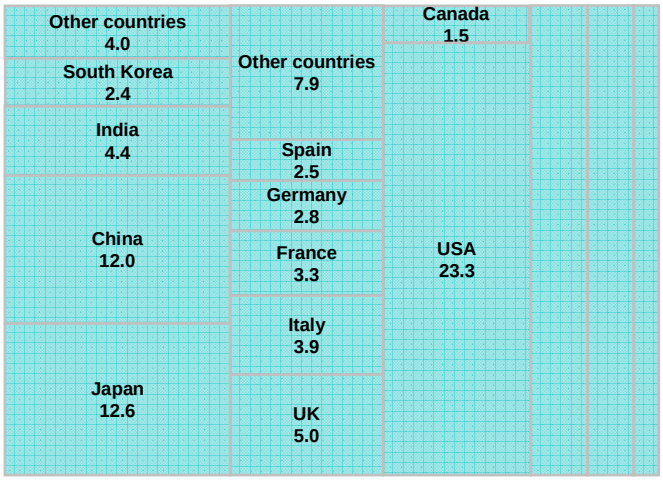
Figure 44: Broadband subscriber base evolution per region 1995-2010 (in millions)



Source: IDATE

The telecom equipment segment will be in the vanguard of this growth transition to emerging regions. China has already tied with Japan as the second largest telecom investment market behind the United States and emerging regions (including China) collectively account for nearly 40% of the capital expenditures in mobile networks and more than 25% in wireline networks worldwide in 2005.

Figure 45: 2005 Mobile capex breakdown per region



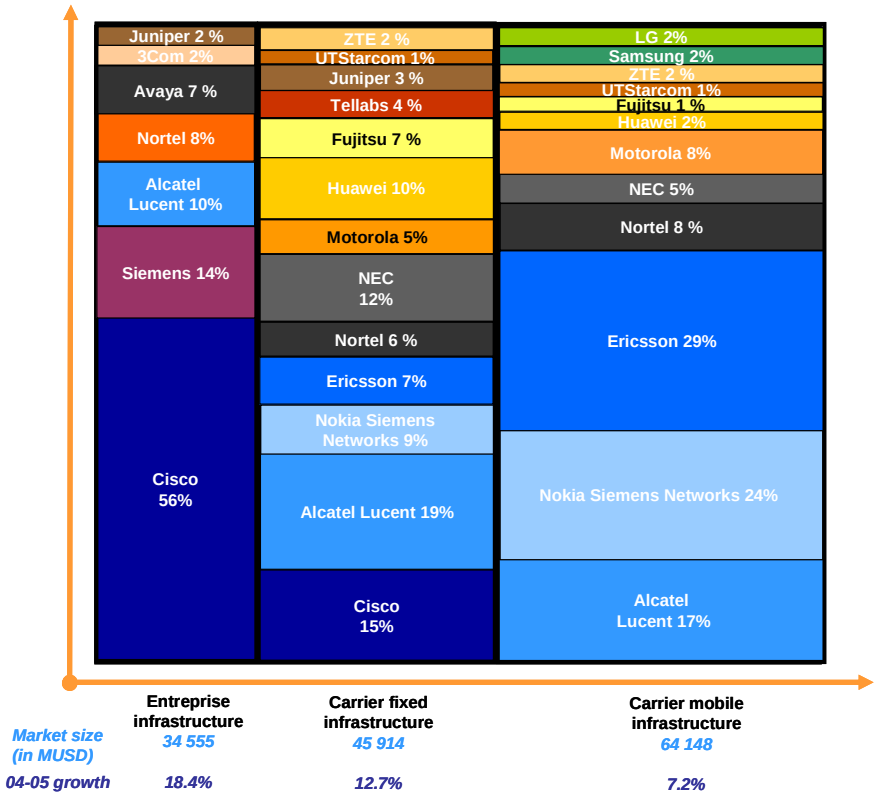
	Asia Pacific	Western Europe	North America	Eastern Europe	Latin America	Middle-East & Africa
Market size (in USDbn)	35.4	25.4	24.9	9.0	8.0	3.0
'05/'04 growth	+7%	-6%	+5%	+50%	+40%	+49%

Source: IDATE

…and see the rise to prominence of new industrial giants.

This shift in regional balances will produce new industrial giants both in telecom services and equipment. The rise to prominence of Chinese equipment vendors is already a reality today. Vendors such as Huawei, ZTE or UTStarcom have capitalized on a robust domestic market, credit facilities from the Chinese state and dynamism in emerging regions to become credible competitors. In just three years, these vendors have doubled their share of the total carrier infrastructure market worldwide to 7%.

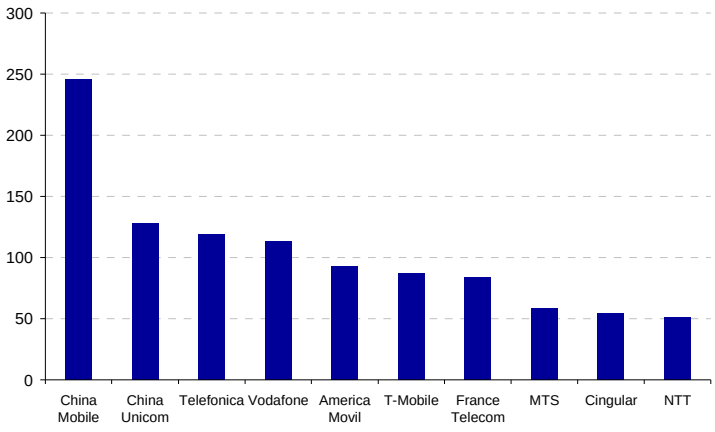
Figure 46: 2005 market share of equipment vendors



Source: IDATE

At the service level, the internationalization of competition appears less likely. Yet, 4 of the 10 largest mobile carriers worldwide in terms of subscribers today are already located in emerging countries.

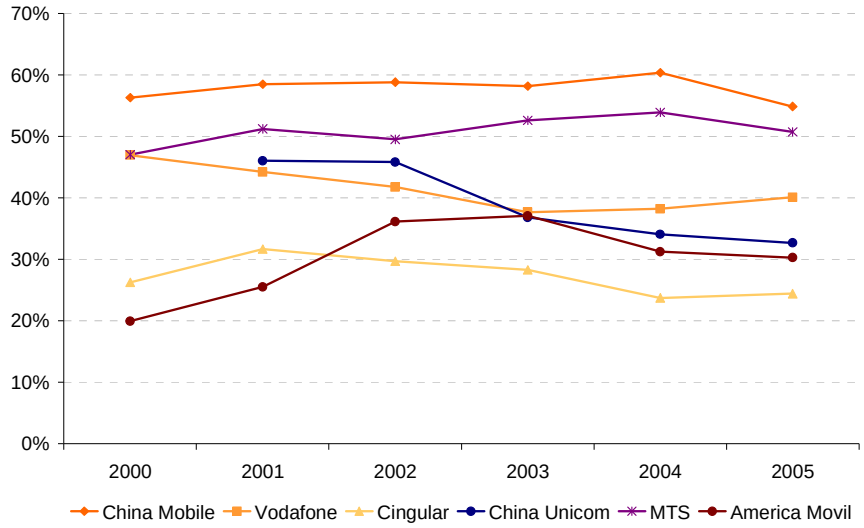
Figure 47: Top ten mobile carriers worldwide in terms of subscriber base, 2005



Source: IDATE

These carriers' specialization on mobile and focus on a single gigantic addressable domestic market have already offset the challenging economics of countries (lower ARPU) they operate in and enabled them to derive an equivalent to superior profitability model and thus compete very favourably with Western Carriers to attract investors' funding. As their market base rapidly grows, massive economies of scale should further improve their profitability model and place them in even more favourable situations.

Figure 48: Compared EBITDA profitability of mobile carriers



Source: IDATE

Taking the example of China's current industry structure which the Chinese government appears keen to preserve with no massive deregulation, China Mobile could have over 500 million mobile subscribers in 2010 on its domestic market alone, ie the equivalent of the total Western European mobile market while China Unicom would have the same number of mobile subscribers as the entire US market.

While their domestic markets should provide these new megacarriers with plenty of growth opportunities, some may also be tempted to position themselves on the European markets where average revenue per user will remain substantially higher. Such a market entry could alter the rules of the game in Europe considering these carriers' potential to propose very different service and device economics as the example of Hutchison 3's entry has already proven.

These globalisation transitions will influence future technology standards

The increasing economic influence of the emerging countries and their industrial carrier and equipment vendor giants will most likely influence the direction of future technology standards. The Chinese government's stance on promoting a home-grown 3G standard (TD-SCDMA) may provide a sign of the times to come. There are multiple critical telecommunications technologies such as IMS, Wimax, long term evolution of 3G that will require international standardization and for which Chinese carriers and vendors are already exerting their influence.

In particular China is expected to spend $130bn on R&D, on a level with Japan ($130bn) and rapidly closing in on the EU15 ($230bn) and the US ($330bn). In telecoms, equipment vendors are increasing their product development and fundamental research in China, particularly in mobile. India has also emerged as the de facto reference for software development in many industries including telecoms.

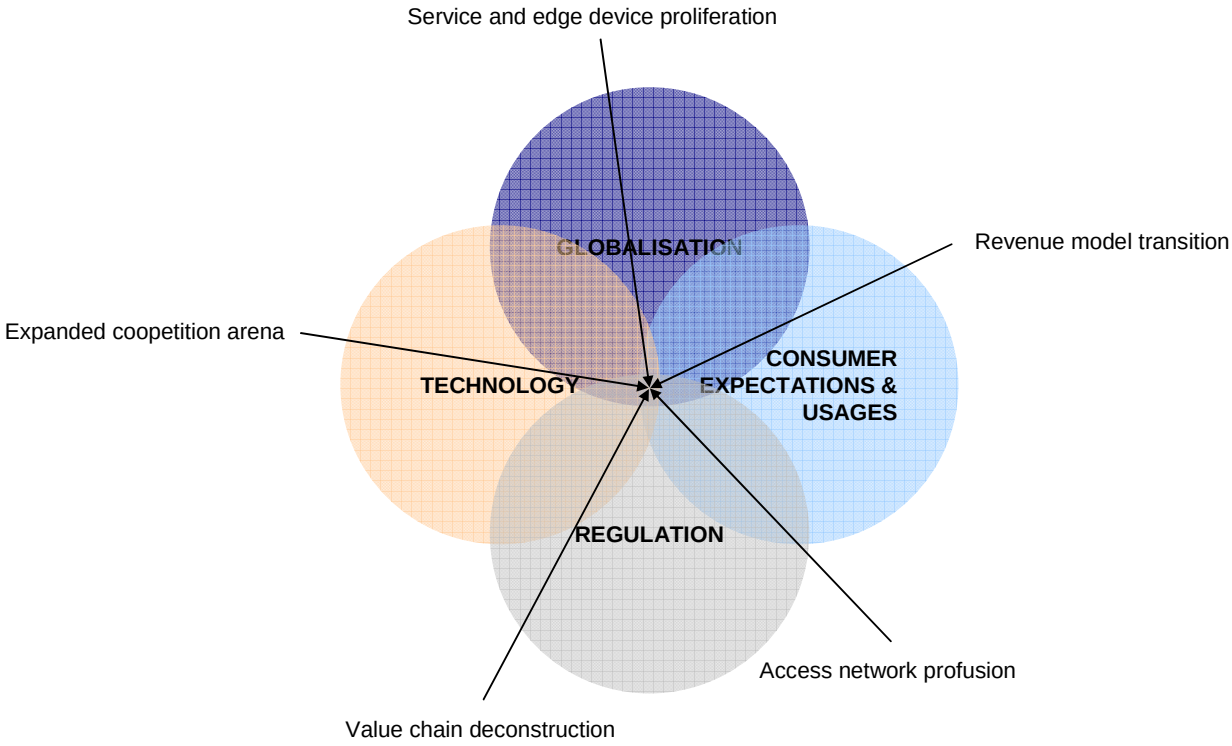
2. Likely impacts on the industry

The numerous unleashed forces described in the previous section will shape the future of the European telecoms industry, far from the monopolistic or oligopolistic structure it has known in the past but also very different from its present form. Because these forces can alternatively disrupt existing revenue streams or create new business opportunities for carriers, its future form is uncertain.

The combined effects of these multiple forces will jointly impact the industry in five major ways:

- Service and edge device proliferation
- Profusion of broadband access networks
- Revenue model transformation
- Expanded co-opetition arena
- Deconstruction of the value chain

Figure 49: Five major possible impacts on the industry



2.1. Service and edge device proliferation

The combination of technology forces (IP, higher broadband, digitalization…), evolutions of end-user expectations and usages and globalisation are paving the way for an ever accelerating proliferation of services available and edge devices connected to networks.

This proliferation is already palpable in the slew of disruptive services that have emerged on the market. These most often are direct substitutes of existing services (VoIP, TVoDSL…) proposed by new entrants that have capitalized on the massive decline in service creation and distribution costs. They have negatively impacted the telecoms industry's existing revenue streams.

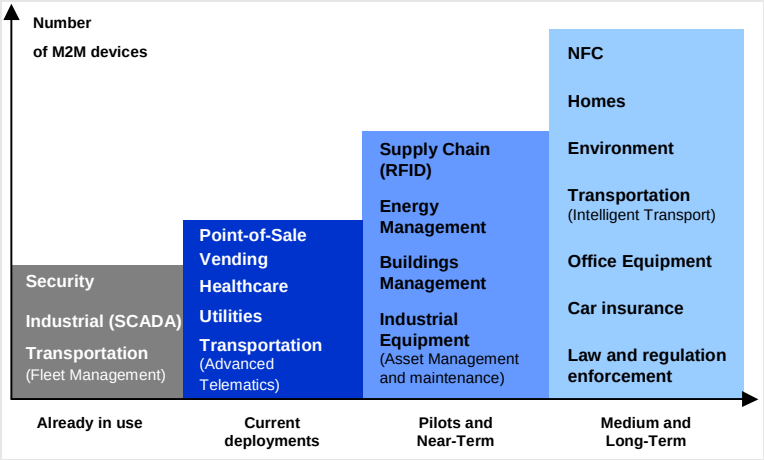
Yet many more services that represent incremental revenue opportunities are now on the horizon: mobile TV, M2M (machine-to-machine or Internet of things), RFID, location-based services or in-car systems. For instance, with IPv6, there should be enough address space to provide static IP addresses for numerous objects, reducing the need to deal with complex dynamic IP. They create new patterns of consumption, which translate into new market disruptions.

Machines talk

As cellular markets are nearing saturation, carriers might have found new opportunities with M2M (Machine-to-Machine) which refers to solutions that enable machines to communicate with a central server without requiring human intervention. Instead of communication between humans or humans and machines, mobile operators can target machines talking to machines.

The M2M market potential involves billions of machines, and hundreds of billions of objects that can be equipped with communication capabilities. Regardless of the sector of activity or the application involved, a machine or an object increases in value when connected to a network that manages or controls it remotely. The number of M2M modules already totalled 92 million units in 2004, all network technologies combined, and is expected to reach 500 million modules by 2010. These modules will involve close to 2 billion machines and 100 billion communicating objects, mainly RFID tags, with pilots for tagging individual items beginning in 2009.

Figure 50: M2M development by vertical industry



Source: IDATE

The M2M market enjoys massive potential, given the number of devices that can be equipped with communication capabilities. These devices go beyond the number of PCs and personal communication tools in use. At the very least, this base represents over 2 billion individual intelligent machines, connected with meters and vehicles. In Western Europe, over 500 million “smart” machines may already be equipped with communication capabilities).

Table 9: Potential communicating device market in Western Europe in 2005

In million units

Type of machine	Number of machines
Meters (electricity, water, gas)	240
Personal vehicles	200 (+15 per year)
Company vehicles	27 (+ 2 per year)
Vending machines	8
Alarm and security systems	24
Lifts	3
Lighting systems	20
Point of sale systems	6 to 10
Office equipment (photocopiers…)	10

Source: IDATE

The combination of the different network technologies and standards has accelerated the innovation rhythm, relying on a layered architecture. Without the need to develop the whole solution, players can assemble products from others and develop only some features by themselves. Those new services can be proposed by existing players, but are generally coming from emerging players.

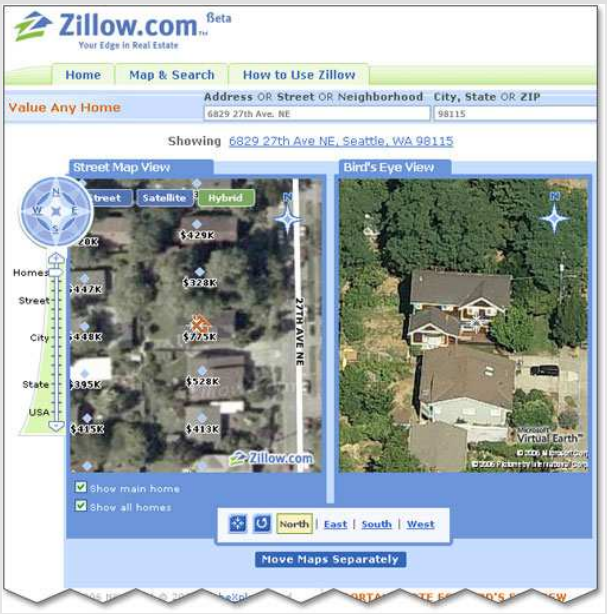
IP and digitalization have in fact lowered the entry barriers, as new entrants with a strong expertise in technology and or marketing can develop convergent applications (or mash-ups). To enter a market, players do not need to invest as much money as previously to launch a new product or service.

