The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

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3 DELIVERING THE DIGITAL SINGLE MARKET
Executive Summary

Europe has the highest regional rate of unique subscriber penetration, at just under 80%, which is nearly 10 percentage points above both North America and the Commonwealth of Independent States (CIS). With this level of maturity, scope for further subscriber growth is limited. Unique subscribers in Europe will reach 450 million by the end of 2020, with the penetration rate reaching 81%.

4G LTE coverage and adoption have continued to expand rapidly across the region. The proportion of LTE connections in Europe is set to almost triple from 20% as of the third quarter of 2015, to almost 60% of total connections by 2020. Average download speeds in Europe exceed the global average by some margin and in many countries are ahead of speeds in both Japan and the US.

Operator investments in 4G network quality and coverage, and growth in smartphone adoption, continue to drive data usage. Average monthly data usage in Western Europe is set to grow from less than 1 GB per month in 2014 to nearly 6 GB in 2019, a CAGR of 45%. There are now signs that the growth rate for data usage across the region may have peaked; the outlook is one of strong but slowing traffic growth.

Data is helping recurring (service) revenues return to growth at the regional level for the first time this decade, with growth forecast from 2017 at an annual rate of around 1% to 2020. Margins have been affected by competition and regulation, but have stabilised in the first half of 2015. Investment in 4G networks, spectrum auctions and network capacity expansion have raised the level of capex from less than 15% of revenues at the beginning of the decade to around 20% in recent years. Although there are signs of a stabilisation, cashflow margins remain well below their historical averages. This may raise questions over the industry’s ability to finance the next wave of investment around 5G.

In 2014, mobile technologies and services generated 3% of GDP in Europe, a contribution that amounted to around €500 billion of economic value. In the period to 2020 we expect this to increase to almost €600 billion, as countries benefit from the improvements in productivity and efficiency brought about by the adoption of new mobile technologies and machine-to-machine (M2M) applications and services.

The mobile ecosystem also supported 3.8 million jobs in 2014. This includes workers directly employed in the ecosystem and jobs that are indirectly supported by economic activity generated by the sector. In addition to the mobile sector’s impact on the economy and labour market, it makes a substantial contribution to the funding of the public sector, with approximately €84 billion raised in the form of general taxation in 2014.
Europe continues to see innovation across all areas of the mobile ecosystem, with a growing number of players and innovative new apps and services affecting all areas of daily life. Operators are helping to drive innovation across the ecosystem through a range of investments and partnerships. A particular area of success is gaming: four of the global top five mobile app gaming companies are European.

Mobile commerce is growing strongly across the region, and the GSMA’s Mobile Connect is well placed to address the demand for straightforward and secure authentication and identification. Mobile Connect has been specifically designed to comply with the European Union’s Electronic Identification, Authentication and Trust Services (eIDAS) regulation, which is currently being implemented across the member states.

The Internet of Things (IoT) can play a significant role in realising the potential of the digital future in Europe, with positive impacts on both the economy and broader society. The European Commission is supportive of the potential for IoT to improve the lives of citizens across the EU. A recent study supported by the Commission estimated that the number of IoT connections across the EU28 could reach 6 billion by 2020, by which time total revenues could total €1.2 trillion (including hardware, software and services).

Despite the growth of the European mobile ecosystem, the world’s largest tech companies today are mainly US based. As well as the more established internet companies such as Google and Facebook, the US market has recently seen a number of new apps and services scale rapidly, both domestically and internationally, particularly those based on the new ‘sharing economy’, such as Uber and Lyft.

A key challenge for European developers and internet companies is the lack of scale in national markets compared to the US or emerging markets in Asia such as China and India. This challenge is compounded by the different national regulatory and legal environments, with an overall regulatory environment that is often not supportive of innovations and the launch of new digital products and services. To reduce barriers to innovation and foster growth in the entrepreneurial community across the region, the EU has developed its Digital Single Market strategy.

Realising a genuine Digital Single Market will require increased investment and innovation, first and foremost in digital networks. European Commission President Jean-Claude Juncker has prioritised the Digital Single Market as arguably the single biggest factor in determining European growth over the coming years. Investing in mobile networks and meeting the goal of digitalising everything is key to realising its potential. However, delivering the Digital Single Market is about far more than just connectivity. The strategy recognises the need to remove online barriers for businesses and consumers, creating an environment of innovation around digital services and networks. It envisions an extensive overhaul of rules, policies and initiatives across the board.

The EU Telecoms Framework Review that is under way is an example of how rules can play a pivotal role in determining the degree of connectivity. With a new set of rules that encourages mobile-sector and next-generation broadband investment, there is a real opportunity to realise the potential of the Digital Single Market. Since the last review, there has been widespread innovation across the mobile ecosystem, with new players, services and business models fundamentally altering how people communicate and interact in the digital world.

So much has changed and yet so much is expected of the Digital Single Market that the industry needs a complete rethink of telecoms regulation in Europe. The Telecoms Framework Review currently under way means the rethink opportunity is now or never.
Industry overview
1.1 Europe is the most penetrated region, with limited room for subscriber growth

Based on unique subscribers, Europe is the most penetrated region globally, with a near-saturation level of 78% currently, nearly 10 percentage points above both North America and the CIS. In terms of connections penetration, the CIS exceeds Europe. Latin America and MENA also show high connections penetration, in all cases due to greater use of multiple SIMs.

Population penetration rates

<table>
<thead>
<tr>
<th>Region</th>
<th>Unique subscriber penetration rate</th>
<th>Connection penetration rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>42%</td>
<td>76%</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>46%</td>
<td>93%</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>50%</td>
<td>105%</td>
</tr>
<tr>
<td>World</td>
<td>51%</td>
<td>98%</td>
</tr>
<tr>
<td>Latin America</td>
<td>52%</td>
<td>112%</td>
</tr>
<tr>
<td>Northern America</td>
<td>70%</td>
<td>102%</td>
</tr>
<tr>
<td>Commonwealth of Independent States</td>
<td>70%</td>
<td>147%</td>
</tr>
<tr>
<td>Europe</td>
<td>78%</td>
<td>124%</td>
</tr>
</tbody>
</table>

Source: GSMA Intelligence, Q3 2015 data
With this level of maturity, there is limited scope for future subscriber growth in Europe. The unique subscriber base will reach 450 million by the end of 2020, growth of less than 5% from the current level. 

