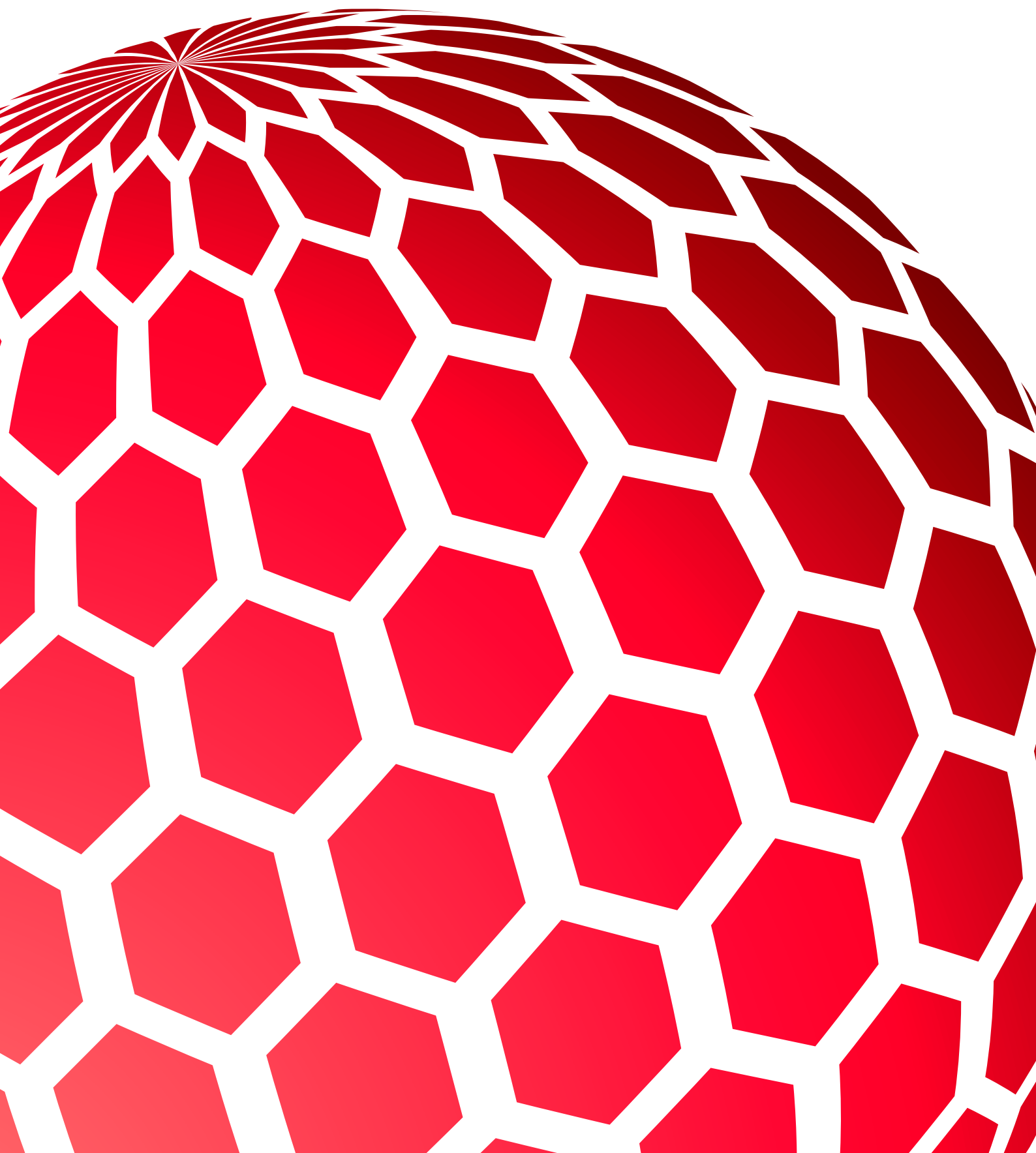




The Mobile Economy 2013

*AT***Kearney**





The **GSMA** represents the interests of mobile operators worldwide. Spanning more than 220 countries, the **GSMA** unites nearly 800 of the world's mobile operators with more than 230 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers and Internet companies, as well as organisations in industry sectors such as financial services, healthcare, media, transport and utilities. The **GSMA** also produces industry-leading events such as the Mobile World Congress and Mobile Asia Expo.

For more information,
please visit the **GSMA** corporate website
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or **MOBILE WORLD LIVE**, the online portal for the
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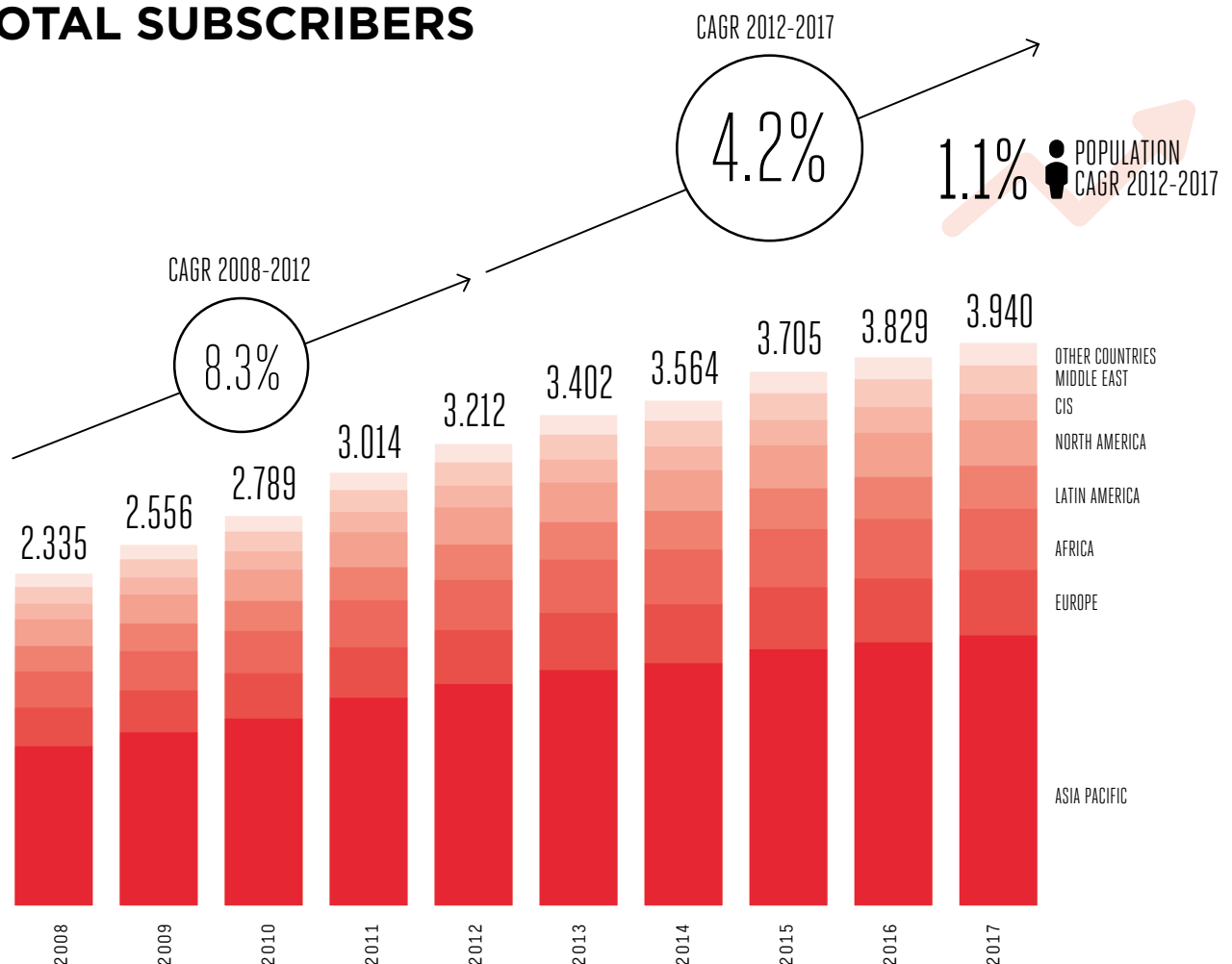
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Executive Summary

Almost half the population of the earth now uses mobile communications. A billion mobile subscribers were added in the last 4 years to leave the total standing at 3.2 billion. There are still many adults and young people who would appreciate the social and economic benefits of mobile technology but are unable to access it, highlighting a huge opportunity for future growth and a challenge to all players in the industry ecosystem to expand the scope of products and services to tap this demand. Given the strong growth trajectory and pace of innovation, we are confident that the next few years will see continued growth with a further 700 million subscribers expected to be added by 2017 and the 4 billion mark to be passed in 2018.

TOTAL SUBSCRIBERS

Bn

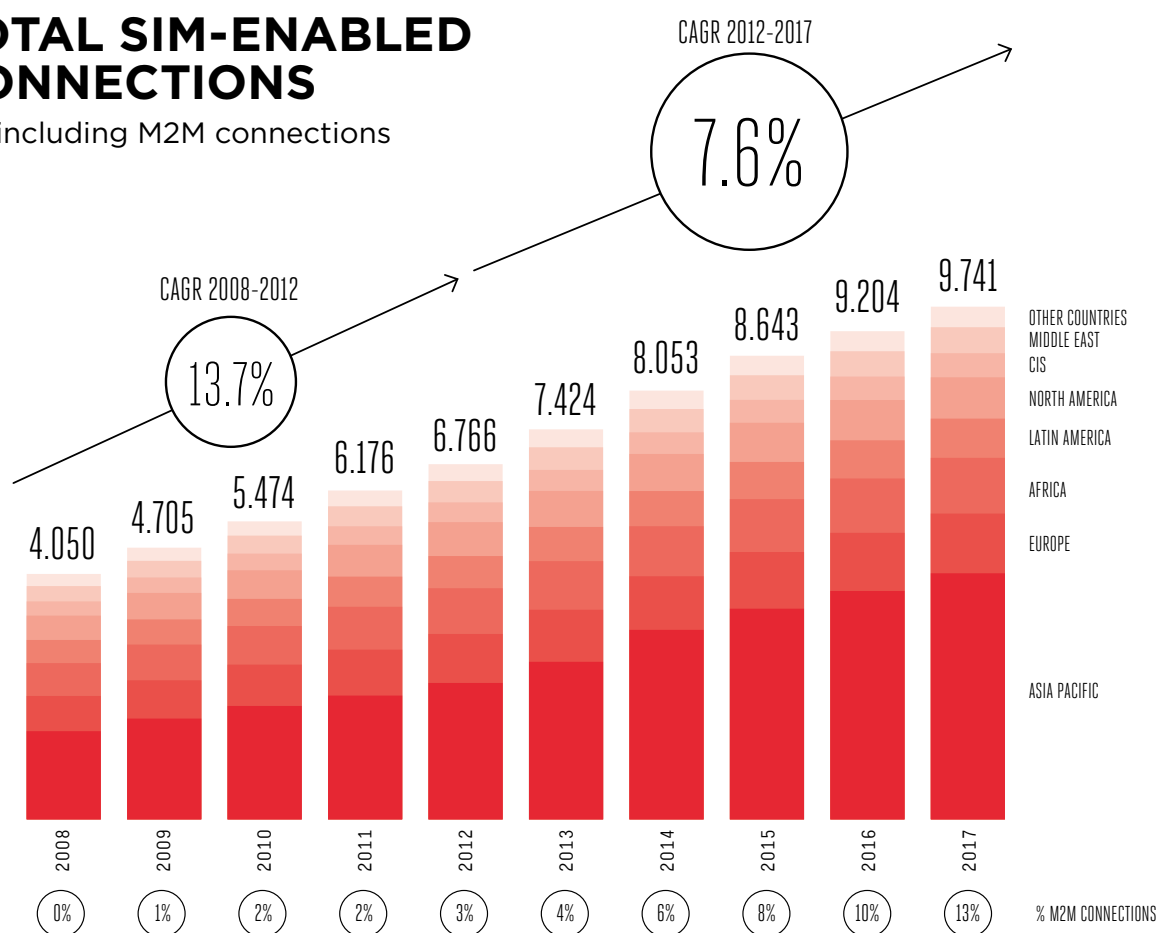


Source: GSMA Wireless Intelligence

This growth is mirrored by strong mobile connections growth, to almost 7 billion connections in 2012, as many consumers have multiple devices or use multiple SIMs to access the best tariffs, while firms in many industry sectors roll out M2M applications to boost their own productivity and tap into new markets. Despite challenging economic headwinds in many regions, the market is expected to grow even more strongly on the dimension of connections over the next five years, with 3 billion additional connections expected to be added between 2012 and 2017, a growth rate of 7.6% p.a.