The combinational services opportunity

Zillow.com launched its beta service in February 2006, and quickly became one of the top-visited real estate sites online. Zillow's goal is to empower consumers with tools and information to transform how they buy and sell homes. The first step is providing valuations and data on 68 million U.S. homes, with contributions from the homeowners themselves. Headquartered in Seattle, Zillow has raised a total of $57 million in funding in less than a year and will rely on an advertising-funded business model.

The site provides data like previous sales prices and the prices of similar properties on 60 million residential properties. The site also includes price appreciation (or depreciation) data in a form that resembles stock charts. In addition, Zillow uses software to offer a free home-value estimator ("Zestimate"). Zillow uses a combination of proprietary algorithms and public records like assessors' valuations and sales filings to arrive at the valuations. Homeowners can also publish details about their own homes, such as a kitchen remodel, a view or deck addition, that is not available from public records and can help to provide a more accurate valuation.

Zillow has also added overhead and sideways mapping using the same technology found in Microsoft's Virtual Earth product. Instead of seeing the rooftops of homes as most mapping programs provide, this product shows 45 degree angles of the homes and properties giving prospects the opportunity to get a much better view of the property they are interesting. The images, which are provided by Microsoft's mapping application, Virtual Earth, offer a panoramic view of homes from four directions at a 45-degree angle. At present, images are available only in major cities such as Los Angeles, San Francisco, Las Vegas, Boston, and Seattle.



For most of its operations, Zillow relies on third-party products to develop the service (Virtual Earth from Microsoft, maps from NAVTEQ, data from public Sources) and monetize it (deal with Yahoo! Real Estate, advertising program from a third party). Zillow is mainly in charge of aggregation and algorithm. It has been able to develop a product with fast time-to-market by combining resources from other players and specializing only on some core functionalities.

The main consequence for the industry could therefore be **service fragmentation**. New entrants can indeed now address efficiently new markets (even niches with low paying customers) that were previously unreachable, with lower distribution and production costs. Even very small players could be

sustainable by addressing under-served markets (long tail concept). Services can be easily replicated for multiple channels and tailored for given customer segments.

2.2. Profusion of broadband access networks

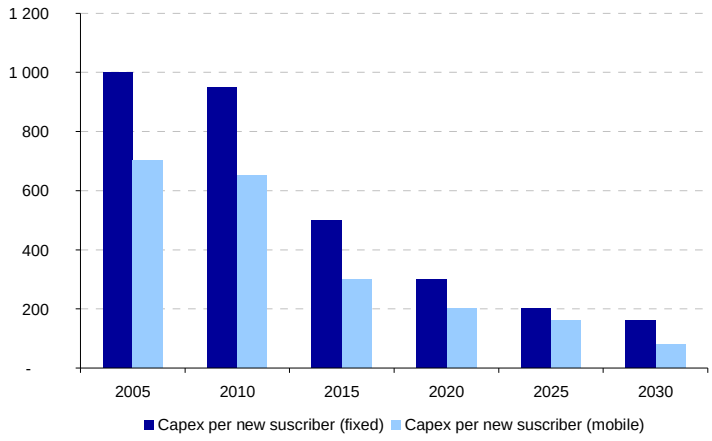
Thanks to the technology developments outlined previously, **multiple access networks are likely to coexist** in the future although in the short term, broadband services >50Mbps will essentially remain enabled by wireline access technology (xDSL or Fiber). While IP will bring down the traditional barriers between different physical networks and unleash cross-platform competition, **broadband wireless access technologies** such as Wimax could **prove real contenders for existing wireline and cellular networks**. They hold the potential **to enable the same services with a cheaper fast-deployment network** in high-density areas. BWA so far offers generally less advanced features (limited mobility for instance), that can still be good enough (sufficient coverage and bandwidth) for the majority of the population living in high-density urban areas. Cellular and BWA may also compete for the same suitable sites for base stations.

BWA also represents an even more **threatening substitution solution for wired access**, especially for high-density areas, as it can offer an efficient static high-speed connectivity (on which can be provided a great number of IP services) without the need for a deployment of a wired local loop. In the near future, the improvement of bandwidth and speed on wireless networks might catch up with those of fixed networks (even with the anticipated growth with fibre).

The probability of access network proliferation will be all the more important as these future infrastructures will require a much lower **capital layout than today's,** particularly for radio networks, resulting in **significantly reduced network-based barriers to entry.**

Figure 51: Projected capex per new subscriber

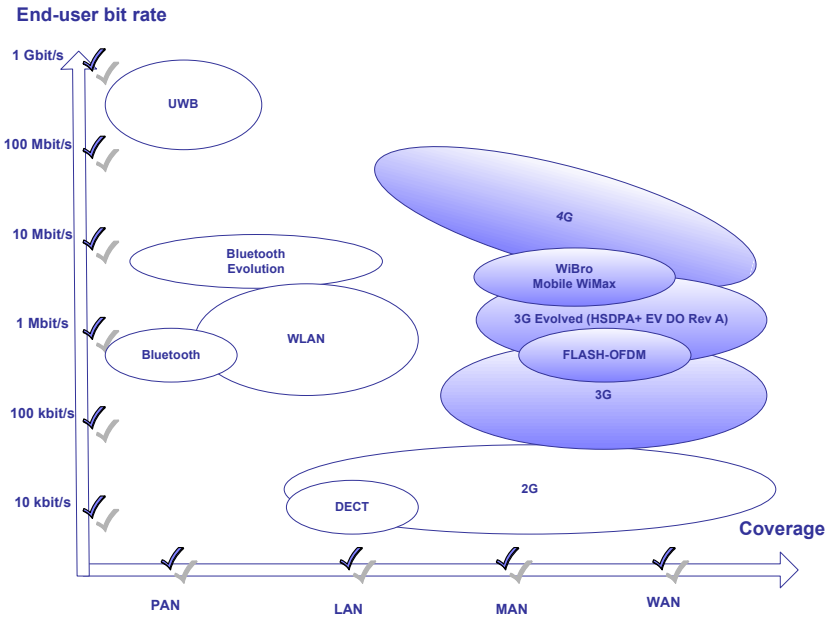
In USD



Source: OECD

Each technology will alternatively complement and compete with existing offerings based on its merits, intrinsic characteristics and business case that may be applicable to specific areas and settings but not to others. We thus foresee a future of multiple access technologies coexisting rather than a single technology takes-it-all paradigm, with carriers cost-efficiently managing multi-access networks through single unified NGN backbone architectures.

Figure 52: Proliferation of wireless access technologies



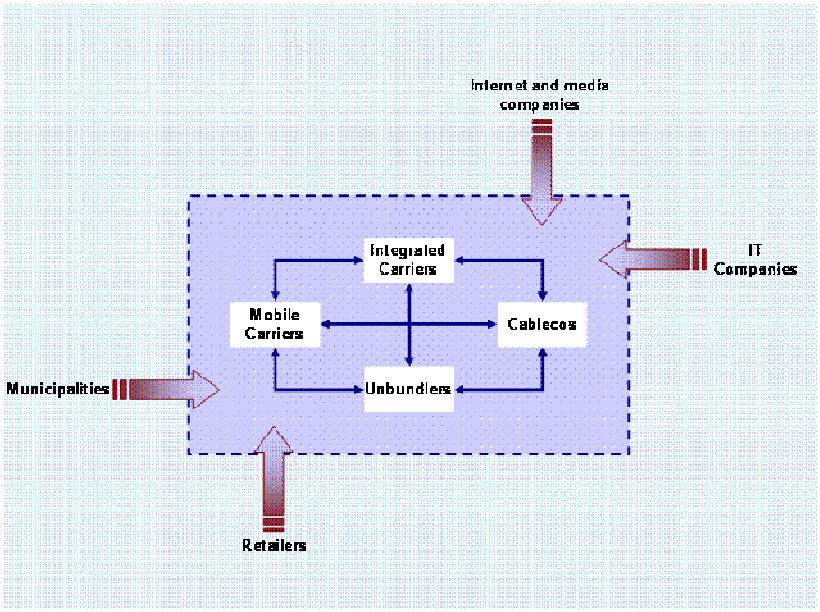
Source: IDATE

2.3. Expanded playing field and co-opetition arena

The combined effects of digitalization and technology convergence craft an entirely new playing field for the telecommunication fields. In the short term, lower service and network-based barriers to entry are blurring the industry's traditional borders and unleashing unprecedented competition across segments. In the longer run, communications' usage and purchases will be increasingly intertwined with those of other digital goods (music, software…), thereby blurring the boundaries between traditionally isolated segments and expanding the addressable market far beyond fixed and mobile telecom services to include segments such as Pay TV, provisioned value added services…

This new playing field of the telecommunications industry has already attracted strong interest from non traditional players of the telecom sector, likely to increase over the next few years, thereby resulting in new coopetition dynamics as shown below.

Figure 53: Expanded coopetition arena



Source: IDATE

More and more players are threatening the telcos from inside …

With VoIP, cablecos and Internet access providers are now addressing the traditional fixed voice market of the incumbents and plan to enter the mobile voice segment as MVNOs (mobile virtual network operators). Making the opposite move, incumbents are pushing TV through their IP pipes, and mobile carriers have introduced mobile TV through 3G. As a major driver in the industry, fixed mobile convergence (FMC) will increasingly drive fixed and mobile carriers to the same battlefield.

Table 10: Telecom operators with operations in fixed and mobile networks with FMC offerings

Country	Integrated operators	Operators with fixed-mobile offerings through MVNO or FVNO or partnerships
Austria	Telekom Austria, DT (acquisition in progress of Telering)	One, UPC, Tele2
Belgium	Belgacom, Mobistar (Orange)	Telenet, Tele2
Denmark	TDC, TeliaSonera, Telenor	
Finland	TeliaSonera, Elisa, Finnet	Tele2
France	France Telecom	Neuf, Free (p)
Germany	DT, Vodafone, Telefonica/O2	Freenet
Italy	Telecom Italia (1), Wind	Fastweb, Vodafone
Japan	NTT, KDDI, Softbank	eAccess (p)
Netherlands	KPN, Orange	Tele2 (Versatel), UPC
Norway	Telenor, TeliaSonera	Tele2
South Korea	KT	
Spain	Telefonica, Orange (avec Amena)	Jazztel (p), ONO (p), DT(p)
Sweden	TeliaSonera, Telenor, Tele2	
Switzerland	Swisscom, TDC	
United Kingdom	Orange, Telefonica/O2	BT, Vodafone (p), NTL (p)
United States	AT&T, Verizon	Comcast (p), Cox (p)

(p) in project; (1) possible evolution with reorganization

Source: IDATE

The **lower barriers to entry** are blurring the traditional boundaries of the industry and numerous insider players have established segments (e.g. cablecos in voice) that were previously out of reach for them. They operate generally with the **same kind of organization and business models as traditional carriers**. But as they want to conquer some part of the new markets, they usually turn to low-end disruptive services and/or aggressive pricing strategies, while trying to protect their original market.

Broadband development in the UK

The broadband market in the UK has reached a very high competitive level with aggressive new entrants in 2006. Carphone Warehouse, a specialized retailer of mobile services, has been the first to launch so-called free broadband and since acquired AOL UK. BSkyB, the leading pay TV platform which acquired network provider Easynet, is touting a similar concept.

"Free broadband" is a DSL access up to 8 Meg with a volume limitation (1 to 5 gigabytes) which is offered if the customer subscribes to unlimited fixed telephony (Talk Talk of Carphone) or pay TV. This offering comes with an 18-month engagement. Carphone has received in early October 625 000 applications in about 6 months.

Orange, which is the only significant integrated player on the UK market, has reacted in May 2006 with a similar product for mobile post-paid subscribers with spending above £30 per month. In the past, Orange UK provided more limited incentives for the same product with reduction of 8£ on a DSL subscription.

With this offering, telcos will be able to promote other solutions by addressing users who still some aspects of DSL (always on, speed) but not all of them (2 GB per month is a high volume of data for people who do not engage in peer-to-peer).

…but also from outside as everybody appears to want to be a telco

This competition comes also from **outside the telecom industry**. After giving up dial-up access, **Internet services giants** have expanded in voice around their softphone and IM and in video around their search engine. Media companies have launched disintermediation and build their own TV portal online, with the same content. **Retailers** are gaining a foothold on the market through the virtual network operator concept (particularly in mobile). **Municipalities** are deploying their own networks as they have done for other utilities, with wireless technologies and even sometimes fibre.

Players from outside the telco world bring **very different ways of doing business** and dispose of specific assets. Internet giants and media companies traditionally rely on other monetization schemes. They generally have a strong financial power that could be used to conquer new markets. With IM, they even invented new ways of communication.

Retailers can leverage their distribution networks to take positions on commodity services. IT vendors have already developed customer relationships with business and want to distribute converging IT-telecom applications. Municipal authorities control most of the land rights and can finance part of the infrastructure by the tax payer. Their primary objective remains to stimulate the local economy rather than build a profitable offering.

With the low barriers and the proliferation of services, other players will continue to appear on the telco playing field. For instance, energy players could try to become the single home utility provider, combining electricity, gas and telecoms.

Players from outside the telco world act as catalysts for changing the rules of the traditional telco game …

So far, new players from outside the traditional telco world have generally **not taken substantial market share**. But their offerings (sustaining or disruptive innovations) can **set new marketing standards** that often become mainstream customer requirements. Traditional pricing of telephony is for instance evolving to a simpler mechanism with the end of the time and distance-based pricing.

When entering those markets, new players might redefine the rules of the game, without necessarily taking some substantial market share. Outside of the telco industry, Gmail (from Google) is a good example, as it has grabbed only a few million users in about 2 years, but has driven major players of the webmail market (Yahoo!, Microsoft) to offer more storage capacity, from the previous modest inbox of 5 MB to more than 1GB currently (which was previously considered as a premium paid offering). They affect the margin level of services of established players, who still have the capacity to react, as they have done with flat rate pricing for voice. This is a general trend which applies to every market.

New rules for international traffic

In Europe, incumbents but also most of the alternative operators (and even some calling cards companies) have long practiced complex pricing schemes for fixed voice with peak and off-peak and a credit time for the call or for the first seconds of the call. Alternative operators differentiate with lower price per minute but higher time credit. Pricing schemes have been simplified over the years for calls to national landlines, especially with the development of unlimited flat rates around VoIP.

But little had changed for international traffic before the development of Skype and other alternative VoIP software providers. Beyond their successful offerings of voice PC-to-PC, they have proposed from 2004 PC-to-Phone offerings with new tariffication principles taking advantage of VoIP capabilities. With VoIP, costs are primarily related to termination, as collection is almost free (and already paid with Internet access) and transportation is very low. This termination is generally done at the national level. Players can then easily propose international rates at the same level of national rates, without credit time and time of day differences. That is what Skype is offering for instance, independently of the call originating place.

Skype share of the market is still very low with less than 3% of its users on a paying formula and less than 1% of global paying international traffic. But its initiative will impose a reaction. Some telcos have already reacted to this attractive value proposition, adding for free international traffic in the unlimited flat rate (Vonage, some ISPs in France…).

2.4. Revenue model transformation

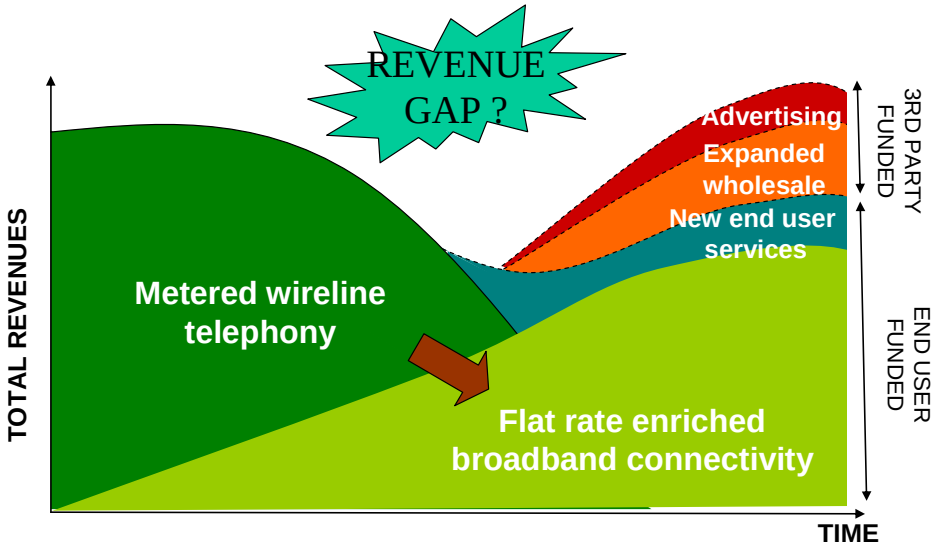
Technology, regulatory and globalisation disruptions are weighing on carriers' traditional revenue model based on distance and/or duration pricing of a scarce resource (network capacity). These pressures and the severe pricing dynamics observed call for an evolution of carriers' revenue model along multiple possible dimensions:

- New pricing schemes for existing services (transition to fixed or flat rate)
- Larger service offering with new end-user services
- Expanded wholesale strategies to rely on 3rd parties to resell (e.g. unbundlers) or use (e.g. application providers) enriched connectivity
- Developing new funding mechanisms (based on advertising) for services

These evolutions will complement rather than supplement the traditional business model which will remain relevant for some market segments.

Nevertheless the barely avoidable **revenue gap** resulting from this revenue model transition raises major strategic questions as to its **duration, magnitude** and as to whether it will result in a **zero, positive or negative sum game** for the industry.