The penetration rate will reach 81% by the end of the decade. Growth in total connections (excluding M2M) is more robust at just over 9% through to 2020.

**Source: GSMA Intelligence**

**Total unique subscribers in Europe**
(Million)
1.2 4G adoption continues apace as coverage has improved

4G network coverage passed 80% of the European population in early 2015 and will exceed 90% in early 2016, growing further to reach 93% by the end of the decade. The improved coverage, a greater number of available devices at a broader range of price points, and increasing use of music and video streaming services are some of the factors driving increased adoption of 4G devices.

Source: GSMA Intelligence

4G adoption in Europe

LTE connections as a proportion of total connections in Europe are set to almost triple from 20% as of the third quarter of 2015, to close to 60% by 2020. This will leave Europe trailing North America (where four out of five connections are set to be LTE by 2020), but will position Europe in second place globally in terms of LTE adoption.
1.3 Spectrum needed to support data traffic growth and geographic coverage requirements

A key factor behind increasing coverage and adoption of 4G is spectrum allocation. Over the past several years, most European countries have auctioned the 800 MHz ‘digital dividend’ spectrum, which had been freed up by the switchover from analogue to digital broadcasting. Of the EU28, 24 have already auctioned and allocated these frequencies; Poland, one of the four outstanding, has recently completed its multi-band auction including 800 MHz spectrum.

More spectrum is required to meet future needs as data traffic continues to grow, and in Europe some countries have taken the lead. In particular, Germany was the first to auction the second digital dividend including the L-band in an auction earlier in 2015, which along with the 900 MHz and the 1800 MHz raised more than €5 billion. France is also set to auction the 700 MHz spectrum before the end of 2015, while Sweden and Finland plan do it by 2017 and 2016 respectively.

Allocating additional frequencies and in particular the second digital dividend is a crucial step towards achieving the Digital Agenda objectives and connecting European citizens throughout the continent.
1.4 Smartphone adoption will continue to grow, albeit more slowly

The level of smartphone adoption, as a percentage of connections, passed the 50% level in 2014 and will end 2015 on around 60%, growing more slowly thereafter to finish the decade on 76%. While in 2014 there were significant differences between the larger countries (with France on a 72% adoption level compared to Germany on 44%), the laggards have begun to close the gap, with Germany finishing 2015 on 60%. By the end of the decade, France will still have a lead on 84% but a much narrower one, with none of the other five largest economies below 76%.

Source: GSMA Intelligence

Smartphone adoption in Europe

The growing level of smartphone adoption is happening at the same time as operators in Europe are moving away from subsidising handsets on a broad scale as they have done in the past. This follows the example of operators in other mature markets such as the US and South Korea. The UK polling firm YouGov, for example, found that the proportion of UK smartphone owners on SIM-only plans had more than tripled, from 5% to 16%, between June 2010 and June 2015. Meanwhile, contract plans (which usually include a handset subsidy) fell from 80% to 67% over the five-year period. The move to both SIM-only as well as equipment instalment plans has been credited with helping operating margins stabilise after years of pressure. The latter are also currently helping total revenues recover more quickly than service revenues, though this effect will normalise over time.

Source: “SIM-only on the march as consumers hold on to handsets for longer”, YouGov, August 2015.
1.5 Data growth enabling revenue recovery

Enabled by increased 4G coverage and device adoption, data usage continues to grow strongly across Europe. The average monthly data usage for Western Europe is set to grow from less than 1 GB per month in 2014 to nearly 6GB in 2019, a CAGR of 45\%\(^2\). There is a clear correlation between 4G adoption and data usage across many developed markets.

Sources: Cisco Mobile VNI 2015, GSMA Intelligence

Increasing data usage driven by 4G adoption

Data usage (GB) per user per month, 4G adoption (% of connections)

\(^2\) Source: Cisco VNI Mobile Forecast, 2015.
1.6 Drivers of data growth: video and audio streaming supported by good speeds

4G coverage and greater adoption of 4G-capable devices are clearly encouraging greater data usage. Telefónica, for example, says that its 4G customers’ usage is 60% higher than 3G, while Vodafone has said that its 4G customers across four European markets use, on average, slightly more than double the average 3G customer (varying from 50% more in Germany to 1.3x as much in the UK and 3x as much in Spain).

Although the use of third-party video sharing apps has continued to grow, operators are increasingly bundling video and audio streaming apps with their tariff offers, usually focused on 4G data and LTE capable devices. Vodafone is among operators including offers such as Netflix and Spotify Premium at no extra charge in its most recent offers, a clear method of encouraging its customers to increase their data consumption. Telefónica as well has said it is “actively bundling content to drive data usage up”. Overall, data consumption by video is expected to rise to almost three-quarters of total usage in 2019 in Western Europe, up from 56% in 2014.

Enabling data-heavy consumption, such as from video, are networks that in addition to offering better coverage are fast enough to make the user experience more satisfying. Average download speeds in Europe exceed the global average by some margin, and many countries in the region are ahead of other developed markets such as Japan and the US, according to OpenSignal data.

1. Source: Cisco
European speeds compare favourably to other regions

Average LTE download speed in Q3 2015 (Mbps)

Move to tiered data plans continues, helping offset losses of voice and SMS revenues to internet players

The GSMA recently conducted a survey of consumers in 54 countries globally, including many European nations, asking “Do you use OTT messaging services more than traditional text messages?” Within Europe, there was wide variation, from less than 10% answering “more” in Denmark to over 80% in Spain. On average 35% of respondents in Europe used online messaging more than SMS – more than twice the level of respondents using it less frequently. By comparison, in the US where prepaid plans are less common, and where tiered and shared data plan adoption is higher, 18% of respondents used online messaging more, which was only slightly higher than the percentage of respondents using online messaging less frequently than SMS.
Offsetting this, European operators are more effectively monetising the growth in data usage through the use of tiered data plans. Telefónica, for example, recently said that 30% of its clients exceed their data bundle allowances and, of these, 40% buy a top-up or increase their allowance. Overall, the use of data beyond allowances added one percentage point to organic revenue growth in Q2 2015. Cisco published a case study which found that tiered plans can increase the number of mobile data subscribers by about 45%, presumably because subscribers do not have a fear of ‘bill shock’, and can increase ARPU by almost $7.  