TOTAL SIM-ENABLED CONNECTIONS

Bn, including M2M connections



Source: A.T. Kearney, GSMA Wireless Intelligence, Machina Research

Underpinning growth in the headline numbers is a diverse set of market conditions:

- Emerging markets are the major engines of mobile connection and subscriber growth – in particular Asia Pacific will add nearly half of all new connections between now and 2017 (1.4 billion) and will remain at just under 50% of both global connections and subscribers. Latin America and Africa combined will add the next 20%, representing 595 million new connections.
- Developed markets' connection and subscriber growth is slowing, but M2M is set to grow – subscriber numbers are forecast to grow at just 1% p.a. between now and 2017 in Europe and North America due to market maturity. However, total connections will grow at 9% and 10% p.a. respectively – faster than in emerging markets – due to strong M2M connections growth (1.2 billion connected devices by 2017 according to GSMA Wireless Intelligence).

Mobile is a vibrant and evolving industry at the heart of everyday life for a growing proportion of the world's population. Network operators are continuing to develop strong value propositions to deliver new and innovative services to users. As technology continues to evolve, so the mobile ecosystem has built new business models to deliver new services in communications and adjacent services. Mobile remains a vibrant and evolving industry constantly finding new ways to inter-connect the user's world in spheres such as automotive, utilities, health and education, and new ways to manage financial transactions.

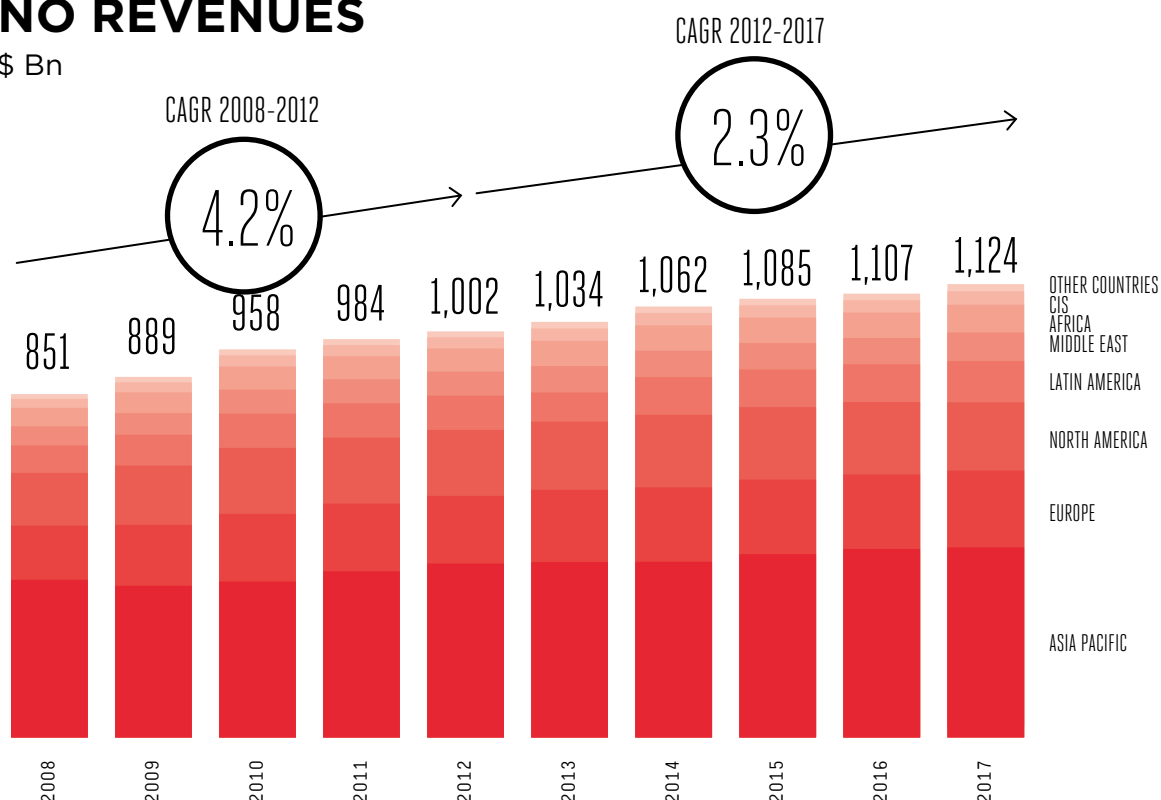
Connected living has become a reality for hundreds of millions of people who cannot imagine life before the smartphone and the mobile broadband connection.

Consequently, mobile data continues to drive rapid traffic growth for mobile operators with all regions showing impressive data volume growth rates as more and more people connect to the internet via mobile. In emerging markets, growth will be driven by the increased penetration of smartphones, while in developed markets it will be driven by both greater smartphone adoption and increased download speeds made possible by new technology such as 4G. In fact total traffic volumes in 2012 alone exceed all the previous years combined and globally data is projected to grow by 66% p.a. through 2017 to 11.2 Exabytes per month – equivalent to more than 5 billion hours of HD video¹.

The mobile internet is at the heart of a dynamic ecosystem of innovation reaching beyond operators. Device manufacturers, including the operating system (OS) developers, are driving innovation through the race to differentiate themselves and make smartphones faster, lighter and more intuitive to use. Network infrastructure vendors are responding to the demand for efficiencies as they seek to support the network demands of tomorrow at lower price points. Content providers are harnessing new hardware and software innovations and the growth of developer communities to deliver their own innovative services and products to the consumer over mobile access.

MNO REVENUES

US\$ Bn



Source: A.T. Kearney, EIU, Gartner, GSMA Wireless Intelligence, IDC, Wireless Matrix

1. Based on one hour of HD video using 2GB of data.

Given this dynamism, it is no surprise that the mobile industry makes a substantial economic contribution, with mobile operators alone expected to contribute 1.4% to global GDP in 2012 and their revenues expected to grow at a robust 2.3% p.a. to reach US\$1.1 trillion by 2017. When the rest of the mobile ecosystem is included, total revenues are forecast by A.T. Kearney to reach US\$2 trillion in 2017, which represents an annual growth rate of 4.7%. In support of the growth in capacity and the level of innovation, the mobile ecosystem will increase its level of annual capital expenditure by just under 4% per annum from 2012 to 2017 to US\$238 billion.

Mobile infrastructure is now as important to a country's economy as its energy grid or transportation network – it is a key enabling infrastructure that drives and supports growth in the wider economy. The high level of investment is needed to continue the development of this infrastructure so that capacity can be built to meet the ever growing demand and so that new services can be launched which bring greater benefits to the wider economy.

The growth in revenues for network operators lags growth in usage because of continued price declines. Average Revenue Per User (ARPU) rates have declined across every region globally, by 8% p.a. from US\$19 to US\$14 per month, with the biggest reductions seen in Africa (-10% p.a.) and Europe (-7% p.a.), indicating that average mobile tariff prices have been decreasing due to price pressures, the growth of multi-SIM users (with a second SIM on a lower tariff) and the fact that many new users are able to gain access at lower price points. If ARPS (Average Revenue per Subscriber) is considered, the downward trend is less pronounced (at -4% p.a.), as this measure strips out the effects of multi-SIM and M2M. The positive aspect here is increasing value for money for consumers, but the worrying outlook is the margin pressure on network operators at a time when investment needs are growing and many of them are also diverting a substantial portion of their revenues towards subsidising the purchase of popular smartphones to promote adoption.

The mobile industry has always made a significant contribution to public funding. By 2017, its contribution to public funding is projected to be US\$550 billion – as a result of spectrum fees as well as direct and indirect taxes. It is important that this level of financial commitment should be structured in a fair and predictable manner, in order to protect growth and employment – for instance the industry already supports 8.5 million jobs today and growth is expected in emerging markets to create an additional 1.3 million jobs by 2017.

The mobile industry is working to support and protect citizens. From empowering women or protecting the vulnerable to helping responses to natural and man-made disasters, mobile phones have significant potential to change the lives of millions. But with any new technology comes new

risks and the whole mobile ecosystem is collaborating to reduce risks to users such as handset theft, mobile fraud and breach of privacy. Mobile operators are also playing their part to work to reduce their impact on the environment and have the potential to make a net positive impact on greenhouse gas emissions – with the potential to enable emission savings in 2020 more than 11 times greater than their own anticipated mobile network emissions. Across all of these areas, the GSMA is leading the drive to implement innovative new services and implement robust protective measures through the sharing of best practices and by encouraging inter and intra-industry co-operation.

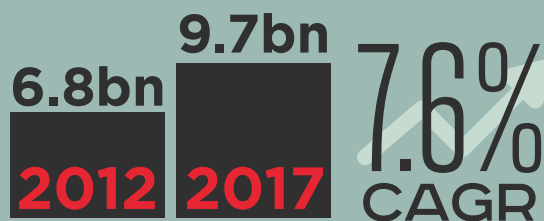
In preparing these forecasts for the years to 2017, we have made a series of assumptions about the environment in which the mobile ecosystem operates. A transparent, consultative and predictable regulatory environment is essential for securing investment that the mobile industry requires to deliver a stable infrastructure for commerce, new technologies and innovations to the consumer. Without confidence in future regulation – from spectrum licencing through to competition, taxation and intellectual property laws – it may not be possible to raise the investment required to develop and implement the next generations of mobile technology.

A competitive industry is a vibrant and innovative industry. A trade-off exists between increased competition and the leveraging of economies of scale to reduce duplication of infrastructure – consolidation being a natural next step in maturing industries that require high levels of capital investment. Finding the right regulatory balance and allowing increased cross-border consolidation within fragmented markets is key to the future healthy development of the mobile industry.

Planning for future growth cannot be delayed. New technologies and coding algorithms will be able to squeeze ever greater capacity out of existing mobile spectrum – the fundamental building block of any mobile network – but this limited resource cannot be relied on to support future growth indefinitely. Additional spectrum – such as that presented by the Digital Dividend – needs to be released to mobile and carefully managed, with its usage planned up to 10 years in advance to ensure that sufficient capacity is available and deployed efficiently to meet future demands. With a policy environment supporting the ecosystem and spurring continued innovation and investment, prospects for the industry, its consumers and the wider economy remain strong.

