European Telecommunications Network Operators' Association

ANNUAL ECONOMIC REPORT I 2017

etno

ETNO companies remain Europe's digital investment pillar, with 70% of the sector investments

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1 KEY TRENDS IN 2017: AN EVER EVOLVING INDUSTRY

By François Barrault, Chairman, IDATE Digiworld

For more than a decade, ETNO's Annual Economic Report provided a wealth of data on the state of the European electronic communications market across a broad range of indicators. IDATE is proud of being a long-standing support to ETNO in this exercise. This year's edition puts forward both some of the traditional figures and some qualitative insights on how the industry is evolving. The aim is to provide inputs for a fact-based analysis and informed discussion available to the community of stakeholders in Europe and beyond. Here we identify the 4 key trends of this year's Report.

Operators investing heavily to sustain super-fast broadband momentum

5G is approaching the starting blocks and ETNO members have launched Europe's first real-life trials in the course of this year. The migration to fibre networks is gaining momentum, with almost a third of households in the ETNO perimeter subscribing to a high-capacity broadband connection and 4G take-up surpassing 3G. The companies represented by ETNO remain the investment leaders in Europe, with almost 70% of the sector investment in EU5 and similar figures in EU28. Rolling out these networks to the largest number of European households and businesses requires massive investments, though. **Data show that telcos are ready to make significant efforts by devoting a rising share of their revenues to capital expenditures.** However, in order sustain these efforts, further improvements of the market environment will be necessary.

Growing demand and improving economics

Demand for connectivity over both mobile and fixed broadband networks is on the rise across Europe and users are keenly adopting the services provided over these infrastructures. Increasing demand for their services is not a fundamental change for telecom operators, though. In an environment with intense pressure on prices induced by extremely competitive markets and strong regulatory measures, operators were facing a situation in which rising demand used to be accompanied by falling revenues and shrinking profit margins.

Operators have made significant efforts to alleviate this situation by launching **richer bundles, innovative services and improving customer satisfaction.** Operational efficiencies, for instance through the move to all-IP networks, are counterbalancing some of the pressure on the margins.

The data for this year seem to confirm that the industry is indeed emerging from the economic downturn that has lasted for almost a decade. The growth remains shy with slightly positive levels so far, but the industry should continue gathering steam over the next years.

Consumers like the different flavours of convergence

Convergence has become a reality in European communications markets. Bundling fixed and mobile services as well as connectivity and content is a convenient value proposition and it appeals to a growing number of users. For operators, too, convergence is a winning move, despite the fact that bundles typically come with a discount compared to standalone offers. Converged bundles increase the stickiness, reduce churn and thus increase customer lifetime value. They also open opportunities for further cross- and upselling, thereby potentially increasing ARPU rather than lowering it.

M2M and IoT

Human communication is not the only element driving demand, but also communication between machines. Communications revenues from M2M services represent 4% of all mobile revenues in 2017, a share that will increase to 8% by the end of the decade. IoT revenues will grow by as much as 11% per year between 2017 and 2025. While verticals in the private sector are currently still honing business models and sorting out technologies, much of the growth at this moment is induced by public initiatives such as e-call services in the automotive sector or smart metering. **The launch of 5G will provide a real boost to IoT by enabling operators to further upgrade their portfolio to offer an array of solutions tailored to the needs of a broad range of verticals.**

In such a fast-paced and ever evolving environment, there is a clear need for a regulatory approach providing operators with certainty and economic incentives to invest. **Decision-makers need to be aware that these infrastructures will not only benefit telcos, but are the pre-requisite to improving the competitiveness of the European economy as a whole.**

Stronger telcos would be good for Europe. Here is why

By Lise Fuhr, Director General, ETNO

Often, in the public debate, some observers equate the good performance of an industrial sector with detriment to consumers and to the public interest. This looks amazingly wrong in general, but it would be particularly trivial if applied to a strategic sector such as telecoms. Europe, its citizens as well as its big and small businesses have a direct interest in a strong telecom sector. One in which sustained growth underpins higher levels of investment and innovation in digital networks and services.

How much investment is enough investment?

Investment is a tool to achieve societal and economic goals, not an end in itself. Measuring how well European telcos are doing in terms of Capital Expenditure (CapEx) is a good indicator of how many resources are dedicated to building the digital backbone of the Continent. All Europeans have an interest in seeing the number grow and match the ambitions of the Gigabit Society objectives. Such objectives, as indicated by both European Commission and BCG estimates, will require at least half a trillion euros.

In the past year, according to IDATE figures, **CapEx growth has still been flat (+0.2% in EU28), but it confirmed a strong effort from operators to maintain previous investment levels** at around €47bn/year. Estimates by BCG[1] and Accenture Strategy[2] indicate that this will not be enough to achieve the Gigabit Society objectives , even in a scenario in which our sector continuously inflates the Capex/Revenue ratio to the benefit of investment.

We are proud that ETNO companies remain Europe's broadband pillar with 70% of the fixed investment: this means they remain the essential partner for network investment. However, we cannot hide **that regulatory reform has become the single most important bottleneck to higher CapEx levels.** This is clearly indicated in several reports from analysts and investors[3], but also in a 2017 Economic Investment Report by the EIB[4]. Europe's bank stresses that the lack of infrastructure investment is harming the Continent's growth potential and that "regulatory pressure on allowed returns" is among the key causes.

What we deliver to customers (and what we still don't)

This year's report is also a handy guide to the value that European users get from our sector – and what they still don't get. In network terms, higher CapEx levels are delivering improved customer experience across technologies. Take-up of 4G lines has surpassed 3G lines for the first time in history, delivering superior performance to people's devices. In the meanwhile, **FTTH/B and VDSL lines have continued growing steadily**. G.Fast is gaining traction in the market and – what is more important – **2018 will witness the first commercial trials for 5G, championed by ETNO members.**

In terms of services, telecom companies have been embracing both new offers, new business models and digital transformation. Bundles are loved by users and they are creating value both on the industry and consumer side. This links to another industry trend: convergence between telecom and media, with content playing a more and more important role. At the same time, **a wealth of industrial sectors is expected to "connect" with the telecoms industry.** This is summarised in stunning forecasts on the IoT units expected in the future. While today we have 753 million objects connected to the network, IDATE says this number will reach almost 1.8 billion in 2025. The utility, electronics and automotive sectors will contribute the most.

However, this does not tell us what telcos still do not fully deliver to customers. Our companies are working hard to make innovation happen and develop new services on top of their networks. Our recent Accenture Strategy report shows how telcos are working to move towards a platform model, in which they empower IoT and connected citizens with rich services underpinned by powerful networks. Nevertheless, a series of legislative initiatives might artificially push telcos towards a dumb-pipe model.

[1] BCG, 2016, Building the Gigabit Society https://etno.eu/datas/ETNO%20Documents/Gigabit_society_fi nal_ETNO-BCG_2016.pdf
[2] Accenture, 2017, Lead or Lose – A vision for Europe's digital future, https://etno.eu/digital2030/people-planet-prosperity
[3] Barclays, EU regulation watch, 3.1.2017 and HSBC, European Telecoms, EU regulation update, 4.10.2017
[4] European Investment Bank, 2017, Economic Investment Report http://www.eib.org/attachments/efs/economic_investment_report_2017_en.pdf

Service regulation in the Code and the new ePrivacy rules risk curtailing our ability to develop digital services, compete with internet players and hence create more consumer choice. What is more, some proposed rules ignore that investment on the supply side (eg., fibre and 5G deployment) is intimately linked to our ability to develop services that meet the demand side.

Who is afraid of revenue growth?

Many, in the policy debate, believe that "revenues" rimes with higher prices. We think this is a very simplistic way of looking at markets and that it is among the factors that led to the sluggish levels of investment identified in the EIB economic investment report. **A more investment and innovation-friendly regulation will unlock more resources to re-invest into the European economy and society.** This can be done in many ways. For example, by empowering telcos to do more with their networks and develop digital services on top. This creates value for the industry, increases competition levels on the digital services market and it creates a broader choice for consumers. Similarly, incentivising infrastructure-based competition as opposed to protecting individual companies will deliver more network investment.
We live in challenging times. Creating new opportunities for citizens and businesses requires a high drive at the political and at the industrial level. Setting bold objectives will not be enough, but it requires coherent regulatory and policy action.

Regulatory reform has become the single most important bottleneck to higher CapEx levels

2 MARKET TRENDS

Foundations for a return to growth

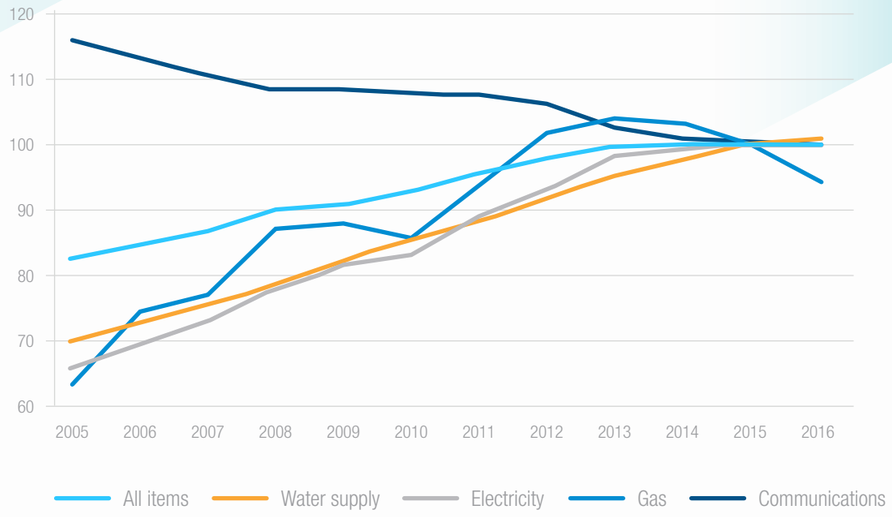
Can the European telecoms sector return to growth? 2017 figures confirmed early trends identified in last year's report, with the European telecom industry emerging from its worst decade. After 8 years in the negative camp, 2017 is expected to see **a slightly positive growth in telecommunications revenues at a rate of 0.1% in EU28**. However, key challenges remain.

European operators continue enjoying growing demand for connectivity. The total number of connections steadily increased, driven by mobile and fixed broadband. At the end of 2017, there will be 778m mobile subscriptions and 193m fixed broadband connections in "ETNO countries", representing an increase of 0.8% and 3.1%, respectively, over 2016. Mobile penetration will increase to 126% of population and broadband to 31% of population.

Unique price pressure in communications

Comparing consumer prices for communications services against a general basket and other network industries shows how unique the evolution of prices in the communications sector has been over time. Contrary to all the other industries, the prices for telecoms have consistently decreased for the entire period covered by the data available, thus reflecting the impact of regulatory intervention and an extremely competitive market environment.