Rate of growth in data may have peaked

After several years of strong growth, there are signs that data growth, in percentage terms, may have plateaued, with the rate of growth now slowing. For example, Vodafone reports aggregate mobile data usage across its entire European base, which includes subscribers in Germany, Greece, Italy, the Netherlands, Portugal, Romania, Spain and the UK. Although European data usage continues to grow at more than 60% year-on-year, this is down slightly on the around 70% growth rate in late 2014/early 2015, but still almost double the annual growth in 2013. However, a re-acceleration cannot be ruled out; for example, some operators in South Korea sustained growth rates above 100% at one point, and in the US Verizon recently said that its LTE traffic is growing at a 75% annual rate.

Vodafone Europe data growth robust but slowing

Total data usage (thousands of terabytes)

Source: Vodafone

GSMA Intelligence, SK Telecom data growth 133% year-on-year in Q4 2013
After several years of strong growth, there are also signs that data growth, in percentage terms, may have plateaued.
1.9 Outlook for pending mobile M&A deals now less certain, driving move to convergence

In the past year, mergers that would have reduced the number of mobile operators, from four to three in each case, have been announced in Denmark, Italy and the UK. In September 2015, the merger bid of Telenor and TeliaSonera’s businesses in Denmark was withdrawn as the owners felt that the concessions required to achieve clearance of the transaction would have negated the benefits. Meanwhile the EU’s Competition Commissioner Margrethe Vestager made comments that raise questions around the likelihood of approval of the pending deals in Italy and the UK – though she has also made clear that approval or rejection of a proposed transaction is not a matter solely of the absolute number of licensed operators.

Footprint-expanding M&A deals have been approved much more quickly than market consolidation deals, which reduce the number of players, and approval has come with fewer and less onerous conditions attached. Examples include Vodafone’s cable acquisitions in Germany and Spain, and the Numericable-SFR merger in France. In the UK, BT’s acquisition of EE was recently given preliminary approval without any remedies. However, the approval of the acquisition by Orange of Jazztel in Spain came with more significant conditions attached than expected, while Telenet’s proposed purchase of Base in Belgium is currently subject to an in-depth (phase II) review by the Commission. In the UK, the Competition and Markets Authority is currently reviewing Three’s proposed acquisition of O2. While it is too soon to say whether these pending transactions will go ahead and if so in what form, the uncertainty is likely to put a pause on further significant activity until there is greater clarity on the outcomes.

Adoption of convergence/quad-play packages by consumers continues to gain pace, driven by incumbents looking to lower churn through multi-service platforms. Pricing is a key tool that numerous operators use to drive the uptake of multi-play offers. Belgium (27%), France (24%) and Spain (21%) are some of the most developed markets in Europe for quad-play adoption in 2015, according to the GSMA Intelligence SIM survey.
1.10 Financial outlook: more stable revenues and cashflow but little growth

Taking into account the combination of a slowly improving economic environment, declining impact of mobile termination rate cuts and other regulatory impositions, increasing adoption of tiered data plans and overall increased data usage, monthly ARPU on a per unique subscriber basis will bottom out in the next year to around €24 and then grow slightly. Helped by the ongoing strong growth in data traffic, as well as a reduction in regulatory headwinds, recurring (service) revenues are set to return to growth. At a Europe-wide level, revenues are forecast to see modest growth from 2017 but at a rate of only around 1% per year through to 2020.

Source: GSMA Intelligence

Revenues slowly returning to growth
Mobile operator revenues (€ billion)
Below the top line, margins have been affected by competition, regulation and revenue declines. Margins have fallen by around 9 percentage points between 2009 and 2014, but there are tentative signs of a recovery in recent quarters. The outlook for margins should also improve with the recovery in top-line trends, as well as the impact of consolidation deals in several markets over the last few years. Aside from the top-line recovery, other factors positively affecting margins include lower levels of handset subsidies and greater outsourcing of sites to third-party tower companies, which allows related costs to be booked as financing rather than operating expenses.

At the same time, investment in 4G networks, spectrum auctions and overall network capacity have raised the level of capex from less than 15% of revenues at the beginning of the decade to around 20% in recent years. Investment will remain higher than in earlier years but has reached a sustainable level for the next several years. Taking the revenue, margin and capex outlook together, the financial outlook for the sector looks healthier than it has for a number of years. However, cashflow margins remain well below their historic averages and may raise questions over the industry’s ability to finance the next wave of investment around 5G.
1.11 Sector share price performance likely to improve along with recovery in financial performance

In the past five years, the European telecoms sector, as measured by the Dow Jones Stoxx Telecoms Index, has fallen by about 15%, while the overall market has risen by approximately 35%. This has occurred largely in tandem with financial results, with sector recurring (service) revenues falling a cumulative 21% from 2010 to 2014 inclusive, as well as heavy capital expenditure on 4G network rollout and operating margin pressure as costs could not be cut as quickly as revenues have fallen. However, with revenues forecast to begin stabilising in the near to medium term, margins recovering slightly and capex as a percentage of revenues also having peaked, the outlook is now more optimistic.

Source: Stoxx

Sector share price performance
Mobile driving growth and innovation in Europe
2.1 Mobile industry’s contribution to economic growth

The mobile ecosystem consists of mobile network operators; infrastructure service providers; retailers and distributors of mobile products and services; handset manufacturers; and mobile content, application and service providers. The direct economic contribution to GDP of these firms is estimated by measuring their value added to the economy, including employee compensation, business operating surplus and taxes. In 2014, the total value added generated by the mobile ecosystem was €154 billion (or 1% of GDP), with network operators accounting for the majority of this (almost 70%).

Source: GSMA Intelligence

Direct GDP contribution of the mobile ecosystem

(€ billion, % 2014 GDP)
In addition to their direct economic contribution, firms in the mobile ecosystem purchase inputs from their providers in the supply chain. For example, handset manufacturers purchase inputs from microchip providers and content providers require services from the IT sector. Furthermore, some of the profits and earnings generated by the ecosystem are spent on other goods and services, stimulating economic activity in those sectors. We estimate that in 2014, this additional economic activity generated a further €92 billion in value add (or 0.6% of GDP) in Europe.