Figure 54: Business model transformation



Source: IDATE

More value for money is the industry's new value proposition

Traditionally, telecom players have been selling new services to existing customers by seeking incremental payment. Increasing ARPU and communications' share of consumers' wallet has long been the industry's mantra for revenue expansion.

Today however, many players are rewriting the rules by maintaining their retail price and adding more and more “free” functionalities to offset single service pricing erosion. If this model has limited built-in growth, except from new customers, it may substantially reduce churn, a key component of carriers' profitability. It can also help stimulate the usage of other paying services.

Giving more value for money

Iliad from France, under its ISP brand Free, has designed a 30 EUR product launched at end 2002 around a proprietary device (Freebox). The retail price has not changed over the years, but numerous new functionalities have been added. At first, it was just DSL access at 512 Kbps. In 2003, Free added telephony with an unlimited flatrate to French landlines and television, while speed was increased in

the 1-2 Mbps range. In 2004, the Freebox was enhanced with WiFi functionalities and increased speeds to 5 Mbps and even 15 Mbps with ADSL2+. In 2005, media center software and VOD were added, with also at the end of the year unlimited calling to 14 countries (mostly Western Europe, USA). In 2006, more international destinations (28 countries) are available, while a new Freebox gives access to HD TV and a PVR and speeds can now go up to 28 Mbps. Line rental is also offered, even for non-unbundling customers. Finally, Free has recently announced it will offer some of its urban customers a 50 to 100Mbps fiber access at the same price point.

Unlimited flat rate is already almost generalized for voice (VoIP) and Internet connectivity on fixed networks. It is being developed progressively on mobile networks for voice (restriction to on-net or to week-ends and evenings) and for data. This transition to flat rate has been facilitated by both the huge capacity made available on networks by recent technology improvements and by the aggressive drive of some players seeking to build market share. While the long term growth limitations that such models induce by design are likely to result at some point in a competitive shake-out for smaller players, the model is likely to prevail in the long term for the remaining players.

Unlimited is spreading to new territories

Fixed and mobile operators have recently being securing their continued growth by rolling out unlimited flat rates. It began with local calling and fixed dial-up access in the US (unmetered local rate), which allowed the country to become the number one in the world in Internet access. These offers next made their way to Europe under the FRIACO model (unlimited interconnection), then became increasingly ubiquitous with broadband, and particularly DSL, as offers that carried limits on data volume gradually disappeared.

In the mobile world, KDDI pioneered unlimited data plans, which gradually became a commonplace in Japan (there are still some restrictions, the offerings being accessible only via certain voice flat rate offers). They are starting to be introduced in Europe (Bouygues Telecom in France) and in the US now as well (US Cellular, Cingular), even if these offers are not completely unlimited outside of browsing and fair use policy). Some carriers have even unlimited flat rates around some applications (email for Movistar, IM for MVNO Ten)

Table 11: Examples of unlimited data plans

Wireless carrier	Data Plan
Bouygues Telecom (France)	Unlimited i-mode for EUR 10 + unlimited imail (free)
KDDI (Japan)	Unlimited EZ Web
NTT DoCoMo (Japan)	Unlimited i-mode
T-Mobile (UK, Germany)	Unlimited Web'n'walk
Cingular (USA)	Media NET unlimited
US Cellular (USA)	Unlimited easy edge for USD 10

Source: IDATE

While offering unlimited flat rates does imply certain risks for operators, it has gradually become a standard practice in a great many countries where competition is fierce. And it naturally appeals to users.

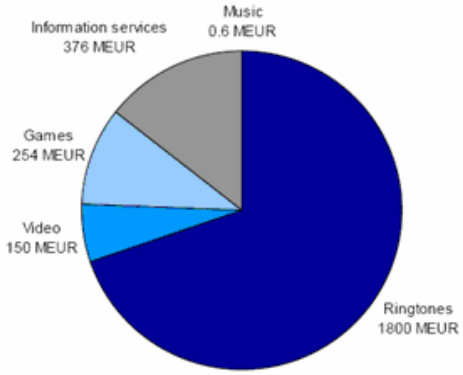
Operators are seeking to monetize digital services going through their networks…

One of the assets of a telecom player is **its billing capacity**, as it has already a financial relationship with customers. As one of the major **distribution channels** for digital (non-telco) services and products, carriers have already taken initiatives to operate as kiosks or resellers of contents and services, and even of products sometimes. In doing so, they leverage their strong proximity with the

consumer through devices (mobile phone, set-top box) and portals/home pages, especially for mobile (bypassing is easier for fixed). As intermediates, they get a share of the sale.

Telcos can in this way monetize their traffic on the valuation of the service itself and not on a traffic base. Some of the best known models implemented so far include personalization (ringtones, avatars) and intermediation with voice value added services.

Figure 55: The market for mobile phone content in Western Europe, 2004

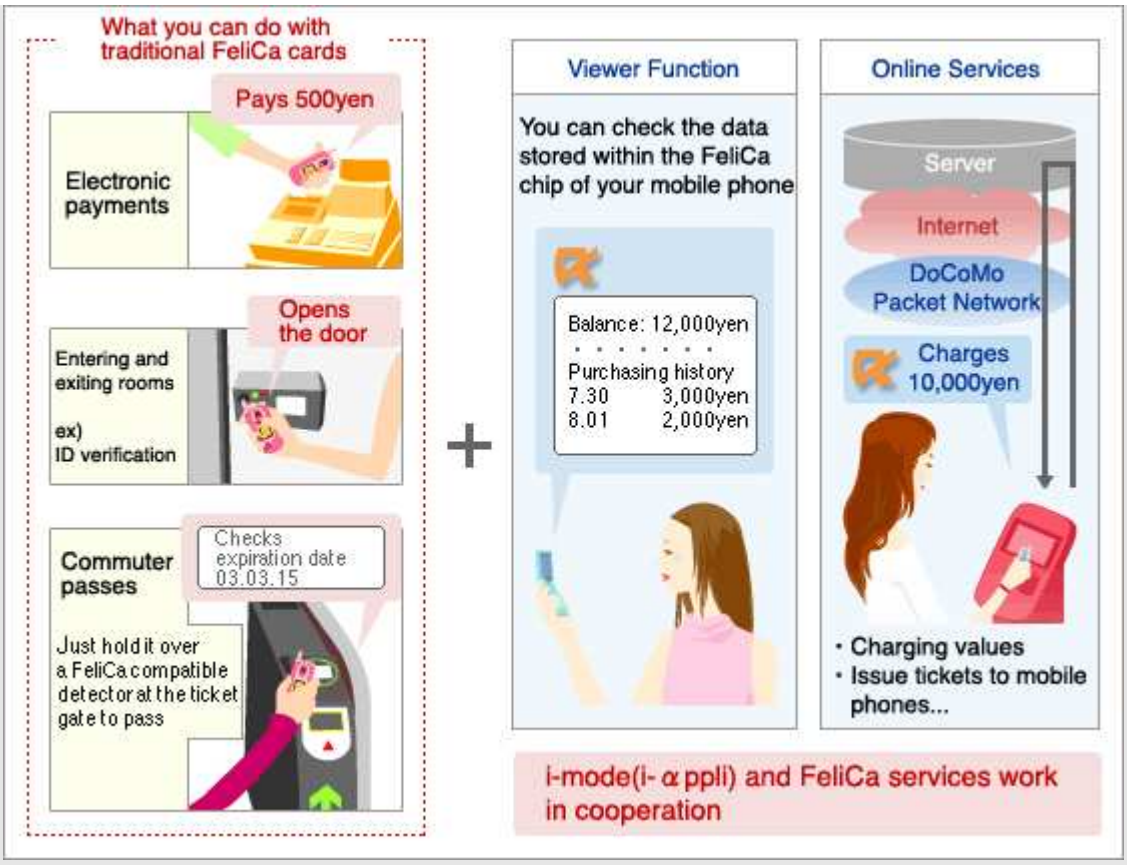


Source: EITO

This is the business model of an **aggregator of services and products** (mainly digital), which takes advantage from its strong presence on the customer screen to distribute almost any kind of services, even those with no direct link to telecom (banking, security, lifestyle services).

Expanding outside the telecom business

NTT DoCoMo, is looking to credit card and payment services to gain competitive edge in a cut-throat market in which its rivals are following suit. Several DoCoMo handsets have carried contactless prepaid wallets (Felica, which can also provide other functionalities) since last year and now support credit card applications. By end June 2006, DoCoMo had more than 13 million subscribers to its core mobile wallet service, launched in mid 2004. Its main competitors have also engaged on this mobile wallet activity.



Before launching a full mobile credit card with DCMX, DoCoMo launched in December 2005 iD credit payment service. The service enables the user to shop or withdraw cash by simply holding up the user's "Osaifu-Keitai" over a compatible reader/writer. This service is based on post-payment, and may be used conveniently in a wider range of applications. To promote the iD technology, DoCoMo invested 98 billion yen in Sumitomo Mitsui Card Co. in April 2005. Sumitomo Mitsui began offering a contactless service in December. In March 2006, DoCoMo also invested 1 billion yen in UC Card Co., a Mizuho Bank affiliate.

DCMX is a consumer credit service via iD, DoCoMo's brand and platform for mobile credit cards, which started from April 2006. DoCoMo offers the service as an issuer. DCMX mini, one of the DCMX service line-up makes it simpler to purchase by waving one's phone in front of a dedicated iD reader/writer in a store, with no signature required. Payments will be billed together with the user's monthly DoCoMo phone charges. Customers are able to start using the service immediately after applying through i-mode.

About 25,000 shops and restaurants already accept payments in the iD format, including Yodobashi Camera and Bic Camera electronics retailers and Tsutaya rental video stores. The company has set a target of 100,000 outlets by the end of 2006 and is focusing on retail sectors where credit cards are least used. The company has enlisted support from three major convenience store chains -Lawson Inc., FamilyMart Co. and am/pm Japan Co.

NTT DoCoMo expects its new mobile credit card service to deliver revenues in the form of merchant transaction fees and ‘brand’ fees on each transaction by third-party credit card companies that use the platform. Research (by DoCoMo) shows that if Japan’s credit card penetration (credit cards facilitated just 9 per cent of payments in Japan in 2003) did grow to parallel that in the US, credit card payments would grow by about 50 trillion yen, or almost USD 423 billion. If a 2 per cent charge was levied for DoCoMo’s mobile credit card service, commission revenues would result of about 1 trillion yen, or over USD 8 billion. DoCoMo won’t be alone as other banks (JCB) or other players (KDDI) are also entering the market. But it has also advantages with almost instant credit acceptation with its billing system and access to 12-year old people.

Several implementations of this model are possible: the aggregator can buy "white" or "grey" brand resources and offer its own-branded service, as it does for instance when it specifies some devices (generally subsidized). It can also propose 3rd party branded as a distributor which takes its

commission on any sale around a kiosk. This can bring significant additional revenues with limited investments, as they can mutualise their telco and reseller operations.

But operators will also have to compete with other distribution channels in which services and contents are sometimes cheaper or even free. The mobile market is becoming more open as the devices get non-GSM connectivity (USB, Bluetooth, WiFi), allowing alternative (and even free) download of contents and services.

Operators are also seeking some compensation from application providers for using their networks…

Monetization could also come from the application provider for enhanced connectivity. To distribute some of the applications requiring extra functionalities (low latency, reserved bandwidth, priority for isochronous media for instance…), application providers could be charged. The user may foot the bill in the end for those extras, but would pay them to the service provider and not to the telco. This is an indirect sale or distribution model.

This business model represents an expanded view of the traditional wholesale approach, which so far has essentially been thought of in terms of reselling connectivity with limited repackaging. It is critical to protect and sustain network-based service providers' business model over the long term. Network operators should be able to leverage their network infrastructure with enhanced network intelligence mechanisms that will allow them to offer various level of service level agreement for their customers and business partners.

With this B2B2C model, numerous application providers could be seen as distributors who would want to package their applications with connectivity and some services. For example, MVNO activities (for retailers or other players) are a possible application of this model. Other classical examples involve IT vendors developing information systems requiring some connectivity like real-time supply chain.

With wholesale, gross margins are generally lower and players lose the "control" or the "ownership" of the customer. But it is also a cost-efficient way to fill networks.

Wholesaling mobile data

Outside of the MVNO model, expanded wholesale has just appeared on the radar of telcos. Cellular operators are looking at it in Europe for non-SMS data, which is still far from expectations. Many customers have been reluctant to use it because of the price, which is perceived as being high. Wholesale data is important because it takes (or rather hides) away the "unknown" in the user's bill - the cost of the data transfer.

mBlox, the world's largest mobile transaction network, and New-Visions, a mobile specialist focused on providing marketing solutions to the entertainment industry, have launched a the end of March 2006 the first off-portal music track download services where consumers pay 'one price' to download music with no additional operator data charges. The services, which are launching later this week, are made possible through mBlox's wholesale data service and are being provided by music labels Ministry of Sound (MoS) and V2.

The operators' data charges for downloading content are often cited as the reason for the slow uptake of rich media services on mobile. Currently consumers are not only paying for the value of the content via premium billing but also for the cost of the data traffic to deliver the content. Consequently, songs that are approximately 1MB in size can cost consumers the £1.50 charge for the song plus an additional £8 in data charges (data charges may vary). These extra charges make the cost of downloading to mobile unacceptably high and can put consumers off downloading music or other media content.

mBlox worked closely with Vodafone to develop an innovative wholesale data model which mBlox can now offer to content providers like New-Visions. These new data tariffs are low enough to be bundled with the cost of the song and provide the consumer with a single cost for both the content and the download. This means consumers on Vodafone buying from MoS or V2's WAP site, created by New-Visions, will not incur any data charges on their mobile phone bill.

Online advertising: the new eldorado ?

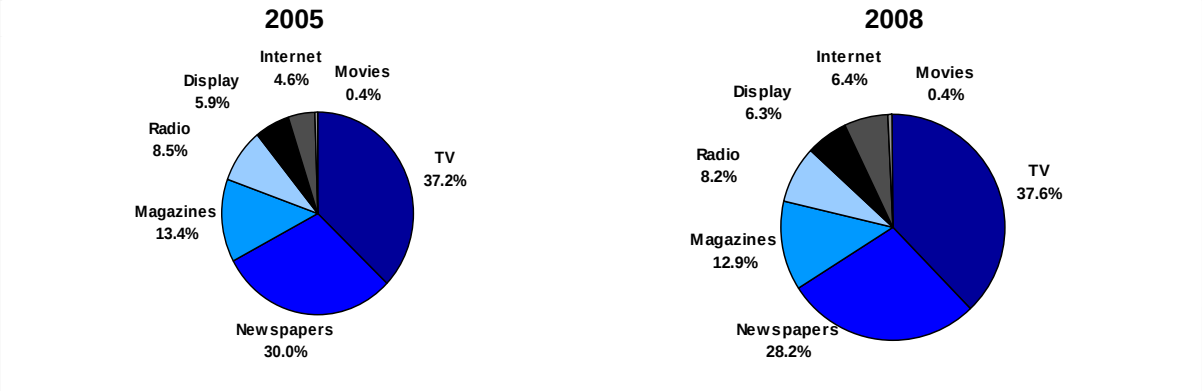
With a tremendous growth over the last years, advertising (especially online) is again on the radar of telcos. In this model, the paying party is the advertiser. Advertisement-funded models are very popular

on Internet services (webmail, instant messaging, blog…) and have attracted the attention of almost every player from the extended telco world (free music with Napster, free VOD with ABC…). Many players are also already working with Internet giants for search engine or display on their portals. The revenue generated can sometimes reach 10% of the Internet activities. Mobile operators are also looking to this opportunity.

Developments of the advertising market

Advertising spending worldwide at the end of 2005 totalled around 400 billion USD, all media combined. After a slight dip in 2005, the market's annual growth rate is expected to reach roughly 6%, starting in 2006. The vast majority of advertisers are now developing cross-media strategies. Although TV is still the medium of choice (its share of investments holding steady at around 37%), the Internet's share of total advertising spending has been growing steadily from year to year, to the detriment of the printed press (newspapers and magazines) whose share of advertising income is on a downwards slide. The Internet accounted for 4.6% of total advertising spending worldwide in 2005, a share which is expected to reach 6.4% in 2008. Online advertising spending is forecast to increase by 65% between 2005 and 2008, with press and radio's revenue increase during that time remaining below 15%.

Figure 56: The different media's share of advertising spending worldwide in 2005 and 2008

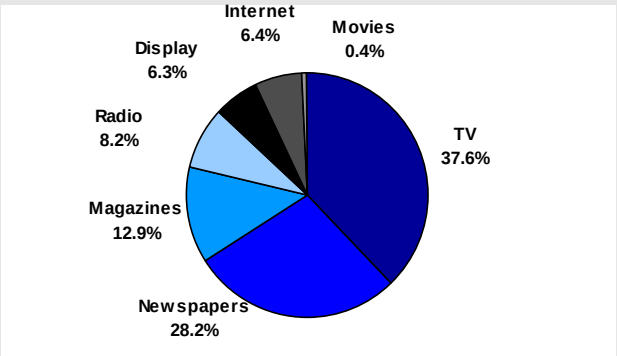


Source: Zenith Optimedia

The (fixed, and especially the mobile) web's share of advertising remains rather modest compared to the time that users spend online, and given the web's advantage of enabling interactivity. The fixed Internet is the most popular medium among gamers, who are also making increasing use of the mobile web.

The online advertising market is therefore benefiting from the growth of the Internet, but it is also relying for its growth on numerous initiatives. The web's growing ubiquity have spurred the medium's creativity and fostered the growing user of new value-added formats like search with Google.