GLOBAL MARKET

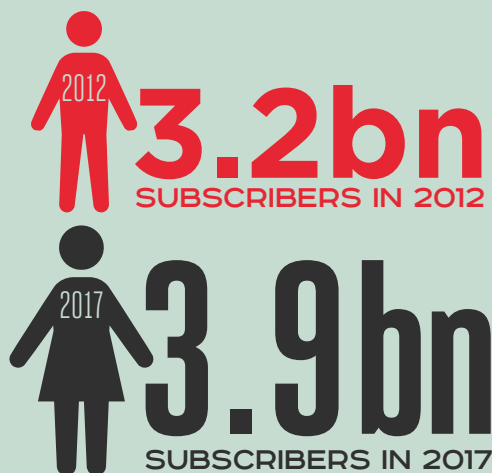
Global Connections



Mobile Broadband Growth



Global Subscribers



Subscribers are growing 4 times faster than global population

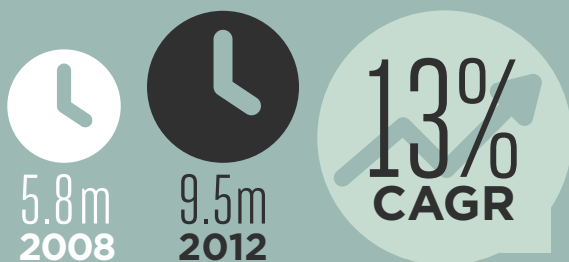
LTE Growth



LTE/4G networks will account for 1 in 5 Mobile Broadband subscriptions by 2017 (versus 1 in 25 in 2012)

2017 920 Million

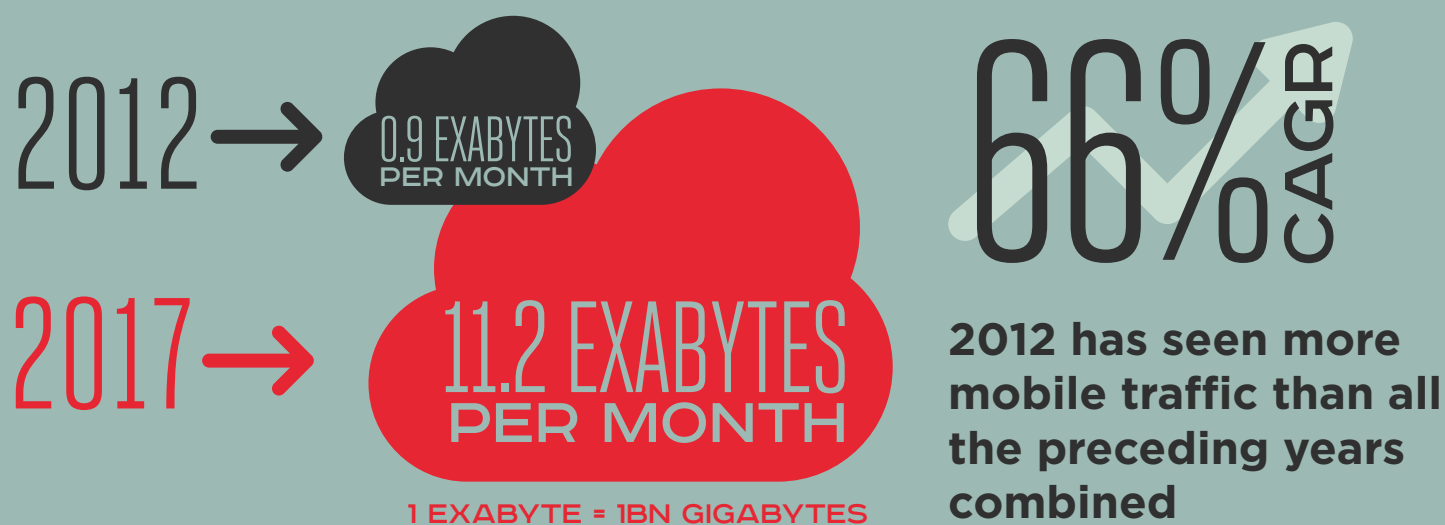
Voice Minutes



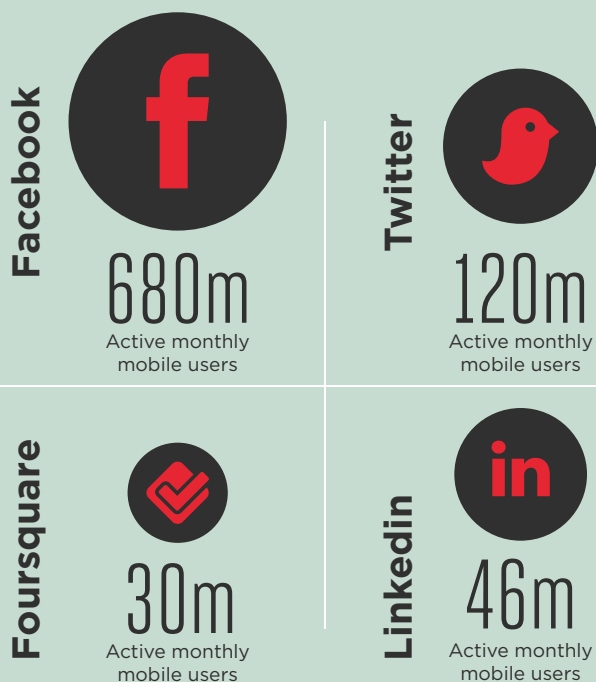
SMS Messages



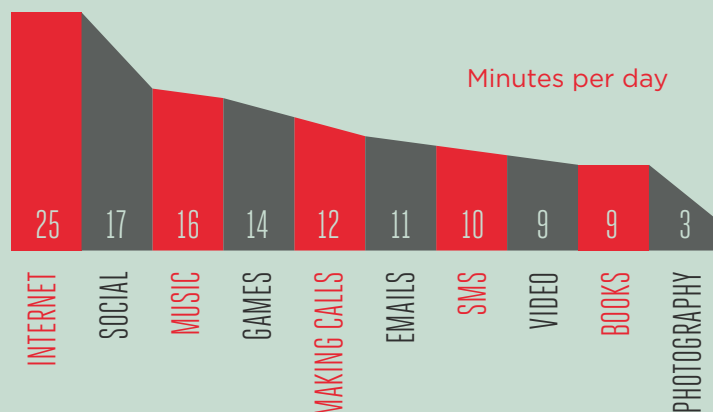
Mobile Data Volumes



Explosion of Mobile Data Services and Social Media



The advent of the smartphone, combined with the widespread deployment of mobile broadband networks, has led to an explosion of mobile data services



Global Market Introduction

KEY POINTS

CONNECTIONS

The global market has grown by 13.7% since 2008 with nearly 7 billion total connections and an additional 2 billion connections projected to be added by 2017.

SUBSCRIBERS

3.2 billion people of the 7 billion on earth benefit from having a mobile phone. A further 700 million subscribers are expected by 2017, but this still leaves a huge potential for further growth.

ASIA PACIFIC

In absolute terms Asia Pacific will add nearly half of all new connections between now and 2017, while 22% will be from Europe and North America combined.

MOBILE DATA

Data continues to be a major area of growth for mobile operators with all regions showing impressive growth rates. In fact, total traffic volume in 2012 alone was higher than previous years combined and globally data is projected to grow by 66% p.a. through 2017.

PENETRATION

Data growth is driven by the increased penetration of smartphones, in particular in emerging markets – and by increased data consumption per subscriber due to the faster download speeds and the uptake of data-hungry applications like video made possible by new technology such as 4G.

2.1

Mobile Proliferation around the World

Global Connections

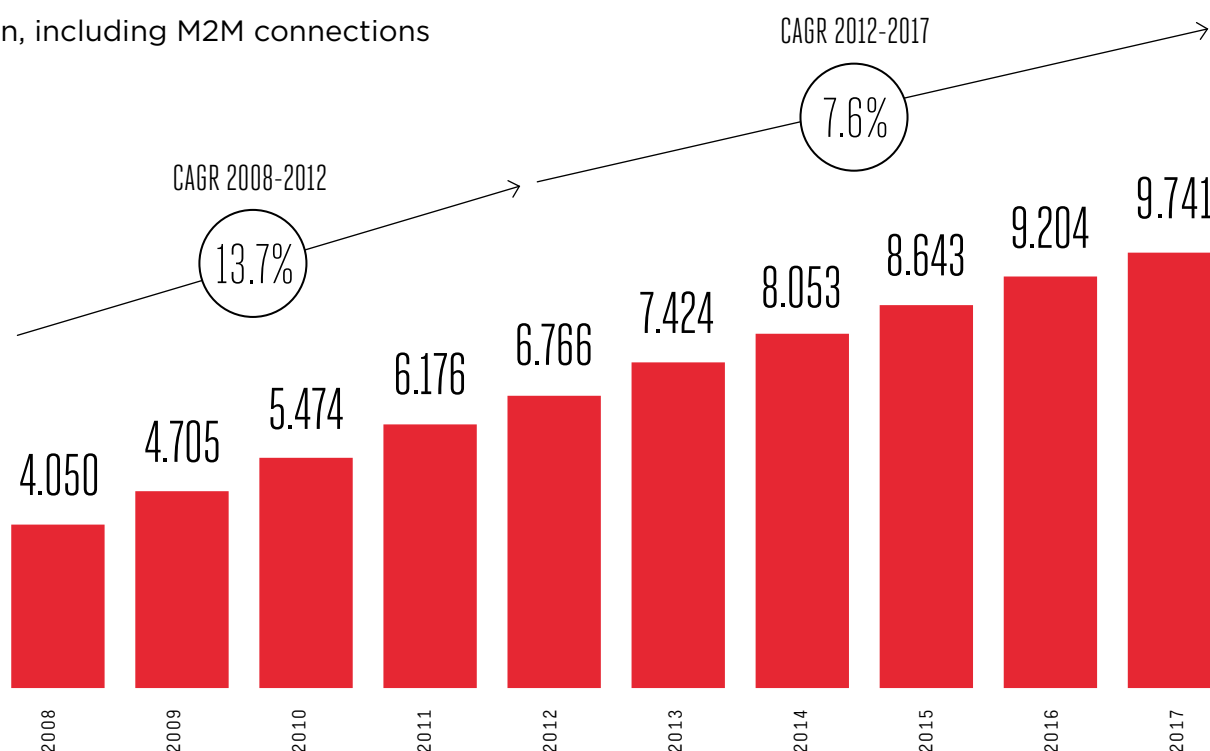
In 2012, the global mobile market grew strongly to nearly 7 billion connections, representing a growth rate of 13.7% p.a. since 2008 (see Figure 1). The number of individual subscribers increased by 38% in the four years from the end of 2008 and the number of connections grew by 67% over the same period (an increasing number of people have multiple connections, e.g. for work and personal use or for phone and tablet). As the global market continues to grow, 2013 is expected to be a landmark year, with for the first time more SIMs active than people alive.

Despite challenging economic headwinds, the global mobile market is expected to continue to grow over the next five

years, with annual growth in the number of connections of 7.6% expected between 2012 and 2017. This is slower than the growth rate of 13.7% over the period 2008 to 2012, which is to be expected given subscriber market saturation in some countries. In absolute terms, however, this still represents 3 billion new connections, 10% more than was added between 2008 and 2012. As a result of this growth, global SIM penetration is forecast to reach 129% by 2017 from the current 94%, breaking the 100% mark during 2013, while subscriber penetration should increase from 45% to 52% in the same period. However, as we explore later in this chapter, the dynamics differ significantly by region (see Figures 4 and 6).