The use of mobile technology also continues to drive improvements in productivity and efficiency for workers and firms. For example, it reduces unproductive travel time and facilitates improved logistics for businesses and workers in services and manufacturing. We estimate these productivity impacts were worth around €254 billion in 2014 (or 1.6% of GDP). Overall, taking into account the direct, indirect and productivity impacts, in 2014 the mobile industry made a total contribution of €500 billion to Europe’s economies in value added terms, equivalent to just over 3% of the region’s total GDP.

Source: GSMA Intelligence

<table>
<thead>
<tr>
<th>Mobile operators</th>
<th>Related industries</th>
<th>Indirect</th>
<th>Productivity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>105</td>
<td>49</td>
<td>92</td>
<td>254</td>
<td>500</td>
</tr>
<tr>
<td>0.7%</td>
<td>0.3%</td>
<td>0.6%</td>
<td>1.6%</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

7. The indirect impact is calculated using multiplier estimates that are derived from the most recent Input-Output tables published by Eurostat.
### 2.1.1 A significant contribution to employment and public funding

In 2014 mobile operators and the ecosystem provided direct employment to approximately 2.3 million people in the region. In addition to this, economic activity in the ecosystem generates jobs in other sectors. Firms that provide goods and services as production inputs for the mobile ecosystem (for example, microchips or transport services) will employ more individuals as a result of the demand generated by the mobile sector.

Furthermore, the wages, public funding contributions and profits paid by the industry are spent in other sectors, which provide additional jobs. We estimate that in 2014, around 1.5 million jobs were indirectly supported in this way, bringing the total impact (both direct and indirect) of the mobile industry to around 3.8 million jobs.

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**Employment impact**

**Jobs (thousands)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure</td>
<td>48</td>
<td></td>
<td>48</td>
</tr>
<tr>
<td>Operators</td>
<td>486</td>
<td></td>
<td>486</td>
</tr>
<tr>
<td>Handset manufacturing</td>
<td>93</td>
<td></td>
<td>93</td>
</tr>
<tr>
<td>Distribution</td>
<td>281</td>
<td></td>
<td>281</td>
</tr>
<tr>
<td>Content, apps and services</td>
<td>1,344</td>
<td></td>
<td>1,344</td>
</tr>
<tr>
<td>Direct</td>
<td>1,509</td>
<td></td>
<td>1,509</td>
</tr>
<tr>
<td>Indirect</td>
<td>2,251</td>
<td></td>
<td>2,251</td>
</tr>
<tr>
<td>Total</td>
<td>3,761</td>
<td></td>
<td>3,761</td>
</tr>
</tbody>
</table>

Source: GSMA Intelligence

Totals may not add up due to rounding.
The mobile ecosystem also makes a significant contribution to the funding of public sector activity in the region through general taxation. For most countries, this includes value added tax, corporation tax, income tax and social security from firms and employees. We estimate that the ecosystem made a tax contribution to the public finances of the region’s governments of approximately €84 billion in 2014.

In addition to tax contributions, mobile network operators generate public funds through the payment of fees for spectrum. In 2014, the allocation of spectrum licences in countries such as Greece, Hungary and Estonia generated approximately €700 million to their respective governments.

Source: GSMA Intelligence

**Contribution to public funding by the mobile industry**

(2014 € billion)
2.1.2 Outlook and trends for the period 2015-2020

We expect the economic contribution of the mobile industry in Europe to continue to increase. In value-added terms, we estimate that the ecosystem will generate around €600 billion by 2020. Due to the limited growth prospects for operators and the ecosystem, the majority of this growth will be driven by improvements in productivity and efficiency, as the adoption of newer mobile technologies and M2M increases.

Economic contribution of mobile industry in Europe: outlook to 2020 (€ billion)

Source: GSMA Intelligence
Europe continues to see innovation in all areas of the mobile ecosystem, with a growing number of players and innovative new apps and services affecting all areas of daily life. Operators are helping to drive innovation across the ecosystem through partnerships and investments. Telefónica announced earlier in 2015 that it would invest up to $200 million in a strategic partnership with Coral Group, a venture-capital firm that invests in innovative start-ups. Telefónica will work with Coral Group to expand the activities of Telefónica Open Future, an online platform that focuses on helping start-ups to accelerate and mature.

The innovation arms of four operators, Telefónica, Orange and Deutsche Telekom in Europe as well as Singapore Telecom, have announced plans to develop a mutual support network for each company’s start-up ventures. The goal is to help new ventures scale more quickly by gaining access to resources and potential customers outside their domestic markets. All three European operators have already established innovation hubs in Europe, and these will now be networked with SingTel’s Innov8 network in Asia.

There are already a number of areas of particular success in Europe; for example, four of the global top five mobile app-based gaming companies are European – an area of genuine market-leading expertise in the digital arena. Data from Vision Mobile indicates that in the first quarter of 2015 there were more than 1.3 million app developers in the EU28, equivalent to around 23% of the total global developer base. App revenues are also typically higher in Europe than in other regions, with over half of app developers making more than $500 per month.

Apps and new services have already had a positive impact on the daily lives of individuals across the region, and are also having a positive effect on enterprises. Some of these developments are discussed in more detail in the remainder of this section. The transformative potential of the app economy is allowing a new generation of entrepreneurs to emerge, with a positive impact on Europe’s economy as well as new export opportunities.

However, despite the ongoing growth of the European mobile ecosystem, particularly in the area of apps and gaming, the largest tech companies globally are largely US based, with several recently emerging from Asia Pacific. North America has clearly established itself at the centre of the mobile ecosystem over the last decade. As well as the more established internet companies such as Google and Facebook, the US market has recently seen a number of new apps and services scale rapidly, both domestically and internationally, particularly those based on the new ‘sharing economy’, such as Uber and Lyft.

As of July 2015, there were more than 60 US tech ‘unicorns’ (private companies with valuations of more than $1 billion). There are a growing number of unicorns in Europe, with 13 companies attaining this valuation since April 2014. However, Europe is still trailing when it comes to seeing promising start-ups scale and gain prominence at a global level. Of the world’s ten largest internet companies by market value, the majority are based in North America, a few in Asia, but none in Europe. Europe’s largest technology company, Rocket Internet, has a current valuation of just under $5.5 billion.