Figure 57: Weight of the different online advertising formats in ad revenue for the H1 2005 in the US



Source: Interactive Advertising Bureau

Classic banner ads are losing steam, being pushed out by rich media formats which have proven more effective. New initiatives are now focused on video (around platforms like YouTube), click-to-call or local search with mapping tools integrating Yellow Pages. The online advertising market is gradually evolving towards a streamlined offering (rates, formats, packages…), and towards new rate policies such as per visitor billing (per visit, per unique visitor only). Major Internet players are also working on targeting and contextualisation tools.

Given the relative sizes of the advertising and telecom service markets, advertising cannot finance infrastructure-based services (broadband access, mobile access), as it generates less than 5USD/month/user. While it provides opportunities to finance free extra functionalities or partly subsidize their access offerings, it clearly cannot substitute other forms of revenues.

Some telcos have already experience in this market with Yellow Pages and could launch their own experiment. Larger ones may have the critical size to operate on their own. But the majority may turn to specialized partners, as advertising is also a scaling business, in which announcers favour "networks" with most important audience, and sometimes largest scope of covered media. There are limited synergies for a telco to operate this business, as resources, processes and values (ways of making money) are very different.

Telcos have nonetheless some assets that could be useful in the context of new forms and formats of publicity, which will value more in the future precise targeting and contextualization. They could provide enhanced profiling through the data collected at subscription and from the traffic. A prerequisite to any successful advertising model for telcos will be to build a consistent media strategy for which new media-oriented services such as mobile TV and social networking will serve as "learning" channels.

2.5. Deconstruction of the value chain

Traditional telecom skills encompass the management of a network infrastructure, the management of a portfolio of products and services and the management of the customer relationship through marketing operations and targeting. Those skills correspond to three very different activities, which do not involve the same resources and processes and have very different strategic imperatives.

The multiple technology, globalisation and regulation forces driving the industry are substantially modifying the interaction costs between these three activities, paving the way for turbulence in the vertically integrated models of the industry and creating opportunities for specialised players.

Table 12: Main functions of a telco

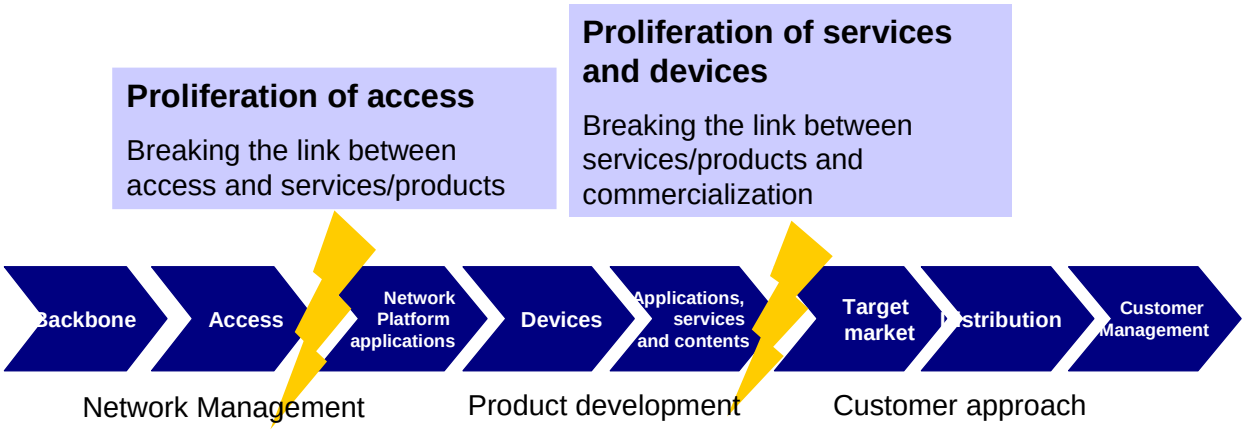
	Network infrastructure	Products and services	Customer approach
Main resources	Infrastructure (operations and R&D)	Application R&D, brand	Point of sales (even digital), billing capacity, CRM
Main process	Cost efficiency through long-term developments and large investments in fixed assets	Creativity and innovation (technological or marketing), mostly mid-term	Sales efficiency around short-term operations (sales rotation, promotions, targeting)
Strategic imperatives	Optimizing network use (contention ratio) and network operations	Designing products and services (cheap and/or with new functionalities)	Optimizing distribution (space occupation) and customer relationships

Source: IDATE

In the traditional carrier model, these three functions were highly integrated, as operators provided only integrated telecom services on dedicated, natural monopoly infrastructures to the mass market. The proliferation of broadband access networks and services, combined with a new playing field and new business models, imply potential fragmentation of the value chain through substantial decline in interaction costs (production and distribution). This leads to de-verticalization which can be implemented at three functional levels: network, product and customer.

As de-verticalization unfolds, supply-chain partners focused on particular aspects of the value chain can emerge. Some players can build and focus only on their strengths in one or two functions to develop and distribute a complete solution. They will let other players on the value chain operate the activities on which they are not efficient enough (technically or economically) and develop greater economies of scale and superior skills than their in-house counterparts on the other activities.

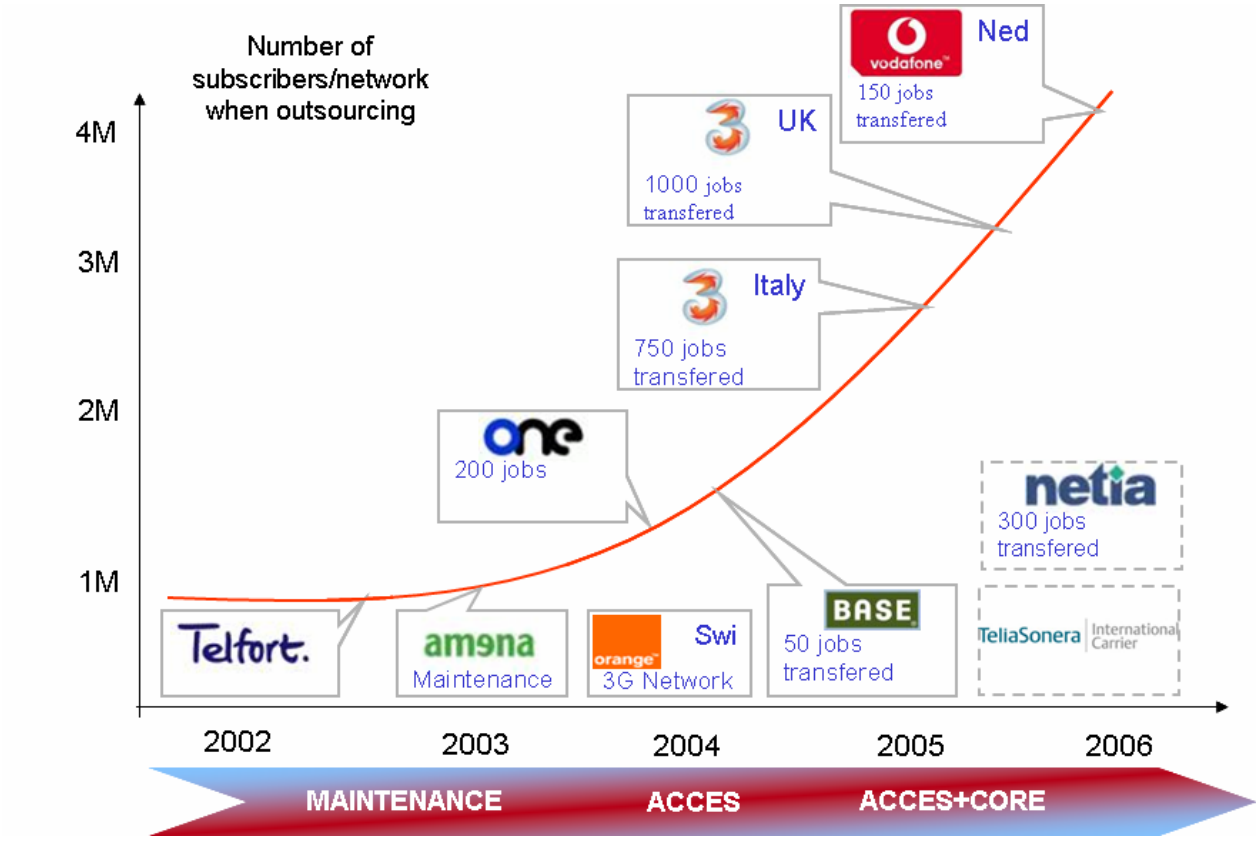
Figure 58: Deconstruction of the value chain



Source: IDATE

This deverticalization process is already producing visible effects in the European industry: an increasing number of operators (particularly mobile) decide to outsource part or all of their network infrastructure. On the other hand, some carriers are increasingly shifting towards a wholesale strategy by actively promoting their virtual network operator program.

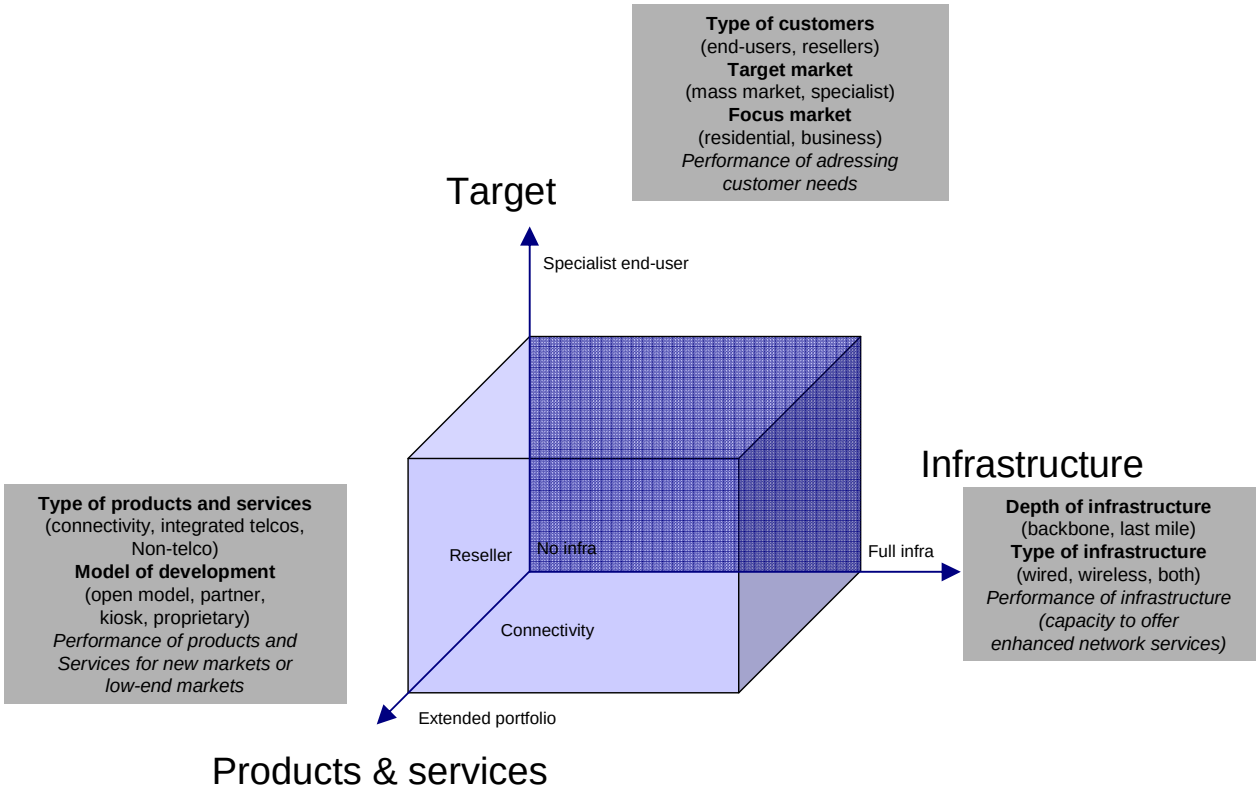
Figure 59: Network outsourcing initiatives



Source: IDATE

We expect telecom operators to increasingly reconsider their strategic positioning along the three dimensions (infrastructure, service and customer). In particular, vertically integrated operators that decide to remain so rather than tap the expertise of suppliers will need to be best-in-class in all aspects of the value chain, or be sure that the difference between their internal capabilities and the best available on the marketplace are less than the transaction costs related to external procurement.

Figure 60: Positioning elements of a telco strategy



Source: IDATE

SECTION 3: Three possible futures for telecoms in Europe in 2015

Drawing upon the analysis carried out in the two previous sections about the current situation of the European telecommunications industry, the major forces shaping its future and their expected impacts, we now present three possible future scenarios for European telecoms in 2015.

1. Scenario approach

"What could the telecoms industry look like in Europe in 2015?" Constructing plausible answers to this question required a staged approach that we structured in 5 phases.

- **Phase 1: Identifying the possible variables influencing the future of European telecoms**

  The purpose of this stage was to identify the various possible variables influencing the future of the industry. To do so, an internal IDATE working group produced 30 variables based on the four clusters of driving forces and their possible impacts identified and discussed in section 2. An enlarged group comprising industry experts then screened the proposed variables and regrouped or excluded 9 of them deemed secondary or less relevant.

- **Phase 2: Evaluating the most important variables to be used in the scenarios**

  At this stage we aimed to select the five or six variables deemed to most impact the industry's future. To achieve this, we submitted a questionnaire to rank the impact degree of the 21 remaining variables to a set of 35 representatives from the regulation, corporate strategy and marketing divisions of leading European carriers and equipment vendors. The results from the questionnaire showed that 5 of the 21 variables clearly stood out in terms of their high expected impact on the future of the industry. These were namely:

  - Fixed and mobile broadband take-up and availability across urban and rural areas
  - Addressable market opportunity for carriers resulting from "over the top" competition of Internet-based application providers
  - Regulatory orientation
  - Operators' revenue model diversification
  - Operators' infrastructure investment intensity

- **Phase 3: Defining the scenario framework.**

  For each of the five key variables, a certain number of possible "states" (of circumstances or configurations) were envisaged to review the range of possibilities and evaluate the degree of interdependence among them.

  Using a prospective scenario-building methodology tool adapted from Michel Godet and drawing upon the analysis made in section 2, we positioned these five variables according to their degree of influence and dependency relative to each other and classified them as **determining critical and resulting variables** (i.e. as inputs, outputs and pivots for the system).

  This work allowed us to start deriving three plausible and differentiated scenarios combining distinct, yet mutually compatible, "values" for each of the five variables.

- **Phase 4: Enriching the scenarios**

  In this last phase, the three scenarios were developed and enriched through **interactions** with several experts to include likely events and stakeholders' strategies that could contribute to reaching each of the three outcomes, and **financial modelling** to quantify the addressable market and value migration impacts compared to the situation in 2005.

2. A few "certainties" about the future

Before taking a look into the future, we need to examine the "backdrop" or overall environment in which our future scenarios will occur. To describe this environment, we have looked at the following:

- A series of determining factors exogenous to the European telecoms sector that will "almost certainly occur" and for which we have as much as possible adopted a median view
- The "known" general medium to long term aims of the main players concerned by the development of the European telecoms sector to the year 2015

In order to build our scenarios, we have identified a number of underlying drivers not influenced by the telecom sector but certainly impacting it for which we have adopted a "median" outcome that we assume to be common across all scenarios.

A stabilized European Union with 27 members

We have considered that the European Union enlargement would mark a pause over the next decade with an emphasis on consolidation as the Union focuses on increasing cooperation and harmonization between the 27 member states (including Bulgaria and Romania) .

A moderately increasing and significantly ageing population

The European population should increase moderately by 2015. According to Eurostat, the EU25 will see its population grow from 457 to 467 million while Europe-5 will grow from 302m to 310m.

Simultaneously, the European population ageing process will start to be visible with 19% of the EU 25 population aged 65 and older in 2015 compared to 16% in 2005.

A modest economic growth within the Euro zone

The OECD recently made a long-term economic forecast for the Euro zone. In its analysis[1], the OECD gave annual growth forecasts for the main macro-economic indicators (Employment, Work Productivity, GDP and Population) up to the year 2020. According to the OECD, if economic policies remain unchanged and taking into account population ageing, the annual growth in GDP for the Euro zone should slow down over the next decade before stabilising at around 1% per year in 2020.

Table 13: Trends for the main macro-economic indicators for the Euro zone up to the year 2015

	Average annual growth rate (%)			
	1995-00	2000-05	2005-10	2010-15
Employment	0.7	0.8	0.3	-0.3
Work productivity	1.2	1.2	1.6	1.6
GDP	2.0	2.0	1.9	1.3
Population	0.3	0.3	0.2	0.1
GDP per habitant	1.8	1.6	1.7	1.2

Source: OCDE

In this general context, with no structural reform to reinforce growth prospects and re-launch the process for economic convergence with the other OECD countries, which are enjoying better results (the United States in particular), the performance of the main countries in the Euro zone will be as follows:

[1] 2005 Economic Survey of the Euro Zone

Table 14: Europe-5 GDP trends, 1995-2015

	Average annual growth rate (%)			
	1995-00	2000-05	2005-10	20010-15
United Kingdom	2.8	2.5	2.5	2.2
Germany	1.3	1.4	1.6	1.4
France	2.3	2.1	2.0	1.5
Italy	1.4	1.2	1.2	0.9
Spain	3.0	3.0	2.9	1.5

Source: OCDE

Players strategies

Below we present the main strategic objectives pursued by each category of service providers covered within our research scope.