Evolution of consumer prices (HICP, 2015=100, EU28)



Source: IDATE based on Eurostat data

Plain circuit-switched fixed telephony services continue on their way into obsolescence, their number falls by 3.7% in 2017 to 148.1m in the ETNO perimeter, meaning that since 2014, when the number of fixed broadband lines first exceeded that of PSTN lines, the differential has grown to almost 45m lines in a period of just three years.

There are more arguments for telecom operators to be reasonably optimistic that the coming years will be more favourable for the industry than the past decade. **The different flavours of convergence (fixed/mobile; telecoms/media) have the potential to create value for the industry.** Furthermore, more and more users are adopting fixed and wireless high-speed networks, thus opening the potential for innovative services and making it possible for operators to progressively switch off costly legacy infrastructures. Consolidation within and across markets in Europe should make another contribution to creating the conditions for recovery.

A new wave of convergence?

Convergence between the telecom and media sectors is not a new idea…

At the turn of the century, many entrepreneurs believed that convergence between content and networks was an obvious move. However, this first wave of telecom and media convergence was not a success.

During the last couple of years, we have seen a second wave of telecom and media convergence. The emergence of new services and usages such as widespread catch-up TV, success of SVoD platforms and the generalization of video use over social networks have created a new opportunity for telecoms to play the media card. **Looking for a killer app for their FTTx and 4G networks, video is the only massive usage that allows monetizing such new access technologies.**

However, convergence strategies are not immune to challenges. With content strategies being aimed at attracting new customers to expand network usage, the rising cost of content puts significant pressure on the potential value creation.

Looking at the issue more in detail, there are actually two types of content strategies pursued by telecom operators. Some telecom operators use content as a **defensive strategy.** Facing new players entering their markets who proposed access at a very low cost to convince customers to buy expensive contents, telecom operators have replied with a mirror strategy that embed content at low price to convince customers to pay the price of their next generation networks.

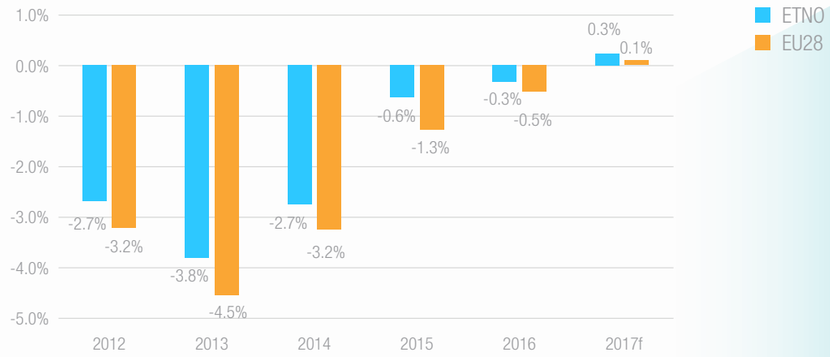
Some other operators are using content as an **offensive strategy.** By integrating exclusive content in their offers, the target is to increase ARPU, lower churn and conquer market share. The challenge is to convince the customer that the bundled access + content product has a higher value-for-money than cheaper no-frills access products. These telecom operators also believe that bundling content with fixed/mobile offers will allow them to address entire households, thus pushing the churn even lower than by classic bundling. This combination of higher ARPU and much lower churn should boost customer lifetime value to a level such that content cost will be recovered.

In term of success, we have seen countries where the defensive strategies effectively work. On the offensive strategy, today it is too early to identify successful players in Europe.

However, some of the key challenges for the industry remain; notably the need to continue investing heavily in infrastructure upgrades as well as the question of a level playing field for all players competing on similar services.

ETNO members are at the forefront of all these transformations. They have the most customers on their networks, are leading investors in fibre and provide jobs to more than 645,000 people across ETNO's footprint.

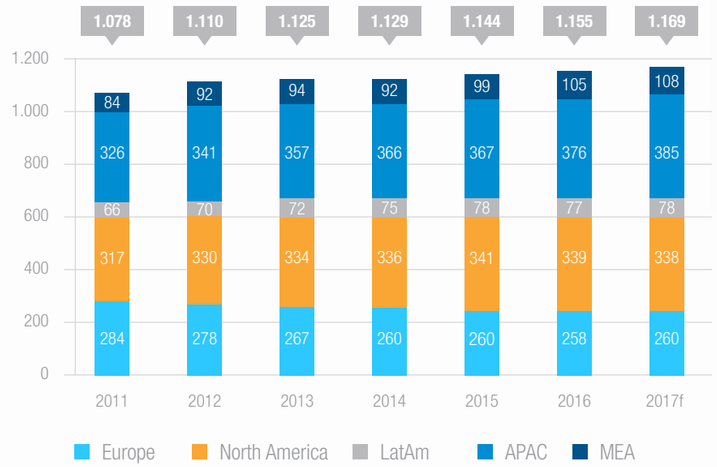
Telecom service revenues (% growth, y-o-y)



	2012	2013	2014	2015	2016	2017f
ETNO perimeter	-2.7%	-3.8%	-2.7%	-0.6%	-0.3%	0.3%
EU28	-3.2%	-4.5%	-3.2%	-1.3%	-0.5%	0.1%

Source: IDATE

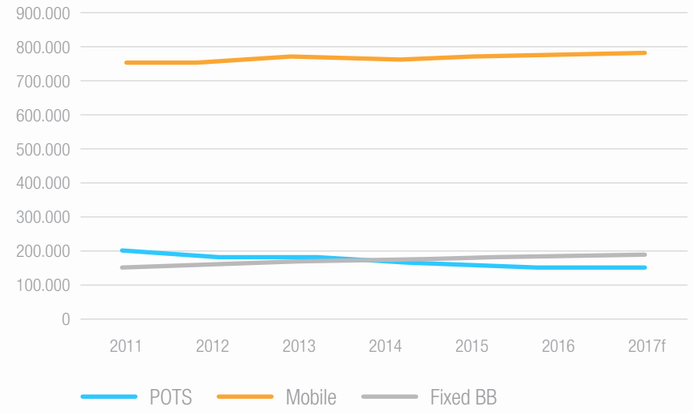
Telecom service revenues (EUR m)



Telecom service revenues (EUR bn)	2011	2012	2013	2014	2015	2016	2017f
Europe	284	278	267	260	260	258	260
North America	317	330	334	336	341	339	338
LatAm	66	70	72	75	78	77	78
APAC	326	341	357	366	367	376	385
MEA	84	92	94	92	99	105	108
Global	1.078	1.110	1.125	1.129	1.144	1.155	1.169

Source: IDATE

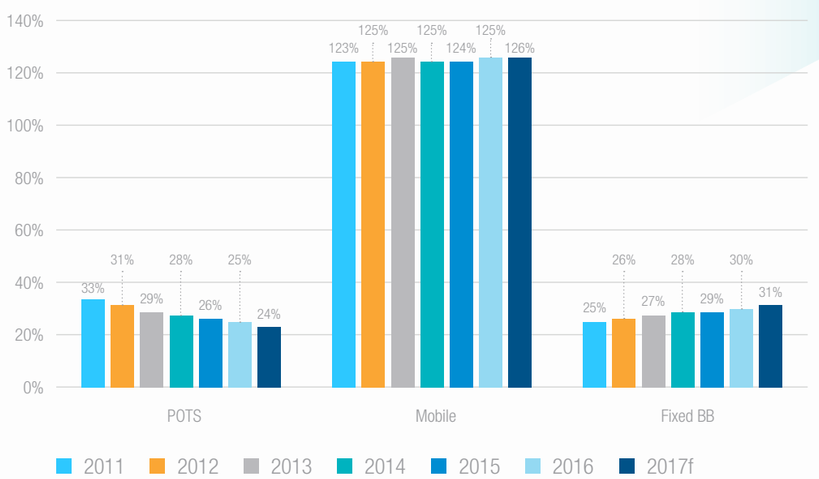
Access to telecom services (ETNO perimeter, 000s of lines)



Acess lines (000s)	2011	2012	2013	2014	2015	2016	2017f
POTS	201.654	188.729	179.037	169.163	159.915	153.897	148.143
Mobile	748.026	759.607	764.033	764.621	765.521	772.241	778.221
Fixed BB	153.818	159.937	166.506	173.357	180.433	187.329	193.056

Source: IDATE

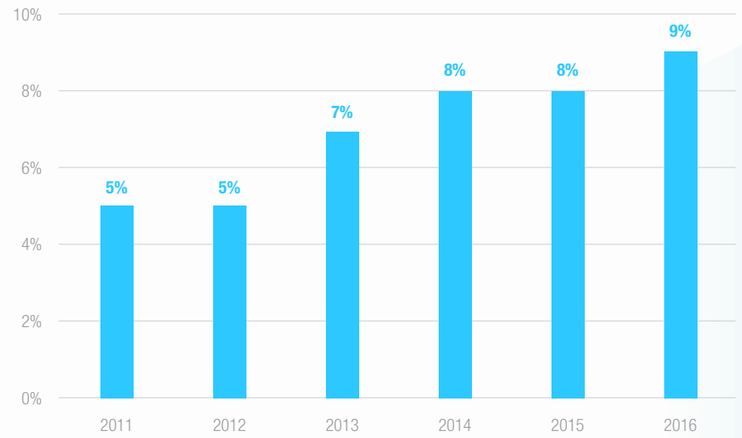
Penetration rates (ETNO perimeter; lines/subscribers per population)



Teledensity (% of pop.)	2011	2012	2013	2014	2015	2016	2017f
POTS	33%	31%	29%	28%	26%	25%	24%
Mobile	123%	125%	125%	125%	124%	125%	126%
Fixed BB	25%	26%	27%	28%	29%	30%	31%

Source: IDATE

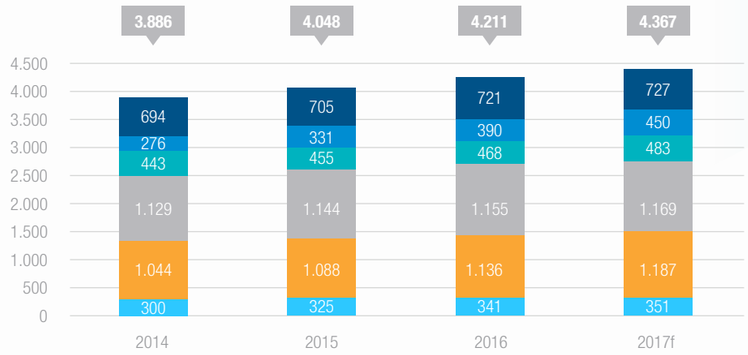
Mobile broadband-only households (% of households)