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Although it once dominated the global market for both devices and equipment, Europe’s position has been undermined over recent years. Nokia was the dominant handset maker in 2007, accounting for nearly two-thirds of smartphone sales. However, Nokia has now all but disappeared from the handset market, with little sign of a revival even after its acquisition by Microsoft. The position is more encouraging on the network equipment side, with three European companies (Alcatel-Lucent, Nokia Networks and Ericsson) in the global top five, although Huawei and Cisco are generally recognised as the global leaders.

A key challenge for European developers and internet companies is the lack of scale in national markets compared to for example the US, or emerging markets in Asia such as China and India. The challenge of scale is compounded by the issue of different national regulatory and legal environments, with an overall regulatory environment that is often not supportive of innovations and the launch of new digital products and services. Partly to address this imbalance, as well as to help stimulate future economic growth and job creation across the region, the EU has developed its Digital Single Market strategy. This strategy aims to foster European entrepreneurs and help reduce barriers to innovation.

A number of innovation hubs have already emerged in countries across the EU, though none to date has come close to replicating the critical mass of Silicon Valley. These innovation hubs include Oxford Science Park and East London Tech City (‘Silicon Roundabout’) in the UK, ‘Silicon Allee’ in Berlin, Isar Valley in Munich and ‘Silicon Docks’ in Dublin.
2.2.1 Mobile commerce is growing strongly

Digital commerce continues to see strong growth across the world, but in Europe (as in many regions of the world) a growing proportion of these transactions are now being undertaken on mobile devices. At the end of the first quarter of 2015, mobile accounted on average for around a third of total e-commerce transactions, with further growth expected over the rest of the year. This is still below the level in some of the more developed markets in Asia, such as South Korea and Japan, where over half of e-commerce transactions are on mobile devices.

**Source: Criteo**

**Mobile share of e-commerce transactions**

<table>
<thead>
<tr>
<th>Country</th>
<th>Q4 2015 (estimate)</th>
<th>Q1 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>29%</td>
<td>26%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>30%</td>
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Google has launched Android Pay (replacing the Google Wallet service) in the US, with a range of banking partners. For now, however, it relies on tokenisation of payment information as the primary means of security. Visa Europe has already announced plans to partner with Google when Android Pay launches in Europe, but to date there is no formal launch date. More recently, Samsung has announced plans to launch Samsung Pay in Europe, following the initial launch in South Korea. The company has announced the UK and Spain as the initial focus markets for launch.

The reality is that Europe is likely to see ongoing strong growth in the mobile commerce space, supporting a range of mobile payment applications from a range of different providers, including banks and mobile operators. The move to mobile payments is strongly supported by the EU, given the opportunity to move away from cash and in the process reduce both transaction costs and scope for fraud.

The Commission recently agreed new rules for payment services in Europe that should help reduce costs and encourage ‘the emergence of new players and the development of innovative mobile and internet payments in Europe’. The European Payment Services Directive (PSD2) is a review of the original 2007 directive, designed to facilitate the emergence of new mobile and internet payment services. The recognition of new players as payment institutions, authorised to access users’ accounts, means new players that offer consumers the opportunity to pay online via bank accounts will find it much easier to enter the market. As a result of this, new services are likely to become a much more prevalent part of the mobile and online commercial experience.

### 2.2.2 The potential of IoT in Europe

The Internet of things (IoT) has the potential to play a significant role in realising the potential of the digital future in Europe, with positive impacts on both the economy and broader society. Mobile operators, other ecosystem players and national governments have all recognised the potential of IoT, and the number of deployments and new service launches continues to increase.

The European Commission is supportive of the potential for IoT to improve the lives of citizens across the EU. A recent study supported by the Commission estimated that the number of IoT connections across the EU28 could reach 6 billion by 2020, by which time total revenues could total €1.2 trillion (including hardware, software and services). The report identified several key focus areas or ‘smart environments’ with the most attractive growth opportunities, namely smart manufacturing, smart homes, smart health and smart customer experience.

The Commission recently announced new funding commitments for its Horizon 2020 programme, which funds research in priority areas across the region. These included new commitments in the areas of autonomous cars and IoT, which have received more than €100 million and €139 million respectively. The technologies are expected to be key factors in the development of smart cities, an area that has itself received €232 million to better integrate environmental, transport, energy and digital networks in the EU’s urban environments.
2.2.3 Smart manufacturing

The potential for the industrial internet to revolutionise manufacturing has been recognised for some time, and Europe is now seeing increasing internet and innovation in this area. In Germany, the government has invested to support the concept of ‘Industrie 4.0’, which could see the transformation of industry through new technologies and digitisation. This could involve for example the creation of self-organising networks that allow the mass customisation of production, using a combination of robotics, sensors and connectivity to enable remote diagnostics and predictive maintenance.

Mobile operators and other ecosystem players are already playing an active role in realising the potential of smart manufacturing. Huawei has been partnering with Deutsche Telekom in support of Industrie 4.0, while a number of players are pushing ahead with outlining the standards for 5G, which is likely to be a key enabling platform for many of the applications and use cases to support the smart manufacturing concept.

2.2.4 Smart homes

Smart homes is an area that has seen numerous service launches and is gaining particular traction with consumers, helped by the growing adoption of smartphones and tablets that can act as remote controls for the wide range of connected devices.

Smart home platforms have been developed by a range of players from across the mobile ecosystem, including Apple and Google but also a number of mobile operators. Deutsche Telekom has launched a platform for the domestic market, QIVICON, with the company indicating that it is in discussions with operators in other European markets outside Germany. Telefónica has been trialing a home security and monitoring service based on AT&T’s Digital Life platform, and recently launched a service offering for its Movistar customers in the Spanish market. Orange France launched Homelive in November 2014, a solution that links the consumer to the connected objects (thermostats, light switches, smoke detectors and so on) in their home, allowing them to manage appliances remotely. The operator announced that in seven months it sold 15,000 Homelive automation packages. The UK operator EE has announced its own push into connected devices, with the company’s Connected Strategy focused on the connected home, as well as car and business. EE CEO Olaf Swantee predicted sales of connected devices will exceed those of smartphones in less than two years.

A growing range of appliance manufacturers are also supporting the smart homes initiative. Bosch recently announced that it will use the Home Connect standard that will allow a range of domestic appliances to be included in home energy management systems, allowing for example consumers to use solar energy to power their appliances. Samsung has announced a range of new smart home sensors with an updated control hub, under the SmartThings brand that the company acquired in 2014. Samsung SmartThings is compatible with more than 150 connected home devices from a range of manufacturers, including Philips Hue, Bose, Yale, Honeywell, Liff, D-Link, Fibaro and Aeotec.