Table 15: Medium to long term rationale and aims of major operator profiles

Player profile	Strategic rationale	Strategic priorities
Integrated carriers	Playing the size/scale advantage all over the place	• Build a complete and complementary portfolio of access technologies • Expand internationally (in both fixed and mobile) to benefit from foreign growth and/or scale • Provide innovative technological offerings around FMC with cost synergies • Promote proprietary converged services and contents • Preserve market share (business segments in particular) • When strongly challenged on fixed : defend line loss (naked DSL)
Mobile carriers	Go for mobile-only, even for fixed usages	• Push substitution of fixed voice, through large bundles (or even flat rate) and pricing innovation • Develop voice traffic (or substitutes like video) with new pricing plans (around on-net) • Enhance network to offer higher speed and substitution of fixed Internet access • Expand internationally (in mobile only) to benefit from foreign growth and scale • Keep control of the mobile device • Use cheaper complementary technologies to provide nomadic solutions (DVB-T, DVB-H, WiFi) • Increase revenue beyond voice with kiosk model and mobile Internet (data, TV, content, …) • Develop wholesale strategies to fill the networks (MVNO, BWA), especially for challengers or target niches • Propose commodity fixed connectivity as a complement to mobile in static situations
Wireline carriers with owning a last mile network	Expand beyond original market to defend it	• Promote bundles on their existing customer base (triple play) to defend/limit line loss • Improve technical features of their offerings with new IP infrastructure • Enhance the device with new features • Seek position in mobile for voice FMC bundle (MVNO) • Extend fixed national coverage by consolidation (no new development) • For challengers : open their network to wholesale activities
Unbundled carriers with no last mile	Conquer urban markets	• Engage in price war, especially on voice to attract/conquer new customers • Adopt an optimized cost structure to sustain the low price offering • Promote connectivity bundles around fixed (triple play) • Extend footprint on national territory, but with a limited target (high density/rich/urban areas) • Buy or more often build a last mile IP-based network (wired with fiber or wireless with BWA) in dense urban areas • Take position on mobility for both voice and data (BWA, MVNO)
Virtual network operators	Develop a marketing approach around under-served markets	• Specialize on marketing and target under-served niches with specific offerings • Offer innovative and disruptive IT services from specialized third parties to differentiate • Adopt a low cost structure to profitably serve the less penetrated markets

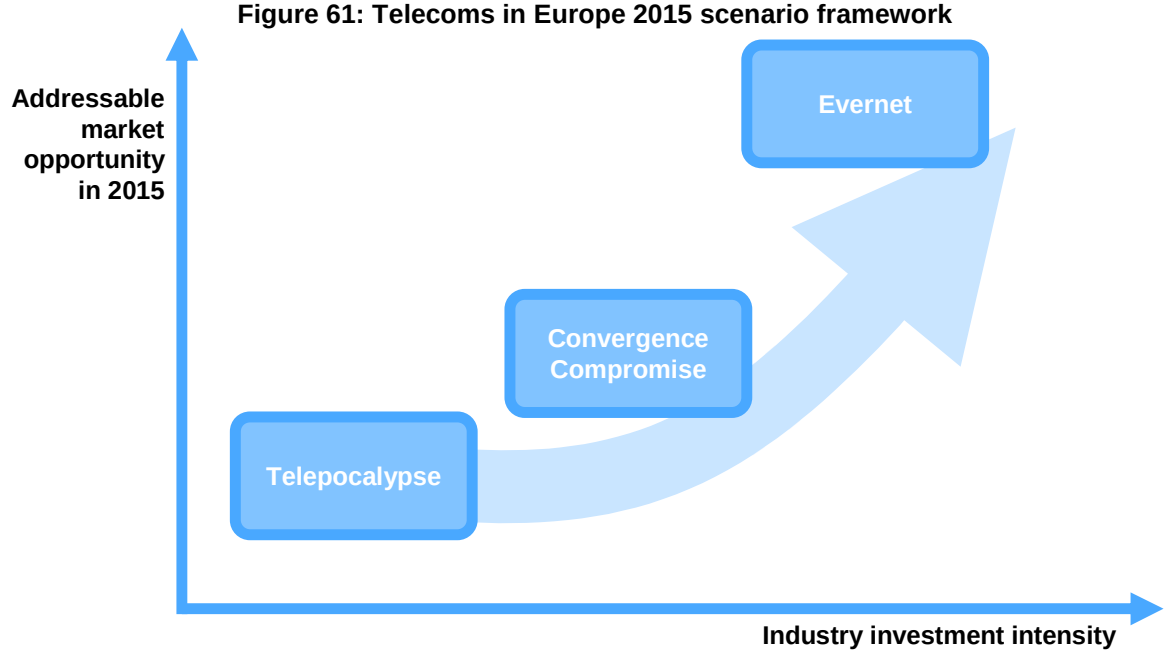
Source: IDATE

3. Scenarios overview

Taking into account the forces that will shape the future of the industry and their expected impacts, analyzed in section 2 as well as the five key variables identified during our survey, we have built three scenarios describing plausible outcomes for the European telecoms industry by the year 2015. The scenarios were not constructed with a view of establishing most probable pictures of the future or ranking their likelihood of occurrence but rather with a deliberate objective of presenting contrasted industry outcomes intended to both **broadly cover the multi-dimensional space of plausible futures** and stimulate discussion around the **role and possible impact of the critical and determining variables** identified during our survey.

Each of the three scenarios was built upon a unique set of configurations (or "values") for each of the five key variables (see Figure 2) as well as on a series of specific events and trends that would contribute to shaping each set of configurations. All scenarios fall within the overall background environment we previously discussed. To facilitate the scenarios' presentation and discussion, we have established a framework articulated around the two most "visible" variables identified during our survey, namely addressable market opportunity (resulting from competition intensity of over the top providers) and the industry investment intensity in infrastructure.

Figure 61: Telecoms in Europe 2015 scenario framework



Source: IDATE

Our three scenarios can essentially be characterized as trap, intermediate and favourable outcomes for the European telecommunications industry in 2015. Because they postulate a strong correlation between the addressable service market opportunity size and the industry's investment intensity level, they illustrate the perspectives available to both service providers and equipment vendors.

While these scenarios are strongly influenced by market-driven exogenous drivers, they also articulate the regulatory orientation's central role in shaping competition dynamics (at both the service and infrastructure levels), and subsequently influencing player strategies and the potential outcome for the European telecommunications industry as a whole.

Figure 62: Variable configurations for future scenarios

Major Variables	Telepocalypse	Convergence Compromise	Evernet
Fixed and mobile broadband take-up and availability across urban and rural areas	Modestly increasing in a highly sporadic fashion and dependent on local municipalities' initiatives	Substantially increasing in dense urban areas both on fixed and mobile through some infrastructure competition. Moderately increasing in rural areas.	Pervasive across urban and rural areas. Broadband is the new fabric of society
Addressable market opportunity for carriers resulting from "over the top" competition of Internet-based application providers	Declining as connectivity subscription increase barely compensates broad service revenue wipe-out due to free-online based alternatives	Moderately growing with converged fixed/mobile applications creating new service and wholesale revenue streams on top of connectivity subscription	Expanding as new applications and services create significant business opportunities for application and infrastructure providers
Regulation orientation	Regulatory uncertainty regarding treatment of new infrastructure freezes investment initiatives while strong net neutrality stance exacerbates internet based service competition	Regulation continues to encourage retail based competition through unbundling of monopoly infrastructures across most territories while favouring infrastructure-based competition in dense urban areas and facilitating European harmonisation, traffic prioritization and commercial freedom for converged services	Regulation promotes facilities-based competition and new infrastructure investments in wireline and mobile networks while public policy fosters cross-industry collaboration on new productivity applications
Operators' revenue source and model diversification	Low. Revenues essentially derived from connectivity subscription	Intermediate. Convergent services produce new revenue sources but model remains largely user-centred	High. Significant new revenue streams from 3rd party application providers for access to enriched connectivity
Operators' infrastructure investment intensity	Low	Intermediate.	High

Source: IDATE

To further stimulate discussion, we have modelled what the addressable service and market equipment sizes could look like under each of the scenarios in the year 2015 for the 5 largest European markets (Europe 5). Consistent with one of the major impacts identified in section 2 and with our scenario elaboration, we used for our modelling an expanded definition of the addressable market, beyond traditional telecom services, to reflect players' newly enabled capacity to enter new segments (through technology convergence) and to fund services through new sources (advertising, revenue-sharing). We thus considered the following segments for the services market:

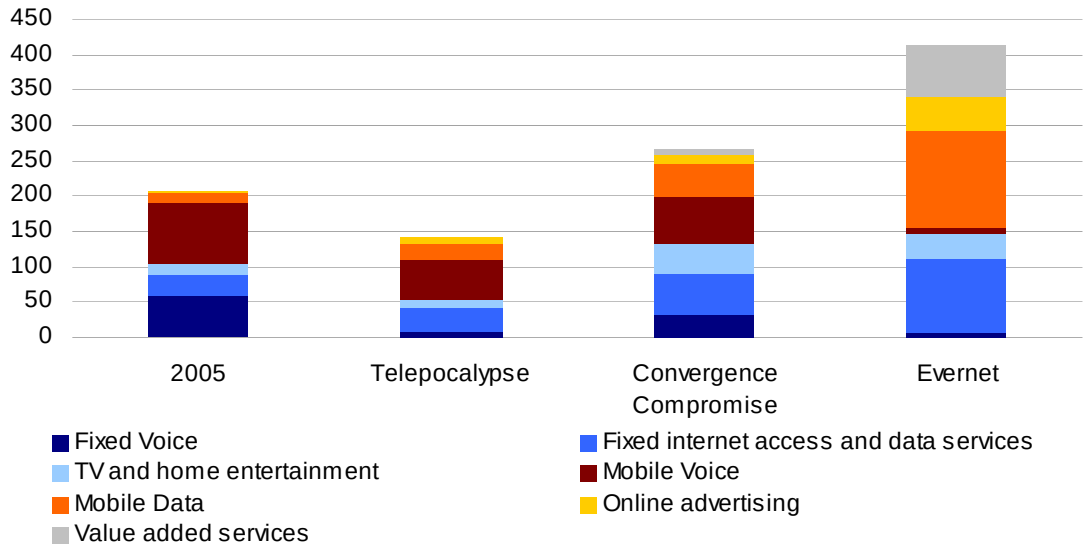
- Fixed and mobile voice and data telecom services including
- Pay TV and home entertainment from home games
- Online advertising
- Provisioned IT and value added services (e.g. hosted applications)

For the equipment market, we considered the network infrastructure and end-user equipment (fixed and mobile handsets, CPEs…) segments.

For each of the service and equipment markets and their sub-segments, we made a number of financial assumptions relating to the average service revenue per user that could be generated (for fixed and mobile voice and data as well as Pay TV), the investment intensity of operators (measured as capex percentage of service revenues), the development of online advertising and hosted IT services.

Figure 63: Compared Europe-5 addressable service market size in 2005 and in 2015 per scenario

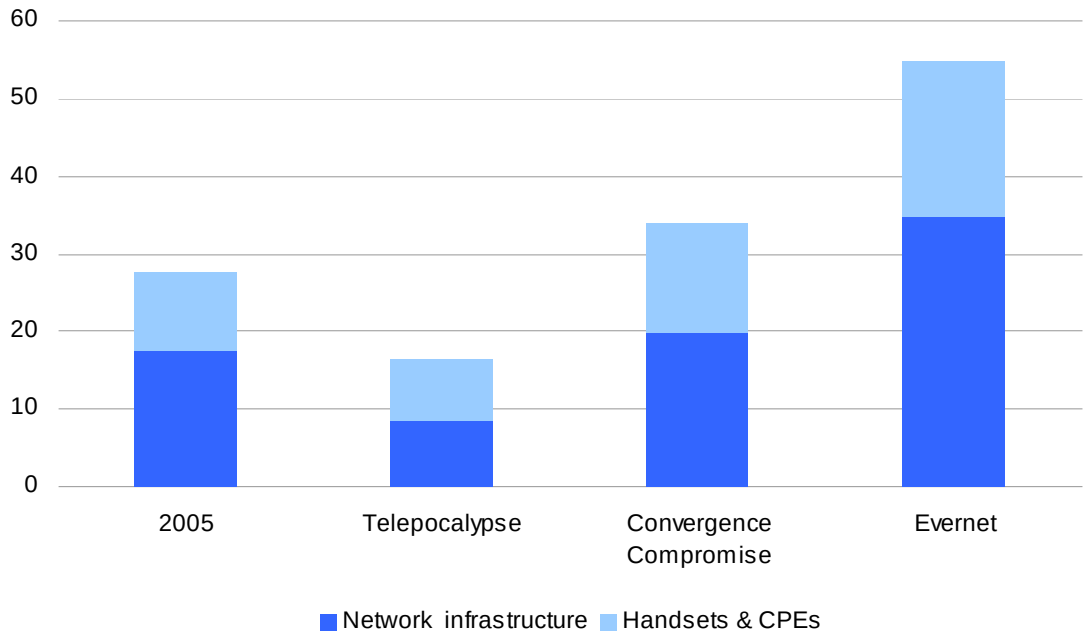
In EUR billions (2006)



Source: IDATE

Figure 64: Compared Europe-5 addressable equipment market size in 2005 and in 2015 per scenario

In EUR billions (2006)



Source: IDATE

4. Presentation of the future scenarios

4.1. Telepocalypse

Overview

- Online advertising-funded service proliferation has attacked most fixed and mobile service revenue sources of operators that have not been matched by a corresponding increase in connectivity revenues
- High broadband availability has modestly improved and is sporadic as fibre and HSDPA deployments remain concentrated in the densest urban areas, essentially targeting the corporate market, with some isolated initiatives of wealthy municipalities.
- The contracting industry-wide revenue level triggers a competitive shake-out and transforms telecoms in a utilities-like industry with only a handful of large private cost-optimized operators and state-sponsored organizations surviving
- This scenario has resulted from a "Mexican standoff" situation between carriers adopting a wait-and-see attitude and delaying or cancelling new network investments while the regulatory framework enforced a strict access at cost policy for new infrastructures and kept a net neutrality stance in favour of application-based competition

The situation of the European telecom market in 2015

Services

Under the massive adoption of alternative electronic communications tools (e-mail, instant messaging and peer to peer VoIP) that now account for more than 90% of person to person communications volumes, traditional voice (fixed and mobile) has become a feature (rather than a product) that the telecoms industry no longer builds its value upon. Only marginal end-user revenues are still derived from mobile services such as SMS and roaming that have largely been displaced by unregulated over the top alternatives (e.g. multiple local SIP numbers, ad-funded SMS…).

Online service hyper-fragmentation has prevailed with consumers accessing millions of niche or short-lived, "free" (advertising-funded) online services designed by creative small or one-person shops from around the world. The fragmentation has also been fuelled by the componentization of normalized web technologies ("web services") that has paved the way for a buoyant edge innovation with infinite "mash-ups" (component combinations) enabling close-to-individualization of the service used by consumers.

The traditional pay TV segment has been less impacted than legacy telecom services by the online service hyper-fragmentation thanks to the large content owners aggressively defending copyrights and convincing operators to actively monitor and block non copyright traffic through deep packet inspection techniques. Nevertheless, the traditional TV viewing experience has not evolved substantially, simply going high definition.

Access

Broadband access availability and take-up improve modestly and in a highly sporadic fashion. The most competitive operators build targeted fibre to the premises infrastructure in the competitive dense urban areas to primarily target the most profitable customer bases (small and medium enterprises as well as large corporations). Households situated within these coverage zones are proposed VDSL access but the dominant technology for residential wireline broadband access remains ADSL2+.

Mobile broadband coverage is largely based on HSDPA with indoor availability in downtown areas. UMTS has displaced GSM as the dominant cellular technology elsewhere because of its improved capacity/cost ratio over 2G technologies in the 900Mhz band.

Main events and trends over the 2005-2015 period

Wireline

Wireline carriers and cable operators have faced accelerating access line loss that peaked at 15% per annum in some countries over the 2007-2010 period. Despite VoIP generalization and aggressive price cuts (with flat rate plans reaching 100% of the subscribers by the end of 2008), they have not been able to curb service revenue erosion as over-the-top internet competition for most legacy services exacerbated in particular for voice telephony. They have also failed to gain shareholders' approval for funding their nationwide broadband access network upgrade plans due to the uncertainties concerning the unbundling regime that would prevail for competitive access to these new infrastructures as well as aggressive regulatory stances on items such as naked DSL that further increase financial markets' concerns about the sector's return on capital employed.

By 2012, the massive service revenue erosion, not compensated by any meaningful broadband access revenue increase, has put smaller wireline operators out of business. Larger integrated operators' merger attempts are greeted with lukewarm feelings by the financial community ("two wrongs don't make one right"), strengthening their focus on cost optimization. The sector's low valuations may also produce some attractive acquisition targets for more competitive North American or Asian carriers.

Mobile

Mobile carriers do not capitalize on the wireline sector's woes as mobile market saturation quickly transforms fixed mobile substitution into "fixed cancellation" (households being already equipped with mobile). During the 2006-2008 period, their primary strategic focus is to stimulate mobile voice usage through the introduction of flat-rate pricing, initially for on-net traffic and then extended to all numbers in response to reduced termination rates. On the data side, mobile carriers gradually and with some degree of reluctance move away from the "walled garden" kiosk model to provide connectivity primarily to the high-margin professional segment. Nevertheless, this is quickly offset by declining mobile voice revenue streams induced by further by greater price competition and the emergence of mobile VoIP alternatives.