	2011	2012	2013	2014	2015	2016
EU28	5%	5%	7%	8%	8%	9%

Source: IDATE

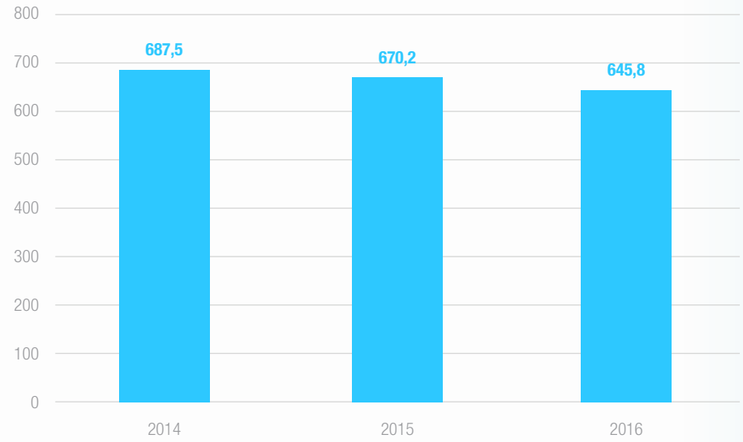
ICT industry revenues (EUR bn)



ICT industry revenue, Europe, EUR bn	2014	2015	2016	2017f
Network equipment	300	325	341	351
IT services & software	1.044	1.088	1.136	1.187
Telecom services	1.129	1.144	1.155	1.169
TV and video services	443	455	468	483
Internet services	276	331	390	450
Devices	694	705	721	727
Total	3.886	4.048	4.211	4.367

Source: IDATE

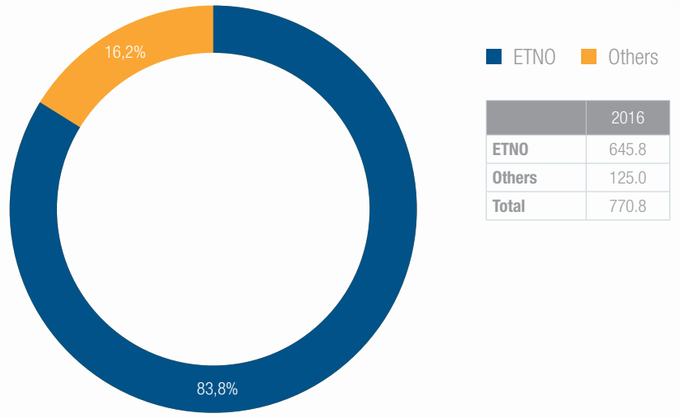
ETNO members' employment (ETNO perimeter; 000s)



	2014	2015	2016
ETNO	687.5	670.2	645.8

Source: IDATE

ETNO members' employment (ETNO perimeter; 000s; 2016)



	2016
ETNO	645.8
Others	125.0
Total	770.8

Source: IDATE

3 REVENUE AND COMPETITIVE TRENDS

Indicators show markets clawing back, but challenges remain

The telecoms sector is well alive in the ETNO perimeter and ETNO members affirm their leadership in markets slowly recovering from years of economic hardship. However, the overall gap with other regions and other industries remains.

In 2017, total revenues in the EU28 perimeter are expected to grow by 0.1% and reach EUR 222.6bn according to IDATE estimates. **The EU-US revenue gap remains significant,** with the US expected to be scoring €87bn more in revenues in 2017 as compared to the EU. However, **in terms of revenue growth, the EU is expected to switch to the positive camp for the first time in 8 years,** while the US is likely to slide into the negative with a slight decrease.

How bundles create value for consumers and for telcos

There is a widespread development of telecom bundled products all over the continent. From the traditional 3P bundles, we see today the rapid development of 4P bundles that include mobile services. This trend is both being eagerly appreciated by customers and creating more value for the industry.

Over the last 12 to 18 months, a new trend in product bundles has emerged with the ongoing trend of telco-media convergence.

More and more telecom players include premium content into their bundles, be it on exclusive or non-exclusive basis. Clients, as part of their subscriptions, get access to movies, TV-shows or sports programs.

Value creation of these new bundles is in question. The cost of the content not always being associated to an increased retail price may lead to think that the strategy does not create value.

However, several levers allow value creation even if the final pricing is declining (through bundle rebate) or if the cost structure increases (through content costs).

Churn control is the first and most obvious lever creating value with bundles. Bundling creates viscosity on a market, meaning customers are less likely to change operators. Customer lifetime value significantly increases.

Value creation of next-generation access is a second lever. Contents require higher bandwidth, especially 4K content. Multi-screen consumptions also increase the burden on the household access. Bundling with content can create a higher demand for FTTx access that operators can monetize with a mark-up.

Finally, strategy of bundle segmentation can create upsale effect. While creation of various bundle segments can create a trend towards declining nominal prices, some operators manage to set up an upselling strategy where cheap bundles attract customers in their commercial channels. Commercial forces and effective pricing strategy allow upselling to the prospect towards higher bundles, thus causing the global average ARPU to increase.

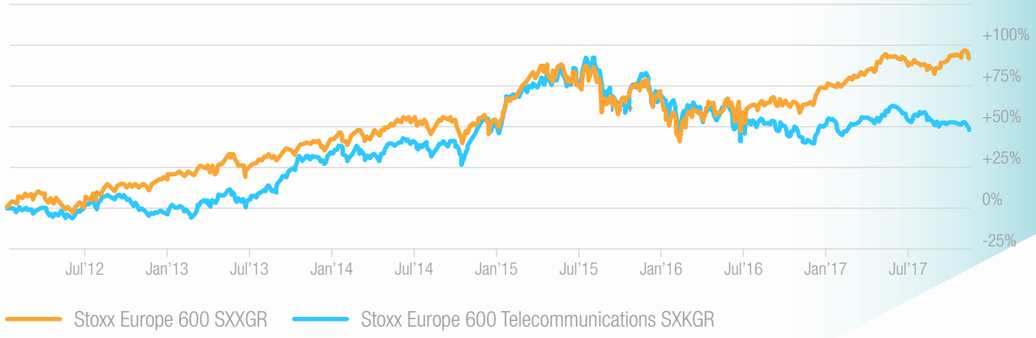
Both mobile and fixed broadband revenues are contributing to this evolution. Growing by a timid 0.1% last year, mobile revenue growth improves in 2017 and will reach 0.8%. Mobile revenues in the ETNO perimeter are set to reach EUR 112.6bn this year, up from EUR 111.9 in 2016.

Fixed broadband is the only service that never sported negative revenue growth. This tendency will be confirmed this year and revenues are expected to grow by 3.4% to EUR 70.4bn. This trend is supported not only by ongoing growth in service take-up numbers, but also by slightly rising average revenues per line.

Not surprisingly, the situation is very different in fixed telephony, where unmetered usage of package-switched services, fixed to mobile substitution and adoption of OTT services have caused an unstoppable decline of revenues. In 2017, revenues will be down by 6.8% compared to 2016 and will reach EUR 39.6bn in EU28 footprint, just somewhat more than half of the EUR 73.2bn that fixed telephony represented a decade ago, in 2008.

If we look at stock markets, the situation remains challenging, with European telcos consistently performing worse than others in the Stoxx Europe 600 (July 2016 onwards).

Stock index evolution (Stoxx Europe 600; January 2012 – November 2017)



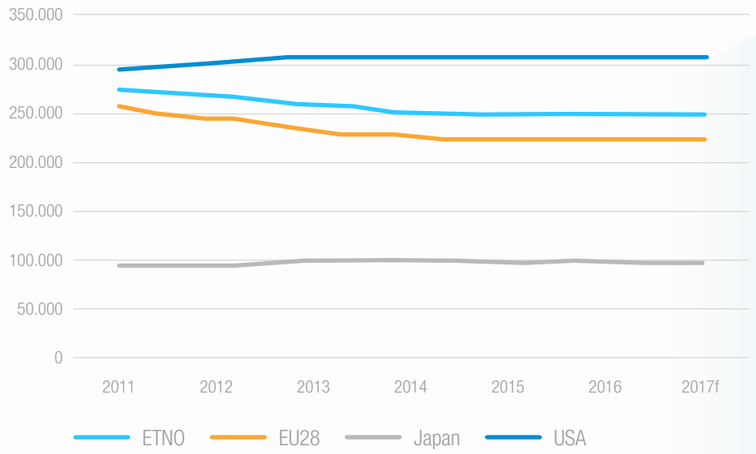
Source: Stoxx.com

If we look at the medium term into 2021, revenues for Europe shall make a rebound. After having hit their low point of EUR 258bn in 2016, revenues are expected to grow by more than EUR 10bn to EUR 269bn in 2021.

Yet, telecoms' growth rates seem very modest projected against the growth of their OTT competitors. In 2017, OTTs' communications revenues will grow by an impressive 24.2%. Despite a slowdown in the years to come, revenue growth for OTTs will remain significantly higher than that of the telecoms industry. In 2021, OTTs' communications revenues will still grow by 5% p.a. compared to a 1% growth in the telecoms sector.

Users show a high level of trust in ETNO member operators. Across the ETNO footprint, almost half of all fixed broadband are subscribers of an ETNO member's brand (48%). In the mobile sector, the situation is even slightly better; 50% of all mobile subscriptions in 2016 were held with an ETNO operator.

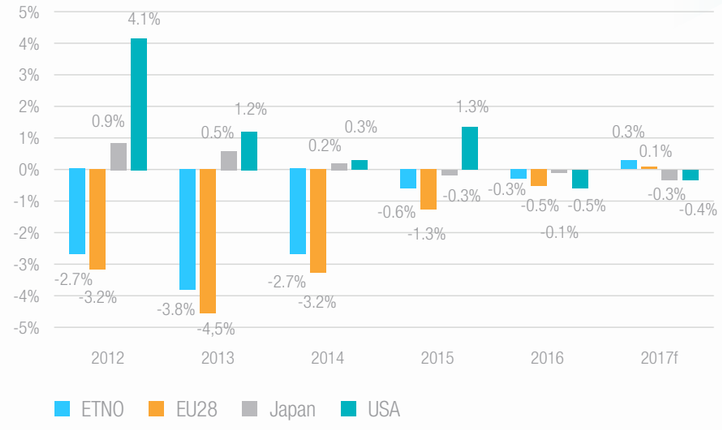
Telecom service revenues (EUR bn)



	2011	2012	2013	2014	2015	2016	2017f
ETNO	276.395	268.985	258.762	251.650	250.060	249.235	249.906
EU28	253.100	245.031	233.912	226.323	223.461	222.336	222.575
Japan	97.486	98.353	98.869	99.055	98.786	98.684	98.341
USA	291.915	303.934	307.524	308.402	312.511	310.830	309.595

Source: IDATE

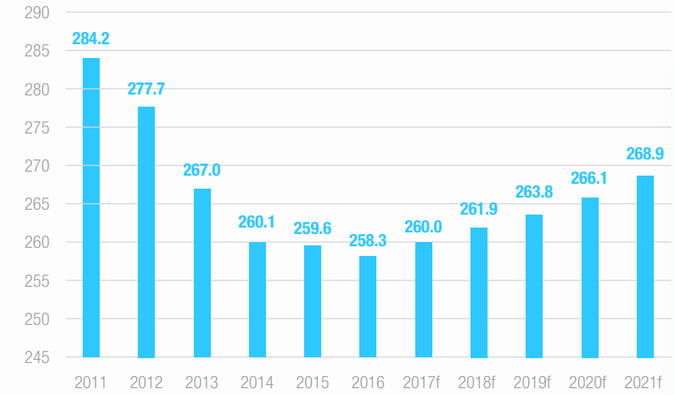
Telecom service revenue growth (% y-o-y)