A challenge with the growing range of connected devices and different platforms to link and control them is interoperability, an issue that could prove a significant barrier to consumer adoption. Samsung is taking the approach of maintaining SmartThings as an open platform with open standards, with the goal of attracting a wide range of developers and allowing different manufacturers to connect their devices to the platform.
2.2.5 Smart health

There is growing consumer adoption of wearable devices across many European markets, but with a particular application in the related areas of fitness and health. Location-aware medical wearables have for some time held the promise that they could address a range of health issues, and this promise is starting to be realised. With a growing number of m-health apps now available, their use is developing rapidly from lifestyle and well-being applications to more sophisticated diagnostic tools.

Vodafone is working with Lively, an emerging provider of remote health services, to support a wearable device that can help elderly people remain independent and in their own homes for longer. The device connects to an in-home hub that is pre-installed with a Vodafone M2M SIM, and connects with activity sensors designed to be placed on pill boxes, refrigerators and doors in order to log the user’s daily routines. Information can then be accessed by relatives and carers to check for example that medication has been taken as required and when the user leaves the house. The service has already been launched in the US and is being launched in the UK. The Commission has supported the development of m-health applications in Europe. EU funding programmes for research and innovation aim to encourage the development of innovative m-health solutions, including the Horizon 2020 initiative, for example.

In Europe there remains the question of whether medical apps should be regulated as medical devices (under the EU Medical Devices Directive). Greater guidance for app designers would be helpful, and could help stimulate further development of the m-health market in Europe. Generally, health apps are regulated as medical devices and will have to comply with the Medical Devices Directive if their intended purpose is the prevention, diagnosis, treatment and/or monitoring of a disease.

2.2.6 Other areas

There are ongoing developments in many other areas of the IoT space, particularly in connected car and fleet telematics services. Orange Business Services acquired Ocean, a fleet-management company, to strengthen its vertical expertise and develop customized M2M/IoT solutions. In addition, Orange plans to work with Ocean to develop new fleet management solutions based on Ocean’s service platform. This follows in the footsteps of Vodafone acquiring Cobra Automotive in August 2014, a similar move to strengthen the company’s credentials in the connected car market.

There is growing interest in the concept of the automated or driverless car, with active participants from the traditional car makers to players from across the mobile ecosystem. Governments are also now becoming involved and supporting initiatives. An increasing number of automotive manufacturers now support either the Android Auto or Apple CarPlay interfaces, although manufacturers are also looking to automate a growing number of functions in their cars as they look to make the concept of the driverless car a reality. However, questions over the legality and safety of certain automated functions at the national level remain a challenge in Europe. Providers also need to address European laws around data privacy.

A consortium of German car companies acquired Nokia’s ‘Here’ mapping business for €2.8 billion, an important step in ensuring the position of car manufacturers in the self-drive market. Internet players such as Uber and Baidu were in the running to purchase the business, reflecting the strategic value of Here as possibly the strongest competitor to Google in mapping.
The total number of cellular M2M connections stood at 64 million at the end of the third quarter of 2015, a figure that is set to increase to more than 180 million by the end of 2020. There remains potential upside to this forecast if governments, regulators and industry players enable a number of growth factors over the coming years.

Several companies have experienced strong growth in the number of M2M connections in recent quarters. For example, in the German market during the first half of 2015, Deutsche Telekom Germany added 588,000 new M2M SIM cards in what it claimed was an aggressively priced market. It stated this growth was due to the increased use of SIM cards, especially in the automotive and logistics industries.

Although cellular will continue to play an integral role in the development of IoT, many of the connected devices that will deliver IoT services will use short-range wireless technologies, rather than cellular connectivity. There is also growing interest in the use of low-power, wide-area (LPWA) solutions, which will play an important role in connecting a range of devices that need to be low mobility, low power and low cost. However, mobile will continue to play a crucial role as an enabling technology for IoT, acting as an aggregator or hub to connect a range of devices and offering wide-area connectivity.
2.3 Future networks in Europe

Operators in many countries across the region have already launched Rich Communications Services (RCS), while there is growing momentum behind voice over LTE (VoLTE) and voice over-Wi-Fi deployments. Vodafone claimed the first commercial VoLTE deployment in Germany earlier in 2015, a service the company is now rolling out in other European markets. VoLTE services are currently available in eight countries across Europe, and HD voice is available in the vast majority of countries.
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Operators, equipment vendors and other ecosystem players are playing an active role in the development of the next generation of mobile network standards, namely 5G. Discussions centre on whether 5G will be a true generational shift in connectivity technology or the consolidation of existing 2G, 3G, 4G, Wi-Fi and other technologies to provide vastly greater network coverage and always-on reliability. Considerable advancements towards the hyper-connected society have already been made. Examples include technologies such as network function virtualisation (NFV), software-defined networks (SDNs) and heterogeneous networks (HetNets). These technologies are regularly bundled under the banner of ‘5G’, despite the fact that they are already being brought to market by vendors and invested in by operators.

The Commission is also playing an active role in the development of 5G, with a particular desire to see Europe at the forefront of future 5G innovation and deployments. At the last Mobile World Congress, the EU Commissioner, together with a number of Europe’s leading technology companies (including Alcatel-Lucent, Ericsson, Nokia, Orange, Thales Alenia Space and other partners in the 5G Public-Private Partnership) presented their vision of the future of 5G technologies and infrastructure. The Commission has also now signed co-operation agreements with South Korea and China, and continues to invest in 5G research across Europe, with a commitment to invest a total of €700 million by 2020. The Commission expects that the mobile industry will also commit to significant investments in support of the development of 5G, with a figure of up to €3 billion over the same period.

There are also a number of initiatives around 5G at the national level. The 5G innovation centre recently opened in the UK, with a range of backers including the UK government; operators such as EE, BT, Telefónica and Vodafone; and equipment vendors including Huawei, Fujitsu and Samsung. Focus areas of the centre include plans to develop a 5G testbed network and to ensure that innovations around 5G will directly benefit the consumer experience.