The regulatory uncertainty surrounding access conditions to new infrastructures spread to broadband cellular networks as new data-centric MVNOs lobbied for an aggressive unbundling regime on 3G and 4G networks in order to provide consumers with advertising funded mobile VoIP services. As a result, established mobile carriers cautiously deploy UMTS as a GSM replacement for voice traffic but significantly curb their HSDPA upgrade plans and limit deployments to downtown areas where the competition risk related to new Wimax-based entrants is strongest.

The Europe 5 market size and breakdown in 2015

Fixed and mobile voice and data

The highly cautious attitude towards new infrastructure build-out does not change the deflationary pricing dynamics observed on the main market segments with carriers vying to keep their market share under unbundling pressure. However, it fails to improve the value proposition of wireline offerings and further accelerates the fixed mobile substitution trend, with 40% of households being mobile-only by 2015 (2% loss per annum over 2005-2015 period). It also impacts broadband density which barely increases to 35% of access lines in 2015 (from 21% in 2005) despite efforts by some local municipalities to propose their own high broadband networks.

Pricing competition on mobile voice continues at -5% per annum while mobile data ARPU growth, despite consumer interest, is hampered by the sporadic mobile broadband coverage; 3G penetration fails to grow beyond 20% of mobile subscribers.

Pay TV and home entertainment

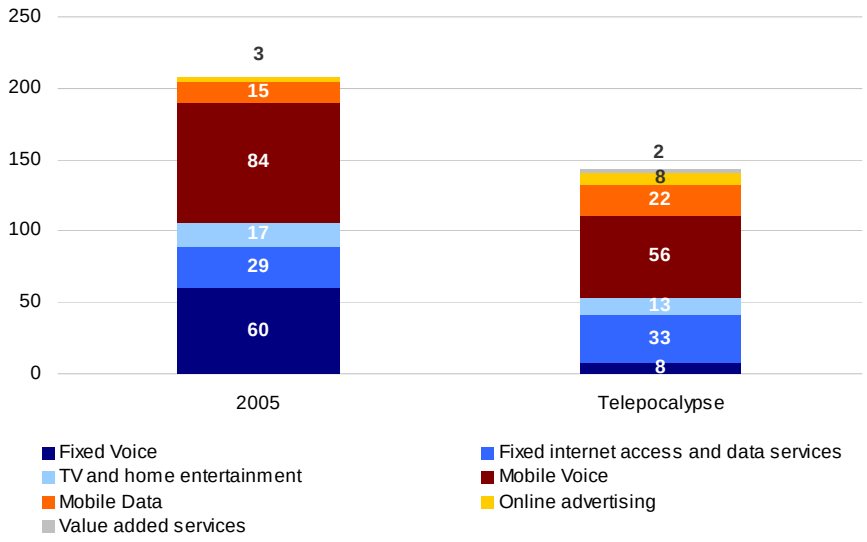
The limited improvement of the pay TV value proposition induces limited density increase while pricing decreases more than 2% per annum under the competition of telecom operators seeking to grab market share away from cable operators.

Online advertising and value added services

Online advertising growth suffers from the slowed fixed and mobile broadband expansion and only grows to 10% of total advertising spending by 2015. Value added services are expected to be marginal in such a configuration.

Figure 65: Compared Europe-5 service market size in 2005 and in Telepocalypse Scenario

In EUR billions

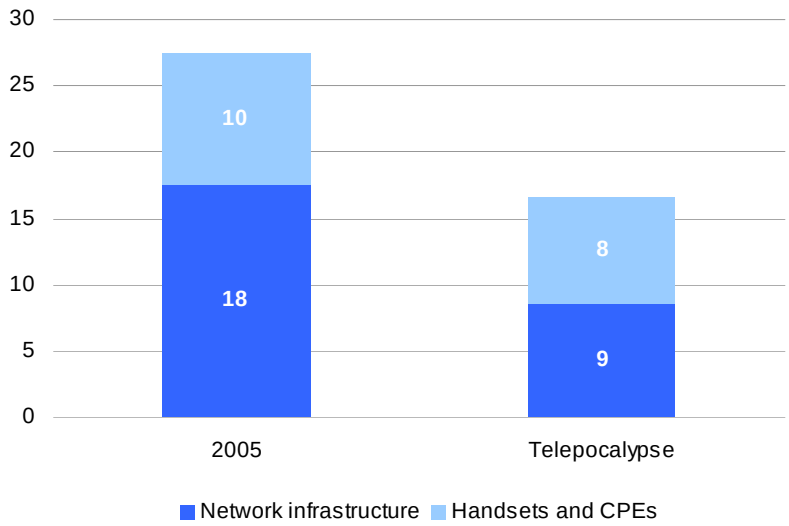


Network infrastructure and handset/CPE equipment segments

This scenario severely impacts the equipment opportunity particularly for the network infrastructure component which suffers from the postponed or cancelled investment plans of operators. The handset market suffers from the modest 3G take-off that does not compensate for the pricing erosion on 2G handsets.

Figure 66: Compared Europe-5 equipment market size in 2005 and in Telepocalypse Scenario

In EUR billions



4.2. Convergence compromise

Overview

- Tiered basic and premium converged applications coexist for the benefit of consumers while ensuring some service revenue streams in addition to connectivity revenues for operators
- High fixed and mobile broadband fuelled by some infrastructure competition has become a reality in dense urban areas with DSL coverage prevailing across less populated areas
- The moderately growing market size has produced contrasted strategic choices from operators to derive cost synergies with the emergence on the one hand of some Pan European integrated carriers and the increased specialization of some dedicated infrastructure providers on the other hand
- This scenario occurs within a regulatory framework that largely continues to ensure retail-based competition through unbundling of monopoly infrastructures across most territories while favouring access-based competition in dense urban areas and facilitating European harmonisation, traffic prioritization and commercial freedom for converged services

The situation of the European telecom market in 2015

Services

While teenagers and young professionals (aged 25 to 35) have now largely shifted to free text-based electronic tools for their leisure and business communications, a significant proportion of adults use fixed and mobile visiophony to "stay in view" with friends, relatives and colleagues. The elderly still pay for easy-to-use, robust voice telephony as they travel more abroad and increasingly share their time between two or three different locations.

Alongside a myriad of "over the top" best-effort online applications, end users are able to seamlessly access premium real time multimedia services combining voice, data and video in fixed and mobile environments. In fact, perceived boundaries between the fixed and mobile have ceased to exist, providing end-users with ambient always-on connectivity (within broadband coverage areas).

Converged services have also become the norm for professionals and corporate clients with employees enjoying highly secured unified digital identities and access interfaces to their emails, voicemails, instant messages, work files and contact lists on their fixed and nomadic devices which are automatically and constantly synchronized. Due to growing piracy and security concerns that require permanent code updates, software "distribution" in particular is now only available through an application service provider model.

Pay TV services particularly benefit from this fixed mobile convergence as the combination of IP, HDTV and accessibility “on the go” create a completely new entertainment experience that is highly more interactive and favoured by users (compared to best-effort web-based video clips). A vast array of multimedia rich content (e.g. interactive, "playable" movies) leveraging these fixed-mobile capabilities are made available by major media production houses and online aggregators of user-generated and independent label content under win-win revenue sharing models with operators. Mobile "connected" entertainment has become a highly popular service for commuters, young adults and within in-car passenger entertainment systems; it is adopted by 20% of mobile subscribers.

Access

The standard offer is unified connectivity through a single personal mobile device to guaranteed broadband anywhere (including on the go). Fixed broadband access in every city of more than 20,0000 is a 50Mbps VDSL or GPON symmetrical access. Elsewhere, ASDSL2+ is pervasive thanks to the introduction of mini-DSLAMs (backhauled with Wimax) that allow deeper reach for longer local

loops. Mobile broadband throughout territories is ensured through widespread HSUPA complemented with fixed and mobile Wimax for remote areas and hotspot zones. These deployments are largely carried out by integrated operators which select the best suited technology (copper, fibre, cellular or other radio) for each coverage area while wireline and mobile infrastructure specialists aim for cost-optimized deployments in high potential areas, partly relying on the unbundling of incumbents' networks in less profitable zones.

The TV entertainment development has also substantially impacted the access offering with the generalization of "home hubs" that serve as set-top boxes for IPTV, personal video recorder, massive multimedia online gaming console, VoIP gateway for the personal mobile devices' communications and WLAN access point for the home equipment devices that are now "IP-intelligent".

Main events and trends over the 2005-2015 period

Wireline

Confronted with accelerating line loss that reaches nearly 15% per annum in some large markets by 2008, large integrated and mobile operators increasingly turned to other (non domestic) European markets for acquisitions to increase their footprint. Depending on the targeted country's regulation and competition policy, they either first acquired a significant unbundled or virtual network operator or they directly snatched up a challenger with significant infrastructure. To stimulate voice usage, integrated carriers progressively aligned their fixed and mobile voice rates (completely unified in 2009) while pushing aggressively their IPTV offerings.

Facing this increased competitive intensity as well as market saturation, cable players accelerated the consolidation begun in 2005 and struck partnerships with tier-2 mobile operators that gave way to mergers by 2010 as the pure mobile operators in turn felt the increased competitive pressure from integrated operators.

Mobile

Confronted with revenue stagnation, limited data usage uptake (and regulatory pressure to open their networks to innovative MVNOs), large mobile service providers moved away from the "walled garden" approach for mass market services and began partnering in 2007-2008 with leading Internet properties (MSN, MySpace, Youtube…) for popular, high network effect, services such as instant messaging, and video sharing as well as for search tools. Simultaneously, the mobile data revenue model transitioned from traffic-based to flat rate under the influence of challenger mobile operators.

The combination of popular service availability and flat-rate pricing brought about significant commercial success with the younger and professional segments. It resulted in increased mobile data revenues and in turn strengthened the business case for wide area UMTS deployment and HSDPA upgrade in all major markets during the 2008-2010 period. Nevertheless, this was rapidly offset by declining mobile voice revenue streams caused by greater price competition and the emergence of mobile VoIP alternatives.

This, added to the growing competitive challenge of Wimax-focused new entrant operators accelerated the implementation of mobile carriers' all-out wholesale strategies to massively sell capacity on their networks to 3rd parties such as cable operators and second generation MVNOs that have turned away from pure price competition to focus on innovative marketing approaches for mobile services by better leveraging handset functionalities. This process also culminates around 2010 in some consolidation of pure mobile operators and mergers with cable operators or pure wireline carriers that have fibre plant.

Regulation

Regulation promotes retail based competition and unbundling of monopoly infrastructures across most territories while favouring some infrastructure competition in dense urban areas, providing commercial freedom, symmetric regulation and European harmonisation.

Reflecting the progressive technology and usage convergence, the regulatory framework in major markets evolved towards symmetrical cable/PSTN/broadcast TV and fixed/mobile regulation. Simultaneously, although happening at a slower pace given the strong national disparities, pan European regulation harmonisation progresses and culminates in a unified framework by 2011.

To foster the emergence of converged services based on seamless high broadband fixed and mobile networks, the regulatory framework has also focused on enabling a tiered traffic provisioning scheme enabling carriers to prioritize traffic related to premium services and has granted integrated operators commercial freedom in marketing converged services.

The Europe 5 market size and breakdown in 2015

Fixed and mobile voice and data

The combination of the converged service value proposition and improved broadband coverage density, turns around the fixed line loss rate that will be, on average, less than 1% per annum over the 2005-2015 period. As a result, the percentage of mobile-only households will only have increased 8 basis points from 17% in 2005.

Average voice revenue per access line will decrease 6% per year to stabilize at the telephony subscription cost level (approximately 17€ per month). Average broadband revenue per subscriber remains flat at 35€ per month as carriers transition from pricing competition to more bandwidth for money.

On the mobile side, the 2% per annum voice pricing erosion is offset by an increase in data revenues (flat-rate connectivity plans).

Pay TV and home entertainment

The differentiation (compared to web-based offerings) and attractiveness of HDTV and IPTV propositions and the introduction of "connected" converged online entertainment services by operators drive average household spending on pay TV and home entertainment up 3% per annum while penetration grows to 80% of all households.

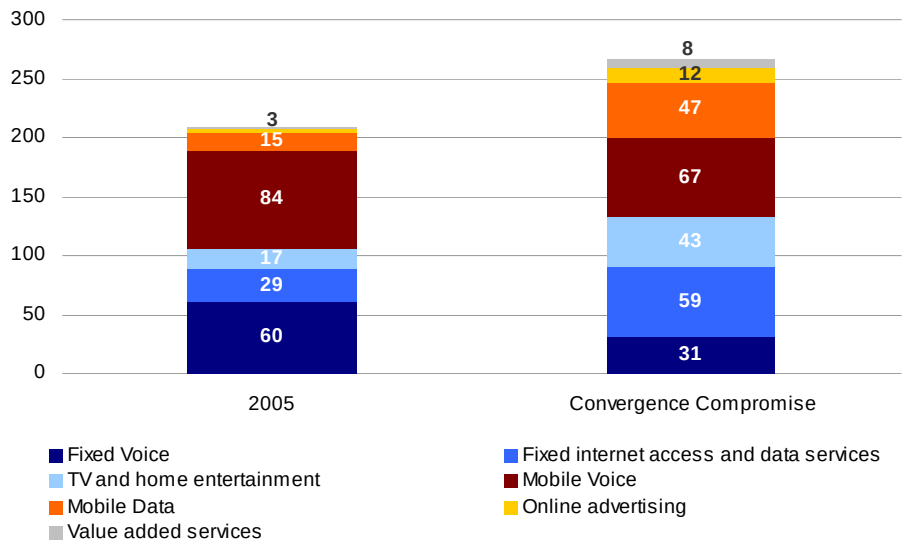
Online advertising and new value added services

Online advertising in this scenario grows "intrinsically" (no positive or negative influence of telecoms) with increased web usage at more than 15% per annum to reach 15% of total advertising expenditures (from 4% in 2005). More than 80% of the value created on this market benefits the large online aggregators (Google and Yahoo) while operators are able to grab a small share of the small but fast growing mobile online ad sub-segment, the rest of the value being shared by the myriad of web application providers.

New IT value added services fail to grow significantly in this scenario as carriers concentrate their efforts on in-house converged services.

Figure 67: Compared Europe-5 service market size in 2005 and in Convergence Compromise Scenario

In EUR billions



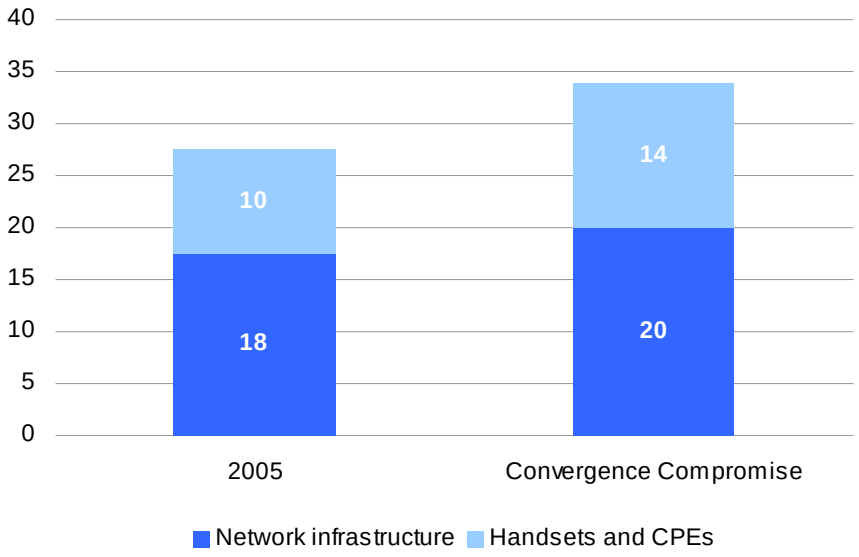
Network infrastructure and handset/CPE equipment segments

The infrastructure buildout carried out by operators occurs under significant cost-optimization resulting from the consolidation and specialization trends. Consequently, the long term infrastructure investment intensity remains stable with capital expenditures at around 16% of service revenues.

The handset/CPE segment is stimulated by the increased mobile penetration, the accelerated need for renewal caused by the development of converged services leveraging the latest handset functionalities and the strong growth of the home networking market. It therefore grows at more than 3% per year in value over the period.

Figure 68: Compared Europe-5 addressable equipment market size in 2005 and in Convergence Compromise Scenario

In EUR billions



4.3. Evernet

Overview

- Newly enabled services, particularly in the business-to-business and public administration domains, generate widely spread productivity gains for the European economy and far reaching benefits for European society at large.
- Broadband has become a new fabric of European society with minimum 50Mbps access available everywhere except in remote areas thanks to strong infrastructure competition fostering the proliferation of multiple fibre and high broadband wireless access networks across large territories.
- The expanded role of the communications sector has created ample growth opportunities for both infrastructure and application providers and produced a vibrant, dynamic and competitive European telecoms industry.
- This scenario has largely been made possible by (i) a proactive European public policy stance that encourages cross-industry collaboration on new application development and (ii) a regulatory framework which stimulates infrastructure-based competition and encourages massive new network investments across most territories.

The situation of the European telecom market in 2015

Services

The internet in Europe has become a truly ubiquitous network enabling anytime, anywhere access to any digital good or service by anyone and anything. A new dimension has been added to telecommunications: any "thing" connection in addition to any "time" and "place" connections. Connectivity now enables new forms of interactions between humans and objects but also between electronics devices and all sorts of inanimate things.