	2012	2013	2014	2015	2016	2017f
ETNO	-2.7%	-3.8%	-2.7%	-0.6%	-0.3%	0.3%
EU28	-3.2%	-4.5%	-3.2%	-1.3%	-0.5%	0.1%
Japan	0.9%	0.5%	0.2%	-0.3%	-0.1%	-0.3%
USA	4.1%	1.2%	0.3%	1.3%	-0.5%	-0.4%

Source: IDATE

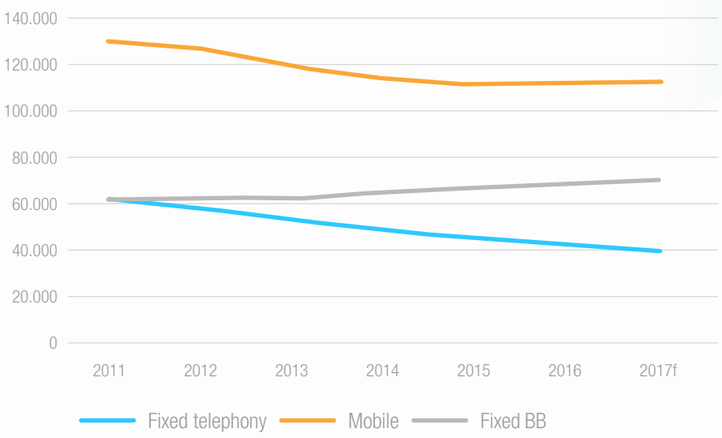
Telecom service revenues Europe (EUR bn)



	2011	2012	2013	2014	2015	2016	2017f	2018f	2019f	2020f	2021f
Europe	284	278	267	260	260	258	260	262	264	266	269

Source: IDATE

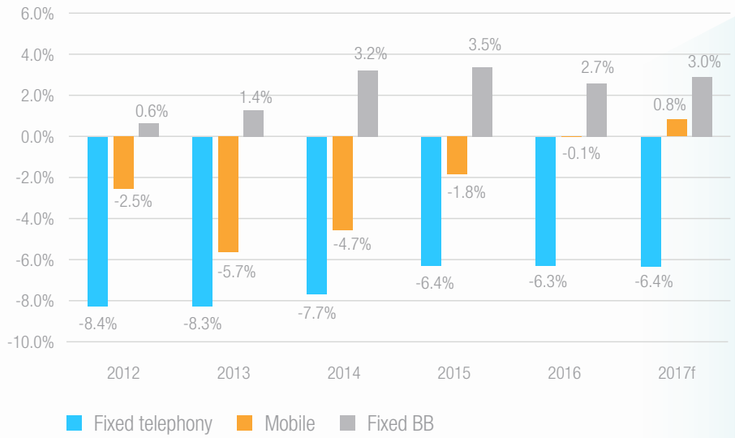
Revenues by type of service (EU28, EUR bn)



Revenues EUR m	2011	2012	2013	2014	2015	2016	2017f
Fixed telephony	62.101	56.907	52.155	48.160	45.099	42.266	39.562
Mobile	129.828	126.585	119 385	113.792	111.770	111.697	112.609
Fixed BB	61.171	61.540	62.372	64.371	66.593	68.373	70.405

Source: IDATE

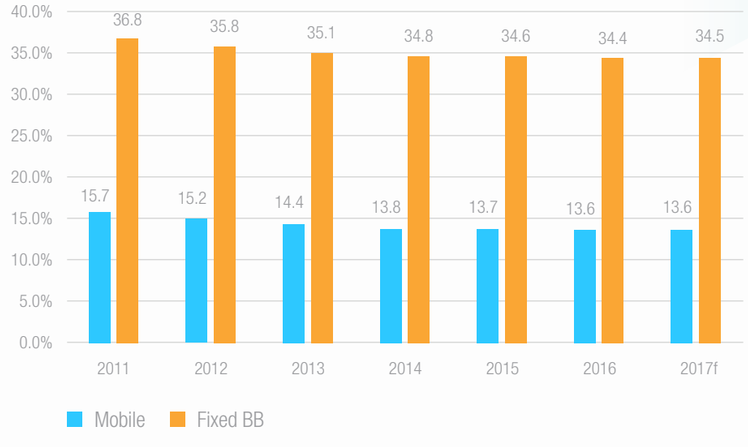
Service revenue growth by type of service (EU28, % y-o-y)



	2012	2013	2014	2015	2016	2017f
Fixed telephony	-8.4%	-8.3%	-7.7%	-6.4%	-6.3%	-6.4%
Mobile	-2.5%	-5.7%	-4.7%	-1.8%	-0.1%	0.8%
Fixed BB	0.6%	1.4%	3.2%	3.5%	2.7%	3.0%

Source: IDATE

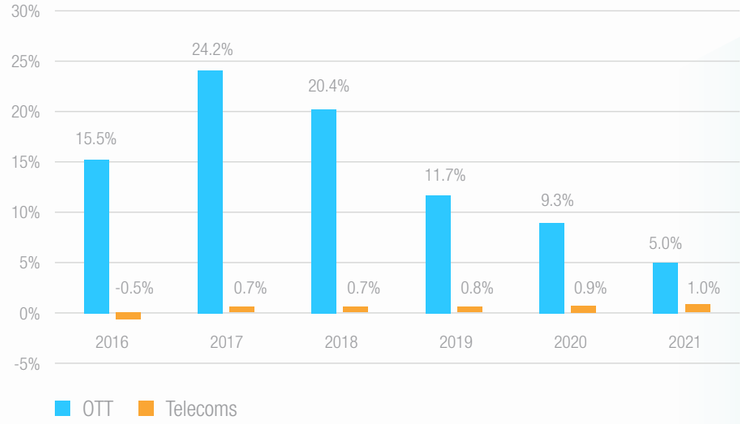
ARPU evolution (ETNO perimeter, EUR/month)



ARPU/ARPL (EUR/month)	2011	2012	2013	2014	2015	2016	2017f
Mobile	15.7	15.2	14.4	13.8	13.7	13.6	13.6
Fixed BB	36.8	35.8	35.1	34.8	34.6	34.4	34.5

Source: IDATE

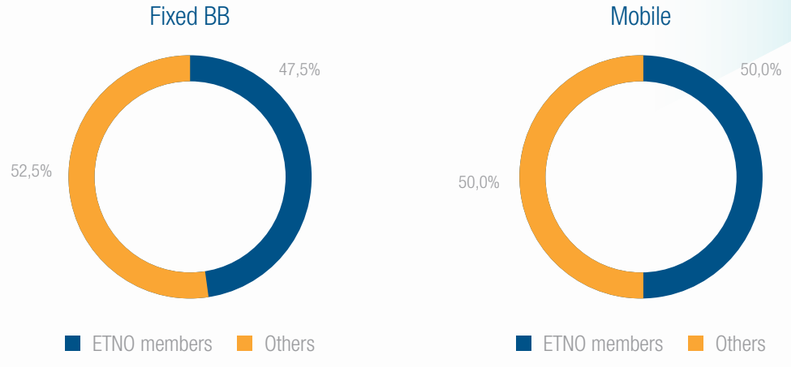
Service revenue growth forecast (Europe, % y-o-y)



Service revenue growth	2016	2017	2018	2019	2020	2021
OTT communication	15.5%	24.2%	20.4%	11.7%	9.3%	5.0%
Telecom	-0.5%	0.7%	0.7%	0.8%	0.9%	1.0%

Source: IDATE

ETNO members' retail market share (ETNO perimeter, % of subscribers, 2016)



Market share	Fixed BB	Mobile
ETNO members	47.5%	50.0%
Others	52.5%	50.0%

Source: IDATE

EU telcos have stepped up their investment effort, with the CapEx/Revenue ratio on the rise for 6 years now

4 INVESTMENT TRENDS

Future-proofing Europe's networks

As the next generation of converged networks is already approaching pre-commercial launch, operators are still busy investing in fibre and radio access networks as well as accompanying high-capacity backhaul infrastructure.

Cumulatively, telecom and cable operators in EU28 invested EUR 47.2bn in tangible assets in 2016. This represents an increase of 0.2% compared to the previous year. The relative effort of operators has also increased: if we look at the time series, the CapEx/Revenue ratio in Europe has been on the rise for the past 6 years. In 2016, operators in the ETNO markets have devoted 17.7% of their revenues to investments, an additional increase of 0.3 percentage points over the year before.

5G approaching the starting blocks

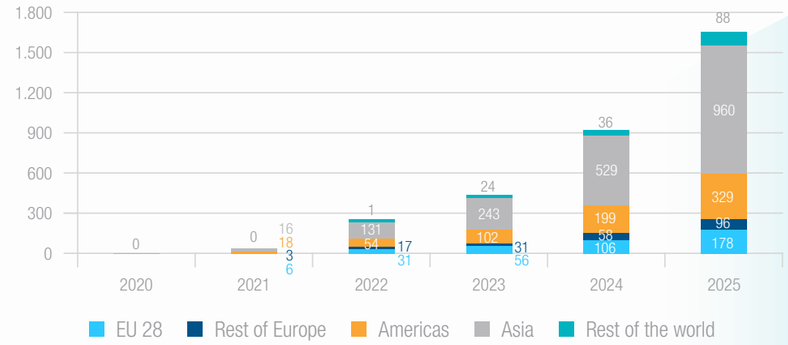
Upcoming Olympic Games in South Korea (2018) and in Japan (2020) are pushing players in these markets to roll out pioneer 5G services before 2020, which is the launch date on which most telcos across the globe seem to converge towards. In the North American market, AT&T and Verizon are announcing the availability of pre-commercial fixed wireless access services by 2018. European operators are not at rest, either. In Europe, leading ETNO members such as Telia Company and Deutsche Telekom have started testing 5G. Telia Company has recently gone live with Europe's first public 5G showcase in Estonia and has announced it will bring 5G to life in Stockholm, Tallinn and Helsinki in early 2018.

5G networks should be capable of meeting demand for superfast transmissions, very short latency, and be able to manage billions of connected objects. The supply of 5G services to vertical sectors, notably the automotive industry, eHealth, energy and factories of the future, have been emphasised by the European Commission, while outside of Europe the focus is on creating an extension of 4G with increased capacity and transmission rates.

For operators, three scenarios to monetize 5G services are emerging. The first is **enhanced mobile broadband (eMBB)**, basically a continuation of LTE set to deliver faster connections. The second scenario is **massive machine-type communication (MMTC)** and focuses chiefly on issues surrounding connected objects. The third option is one of **ultra-reliable and low latency communication** with a focus on network security and reliability for use by highly critical services, most notably in public safety networks, autonomous connected cars, robotics and drones. In addition, one should keep in mind that these options are not mutually exclusive and operators can thus follow a multi-track approach.

For 2025, we expect a take-up of about 1.5bn subscribers, of which close to 180m in the EU28 countries.