GLOBAL CONNECTIONS

Bn, including M2M connections



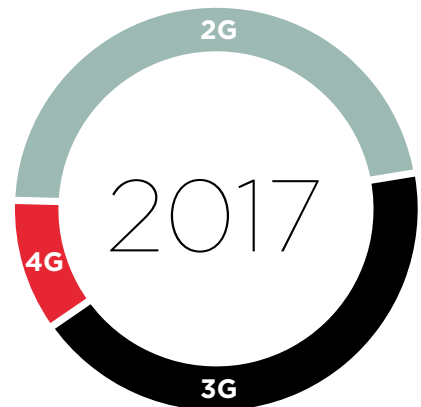
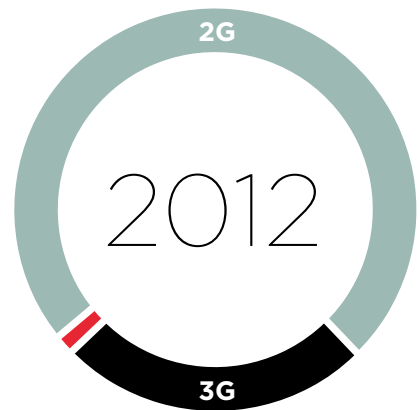
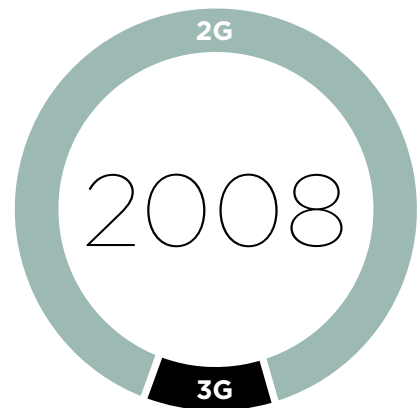
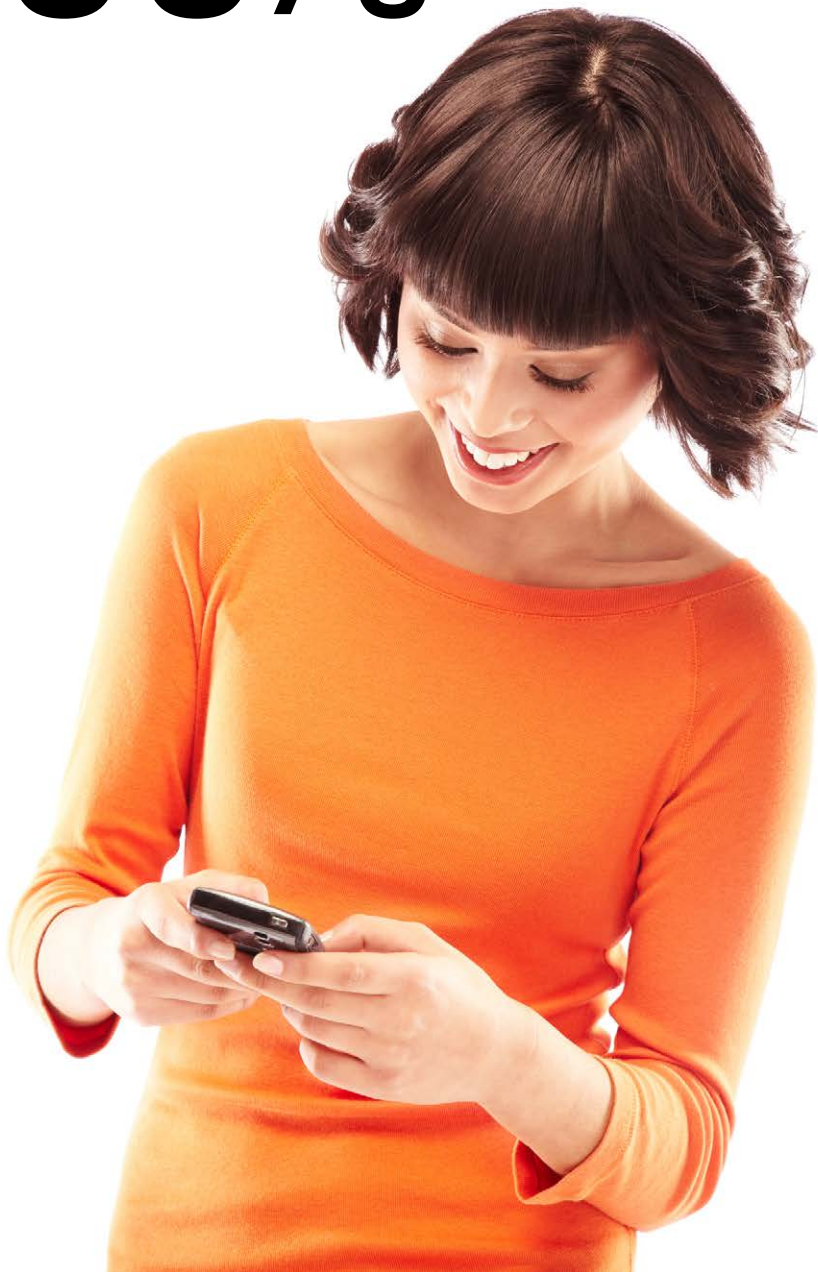
Source: GSMA Wireless Intelligence, Machina Research, A.T. Kearney Analysis

Figure 1

Global Connections by Technology

BY 2017 3G AND 4G SHARE IS
FORECAST TO INCREASE TO

53%



The headline growth in number of connections hides an important shift taking place in the types of connections that make up the total. In terms of numbers of connections, 2G technology – which provides digital quality voice, messaging and low bandwidth data connections – still accounts for the majority of global connections in 2012, 5 billion of the 6.8 billion total. However, the growth in connections will be driven by increased uptake of 3G and 4G connections, which are forecast to increase from 26% to 53% of global connections over the period 2012 to 2017 (see Figure 2).

Globally, 3G connections have approximately quadrupled since 2008 to a total of 1.7 billion. This growth is set to continue to 4.2 billion connections in 2017, representing a growth rate of 20% p.a. Part of this growth will be driven by the growth in M2M connections, which have been doubling every year since 2008 and are expected to rise from 0.2 billion connections in 2012 to 1.3 billion by 2017 – the majority of the increase being 3G connections (67%). However, overall 3G growth will in turn be impacted by the roll-out of 4G technology, which in 2012 represented just 1% of total global connections yet is projected to represent 10% of global connections by 2017, as the technology becomes more widely available across developed markets and consumers upgrade to 4G-enabled phones. Global penetration of mobile broadband is accelerating, with penetration growing by 6 then 7 percentage points in the last two years to 22%, representing 1.6 billion MBB connections and underscoring the increasing importance of mobile infrastructure in the way we access the internet².

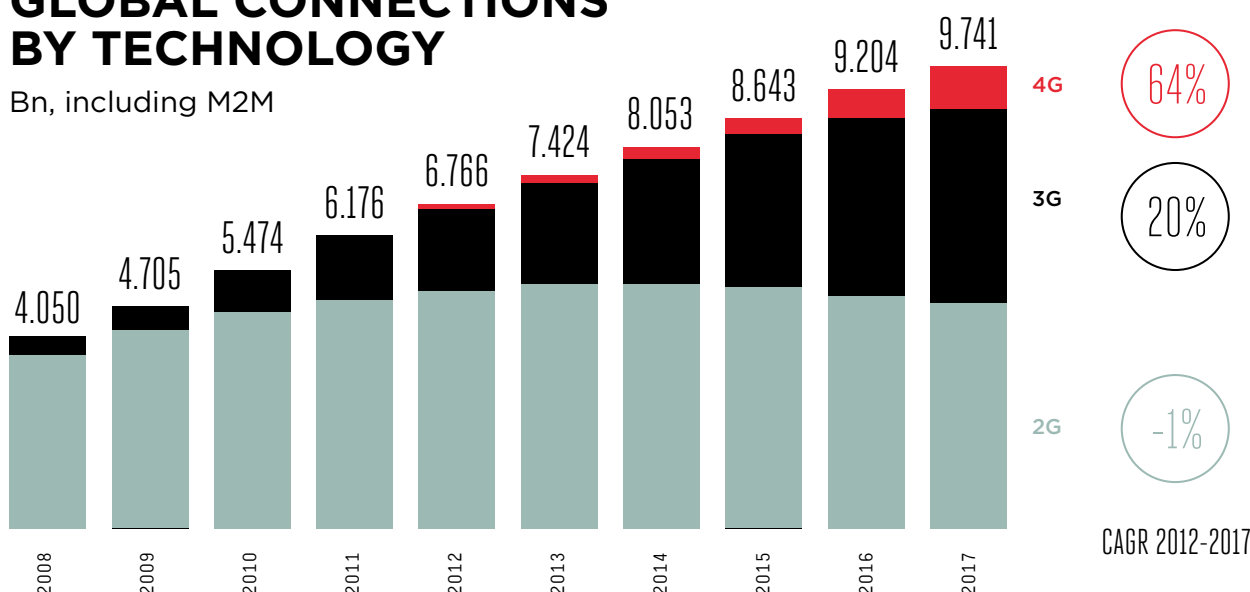
This contrasts with 2G connections which are expected to decline in absolute terms to around 4.6 billion by 2017 as accelerating upgrades of 2G to newer technologies are partially offset by

rapidly growing connections in the developing regions and by growth of 2G M2M connections of just over 200 million. Despite the decline of 2G, this generation will still represent a significant share of global connections in 2017 (47%). Two major factors underlie this: inertia in the handset and equipment base and new 2G connections in the developing world. A majority of world's handsets are still "feature phones". Less than one in four handsets shipped in 2012 is a smartphone³, while LTE-enabled phones represent less than 4%. Given the significant renewal cycles the handsets have, especially in the poorer countries, the dominance of the phones which don't support newer generations slows down advancement of both 3G and 4G.

Rapid expansion of mobile connectivity in the developing world, where the industry tends to rely more on 2G technologies for coverage, offers another explanation for the "stickiness" of 2G. For example, while the 2G connections are expected to fall by a substantial 47% by 2017 in the developed world, the decline in the developing world is only 8%. At the same time, African 2G connections are projected to increase 5% due to more people being connected in the poorest and least developed regions.

GLOBAL CONNECTIONS BY TECHNOLOGY

Bn, including M2M



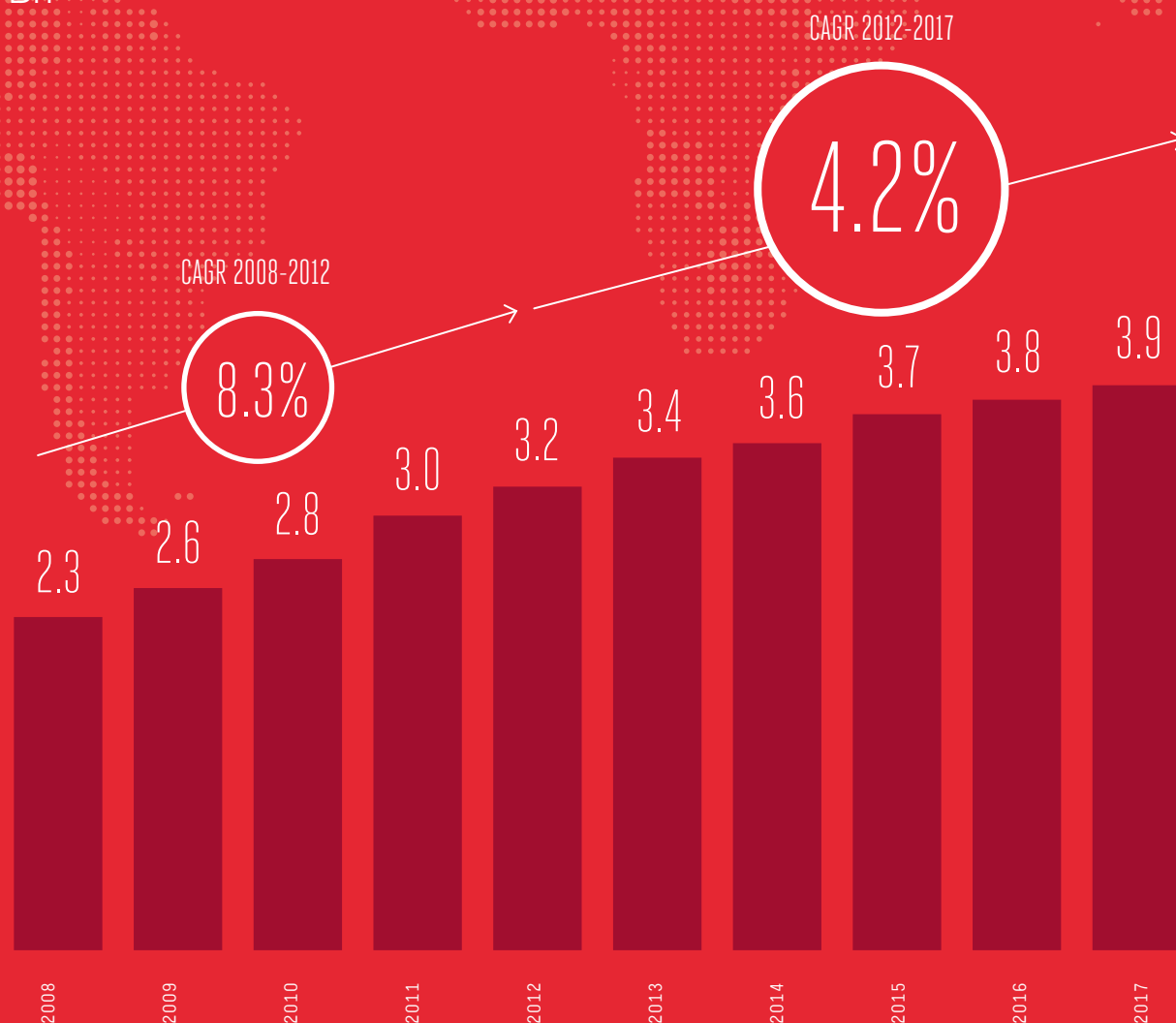
Source: GSMA Wireless Intelligence, Machina Research, A.T. Kearney Analysis

Figure 2

2. A.T. Kearney analysis based on GSMA Wireless Intelligence and ABI Research data. 2012/2013.
3. IDC sees 2012 global handset shipments up 4%. Total Telecom. June 2012.