In this scenario, the voice "old dog" has learned new tricks: progress in speech recognition has positioned voice as the natural interface of humans to communicate with and remotely command the myriad of smart objects that surround them. While person to person voice communications are now free, the embedding embedment of voice in new value added services has created more than compensating market opportunities, particularly in the business to business space.

Both the consumer Internet and professional services are completely transformed by what is now the ubiquitous delivery platform for any digital good. Traditional industries have unearthed new major productivity gains through the widespread adoption of technologies such as RFID and machine to machine communications. Wireless sensor networks have revolutionized most industries: automated cars are now frequently seen on highways, remote metering is the norm within utilities…Public administrations allow citizens to benefit from entirely new services (particularly in the education field) wherever they are located on a territory.

Most public administration services (health, education, government…) have leveraged the new technologies to provide a high quality of service at significantly lower processing costs for the benefit of citizens and society at large. These new services are made possible by the availability of guaranteed high availability and QoS broadband networks that have required significant investments enabled in turn by the revenue and ROI visibility offered by the providers of such services.

Access

Broadband has become a fabric of European society. Even in remote and scarcely populated areas, high broadband (>20Mbps) access everywhere is now a reality enabled by the complementarities of access technologies and by a business case that has been facilitated by the newly enabled applications (e.g. remote metering, home care…). In cities, all residential and office buildings are connected with dedicated fibres while more remote areas are predominantly addressed through

advanced wireless technologies such as mobile Wimax and mesh networks based on MIMO antennas.

In addition to incumbent wireline operators, all markets have seen the largest unbundled challengers (to improve their operating profitability model) and/or cable operators (to offer HDTV) invest in fibre infrastructure (either fibre to the premise or a combination of fibre to the curb and VDSL to the premise). These parallel build outs have been greatly facilitated by major municipalities providing free access to their public infrastructure (ducts, sewer systems…).

In mobile access, end-users can choose between UMTS/HSUPA networks provided by historic mobile operators and from new wide-coverage mobile Wimax offerings of "new" entrants (tower companies and private-equity funded ventures).

Main events and trends over the 2005-2015 period

Wireline and Mobile

Fixed carriers have sought to stabilize and curb access line loss through VoIP generalization and aggressive price cuts: flat rate plans have reached 100% of the subscribers by 2008. Nevertheless, the commoditization of voice continued, caused by exacerbated over-the-top internet service competition, resulting in accelerated pricing erosion not curbed by the generalization of triple play services. Broadband connectivity rapidly became the value anchor for wireline operators and investment in new fiber-based access infrastructure a strategic necessity to survive. Ambitious investment plans for new broadband networks were engaged by multiple operators with the support of financial investors, convinced by the emerging market opportunity of value-added business-oriented services, and reassured by the regulatory visibility provided by authorities.

This fierce access-based competition and the accelerating legacy service revenue erosion led carriers to implement strict cost optimization strategies, further accelerating their transformation into infrastructure providers. By 2010, most of them had begun pushing new network monetization strategies to leverage the standardized service creation capabilities enabled by IMS and NGN, opening their networks to 3rd party application developers and focusing on wholesale strategies.

As these emerging market opportunities began to materialize, new ambitious infrastructure build-outs were engaged by multiple fixed and mobile operators across all major markets, supported by national regulation authorities through a clear facilities-based competition model.

Regulation

Regulation and local public policy have jointly fostered a buoyant access platform competition by creating a favourable framework for new infrastructure investment. Regulation has actively promoted facilities-based competition in new wireline and mobile networks by acknowledging plummeting technology costs (and resulting reduced barriers to entry) and accordingly not intervened on newly built access networks. It has also freed up new spectrum and increased flexibility in spectrum usage. It has also enforced roaming agreements enabling densely populated area focused operators to offer their customers nationwide and international service coverage. Simultaneously, municipalities have ensured equal access rights to public infrastructure (ducts, sewer systems…) to facilitate multiple new fibre build outs.

Through the funding of ambitious R&D programmes, the European Union as early as 2007 fostered research cooperation between the telecommunications sector and major vertical industries poised to benefit from ubiquitous networking (transport, logistics, banking…) on the enabling technologies and their standardization: RFID, sensor networks, nanotechnologies, robotics... This has triggered early adoption starting in 2010 by multiple large industry conglomerates and generated significant productivity gains that have benefited the European economy over the next 5 years. This cooperation

was strengthened by the early collaboration between operators and IT companies to conceive large scale value added service programmes for large corporations and administrations, leveraging the newly enabled functionalities of next generation networks. New revenue models were also explored for the infrastructure providers to reflect both the traffic transported element and the value added functionalities embedded into the application provisioned (e.g. security, presence, voice…)

The Europe 5 market size and breakdown in 2015

The growing “opportunity pie” facilitates cooperation between carriers and application providers that respectively contribute their infrastructure and service or vertical industry expertise and evenly share the incremental value generated.

Fixed and mobile voice and data

The service and broadband access competition together transform the industry's revenue model for fixed and mobile services into a flat-rate €25 per month connectivity subscription per access line (fixed or mobile). This connectivity subscription may be subsidised in part or wholly by public administrations in specific cases (e.g. for home care or e-education services).

The value proposition of broadband access grows exponentially with the nearly infinite number of services accessible online and broadband density thus grows to 95% of fixed access lines. Furthermore, the number of access lines has increased an average 5% per annum until 2015 as an increased number of sites and objects are connected.

Mobile density has also reached 120% of households with multi SIM users and wirelessly connected objects expanding the penetration potential of mobile. Almost all mobile subscribers are connecting through a 3G network.

Pay TV and home entertainment

Average household spending grows to 30€ per month while penetration grows to 80% of households as home connected entertainment gradually replaces traditional pay TV consumption.

Online advertising and new value added services

Broadband pervasiveness produces a huge impact on the online advertising market that grows more than 30% per annum to reach 55% of total advertising expenditures by 2015.

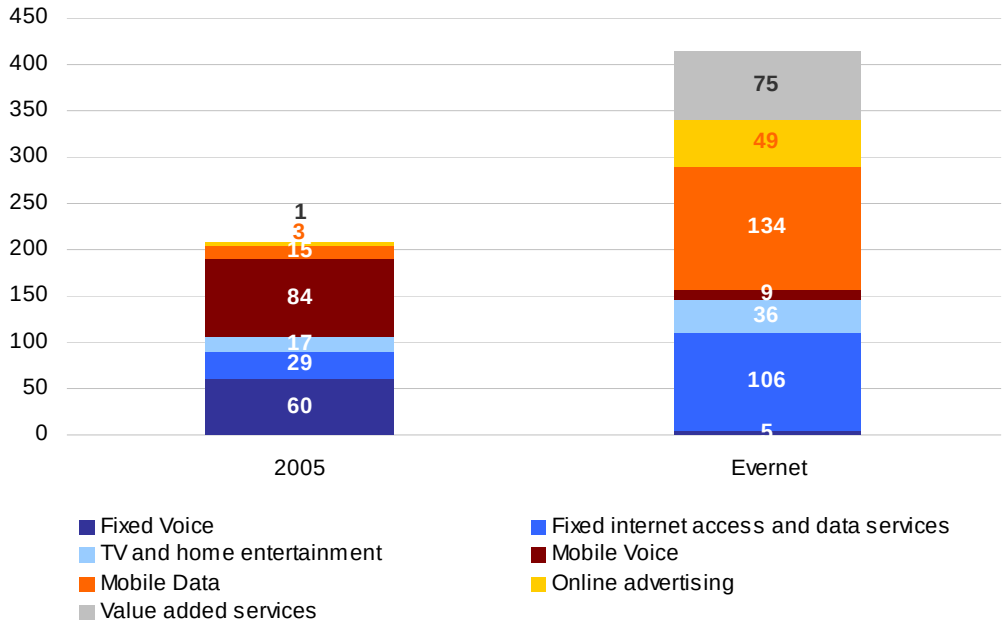
Value added services (RFID, machine to machine, sensor networks…) represent the fastest growing opportunity in this scenario and reach more than 50% of total IT services by the year 2015.

The accelerating fixed and broadband diffusion and usage stimulates the online advertising market that grows at nearly 25% per annum to reach 35% of total advertising expenditures (from 4% in 2005). This value is captured for the most part by the large online aggregators and shared with the various application/service providers, including web companies and virtual network operators. Infrastructure providers, focusing primarily on wholesale types of strategies do not aim to grab a meaningful share of this market.

Value added service development also largely benefits from the increased horizontal integration of the industry. While largely captured by IT-oriented companies providing vertical solutions to the public administration, health or banking industries, the profusion of high broadband access networks available in strategic areas allows completely new service models to emerge (e.g. generalized software ASP distribution), resulting in 35% of the IT services market being provisioned through telecom networks (compared to less than 1% in 2005).

Figure 69: Compared Europe-5 addressable service market size in 2005 and in Evernet Scenario

In EUR billions

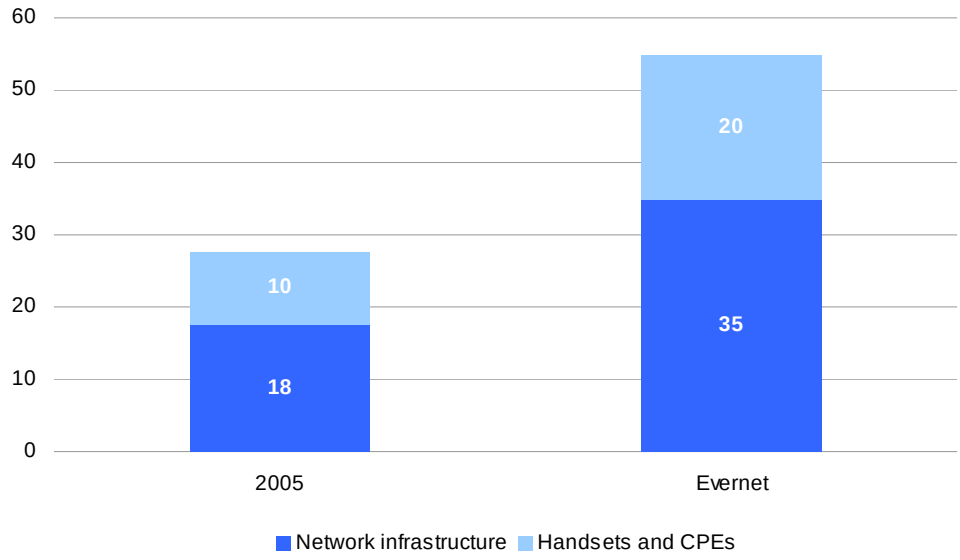


Network infrastructure and handset/CPE equipment segments

This scenario also produces significant market expansion opportunities for equipment vendors both on the infrastructure side and the handset side. Large investments in wireless sensor networks and RFID applications will enable capital expenditures to grow to 18% of service revenues while the CPE segment will benefit from the proliferation of tags and sensors installed at the edge of the network.

Figure 70: Compared Europe-5 addressable equipment market size in 2005 and in Evernet Scenario

In EUR billions



SECTION 4: Regulatory Policy[2]

The previous section analysed the possible evolution of the ICT market until 2015 in three scenarios: Telepocalypse, Converged Compromise and Evernet. Regulation, and in particular the EU Regulatory Framework, will be one of the key factors determining to which scenario the EU communications market will converge.

From Scenarios to Regulatory Policy Analysis

In this section we analyse in detail how regulatory policy will contribute to the development of the market as described in the three scenarios. Section 3 reveals that the scenarios are constructed along two general axes:

- Industry investment intensity (horizontal axis); and
- Addressable market opportunity (vertical axis)

Section 3 explains further that the main driving factor of the *addressable market opportunity* is competition from delayered 'over the top' service providers, and the consolidation of the industry, horizontally across regions and vertically across infrastructure and service layers. Issues surrounding delayered service providers, such as interconnection and net neutrality, featured strongly in the BRT Roundtable discussion of 2005. This leaves two key regulatory problems for the 2006 report: regulation for products that require investments, and the regulatory treatment of horizontal and vertical consolidation.

Both of these areas, investment and consolidation, are worthy of in-depth research. If companies can consolidate depends to a substantial degree on the practice of Competition Policy at national and EU levels. A brief glance at regulatory decisions in mergers and acquisitions reveals that remedies imposed in transactions since liberalisation present a diffuse picture of the policy on consolidation.

The large transaction in this sector do not present a completely unified view on important issues such as what should be the difference between EC(DEC)2003/311 and the definition of markets in a merger context; whether there are portfolio effects; how regulation is a substitute for remedies and so on. Also, there has been no test-case for merging a large incumbent content provider with a large infrastructure operator. Competition Policy of consolidation is therefore an important topic to analyse for the industry.

Nevertheless, we do not consider it further here. The competition policy of mergers is largely the domain of the Directorate General of Competition, rather than the Directorate General of the Information Society. Since the present study is presented to DG Information Society, it appears pertinent to focus on the other regulatory theme that emerges from the scenarios. We have therefore decided to analyse, in depth, how regulatory choices will affect investment by operators.

Investment and regulation

Consumers can only enjoy superior services and products if the ICT sector carries out substantial investments to develop, create and produce these services. Costs are highest and most evident for products that require operators to upgrade existing infrastructures. Current estimates are that VDSL would cost €500 per connection, and fibre possibly up to €1,000 per connection[3]. Likewise, HSDPA build-out costs are significant.

Regulatory policies will be one of the factors that company will take into account when deciding on such large investments.

In order to address the regulatory theme of regulation and investment, LECG have written a scientific economic paper, attached in the annex, called 'Access Conditions, Investment and Welfare'. In this paper, we attempt to formally establish a relationship between how much companies invest, the access they give to rival operators without their own infrastructure, and the welfare of consumers.

[2] LECG Ltd are the authors of this section and the accompanying annex.

[3] Estimates of members of the Brussels Round Table

Regulation encompasses more tools than just the imposition of access. Other obligations include retail price regulation, transparency, non-discrimination or accounting separation conditions. As is clear from the Commission's Staff Working Document recommendation[4] regarding the reform of the New Regulatory Framework, in particular the Art. 7 procedure and the recommended markets of EC(DEC)2003/311, the focus of regulation will shift increasingly to wholesale markets. If one would want to summarise the recommendations, it would be the tenet that *'if wholesale markets are regulated, then competition in retail market follows'*. The primary tool of regulation in wholesale markets is the requirement to give access to competitors and therefore we concentrate on this aspect.

Obligatory access is also a key aspect of our investigation for another reason. It has been explicitly stated that sectoral regulation should at some point be replaced by the reliance on competition law only. One of the key distinguishing factors between current sectoral regulation and competition policy practice is that the imposition of access obligations is seen as a very severe remedy for the abuse of a dominant position, which is granted only under strict conditions.[5] Competition practice therefore recognises that access obligations represent a strong intervention into the commercial business and property rights of companies. Of all regulatory measures, it is likely to be the one which most affects investment.

A simple abstract model of access and investment

The annex provides a simple and intuitive economic model of access and investment. For the most part, in the economic model, there are two companies and a regulator[7]. They take the following decisions:

- First, one or both infrastructure companies decide to make an investment to upgrade their infrastructure;
- Then, a regulator can impose access conditions;
- Lastly, companies compete a la Cournot in the retail market.

At all times, we assume that the companies who invest are forward-looking. They foresee whether the regulator will or will not impose access conditions, and they modify their investment decisions accordingly. There is no uncertainty regarding the decision of the regulator or the actions of competitors.

Investment is investment in quality

New investments in infrastructure can be thought of as investments in 'quality'[8]. Quality in this sense is a generic term which stands for all product enhancements made feasible through the investment, such as higher speed, lower latency, new services and so on. When companies invest in infrastructure, they increase quality. Consumers in our model like the quality improvement. They are willing to pay more for the same quantity of the service, or equivalently, they are willing to consume more of the service at the same price. This allows the company which creates higher quality products to improve its position in the market, both in absolute terms (the company's revenues increase), and relatively (the company improves its position vis-à-vis its competitors).

There is a cost of investing, which is one of the factors determining how much companies invest. If investment costs are low than the investment is particularly effective and other things equal a company would invest more. If costs are high then investments are less effective and, other things equal, a company would invest less. Some of the results in our analysis depend on how effective the investment is. In particular we find that a higher access price has good or bad effects on consumer welfare depending on the effectiveness of investment. The costs of investment are assumed to be increasing in the quantity that is invested. This is a standard assumption which can be interpreted in a

[4] Commission Staff Working Document regarding market susceptible to ex ante regulation, 28 June 2006

[5] See the wide discussion of Brönner, Magill and IMS Health cases.

[7] Most results can be extended to more companies.

[8] Quality is a standard economic way of thinking about differentiated goods called 'vertical product differentiation'.

geographic way: big cities are the least costly in which to upgrade infrastructure, smaller cities are more costly and rural areas are very costly. Therefore the more lines are upgraded, the more expensive is the average investment cost per line. Higher levels of investment can be construed as a wider roll-out of upgraded infrastructure.