With 4G network coverage having expanded significantly in recent years to stand today at more than 80% of the population, operators across Europe are also moving to deploy LTE-Advanced (LTE-A). LTE-A offers much faster speeds through carrier aggregation. A number of countries have seen tri-band LTE-A launches, with Swisscom for example recently claiming that it had achieved peak speeds of 436 Mbps in live trials.
2.4 GSMA activities to support the developing mobile ecosystem

The GSMA has identified four key growth areas that present both significant opportunities and benefits for consumers, as well as providing clear opportunities for mobile operators to collaborate and in doing so to play an active role in delivering these future opportunities and benefits.

CONNECTED LIVING

The GSMA, through its Connected Living Programme, aims to further develop the IoT market, both within the European region and at the global industry level. The initial focus of the Connected Living programme is to accelerate the delivery of new connected devices and services in the M2M market through industry collaboration, appropriate regulation, optimising networks and developing key enablers to support the growth of M2M in the immediate future. The ultimate aim is to enable the IoT, a world in which consumers and businesses enjoy rich new services, connected by an intelligent and secure mobile network.

Working with its partners across the ecosystem and key verticals, the GSMA is active in a number of areas to drive forward this initiative:

• **Remote SIM provisioning for M2M:** the GSMA’s vision is to unite all stakeholders behind a single, common and interoperable global embedded SIM specification to help accelerate the growing M2M market.

• **IoT business enablers:** the GSMA is working to create a sustainable M2M regulatory and policy environment that enables operators to unlock the consumer and business benefits of the IoT.

• **Secure IoT networks:** the GSMA is working to establish security requirements for how machines should communicate via the mobile network in the most secure way.

• **Mobile IoT:** the GSMA is working with mobile operators and ecosystem partners to assess solutions for low-power, wide-area connections to enable further scaling of the IoT.
NETWORK 2020

The GSMA’s Network 2020 programme is designed to help mobile network operators in the move to an all-IP world and help them deliver global interconnected all-IP communications services to consumers such as voice over LTE, video over LTE (ViLTE), voice over Wi-Fi (VoWi-Fi) and RCS. Operators are in a unique position to offer secure, ubiquitous all-IP solutions with reach, reliability and richness. The transition will allow them to deliver an enhanced customer user experience that when interconnected with other operators offers truly global reach and scale. The programme is already helping operators from around the world to migrate from circuit-switched technology to an all-IP infrastructure while helping them to maintain service continuity.

The first phase of the programme focuses on helping networks deploy VoLTE and conversational video calls over LTE, VoWi-Fi and encouraging the RCS ecosystem to help operators prepare for and launch RCS-based interoperable solutions and VoLTE roaming architectures for their customers around the world.

Additionally, the Network 2020 programme will work with operators to determine the technical and commercial specifications for operator-to-operator quality of service (QoS) for IP services, and encourage them to incorporate the QoS philosophy into their customer solutions. The Network 2020 programme also aims to help catalyse commercial implementations for IP interconnect solutions between operators and service/content providers.

Finally, until such time as the industry requirements and definition of 5G have stabilised, the GSMA will focus on improving the overall sustainability of the mobile telecoms sector, allowing more networks to achieve greater connection numbers by enhancing the business model for expanded coverage and offering connectivity to those in the world that currently have no connectivity at all.
DIGITAL COMMERCE

Working with mobile operators, regulators, banks, retailers, transport operators and other service providers both in Europe and across the globe, the GSMA’s Digital Commerce programme is active in driving the mass adoption of SIM-secured digital commerce services globally.

The GSMA engages regularly with key government and regulatory bodies, providing advice and guidance on how to harness the potential benefits of SIM-based services in transport, retail and other sectors of the economy, and developing industry positions on aspects of policy, highlighting the impact of regulation and informing regulators’ decision-making processes.

The programme is also focussed on developing Mobile Connect as an enabler for digital commerce use cases. Mobile Connect is a GSMA service launched in 13 countries, designed to deliver a universal identity that securely authenticates the user and provides safe access to mobile and digital services via the mobile phone.

As the number of commercial mobile commerce services around the world rises, the GSMA continues to promote the use of common standards to enable the global interoperability of services and generate economies of scale, liaising with other relevant stakeholders to ensure the consistency of the overall set of specifications involved in mobile commerce deployments. Covering many topics, these specifications set out a common framework of requirements to ensure interoperability and an efficient and consistent development and deployment of mobile commerce services.

Two areas of focus for the Digital Commerce initiative are as follows:

• **Tokenisation:** the Digital Commerce programme is working with operators from around the world to provide a tokenisation-based framework that will allow banks to put their payments cards in non-Apple phones, with a bank on-boarding model that includes the SIM playing a role as the secure element.

• **Remote payments:** the GSMA is working with operators and industry partners to improve the user experience when using mobile devices for remote payments. In addition to being technically secure, solutions need to be simple and widely distributed.
PERSONAL DATA

The GSMA's Personal Data programme is working with mobile operators that have launched identity services across the globe. The mobile industry needs to deliver common and consistent interfaces to a range of digital service providers, which at the same time need to offer seamless and convenient solutions to consumers.

The use of standards and interoperability are therefore key, in particular the need to create a common, industry-wide set of identity-related APIs (application programming interfaces). The GSMA is working closely with operators to establish a uniform set of APIs to underpin key mobile identity services.

Mobile Connect is well placed to address the needs of both service providers acting as a primary log-in for websites, apps, and other online services and consumers’ demands for straightforward and secure authentication and identification. The solution can help government agencies and other service providers increase usage of their online services, improving efficiency, enriching the end-user experience and increasing engagement.

Mobile Connect has been specifically designed to comply with the European Union’s eIDAS Regulation (regulation on electronic identification and trust services for electronic transactions in the internal market), which is currently being implemented by the 28 Member States. The Regulation, which introduces new rules on electronic identification services, is designed to enable citizens to carry out secure cross-border electronic transactions; for example, enrolment in a foreign university, filing of multiple tax returns, access to electronic medical records or authorisation of a doctor to access them on one’s behalf. It will also enable citizens moving to another Member State to manage registration and all other administration online with the same legal certainty as they currently have with traditional paper-based processes.

Government agencies could use Mobile Connect for their e-government services to achieve the optimum balance between maintaining security, obtaining consent, and providing a smooth and straightforward end-user experience. This would help the European Union to realise the objectives of the eIDAS Regulation and fuel the growth of Europe’s digital economy.