TOTAL SUBSCRIBERS

Bn



Source: GSMA Wireless Intelligence

Figure 3

GLOBAL SUBSCRIBERS

Growth in the number of unique individual subscribers is similarly strong, only slowing slightly as subscriber penetration rises (see Figure 3.) Nearly one billion subscribers were added in the four years to 2012, and by the end of that year, there were 3.2 billion mobile subscribers, or nearly half the world's population. This is a significant achievement, but also demonstrates the opportunity to bring the social and economic benefits of mobile technology to the rest of the world.

4 BILLION

A FURTHER 700 MILLION SUBSCRIBERS ARE EXPECTED BY 2017, BRINGING THE TOTAL NUMBER OF SUBSCRIBERS TO ALMOST 4 BILLION, OR 80% OF THE GLOBAL ADULT POPULATION.

The forecast rate of subscriber growth of 4.2% p.a. is almost four times the rate of global population growth, which is forecast to be 1.1% per year in 2012 to 2017⁴. Looking to the future, the milestone 4 billion mark is expected to be broken at some point in 2018.

The gap between subscribers and connections growth is explained by adoption of multiple SIM devices per person and rapid growth of M2M, especially in the developed world. This is indicated by SIM-per-subscriber ratio which is forecast to grow from 2.1 in 2012 to 2.5 in 2017 globally. North America, which sees the one of the fastest multi-device, has 2.8 SIM cards per subscriber, higher than any other region⁵.

4. Economist Intelligence Unit, 2013

5. Based on primary research in 39 countries by GSMA Wireless Intelligence during 2012.

2.2

Regional Differences in Growth

Previous GSMA reports on the mobile industry have highlighted the diversity that exists even within a geographically or politically homogenous region. This report offers a global perspective, with further detail at the regional level.

50%

In both connections and subscribers, Asia Pacific currently represents just under 50% of the global total and this share will remain constant through 2017.

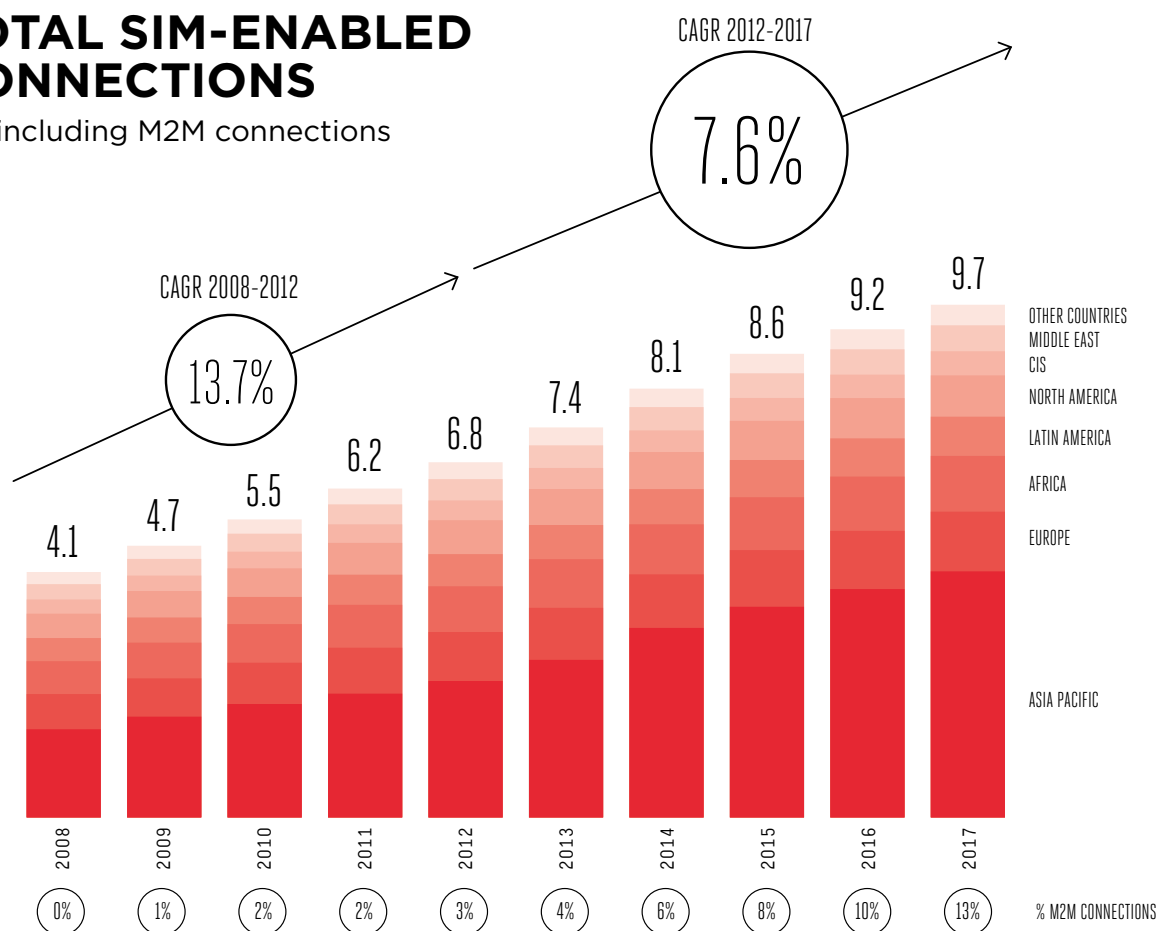
CONNECTIONS AND SUBSCRIBERS GROWTH

The global view of mobile growth identifies a number of regional themes. Emerging markets are the major engines of mobile growth – Asia Pacific in particular. The region generated an impressive 57% of all new connections between 2008 and 2012 to stand at 3.3 billion and is projected to grow at 7% p.a. between 2012 and 2017 adding 1.4 billion new connections (see Figure 4).

Africa and Latin America have also been a key source of mobile industry growth, accounting for the next 20% of connections growth between 2008 and 2012. This growth is set to continue with combined connections growth rate of 7% - 8% p.a. over the next 5 years to 2017, representing 0.6 billion new connections by 2017.

TOTAL SIM-ENABLED CONNECTIONS

Bn, including M2M connections



Source: GSMA Wireless Intelligence, Machina Research, A.T. Kearney Analysis

Figure 4

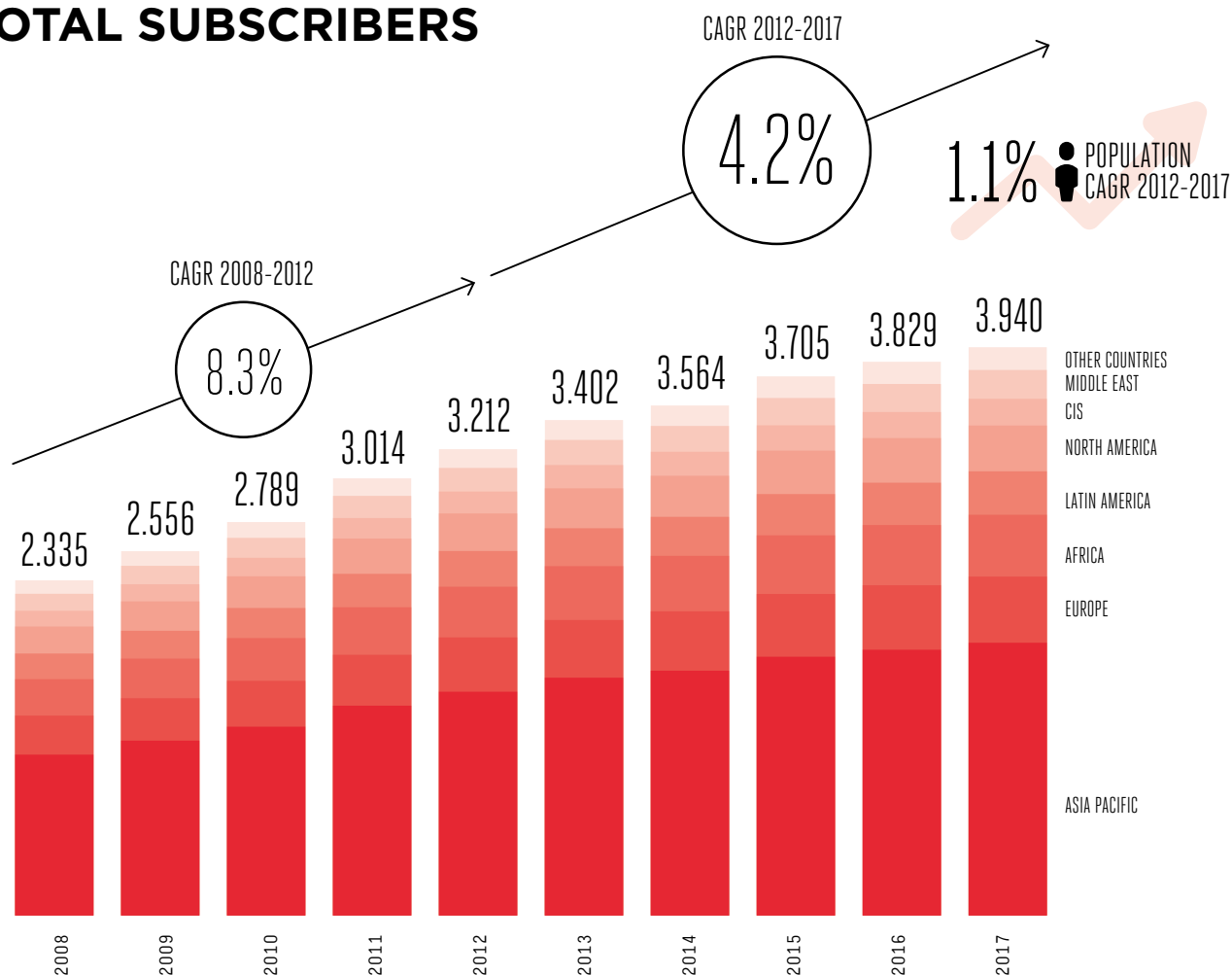


This strong growth across the emerging markets has been enabled by a number of factors, including:

- Falling prices and rising disposable income – enabling more people to own and use mobile technology – along with the creation of business models such as pay-as-you-go plans, micro-top-up and the availability of low cost handsets
- The lack of economically viable alternatives (i.e. fixed line communications) in a number of emerging markets, especially in Africa
- Mobile operators leading the way in developing and implementing new technologies with significant investment in building infrastructure to serve rural communities

TOTAL SUBSCRIBERS

Bn



Source: GSMA Wireless Intelligence

Figure 5



10% P.A. GROWTH IN CONNECTIONS IN NORTH AMERICA

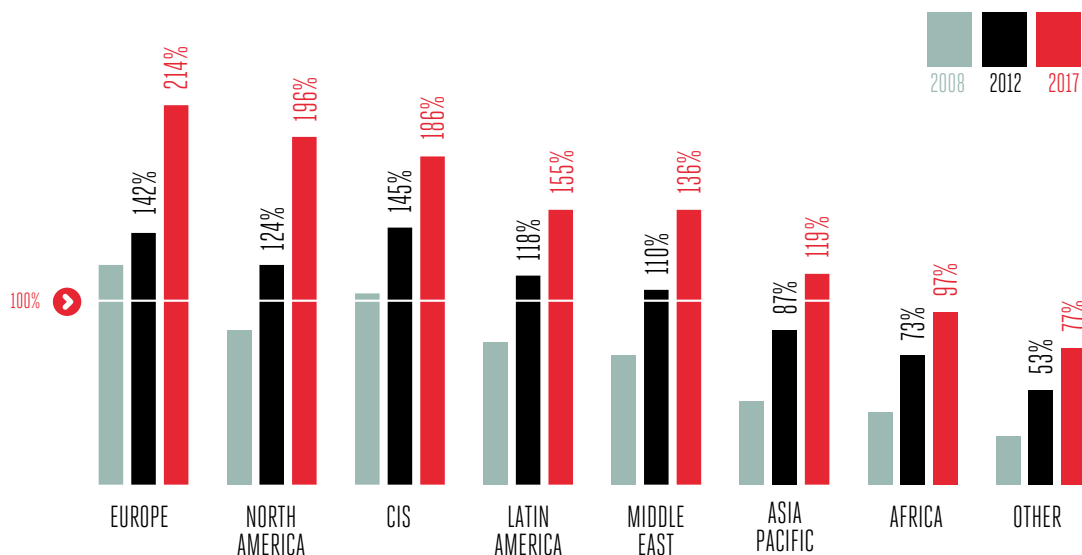
In developed markets, both Europe and North America will see strong M2M growth with a projected 42% of the market in 2017 representing 657m connections, which enable overall connections growth rates of 9% and 10% p.a. respectively to be sustained from 2012 to 2017, higher than the emerging markets growth rates.