We consider the following variations on investment:

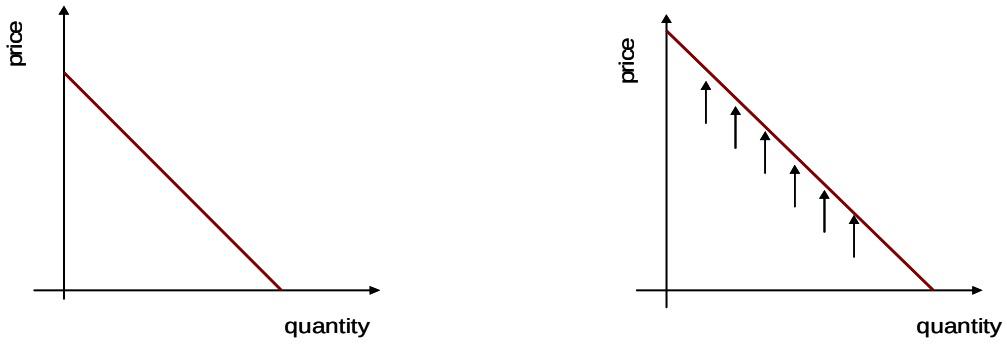
- Only one company invests;
- Both companies invest in competition to each other; and
- The companies form a joint venture and invest cooperatively.

If a company invests, then, by that investment, it upgrades its network and therefore increases its own product quality. Whether this also affects the product quality of the second company depends on the access conditions.

In Figure 71, we present a generic demonstration of the effect of the investment decision. Before investing, firms face a demand curve. With the investment, firms increase the quality of the product. This means that consumers are increasing their willingness to pay. Graphically speaking this means that the demand curve shifts vertically, which means that either a larger quantity of the improved quality product can be sold at the same price, or equivalently, the same amount of quantity of the improved quality product can be sold at a higher price.

How much the demand curve shifts depends on how much investment is made, which in turn depends on the effectiveness of the investment, access conditions, and competition in the retail market.

Figure 71 Demand curve and investment



Initial demand curve

Demand curve following investment

Access conditions: access/no-access to the upgraded infrastructure

Following the investment decision by companies, access conditions are established. Access conditions consist of two elements. A regulator decides whether or not to require the incumbent to provide access to the upgraded infrastructure, therefore enabling the other company to offer products of the same quality. The regulator also decides whether to impose access at cost.

Access conditions can be understood graphically from Figure 1. If access is given to a company without its own infrastructure (and therefore without investment), that company's demand curve also shifts up. If access is not given, that company's demand curve stays where it was.

In our model, if there is only one company which invests, it would maximise its profitability by not giving access to its upgraded infrastructure at cost. Instead, it would want to set such a high access price that the company asking for access could not effectively compete in the retail market. Provided that alternative access investment is not economically feasible, access conditions must then be set externally. This is not so surprising. The retail market in the model is not perfectly competitive (there is

Cournot competition) and therefore the 'Chicago critique' does not hold here. Companies prefer their own retail operations to others. Doing so increases their profits.[9]

If both firms invest, either cooperatively or in competition to each other, then both firms' demand curves shift up. In that case we assume that there is no obligation to give access to companies that do not operate their own infrastructure. This case can therefore be interpreted as one in which competition law replaces regulation, in the sense that there is no imposition of access obligations.

Competition in the retail market

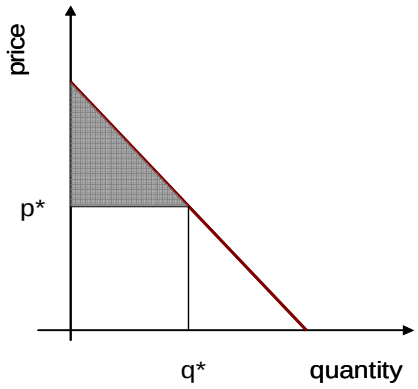
Following investment decisions by firms and the establishment of access conditions to the upgraded infrastructure (which in turn determines whether companies can offer higher quality products), companies compete in the retail market 'a la Cournot'. 'Cournot' competition is a standard mechanism of economic models of markets with a small number of firms. Both firms determine the quantity that they want to sell in the market, taking into account the quantity that the other firm offers. Price is then determined by matching the sum of the quantities offered with the willingness to pay by consumers.

The ability to compete by firms in the retail market is determined by two factors, namely the retail cost of production of the good and the quality of their product (determined by whether they face a 'shifted' or a 'non-shifted' demand curve). Infrastructure companies have a constant marginal retail cost of production of the good. Service companies' costs are determined by the wholesale price of access.

Tools for evaluating results: consumer welfare and investment

The results of our analysis are evaluated in the standard economic framework of consumer surplus. 'Consumer surplus' is described in Figure 72. As stated before, the demand curve is a measure of willingness to pay of consumers. Where the demand curve cuts the price axis, no quantity is sold in the market. The price is so high that no consumer is willing to purchase the good. As we move to the right, more consumers are willing to purchase the good as the price declines. At the equilibrium price p*, consumers are willing to purchase a total of q* units of the product. However at that price, all the consumers that would have been willing to pay more than q* (those between the origin and q*) make a notional profit or consumer surplus.

Figure 72 Consumer surplus

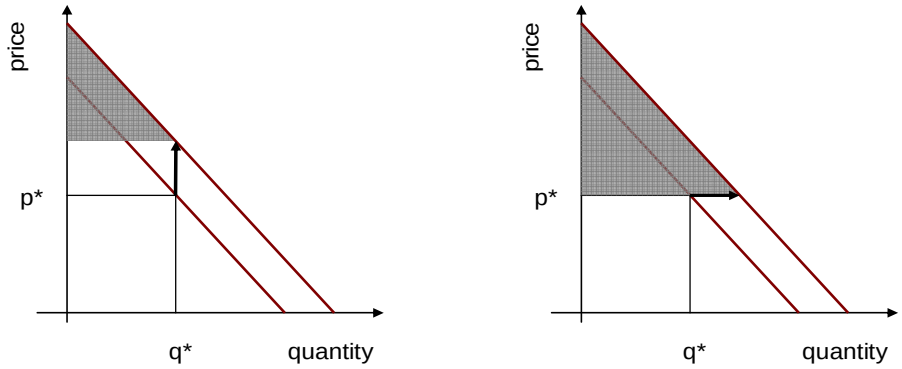


As we stated above, investment influences consumers' willingness to pay for a product. It shifts the demand curve up. If this increases consumer surplus depends on the effect on the quantity sold. As Figure 73 shows, if – following the investment - quantity increases but price does not increase as in the figure on the right, then consumer surplus increases most. If on the other hand quantity does not increase and only price increases as in the figure on the left, then consumer surplus does not increase.[10]

[9] There would not be monopoly profits if the market were contestable, i.e. if there were a threat of entry.

[10] It can be argued producer surplus should also be included in welfare analysis, and regulation / competition policy treatment is not consistent in this respect. In our analysis, we exclude these considerations.

Figure 73 Change in consumer surplus following investment – no increase / increase in consumer surplus



Since both firms have a demand curve, total consumer surplus is just the sum of the individual consumer surpluses. It is immediately clear then that in our analysis, price is not the only determinant of consumer surplus. Consider an intermediate case between the two figures above. If, following an improvement in quality, price of the good increases, but the quantity is also increased, then we will see a rise in consumer surplus.

Results of the economic analysis

Figure 74 provides a ranking of our results. In the following paragraphs we will expand on them and explain the reasons for our findings.

Figure 74 Ranking of results (1=best)

	Investment	**Consumer surplus**
One firm invests		
Access to new network at cost	5	5 (note CS increases if access price higher and investment effective)
Access to old network at cost	4	4 (note CS increases if access price higher and investment effective)
Both firms invest		
Non-cooperative and no access	2	=2
Non-cooperative and mutual access	3	=2
[Cooperative (JV)*	1*	1*]

We observe the following results: generally, the joint venture (last row) where both companies make a joint investment decision and then compete in the retail market comes out best. However, we have added a (*) to this case since it uses a formulation of the joint venture which has been debated in the economic literature. There are additional aspects of the joint venture which need further research before clear regulatory policy conclusions can be drawn. We devote a section below to explaining the joint venture and our caution regarding the results.

Abstracting from the joint venture results, we focus on the other rows. We have the result that two infrastructure competitors create more investment and consumer welfare than a single firm which gives access to an *infrastructureless* operator at cost.[11] This is our central result. It is striking since it appears to contradict current regulation, which is focused on giving access to infrastructures at cost. In the following paragraphs we explain how this result arises and how it relates to current regulation.

Investment in new infrastructure has truly different regulatory requirements

For legacy bottleneck assets, access at cost is good for consumers

When carrying out our analysis, we took great care to isolate the effect of investment in new infrastructure/higher quality products. To do so, we analysed what access regime would maximise consumer welfare once an investment had been made. This question is identical to asking what the best regulation would be for legacy assets.

Privatisation and the introduction of competition and regulation in fixed telephony markets largely followed the build-out of infrastructure. Local loops did exist before they were regulated. While replacement investments have to be made on an ongoing basis, the basic structure of the copper local loop has remained largely unchanged for decades.

We show that in such a world of legacy bottleneck assets, the best a regulating body can do is to give full access at cost. This decision means that there is strong competition in the retail market, which benefits consumers, and there is by definition no negative effect of investment, since investments have already been made. *In this sense, cost based access regulation has worked and was the best available regulatory policy for access to legacy infrastructures.*

The picture changes entirely when higher quality products are created through investment. It can continue to force access at cost, but now the infrastructure company will optimise its investments by conditioning them on the access conditions. The regulator cannot control these investment decisions. The regulator loses its previous level of control.

Access at cost reduces incentives to invest

The result of the loss of control is that, in the model, the regulator *cannot have everything*. If it gives access at cost, then the infrastructure company will reduce its investment. This is straightforward to understand. As we have stated above, investment becomes costlier the more investment is made (the less densely populated the areas become in which the company invests). If the company can appropriate all the benefits of its investment, then more areas are profitable. In contrast, if access is given at cost, then also the non-infrastructure company's products have a higher quality. There is no quality differentiation between the competitors and, with the same cost, the retail market will be split equally between the infrastructure provider and the non-infrastructure provider. In other words, the infrastructure provider only gets half the benefit of its investment. This implies that some areas which had previously been profitable become unprofitable to invest in. Therefore investment falls.

Access at cost can create less welfare than two competing infrastructures

As a result, also consumer surplus falls. We show in our model that two competing infrastructure providers sell more than one infrastructure provider who gives access at cost. Since, by figure 3, we know that increasing sales means that the quality improvement is not just appropriated by the firms, but instead the higher quantity means that consumers also benefit from the improved products.

This result can to some extent be generalised: suppose that there is one infrastructure company but a *large* number of service companies who all have access to the infrastructure company's upgraded network. A larger number of retail firms means more competition and therefore higher welfare – however, at the same time the market share of the infrastructure operator shrinks, which means that it will have fewer incentives to invest, thereby reducing consumer welfare. We show that the *effect of*

[11] Comparing the rows under the header 'Both firms invest' with those under the header 'one firm invests'

reduced investment caused by a smaller market share dominates the *competition effect of a large number of retail operators* if the investment in infrastructure is particularly effective in raising quality. In our model this is the case over a relatively large parameter range. In other words, in a relatively large number of cases, it is better to have two infrastructure companies rather than one infrastructure companies with many retail companies who have access at cost. Only when investment is not effective at creating quality, we arrive at a case for which a single infrastructure company and a *large* number of retail firms can be better than two competing infrastructure operators.

Access *above* cost can yield higher consumer welfare if investment is effective in creating quality

In a further variation of our model we investigate the effect of access which is given above cost. We arrive at an ambiguous result. In our specification, we show that if the investment is particularly effective, then a small increase in the access price will increase consumer welfare. If, on the other hand, investment is not effective, then a small increase in the access price will lower consumer welfare.

The intuition of this result is as follows. A higher access price means that the non-infrastructure competitor has higher costs. This effectively has two effects: it softens competition in the retail market, but it also allows the infrastructure company to gain a higher market share. Through that higher market share, it can appropriate a higher percentage of its investment and will therefore invest more. Whether this positive effect of additional investment outweighs the effect of softer competition depends on the effectiveness of investment.

Plausible analysis for both fixed and mobile markets

Our analysis seems quite a plausible description for both fixed and mobile markets. In mobile markets, there is generally no mandated access. The licensing system ensures that only a small and limited number of players are active in the market. In the context of our model, we show that if these companies need to make investments, then such a market structure can be good for consumer welfare. The market structure balances the need for investment in higher quality products with the requirement of competition in the retail market.

In the fixed markets, a debate has started around mandatory access to upgraded high-speed infrastructure. The German VDSL case falls under this scenario. Deutsche Telekom has in 2006 rolled out a high speed VDSL network in 10 cities. That roll-out would be extended to a further 40 cities depending on access conditions to competitors.

Infrastructure joint ventures

In order to complete our analysis, we considered infrastructure joint ventures. We had a particular interest in carrying out this exercise, since the problem of investment in new products seemed very close to the literature on ‘Research Joint Ventures’. This literature is based on research joint ventures for patents in the pharmaceutical industry. We understand that such joint ventures are generally allowed and in some cases also supported. The parallel with communications markets comes from the fact that a patent of a drug protects drug makers from competition, which would be akin to not having to give access to upgraded infrastructure. Yet we also discovered major differences to the area of research joint ventures, which we will explain below. We ask whether such a model could provide an approach for investment projects such as fibre upgrades. The beauty of the joint venture is that it only extends to the stage of research and development, or, in our case, to investment. Once the drug has been discovered and is produced, then the members of the JV compete against each other. In this way, it is effectively a model of access at cost, under the condition that retail companies contribute to the build-out of infrastructure.

We note in this context that in the mobile sector, there are already joint ventures in infrastructure, including site-sharing, and in the known T-Mobile/O2 case complete infrastructure sharing of 3G networks in rural areas of the United Kingdom.

We adopted one of two seminal models of the Research JV literature, namely an article by d'Aspremont and Jacquemin, published in the American Economic Review12. In their formulation, a joint venture means that, for a particular project two companies agree to licence each other free of charge, but their own research teams remain separate. Following the discovery, they compete in the retail market and need not give third party 'access'. When directly translating this model, we find that

- Investments are higher than under any other market structure; and
- Consumer welfare is higher.

These results appear very positive. However, limitations of the model that arise out of its cost function and bargaining make it not possible at this stage to deduce definite regulatory policy implications.

Limitations of our JV model: cost functions and bargaining

Since we simply adopted the d'Aspremont and Jacquemin framework, we also inherit their specifications of cost functions. Firms in their specification remain independent when they conduct research and therefore have their own cost functions. Since cost functions have decreasing returns to scale, this gives a direct advantage of the joint venture of the investment of a single (for example a merged) company.[13] This assumption drives the very high efficiency results in the literature. If instead, it was assumed that the cost functions of the JV were the same as a merged company, then the efficiency benefits would be reduced.

Which form of combination of cost functions represents the JV best is largely an empirical questions. For example, if two incumbents decided to give access to each other's upgraded networks in geographically different regions, where each of them had their own incumbency cost advantage, then such a formulation may be correct. If on the other hand a JV were carried out between an entrant and an incumbent, then the cost function may not represent the true nature of scale economies. We therefore think that further investigations into cost functions and their specifications would be required.

There is a second aspect that may be different between research JVs in the pharmaceutical industry and infrastructure JVs in telecoms between incumbents and entrants. This is related to the fall-back position. When a JV in pharmaceuticals breaks down, then the fall-back position is that the companies compete. However, when the infrastructure JV between an incumbent and an entrant breaks down, the result may well be that the incumbent would be regulated to give cost based access to the entrant. This asymmetry due to sector-specific regulation opens the door for strategic gaming on the part of the new entrant, which may well destroy the investment benefits of the joint venture.

In order to understand these effects and their repercussions on investment, one would need to consider how bargaining between the two parties evolves. We have not carried out such an analysis. It would seem however, that the asymmetry in the fall-back position may prevent a potentially fruitful cooperation between the incumbent and the entrant. This could be interpreted as a cost of regulation.

Policy conclusions from our analysis

We have taken one of two broad regulatory themes that has emerged from iDate's scenario analysis and investigated it in a formal economic model. We describe the relationship between investment in new infrastructures and access conditions to that infrastructure. Our policy conclusions can be summarised in the following points:

- When investment plays no role, such as for legacy assets, access at cost appears to be a good regulatory policy for consumer welfare.
- This no longer the case when new investments need to be made. New regulation or deregulation is required to capture the positive effects of investment induced quality improvements of products and services.

[12] C. D'Aspremont and A. Jacquemin, *Cooperative and Noncooperative R&D in duopoly with spillovers,* American Economic Review 1988

[13] If there are decreasing returns to scale there is an efficiency effect from being small. So the investment of the sum of two companies is less efficient than that of two separate companies.

- When companies can decide how much investment to carry out to upgrade their infrastructure for higher quality products and services, then the regulator loses power in the determination of consumer welfare.
- Access at cost has a negative impact on investment, which in turn has a negative impact on welfare. The negative impact on investment results from the fact that the investing company cannot fully appropriate the benefits of the investment. In fact, as the number of companies gaining access in the market grows, the infrastructure company will lose retail market share and therefore invest less and less.
- If quality improvements are feasible, then companies will always invest to a degree. How much they invest depends on access conditions. We can interpret this geographically: dense metropolitan areas will always attract investment, no matter what regulation there is. However, investment in smaller cities may not happen with regulation of access at cost. We therefore hypothesize that cost based access regulation may well increase the digital divide.
- We further show that increasing the access price can lead to higher consumer welfare, if the investment is particularly effective in creating quality.
- In the second part of our paper, we contrast the cost based access result with the case in which both companies invest in infrastructure. We find that if market conditions are such that both companies can invest profitably, then competing investment is superior for consumer welfare than one company investing and giving access to one non-infrastructure company. This result generalises to many access seekers provided the investment is sufficiently effective.
- There is therefore a trade-off between low access prices and infrastructure competition. Our paper highlights that the positive effect on investment derived from preventing cost based access for upgraded infrastructure can outweigh negative effects on competition in the retail market.