The GSMA recently announced that Mobile Connect trials are now under way in all regions of the world, with 17 mobile operators in 13 countries having launched the service. There are plans for additional launches and beta trials. Operators committed to launch include Bouygues Telecom and Orange (France); Deutsche Telekom and Vodafone (Germany); Telecom Italia and Vodafone (Italy); Orange, Telefónica and Vodafone (Spain); Swisscom (Switzerland) and Vodafone (UK). Orange is also committed to launch the Mobile Connect service in Belgium, Poland and Romania.
Delivering the Digital Single Market in the EU will require increased investment and innovation, first and foremost in digital networks. European Commission President Juncker has prioritised the Digital Single Market as arguably the single biggest factor in determining European growth over the coming years. Indeed, the Commission estimates €415 billion in additional growth per year from a fully realised Digital Single Market. Investment in digital networks is therefore investment for European growth.

The Digital Single Market agenda has not only captured the interest of the obvious players such as telecoms and internet companies. The automotive, financial, health, energy and manufacturing industries, as well as public authorities interested in smart-city or e-government solutions, are all engaging with this policy at EU level. The Digital Single Market matters to many industries, just as digital matters to people in their daily lives.

The Digital Single Market is founded on the idea of the ‘digitalisation of everything’, with everything being connected. Every business, industry or service can improve and innovate through this connectivity. It will facilitate new business models, increase efficiencies and improve services across many different sectors. Adding connectivity to a vast array of machines and vehicles to create what Commissioner Günther Oettinger calls ‘Industry 4.0’ will transform enterprises, presenting new sources of growth and competitiveness across the economy. A significant element of this connectivity will be based on mobile networks, acting as an aggregator or hub to connect a range of devices or offering wide-area connectivity. Investment in mobile networks is therefore key to the Digital Single Market and to growth in Europe.

The Digital Single Market also recognises the need to remove online barriers for businesses and consumers, creating an environment of innovation around digital services and networks. It envisages an extensive overhaul of rules, policies and initiatives across the board, encompassing areas such as copyright law, parcel delivery, online security, cloud, big data and, of course, the EU Telecoms Framework.

The EU Telecoms Framework Review provides the chance to set the right rules to ensure the mobile connectivity levels required for the Digital Single Market. With a new set of rules that encourages mobile-sector investment, the Digital Single Market stands a real chance. For example, focusing on a consistent and predictable single market approach to spectrum policy and management will be an essential building block of the strategy. To achieve this, the review provides a key opportunity to address the current fragmentation of spectrum policy in Europe, particularly the timing of spectrum availability, auction design, duration of licence and price of spectrum.

The release of the digital dividend spectrum and operator investments in recent years have accelerated the migration in Europe to 4G, though Europe still trails other developed markets such as the US and South Korea on overall 4G adoption rates.
The EU Telecoms (Electronic Communications) Framework rules have served their original purpose well. They have opened up previous state monopolies and fostered competition in both mobile and fixed telecoms markets. Operators have invested more than €100 billion in network deployments over the last five years. Although the operating performance of operators in Europe appears now to be stabilising, cashflow margins remain well below their historical averages and may raise questions about the industry’s ability to finance the next wave of investment around 5G.

A result of the investment is the digital experience most European citizens have today. A huge array of business models and digital innovations has developed and prospered, and citizens have responded with take-up of mobile devices and subscriptions to digital services. Innovation has flourished. Almost all of this has taken place since the framework was last reviewed in 2009. Those rules did their job, but today’s market is utterly transformed in terms of the variety of players offering voice, message and related communication services. For example, the 2009 framework rules did not envision voice-over-IP or IP message services, yet these are now ubiquitous. Indeed, new business models and innovative new services continue to emerge.

Against this background, the business models of the telecoms infrastructure companies, who are regulated by the EU Telecoms Framework, must also be allowed to evolve and adapt. That is where the existing regulatory framework is not working. Indeed, it is inhibiting the significant step-change in investment for the future expected of the digital infrastructure companies, especially if the Digital Single Market is to happen. The rules for mobile network investors are preventing them from competing when it comes to large swathes of the services delivered over their networks.

That paradox needs now to be resolved, and the Telecoms Framework Review presents the ideal opportunity. It is an opportunity to make the rules as future-proof as possible. This is certainly a big task, to be undertaken through dialogue between policymakers, industry and stakeholders over a period of policy development. However, it would be a good start to simply shift the main emphasis of regulation from a sector-specific approach, as with the current Telecoms Framework, to one that is ‘horizontal’, based on general principles and targeting the function or service in question (e.g. electronic voice communications services).
A result of the investment is the digital experience most European citizens have today. A huge array of business models and digital innovations has developed and prospered, and citizens have responded with take-up of mobile devices and subscriptions to digital services.
Rethink not review

The legal framework has struggled to keep pace with technological and business-model change in the digital age. If we are serious about a Digital Single Market, it is time to make ‘future-proof’ a reality. So much has changed and yet so much is expected of the Digital Single Market. In order to deliver it, a complete rethink is required, and now is the opportunity to do so.

From the perspective of mobile network investors, a successful rethink by the EU of its regulatory approach would follow three principles:

• A thorough assessment of the vision and regulatory objectives being pursued, and an examination of how those objectives can best be achieved. Only then will it be possible to agree on measures.

• As many of today’s legacy regulatory structures are outdated, policy-makers should take a clean-slate approach that assesses current, as well as potential new, regulations. They should identify the optimal means of achieving the regulatory objectives, without reference to legacy regulatory regimes and approaches. This recognises that changes in technologies and markets have likely altered both the need for regulation and its optimal form and focus.

• To enable the dynamism and innovation of the Digital Single Market, the new regulatory framework should prioritise flexible, performance-based approaches over prescriptive standards. A dynamic model that avoids, wherever possible, prescriptive rules would better account for the pace and inevitability of technological and market innovation. Such a model allows the means by which regulatory objectives are realised to evolve over time, even while the objectives remain largely stable.

The Digital Single Market strategy, together with the start of the Telecommunications Regulatory Framework Review, provides an opportunity for this rethink.

And Europe can once again lead the world in mobile innovation.
To download the Mobile Economy Europe 2015 report please visit the GSMA website at www.gsmamobileeconomy.com