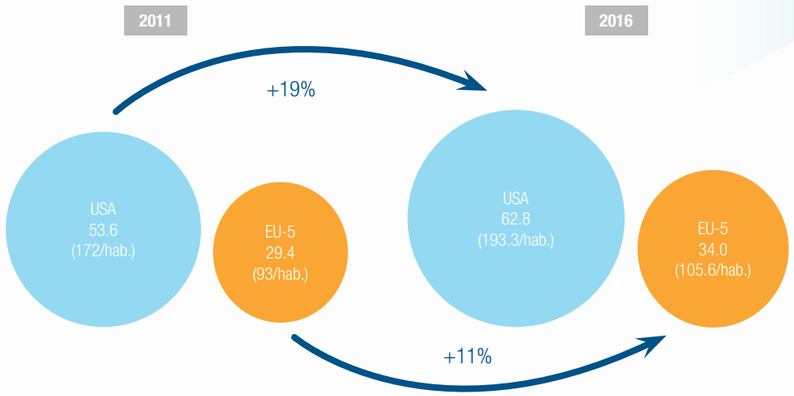
5G subscribers forecast (million subscribers)



Source: IDATE

Interestingly, **European operators are thus devoting a higher share of their revenues to infrastructure investments** than their peers in the US, where this ratio keeps hovering around 14%. However, a further drill-down shows that the investment challenge remains sizeable for Europe's telcos. In absolute terms, the picture is quite different, mainly as a result of the more favourable revenue evolution in the US. With EUR 62.8bn, CapEx in the US is almost 20% higher than in the ETNO perimeter. In terms of spending per capita, this means that the US operators invested EUR 193.9, which is more than twice the EUR 85.0 per capita CapEx in the ETNO perimeter.

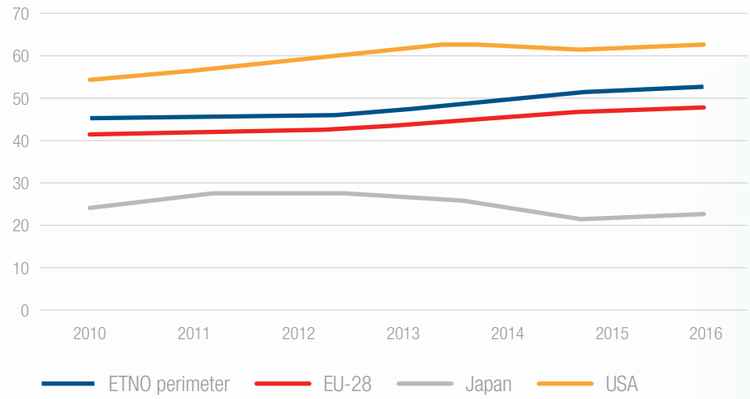
CapEx in the United States and the EU-5, in 2011 and 2016 (EUR bn and EUR/capita)



Source: IDATE

ETNO members are taking the lead in future-proofing European network infrastructures. If we look at the 5 largest EU countries, total fixed CapEx was EUR 20.7bn in the past year. ETNO members showed strong leadership by deploying almost 70% of the total fixed investment. The gap with other telcos is significant, with alternative operators cumulatively accounting for around 17% of 2016 fixed CapEx. Cable operators alone, instead, are contributing to roll-out with 15% of the investments in 2016. Such leadership is confirmed also if we look at the overall sector investment, both fixed and mobile, with ETNO companies representing 62.0% of the total.

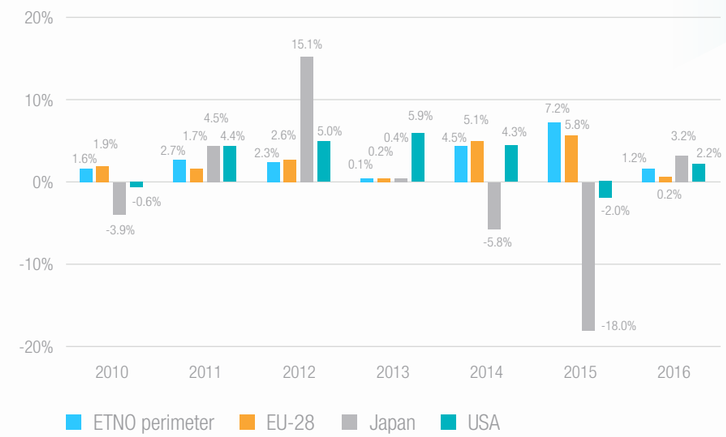
CapEx (EUR bn, excl. spectrum)



Tangible CapEx (EUR bn)	2010	2011	2012	2013	2014	2015	2016
ETNO perimeter	43.9	45.1	46.1	46.2	48.3	51.7	52.3
EU-28	40.5	41.2	42.2	42.3	44.5	47.0	47.2
Japan	23.0	24.0	27.7	27.8	26.2	21.5	22.2
USA	51.8	54.1	56.8	60.2	62.8	61.5	62.8

Source: IDATE

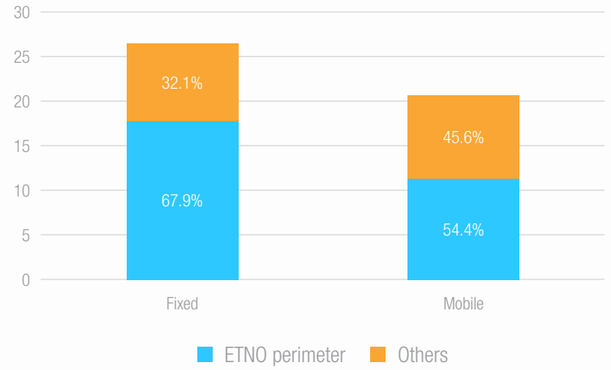
CapEx growth (%, y-o-y)



Tangible CapEx (EUR bn)	2010	2011	2012	2013	2014	2015	2016
ETNO perimeter	1.6%	2.7%	2.3%	0.1%	4.5%	7.2%	1.2%
EU-28	1.9%	1.7%	2.6%	0.2%	5.1%	5.8%	0.2%
Japan	-3.9%	4.5%	15.1%	0.4%	-5.8%	-18.0%	3.2%
USA	-0.6%	4.4%	5.0%	5.9%	4.3%	-2.0%	2.2%

Source: IDATE

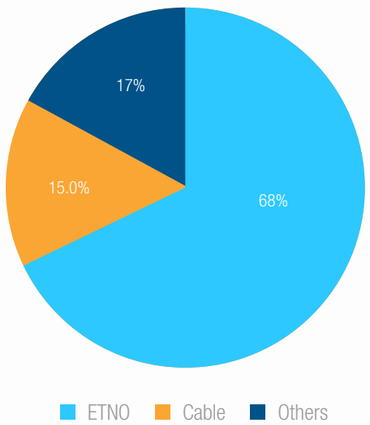
Fixed and mobile CapEx (EU28, EUR bn, 2016)



	Fixed	Mobile
ETNO members	18.0	11.2
Others	8.5	20.7
Total	26.5	20.8

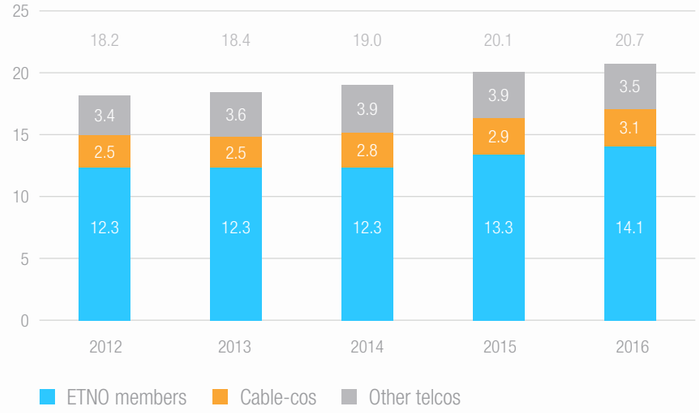
Source: IDATE

Fixed CapEx (% of CapEx, EU5)



Source: IDATE

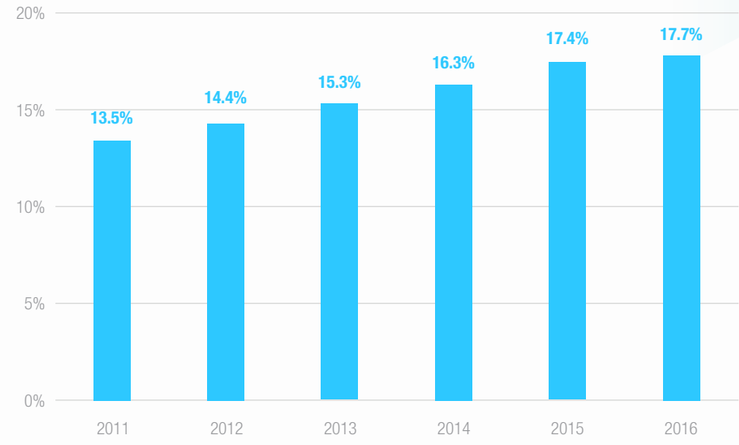
Fixed CapEx (EUR bn, EU5)



Total CapEx (EUR bn)	2012	2013	2014	2015	2016
ETNO members	12.3	12.3	12.3	13.3	14.1
Cable-cos	2.5	2.5	2.8	2.9	3.1
Other telcos	3.4	3.6	3.9	3.9	3.5
Total	18.2	18.4	19.0	20.1	20.7

Source: IDATE

CapEx share of revenues (%, ETNO perimeter)



Source: IDATE

The European investment per capita (€85/habitant) is less than half than in the US (€193/habitant)

5 BROADBAND AND NGA

More lines, more speed and more to come…

As broadband has become the central pillar for individuals and businesses' communications needs, the demand for connectivity continues growing. In the ETNO perimeter, the number of broadband connections is set to hit 858m by the end of 2017, representing a growth of 8% on a yearly basis.

Demand for broadband connectivity increases over fixed and wireless access networks alike, although the underlying dynamics are not the same. In terms of fixed broadband, an expected growth rate of 3.1% in 2017 should take the number of access line to 193m.

Mobile connections represent the lion's share of broadband lines. There will be 665m of 3G and 4G connections at year-end 2017. Progressing at a 9.1% rate year-on-year, the segment is thus expanding considerably more rapidly than the already respectably growing fixed broadband segment. Within the mobile segment, the transition from 3G to 4G is an interesting element to observe. Users are massively abandoning their 3G lines in favour of better performing 4G connectivity. The number of 3G subscriptions in the ETNO area will have decreased by 31.6m in 2017. However, while the expansion of the mobile broadband market is thus entirely driven by 4G, there is more to its growth than just 3G to 4G substitution. In the course of the 2017, 88.9m additional users will have adopted 4G. In terms of growth, this represents a 9.1% decline for 3G compared to a growth of 34.3% for 4G. Therefore, **4G has surpassed 3G also in absolute take-up** with 348.7m subscriptions versus 316.4m 3G lines, respectively.