When subscriber growth rates are compared side-by-side to connections growth rates, it becomes clear that the nature of growth in developed world is different to that of the developing. Europe and Africa have similar rates of connections additions: 9% and 8% respectively. However, relatively low subscriber growth in Europe (1% p.a.) suggests that most of connections come from the number of SIM cards per subscriber, rather than an increase in the number of subscribers. Africa, however, is on the other end of the spectrum – most of its 8% connections growth comes directly from subscriber additions. Other developed countries show a trend similar to Europe, in particular North America (10% connections growth vs. 1% subscriber growth), while developing markets still see connections and subscribers grow strongly: for instance, Asia Pacific (7% vs. 5%) and Middle East (6% vs. 4%).

SIM PENETRATION AND MODELS

The consequence of this continued strong growth is that SIM penetration (measured as connections divided by total population) is rising rapidly in all regions and by 2017 is expected to be well in excess of 100% in all major regions except Africa (which will reach 97%). In fact in Europe SIM penetration will be over 200%, with North American and CIS greater than 185% and Latin America, Middle East and Asia Pacific greater than 115%. This is in contrast to 2008 when Europe and CIS were the only two regions to exceed the 100% barrier at 124% and 108% respectively (see Figure 6).

SIM PENETRATION BY REGION



Source: A.T. Kearney, GSMA Wireless Intelligence

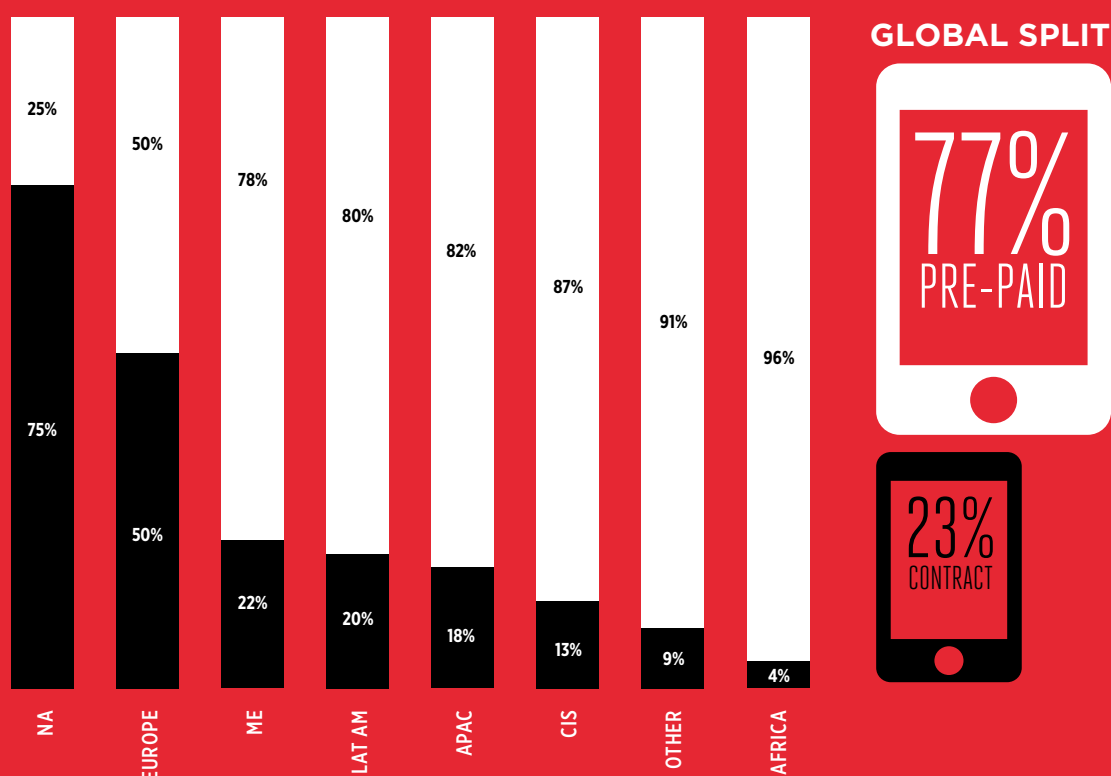
Figure 6

The common trend towards increasing penetration hides a wide variation between regions. Current penetration rates range from 132% in Europe – with individual countries reaching as high as 182% in Finland – to 72% in Africa, where penetration in Eritrea is only 5%. North America leads the way in penetration of 4G technologies at 10% of connections, although Europe leads in penetration of 3G technologies at 66%. This is in sharp contrast to the emerging markets which show a significant potential for growth in these technologies – and hence data consumption – with 3G penetration rates currently standing at 17% of connections in Asia Pacific and 8% in Africa.

Commercial models differ between markets and regions.

In developed economies, mobile subscriptions tend to be on contract (post-paid) as opposed to pre-paid. For example, in North America 75% of connections are post-paid, while in Europe the proportion is 50%, reaching 75% in North-Western Europe as compared to 40% in South-Eastern European states (see Figure 7). At the same time, other regions are largely pre-paid: 18% of connections are post-paid in Asia Pacific, 20% in Latin America, 13% in CIS and only 4% in Africa. This is partly a historic factor in the development of markets where early adopting countries required contracts but later adopting markets used pre-paid as a quicker way to launch and get customers connected. As markets mature, consumer expectations are harder to shift. In some countries the pre-paid model is more accessible to populations of people who do not possess the prerequisite bank account and identity documentation required to enter into a contract.

CONTRACT / PREPAID CONNECTIONS SPLIT % 2012



Source: A.T. Kearney, GSMA Wireless Intelligence

Figure 7

2.3

Data is the Driving Force of Growth

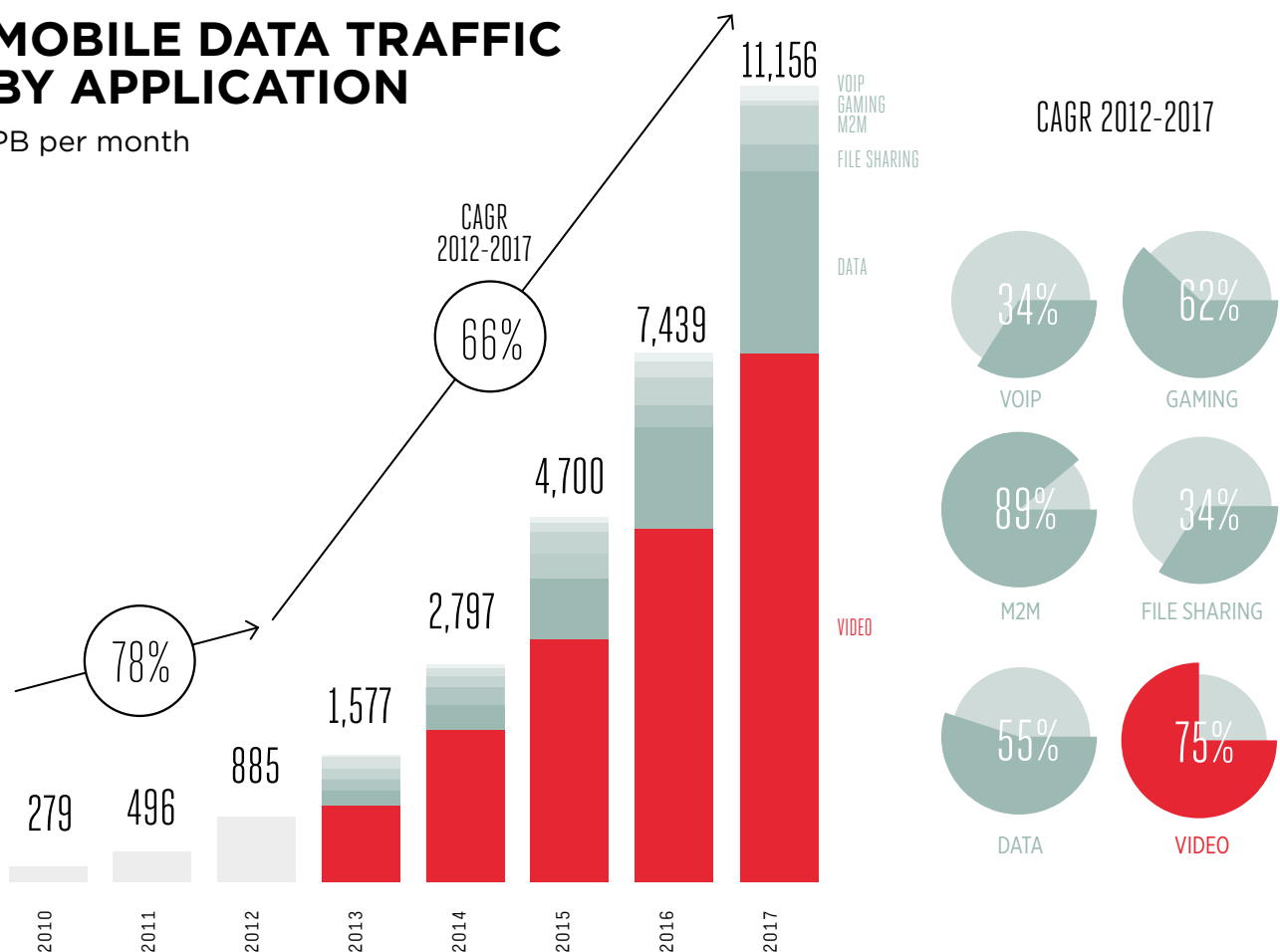
Data continues to be a major area of growth for mobile operators. As Cisco reported in their recent Visual Networking Index (VNI) study⁶, the volume of mobile broadband (MBB) traffic has been doubling every year, reaching 1,577 Petabytes per month⁷ in 2013 (the equivalent of 500 billion .mp3 files or 800 million hours of streaming HD video⁸) and is forecast to reach 11,156 Petabytes by 2017 (see Figure 8). The rate of growth is underlined by the fact that total traffic volumes in 2012 were as high as all prior years combined. Furthermore, this growth hasn't been isolated to one area – all regions have been showing impressive growth rates. In absolute terms, however, Asia Pacific is the clear leader and is forecast to account for 47% of traffic by 2017.

66% CAGR

2012 has seen more mobile traffic than all the preceding years combined

MOBILE DATA TRAFFIC BY APPLICATION

PB per month



Source: Cisco VNI, 2013, A.T. Kearney Analysis

Figure 8

6. Cisco Visual Networking Index (VNI) Global Mobile Data Traffic Forecast for 2012 to 2017. Cisco. 2013.
 7. Equal to 1.6 billion Gigabytes
 8. Assuming .mp3 files are 3 Megabytes each, and an hour of HD video uses 2 Gigabytes of data

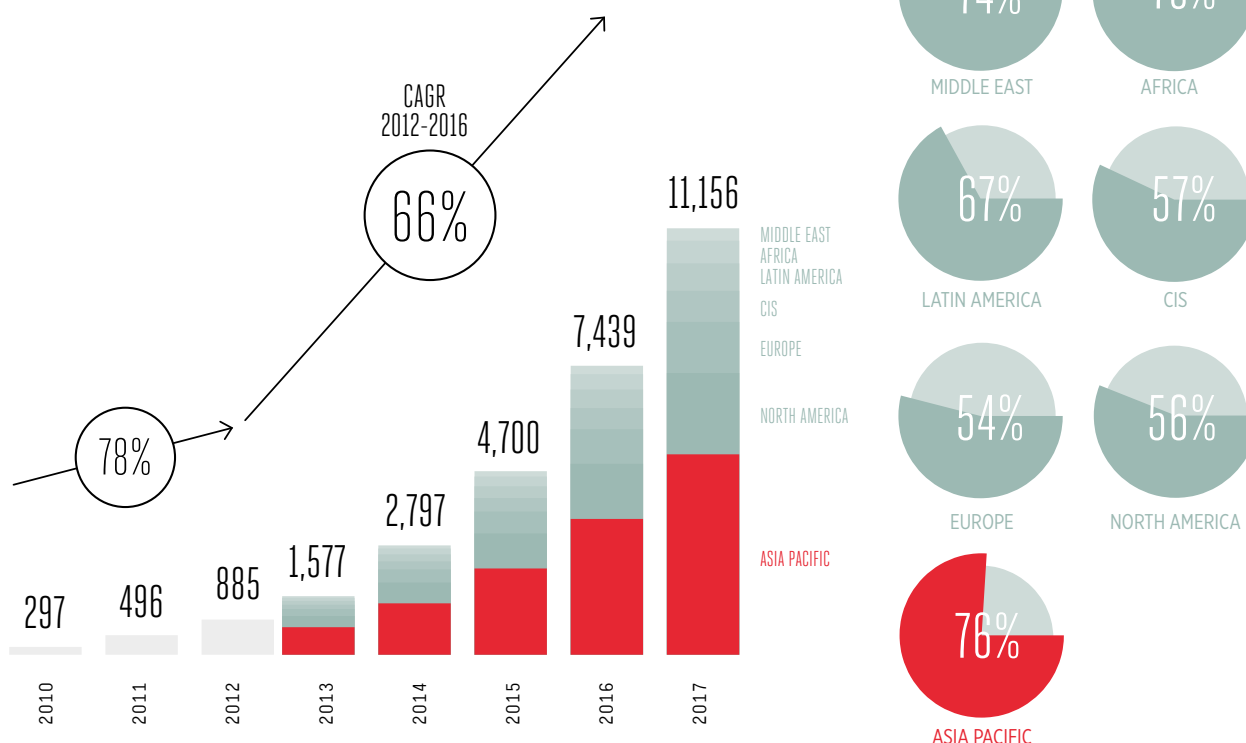
The key driver of data consumption growth today is video content.

From 852 Petabytes per month in 2013 it is projected to grow to 7,363 Petabytes per month in 2017 – representing growth in its share of all traffic from 54% to 66% – fuelled primarily by the increased penetration of 3G and 4G technologies and in particular 4G's ability to stream high definition video. The next highest volume of traffic in absolute terms is generated by data services such as web browsing and sending emails, growing from 490 Petabytes per month in 2013 to 2,577 Petabytes in 2017, also driven by the increased penetration of smartphones. In 2012, 4G already accounts for 14% of traffic (while it represents only about 1% of connections) and by 2017 the share is forecast to increase to 45%, vs. a 10% connections share.

In response to growing data traffic, mobile operators will increase efforts to offload it to fixed-line infrastructure through WiFi, for example. Cisco's VNI study estimates that the share of offloaded traffic will increase from 33% in 2012 to 46% in 2017. This means that the total data traffic generated by mobile devices (mobile plus offloaded data) will be over 20,000 PB in 2017. At the low-volume end of the scale, Machine to Machine (M2M) data traffic will only represent 5% of all traffic by 2017, but is forecast to grow at almost 90% p.a., driven by a wide range of applications from smart utility meters to in-car telematics services. By 2017 this will have led to a volume increase by a factor of 10 – breaking the mark of 500 Terabytes per month in 2017.

MOBILE DATA TRAFFIC BY REGION

PB per month



Source: Cisco VNI, 2013, A.T. Kearney Analysis

Figure 8

Number and Speed of Connections are Enabling the Growth of Data

The growth in data traffic is supported by an increasing number of mobile broadband (MBB) connections, which have grown 7 fold since 2008 – from just over 0.2 billion to 1.6 billion – and which are expected to grow at 26% p.a. until breaking the 5 billion mark in 2017. In fact, not only is the number of connections growing, but the absolute number of new connections is increasing also: 528 million connections were added in 2012, while in 2017 an additional 775 million new connections are expected.

MBB AND LTE^{1, 2} CONNECTIONS

Mn, including M2M

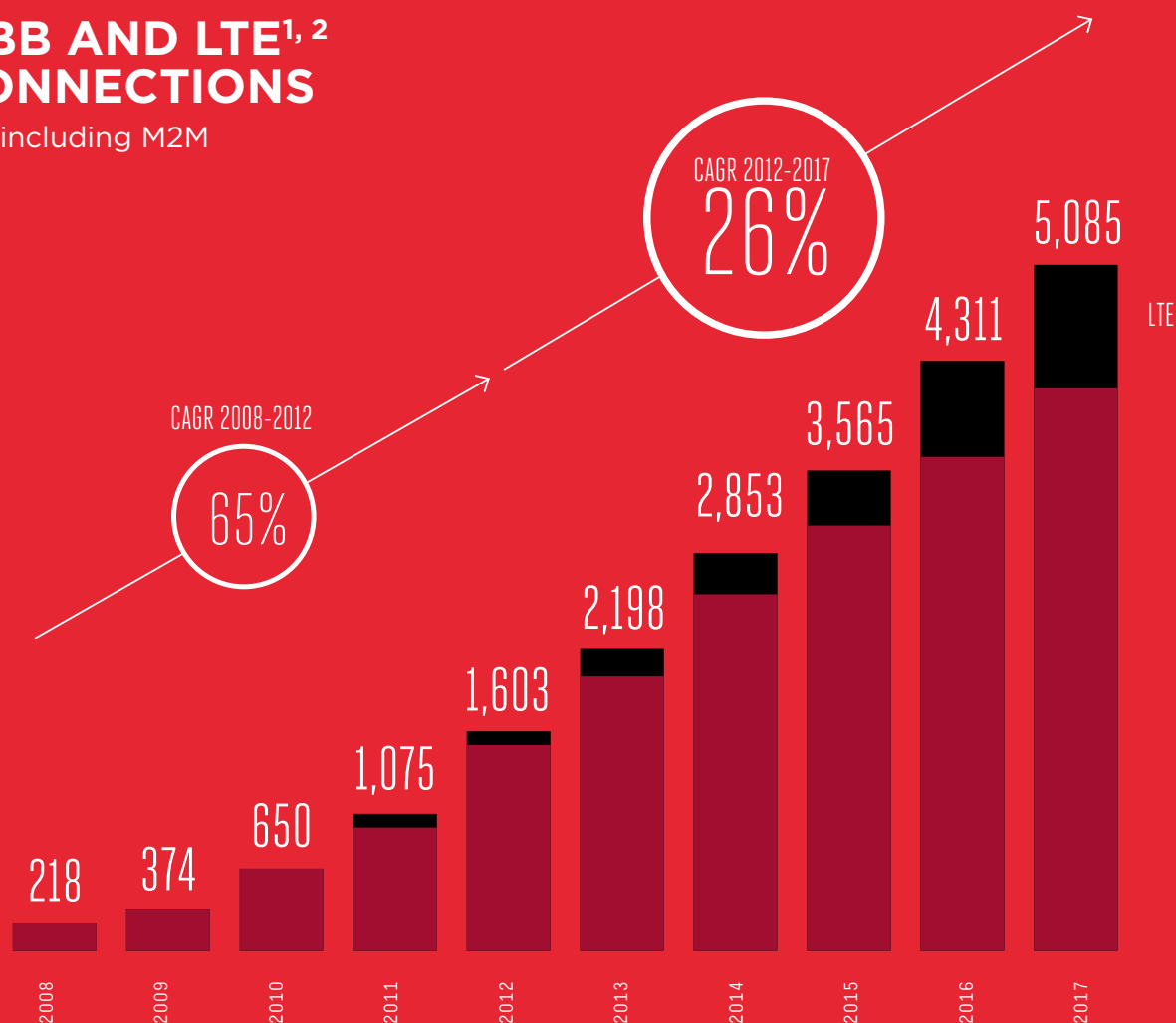


Figure 9

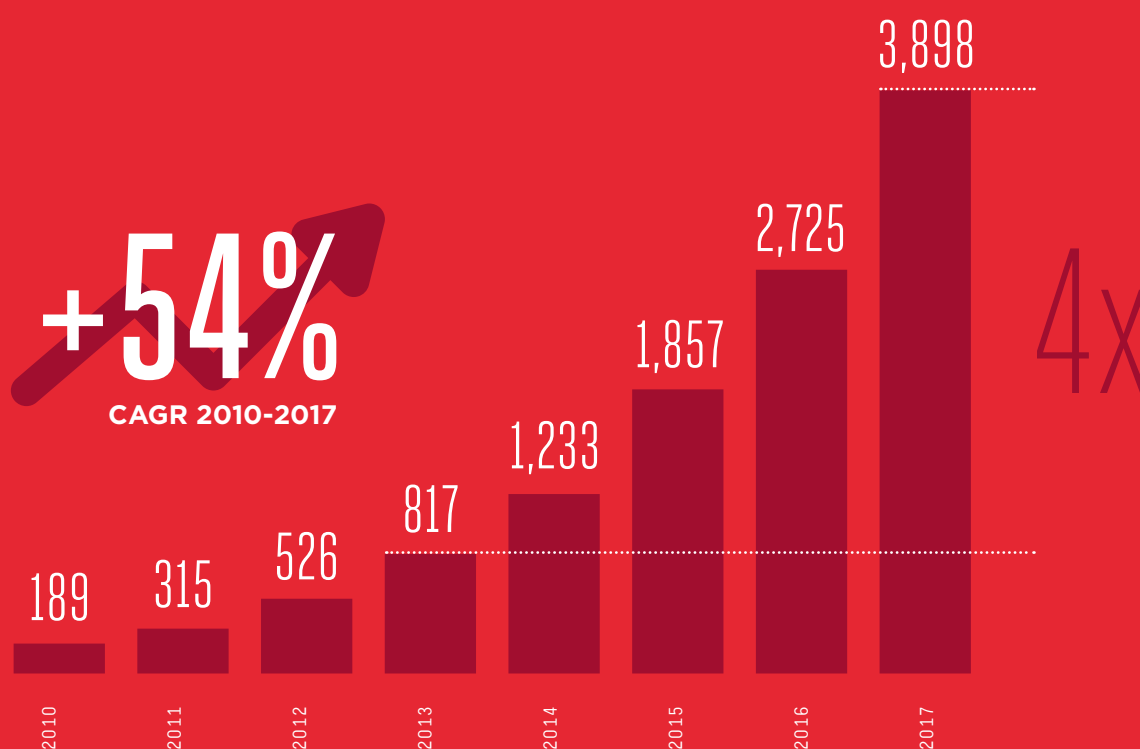
1. "Other MBB" includes the following technologies: CDMA2000 EV-DO, Rev. A, Rev. B, WCDMA HSPA, TD SCDMA, AXGP, WiMAX
 2. For M2M it was assumed that all 3G connections is "other MBB" and all 4G is LTE
 Source: GSMA Wireless Intelligence, A.T. Kearney Analysis

Increasingly fast connection speeds allow each user to consume more data. The average mobile Internet connection speed has more than doubled between 2010 and 2012 and it is forecast to increase sevenfold by 2017, reaching almost 4 Mbps⁹ on average (see Figure 10). This enables many emerging applications of mobile phones, specifically social networking, video streaming, video calls and games. The forecast average speed around the world in 2016 would be enough to stream HD video through the mobile network to users' phones.