G.Fast gaining traction in the market

G.Fast appeared in the market about three years ago and key vendors put a lot of hope in this superfast copper technology, which allows to deliver more than 300 Mbps to users over short distances.

Indeed, the main use cases are quite strong:

- Avoiding having to enter the user's households for a telco rolling out an FTTx network (cost and time to deploy) and using for the very last mile the old copper network,
- Connecting MDUs by installing a fibre at the basement of small MDUs or on each floor for large ones and then once again using existing copper for the indoor wiring.

For 2017, the volumes of G.Fast shipments were still very small, so the promises have not yet materialized for this technology. Still, there is reason to believe that in the 5 years to come, G.Fast could gain a certain success in the market. A number of key players have now committed to G.Fast. Among them is BT, which announced to deploy G.Fast to 10m homes by 2020 and to provide more than 300 Mbps in download speed. The architecture envisioned by BT diverts the initial use case of the technology as G.Fast has been customised for BT to be deployed from the Street Cabinet for a distance of up to 350 meters.

In the USA, AT&T also announced looking at G.Fast for the indoor coverage of MDUs. Indeed, main FTTx rollouts in the USA have not yet targeted MDUs and this is the challenge for the years to come.

Finally, during the last BBWF in Berlin, NBN Australia announced a launch of G.Fast access under its FTTC architecture for 2018 using 106 Mhz and 212 Mhz technologies.

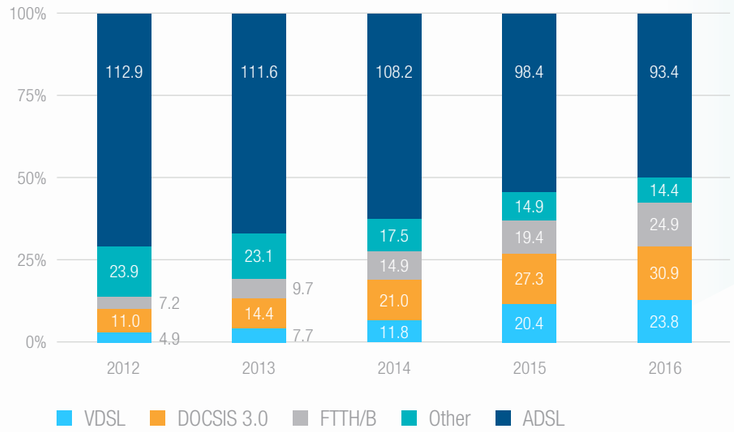
G.Fast technology is credited with significant potential for further upgrades: today the 106 Mhz solution is proposed in the market but probably during second half of 2018, the 212 Mhz solution will be commercially available allowing to reach a speed of 1 Gbps over up to 150 m of copper. A further upgrade is still under development; the goal set out for XGFast is to reach 10 Gbps over a copper terminating segment.

In the fixed market, too, the adoption of high-speed broadband access continues making inroads. 31.7% of homes in ETNO-countries had already subscribed to an NGA access line. Cable operators' DOCSIS 3.0 (or 3.1) technology was the most widely adopted high-speed access with 30.9m subscriptions, giving it a 39% share of the market. FTTH/B networks have claimed back the second position in the market, totalling 24.9m subscriptions, representing 31% of the market. VDSL-based accesses are on a close third rank with 23.8m subscribers and 30% NGA market share.

Operators' massive investments in infrastructure keep pushing the boundaries of NGA coverage. 57% of households in ETNO market could opt for an access based on VDSL technology in 2016. High-speed cable networks were available to 38% of households and 31% of homes could have opted for FTHH/B to access the Internet. These coverage extensions are accompanied by further performance upgrades. Although FTTH/B networks remain the "platinum" option, VDSL and cable-based access networks are continuously being upgraded. Cable-cos have started migrating to DOCSIS 3.1 and telcos already offer speeds of more than 100Mbps over copper terminating segments. On the mobile side, 5G networks will not only improve the speeds delivered to users but also allow for significant QoS upgrades.

The members of ETNO are leading architects of this transition. They make available the majority of the NGA sockets deployed over Europe. **In total, 56% of the sockets deployed are from ETNO members.** In terms of technology, ETNO operators have deployed 56% of FTTH and no less than 85% of the VDSL sockets. In DOCSIS segment, ETNO players represent 4% of the homes passed.

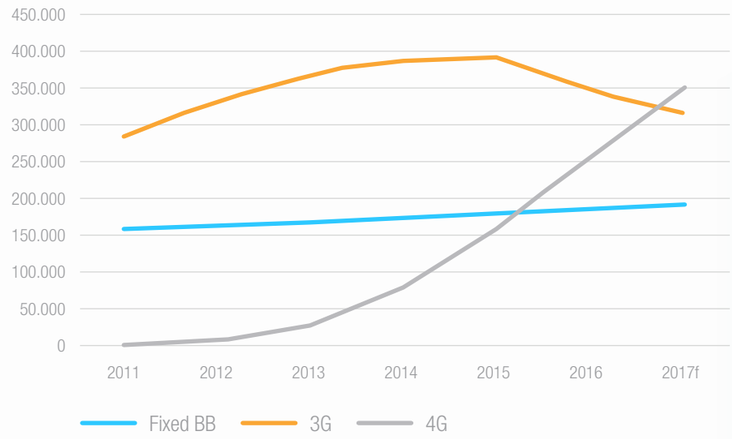
Fixed broadband lines by technology (ETNO perimeter, % of subscriptions)



Broadband subscriptions	2012	2013	2014	2015	2016
VDSL	4.9	7.7	11.8	20.4	23.8
DOCSIS 3.x	11.0	14.4	21.0	27.3	30.9
FTTH/B	7.2	9.7	14.9	19.4	24.9
Other	23.9	23.1	17.5	14.9	14.4
ADSL	112.9	111.6	108.2	98.4	93.4

Source: IDATE

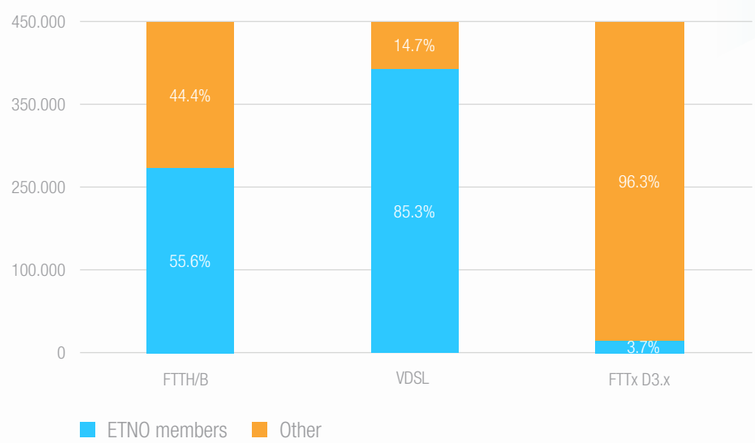
Fixed and mobile broadband take-up (ETNO perimeter, 000s of subscribers)



Broadband lines	2011	2012	2013	2014	2015	2016	2017f
Fixed BB	153.818	159.937	166.506	173.357	180.433	187.329	193.056
3G	283.507	334.960	370.760	391.183	393.542	347.987	316.382
4G	415	4.224	25.743	82.136	162.278	259.739	348.736

Source: IDATE

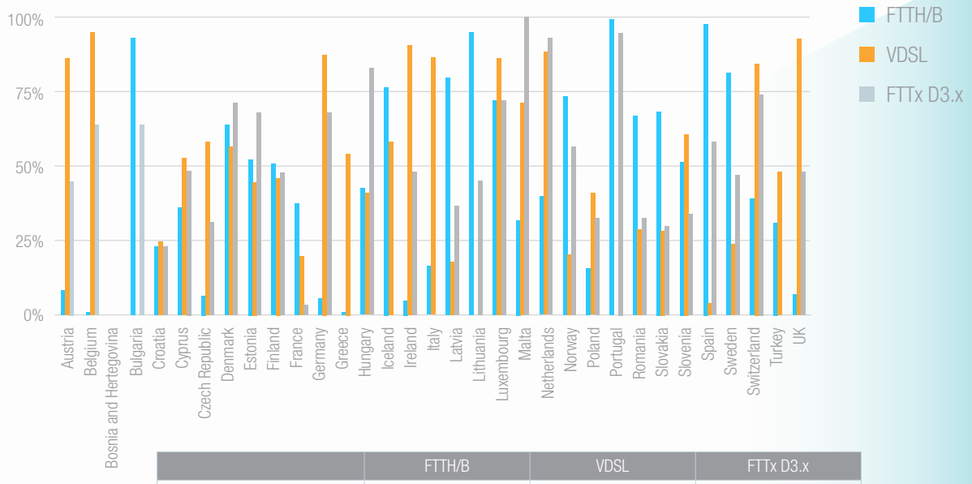
NGA sockets installed and ETNO share (ETNO perimeter)



	FTTH/B	VDSL	FTTx D3.x	Total
Sockets	109.768.638	174.747.798	97.574.226	382.107.286
Share ETNO members	56%	85%	4%	56%

Source: IDATE

NGA coverage (% of households, 2016)

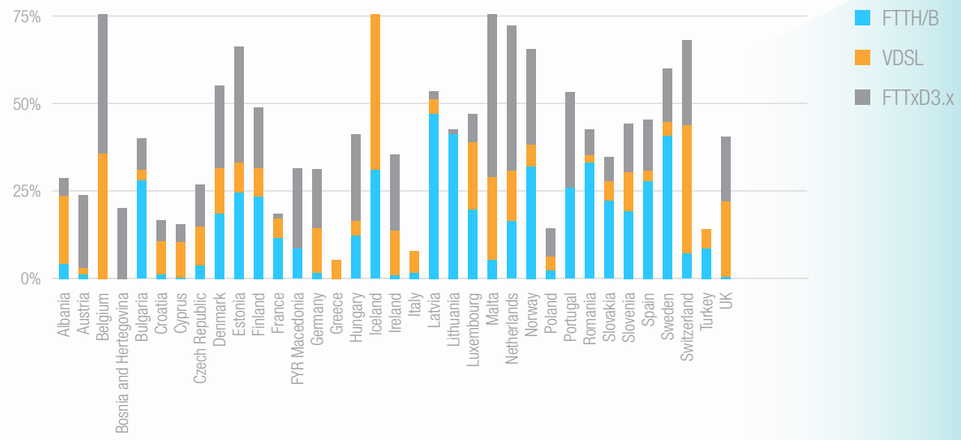


	FTTH/B	VDSL	FTTx D3.x
ETNO perimeter	24.852.722	23.836.638	30.854.109
Albania	n/a	n/a	n/a
Austria	8%	87%	45%
Belgium	0%	95%	64%
Bosnia and Hertegovina	0%	0%	0%
Bulgaria	93%	0%	64%
Croatia	23%	25%	23%
Cyprus	36%	53%	49%
Czech Republic	6%	58%	31%
Denmark	64%	56%	71%
Estonia	52%	45%	68%
Finland	51%	46%	48%
France	38%	19%	3%
FYR Macedonia	n/a	n/a	n/a
Germany	6%	89%	68%
Greece	0%	54%	0%
Hungary	42%	41%	83%
Iceland	77%	59%	0%
Ireland	5%	92%	48%
Italy	16%	87%	0%
Latvia	81%	18%	36%
Lithuania	95%	0%	45%
Luxembourg	72%	87%	72%
Malta	32%	72%	100%
Netherlands	40%	89%	93%
Norway	73%	20%	57%
Poland	15%	41%	33%
Portugal	99%	0%	92%
Romania	67%	29%	33%
Slovakia	69%	29%	30%
Slovenia	52%	61%	35%
Spain	99%	4%	58%
Sweden	82%	24%	48%
Switzerland	40%	85%	74%
Turkey	31%	48%	0%
UK	7%	93%	48%

[4] Figures include an estimated correction for network overlap, however they might still be subject to marginal errors in certain specific cases, e.g. due to co-investment or other wholesale access schemes

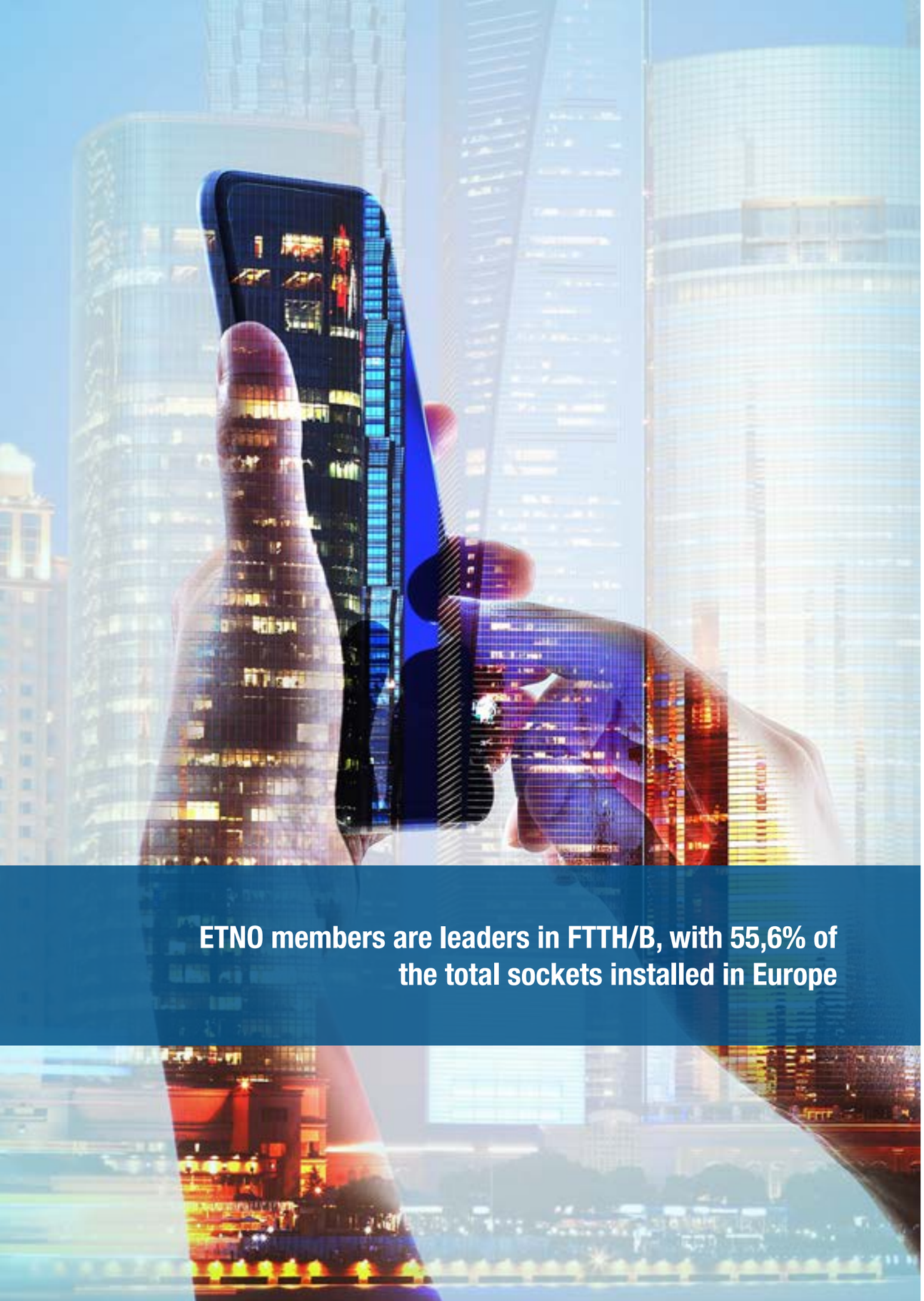
Source: IDATE

NGA subscribers (ETNO perimeter, 2016, % of homes)



	FTTH/B	VDSL	FTTx D3.x
ETNO perimeter	24.852.722	23.836.638	30.854.109
Albania	29.302	141.181	36.920
Austria	46.740	68.000	795.000
Belgium	9.550	1.775.000	2.294.700
Bosnia and Hertegovina	960	n/a	213.640
Bulgaria	857.870	90.000	259.300
Croatia	33.550	178.000	98.000
Cyprus	1845	41.668	23.019
Czech Republic	163.500	524.000	566.400
Denmark	485.000	335.000	616.000
Estonia	146.000	51.000	195.000
Finland	624.500	216.100	445.500
France	3.443.000	1.494.000	505.000
FYR Macedonia	50.000	n/a	126 249
Germany	747.650	5.293.000	7.159.000
Greece	7.725	205.300	0
Hungary	526.592	175.000	1.009.649
Iceland	39.190	84.300	0
Ireland	17.000	227.500	375.000
Italy	540.300	1.500.000	0
Latvia	392.000	31.000	16.400
Lithuania	547.300	0	16.460
Luxembourg	45.790	45.750	17.900
Malta	9.504	37.869	81.000
Netherlands	1.275.100	1.071.000	3.178.200
Norway	757.450	146.000	639.278
Poland	401.500	586.500	1.105.100
Portugal	1.089.000	0	1.118.000
Romania	2.865.000	171.000	632.100
Slovakia	409.500	101.000	128.000
Slovenia	163.000	100.000	118.000
Spain	4.863.649	544.500	2.560.394
Sweden	1.943.000	178.670	695.000
Switzerland	283.500	1.345.000	919.900
Turkey	1.912.900	1.149.300	0
UK	126.100	5.930.000	4.910.000

Source: IDATE



ETNO members are leaders in FTTH/B, with 55,6% of the total sockets installed in Europe

6 INTERNET USAGE AND DIGITAL SERVICES

Keen consumers

While the previous chapter referred to the ever-growing demand for broadband connectivity, the following data examines how users are putting to use theses access lines, with a focus on the five largest EU member states (France, Germany, Italy, Spain and the UK). These services are largely provided by OTTs.

The chapter also looks at how the take-up of IoT services by different verticals evolves and what revenues telcos can derive from corresponding communications services.

Search remains a quintessential online service for users. Between 81.8% (in Italy) and 87.3% (in the UK) of fixed users called upon search engines to find their way through the web. Their share will continue to increase to as much as 92.7% of users in the UK by 2021. On the mobile side, users are not relying as much on online search. Its adoption lies between 52.3% and 61.1% of users, with Italy and the UK again defining the lower and upper boundaries of the range.

German users are the most hesitant ones to adopt social networks. 55.8% and 46.9% of German fixed and mobile Internet users use social networks. In France, Italy and Spain, the adoption rates are roughly similar with 62% to 64% of fixed and 56% to 59% of mobile users. British users are again most likely to adopt social networks, 72.2% and 68.3% of fixed and mobile users having accessed these services in 2015. By 2021, the ranking will remain largely unchanged, although the degree of adoption will be higher. Remarkably, at 60.3% for fixed and 53.3% for mobile, adoption in Germany will remain below the levels of adoption in peer countries in 2015.

The picture is a different one with respect to e-commerce. Germans are the most inclined users to do their shopping over fixed networks, with 77.6% of users doing so in 2015. This will remain unchanged in 2021 when 81% of users will use their fixed connection for e-commerce purposes. On the mobile side, Spanish and British users lead the way with 35.7% and 36.2% of users respectively. By 2021, this share will rise to 41.9% in Spain and 42.8% in the UK. With 31.5% and 32.1% of mobile users, France and Germany will be the countries with the lowest adoption rate.

The revenues that OTTs can generate in the EU28 thanks to the keen adoption of their services are sizeable and will continue expanding: between 2017 and 2021, their revenues will grow from EUR 95.1bn to EUR 146.2bn. Cloud services, online search and e-commerce commissions are the biggest revenue drivers. For instance, cloud services account for EUR 20.4bn of OTT revenues in 2017 and will grow to EUR 36.5 bn in 2021. On the contrary, the very popular “social” services generate only relatively moderate amounts of revenues. In 2017, OTTs’ “social” revenues amounted to EUR 5.6bn and this sum will not exceed EUR 8.0bn in 2021.

Nevertheless, communications will not only increase between human beings. **Machines will exchange more and more information and their usage will grow at a rapid pace.** Between 2016 and 2021 the number of cellular M2M modules in the EU28 will rise from just under 74 million units to 280 million, representing around 25% of all SIM cards in Europe. By 2021, M2M connectivity will account for as much as 8.5% of total mobile data revenues.

The IoT market will continue to unfold as well, although it might take somewhat longer for the industrial market to gain full traction. A significative number of deployments has been delayed as verticals are currently realizing PoC (proof of concept), to test different kind of technologies, and to see what kind of information they can collect. **Today, 90% of the data collected from the devices are not processed.** Industrials need to modify their own organization, recruit new skills and this takes time.
In the consumer world, connected device adoption is also longer than expected as many hurdles are to overcome like the retail price, technology fragmentation as well as challenges regarding security and privacy.

Today, the main driver remains regulation: automotive is benefiting from the eCall directive in Europe (from 2018) and utilities are taking advantage of public policies supporting the rollout of connected meters for electricity and gas.

Adoption of OTT services (% of fixed and mobile users)

Social networks	FR		DE		IT		ES		UK	
	2015	2021	2015	2021	2015	2021	2015	2021	2015	2021
Fixed	62.5%	69.1%	55.8%	60.8%	55.8%	60.8%	63.6%	69.9%	72.2%	78.2%
Mobile	58.8%	67.7%	46.9%	53.4%	46.9%	53.4%	59%	67%	68.3%	76.2%

E-commerce	FR		DE		IT		ES		UK	
	2015	2021	2015	2021	2015	2021	2015	2021	2015	2021
Fixed	62.7%	68.7%	77.6%	81.4%	58.5%	66.3%	55.9%	60.4%	70.4%	76.9%
Mobile	24.7%	31.5%	27.3%	32.1%	34.6%	40.9%	35.7%	41.9%	36.2%	42.8%

Online search	FR		DE		IT		ES		UK	
	2015	2021	2015	2021	2015	2021	2015	2021	2015	2021
Fixed	85.0%	87.6%	87.0%	87.6%	81.8%	84.8%	83.9%	85.6%	87.3%	92.7%
Mobile	54.9%	74.6%	53.3%	71.3%	52.3%	67.8%	57.4%	73.1%	61.1%	79.1%

Source: IDATE

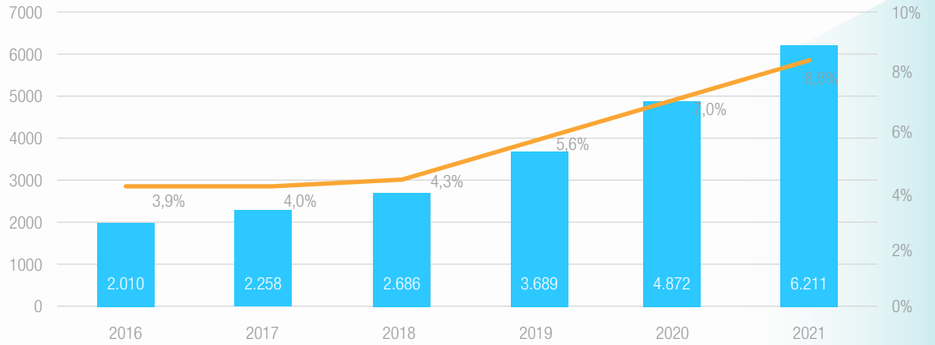
OTT revenues (EUR m, EU28)

	2012	2013	2014	2015	2016	2017f	2018f	2019f	2020f
Search	9.344	10.385	11.642	12.461	14.003	15.041	16.549	17.278	18.947
Social	1.580	1.845	2.106	2.479	2.866	3.285	3.717	3.888	4.249
Mobile	2.791	4.828	7.001	8.698	10.305	11.835	13.668	15.198	16.685
OTT Video	1.288	1.881	2.693	3.940	5.018	6.114	7.278	8.493	9.842
Communication (VoIP, IP messaging)	394	488	632	824	1.008	1.374	1.705	1.941	2.208
Cloud (excluding mobile apps)	11.505	14.526	18.563	22.160	27.132	32.449	38.389	44.304	50.673
Digital contents	1.307	1.670	2.098	2.663	3.174	3.607	4.150	4.843	5.131
E-commerce commission	8.303	9.512	10.796	12.055	13.124	13.935	14.939	15.985	17.023
Online games (excluding mobile)	1.860	2.160	2.428	2.703	2.969	3.110	3.223	3.288	3.297
Total OTT services market	42.707	50.872	60.263	69.161	79.896	89.509	101.302	112.248	124.287

* Note: Simple addition of each OTT service type does not equal total OTT services market, as there are various overlaps (such as mobile being part of search, social, etc.)

Source: IDATE

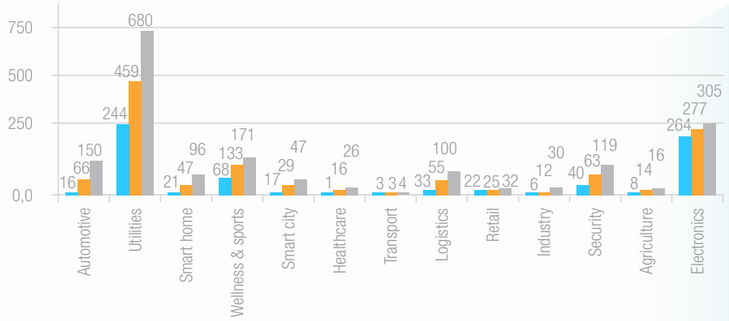
M2M connectivity revenues forecast (EUR m, EU28)



Communication & associated services revenues	2016	2017	2018	2019	2020	2021
EUR m	2010	2258	2686	3689	4872	6211
Share of total mobile revenues	3.9%	4.0%	4.3%	5.6%	7.0%	8.5%

Source: IDATE

IoT units by vertical (EU28, million)



Vertical	2017	2020	2025
Automotive	15.9	66.3	149.6
Utilities	243.9	458.9	680.3
Smart home	21.2	47.0	96.4
Wellness & sports	68.4	132.8	171.2
Smart city	17.3	28.8	47.1
Healthcare	11.1	16.5	25.8
Transport	2.6	3.1	3.7
Logistics	33.1	55.5	99.5
Retail	21.6	25.2	32.4
Industry	5.9	12.4	29.7
Security	40.3	62.9	119.3
Agriculture	7.8	14.0	16.0
Electronics	264.0	277.4	305.0
Total	753.1	1200.8	1776

Source: IDATE

7 RANKING OF EUROPEAN TOP 20 AND GLOBAL TOP 50 TELECOM OPERATORS

: ETNO Members : ETNO Observers

European top 20 communications providers by revenue* (2016, EUR bn)

Rank	Company	Country	2016 revenues
1	**Deutsche Telekom**	Germany	73.1
2	**Telefonica**	Spain	52.0
3	Vodafone	UK	47.6
4	**Orange**	France	40.9
5	**BT**	UK	29.4
6	**Telecom Italia**	Italy	19.0
7	**Telenor**	Norway	14.1
8	SFR	France	11.0
9	**Swisscom**	Switzerland	10.7
10	**Telia Company**	Sweden	8.9
11	VEON	Netherlands	8.0
12	**KPN**	Netherlands	6.8
13	MTS	Russia	5.9
14	**Proximus**	Belgium	5.9
15	Virgin Media	UK	5.9
16	**Turk Telekom**	Turkey	4.8
17	Bouygues Telecom	France	4.8
18	Turkcell	Turkey	4.3
19	Megafon	Russia	4.3
20	**Telekom Austria**	Austria	4.2

*incl. non-European revenues

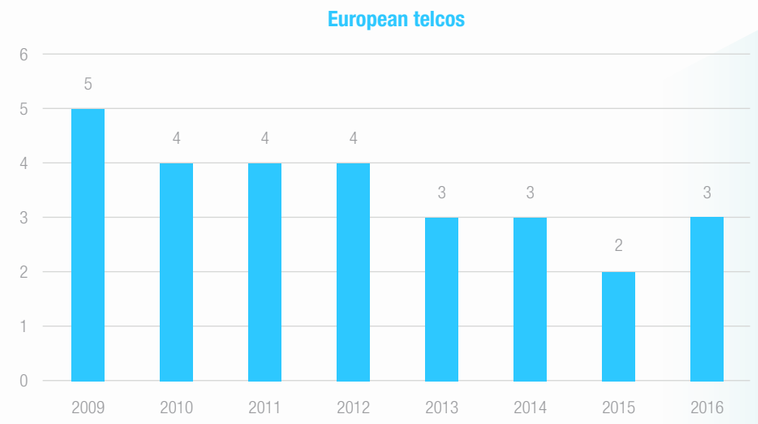
Global top 50 communications providers by revenue* (2016, EUR bn)

Rank	Company	Country	2016 revenues
1	**AT&T**	USA	148.1
2	**Verizon**	USA	113.9
3	China Mobile	China	96.4
4	NTT	Japan	94.7
5	Softbank	Japan	74.0
6	**Deutsche Telekom**	Germany	73.1
7	**Telefonica**	Spain	52.0
8	China Telecom	China	47.9

9	Vodafone	UK	47.6
10	America Movil	Mexico	47.2
11	Comcast	USA	45.2
12	**Orange**	France	40.9
13	KDDI	South Korea	39.5
14	China Unicom	China	37.3
15	Charter	USA	36.2
16	**BT**	UK	29.4
17	**Telecom Italia**	Italy	19.0
18	Liberty Global	USA	18.1
19	KT	South Korea	17.7
20	Telstra	Australia	17.5
21	CenturyLink	USA	15.8
22	BCE	Canada	14.8
23	**Telenor**	Norway	14.1
24	SK Telecom	South Korea	13.3
25	Etisalat	UAE	12.9
26	Bharti Airtel	India	12.8
27	STC	KSA	12.5
28	SFR	France	11.0
29	SingTel	Singapore	10.9
30	**Swisscom**	Switzerland	10.7
31	CK Hutchison	Hong Kong	9.6
32	Rogers	Canada	9.3
33	Viettel	Vietnam	9.2
34	MTN	South Africa	9.0
35	LG Uplus	South Korea	8.9
36	**Telia Company**	Sweden	8.9
37	Telus	Canada	8.7
38	Ooredoo	Qatar	8.1
39	VEON	Netherlands	8.0
40	Telkom Indonesia	Indonesia	7.9
41	**KPN**	Netherlands	6.8
42	OI	Brazil	6.7
43	Chunghwa Telecom	Taiwan	6.5
44	MTS	Russia	5.9
45	**Proximus**	Belgium	5.9
46	Virgin Media	UK	5.9
47	**Turk Telekom**	Turkey	4.8
48	Bouygues Telecom	France	4.8
49	Axiata	Malaysia	4.7
50	Turkcell	Turkey	4.3

Source: IDATE

Number of European players in global top 50



Source: IDATE

Definition of geographic perimeters

ETNO perimeter	ETNO perimeter	EU28	EU28
Albania	**Italy**	Austria	Italy
Austria	**Latvia**	Belgium	Latvia
Belgium	**Lithuania**	Bulgaria	Lithuania
Bosnia and Hertegovina	**Luxembourg**	Croatia	Luxembourg
Bulgaria	**Malta**	Cyprus	Malta
Croatia	**Netherlands**	Czech Republic	Netherlands
Cyprus	**Norway**	Denmark	Poland
Czech Republic	**Poland**	Estonia	Portugal
Denmark	**Portugal**	Finland	Romania
Estonia	**Romania**	France	Slovakia
Finland	**Slovakia**	Germany	Slovenia
France	**Slovenia**	Greece	Spain
FYR Macedonia	**Spain**	Hungary	Sweden
Germany	**Sweden**	Ireland	UK
Greece	**Switzerland**		
Hungary	**Turkey**		
Iceland	**UK**		
Ireland			

In 2025, there will be 1.77 billion connected objects and 178 million 5G subscribers in Europe

Definition of geographic perimeters

ETNO perimeter	EU28
Albania	Austria
Austria	Belgium
Belgium	Bulgaria
Bosnia and Hertegovina	Croatia
Bulgaria	Cyprus
Croatia	Czech Republic
Cyprus	Denmark
Czech Republic	Estonia
Denmark	Finland
Estonia	France
Finland	Germany
France	Greece
FYR Macedonia	Hungary
Germany	Ireland
Greece	Italy
Hungary	Latvia
Iceland	Lithuania
Ireland	Luxembourg
Italy	Malta
Latvia	Netherlands
Lithuania	Poland
Luxembourg	Portugal
Malta	Romania
Netherlands	Slovakia
Norway	Slovenia
Poland	Spain
Portugal	Sweden
Romania	UK
Slovakia	
Slovenia	
Spain	
Sweden	
Switzerland	
Turkey	
UK	

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