AVERAGE GLOBAL CONNECTION SPEED

Kbps

 2,500kbps
SPEED REQUIRED FOR
HD VIDEO STREAMING



Source: Cisco VNI 2013

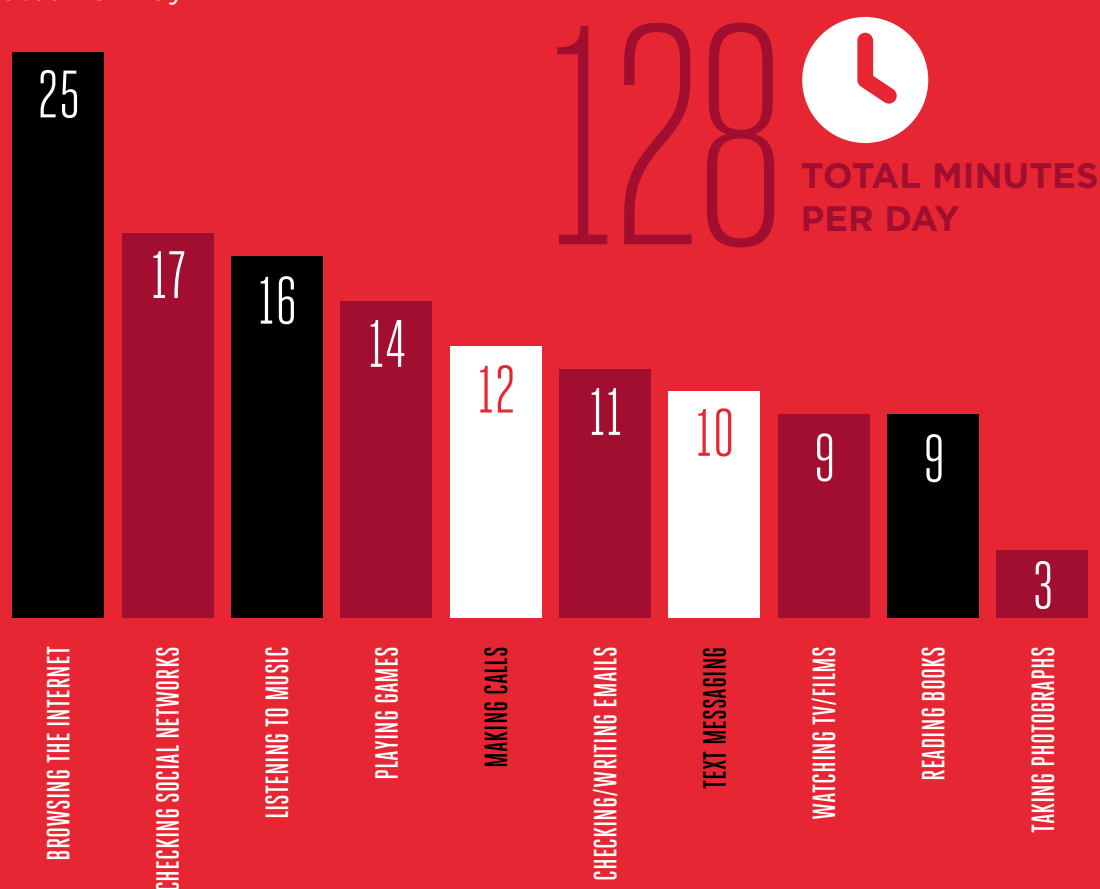
Figure 10

9. Megabits per second

A recent study of the UK market published by Telefónica confirms the growth of new applications enabled by MBB. This study highlights the many different functions for which mobile devices are used (see Figure 11). Voice calls are now fifth in the list of most used mobile applications, as measured by the average time spent using them per day (12 minutes). Top of the list is browsing the Internet at 25 minutes per day – more than twice as much as is spent making calls. Checking social networks, listening to music and playing games also consume more time than making calls. Time spent SMS messaging is similar to time checking/writing emails: 10 vs. 11 minutes per day on average.

TIME SPENT PER DAY BY UK SMARTPHONE USERS, BY APPLICATION

Minutes Per Day



Source: O2

Figure 11

In the emerging markets a similar trend exists. A 2011 study by Nielsen Informat Mobile Insights¹⁰ found that smartphone users in India are spending more than twice as much time viewing content on their mobiles as making voice calls. Indian smartphone users spend on average 2.5 hours per day using their mobiles

and about three quarters of that time is spent on social media sites, playing games, accessing entertainment and other forms of online browsing. The younger generation – ages 15 to 24 – also spend on average an additional one hour on top of this, mostly surfing the web.

This trend underscores the growing importance of mobile technologies. Mobile phones had a narrow specialised use a decade ago, while now they perform functions of mobile TV, digital watch, gaming console, organiser, music player and many others, further integrating mobile with everyday life.

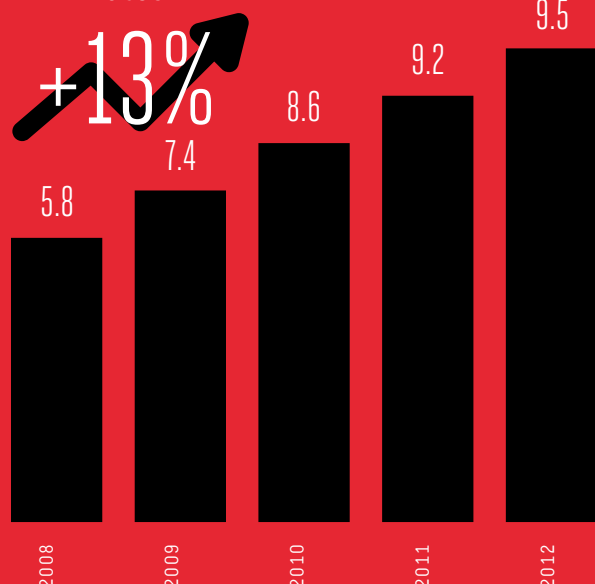
10. Indian smartphone Users Now Spend More Time on Content Than Voice and SMS: Nielsen and Informat form Strategic Alliance for Insights on India's Emerging smartphone Consumers. Nielsen Informat Mobile Insights. 2011.

IN PARALLEL, TRADITIONAL USAGE IS STILL SHOWING ROBUST GROWTH

Both voice Minutes of Use (MoU) and SMS show strong – although slowing – growth (see Figure 12). MoU grew on average 13% per year in 2008-2012 but only grew 4% in 2012. SMS grew an impressive 28% p.a. in the same period, while the growth in 2012 is estimated at 8%. The slowdown in growth is largely attributed to increasing usage of VoIP, Instant Messaging and Social Networking. Both VoIP and Instant Messaging decrease cost of communication, especially on “unlimited” data plans and with international calls and messages. At the same time they add more features, such as video calling, conference calls and chats and easy exchange of images, video and other media attachments. Social networks decrease demand for personal messages, partially replacing them with “status updates” which reach all friends or colleagues at once. Nevertheless, new subscribers and increasing consumption of SMS and minutes per person in the developing world as a result of falling prices of handsets and mobile services support robust growth of traditional usage.

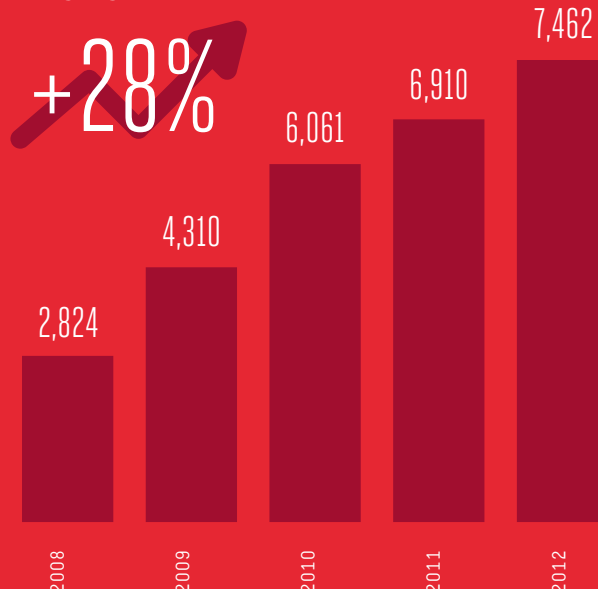
GLOBAL MINUTES OF USE

Tn Minutes



GLOBAL SMS SENT

Bn SMS

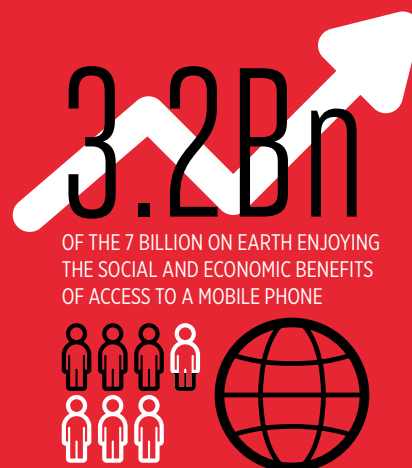


Source: ITU, IDC, Forrester, A.T. Kearney Analysis

Figure 12

POTENTIAL FOR FUTURE GROWTH

The mobile industry has shown solid growth in recent years, with both total connections and subscriber numbers growing strongly. The headline hides a number of regional trends – with the growth of data highlighting new types of industry growth in the developed markets and increased SIM and subscriber penetration in the emerging markets. With 3.2 billion people of the 7 billion on earth enjoying the social and economic benefits of access to a mobile phone and a further 700 million subscribers expected by 2017, there is still a huge potential for further strong growth in the mobile industry to 2017 and beyond.



A VIBRANT AND EVOLVING INDUSTRY

M2M Connections



215m
2012

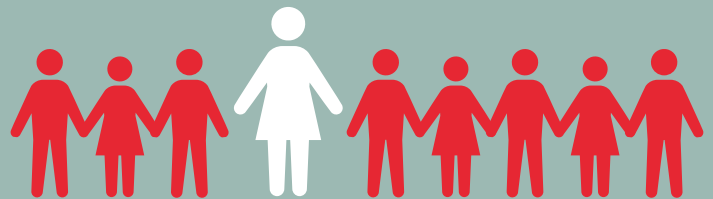
1.2bn
2017

41.6%
CAGR

mAutomotive



85,000 Lives lost annually
in road traffic accidents



1 IN 9 LIVES SAVED OR

35,000

LIVES SAVED BY 2017 THROUGH
IN-CAR EMERGENCY CALLING SERVICES

Healthcare Spend OECD Countries

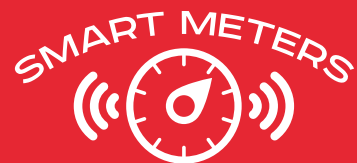
 \$6.9tr



in 2017, Mobile Healthcare
can help cut healthcare costs
in OECD countries by over

\$400bn

Smart Cities



 27m
TONNES

Smart metering in major cities can
reduce carbon emissions by 27m tonnes,
the carbon offsetting equivalent of 1.2bn trees

 1,2bn

Future Communications

INDUSTRY SNAPSHOT

9.6tn

9.6 trillion
messages
sent in 2012

28.2tn

28.2 trillion
messages
forecast for
2017



\$1.6bn

Mobile operators around the world are expected to take in a cumulative \$1.6 billion over the 5 years from 2012 to 2016 from RCS service fees

STRONG RCS ECOSYSTEM



31 OPERATORS LAUNCHED
OR COMMITTED TO LAUNCH



8 HANDSET VENDORS
OFFERING PRODUCTS



19 SUPPLIERS OF
HOSTED SOLUTIONS



5 LEADING INFRASTRUCTURE
VENDORS WITH FULL SOLUTIONS

JOYN SERVICES ARE HERE - NOW



Enables users to
share instant messages



Enables users to share files
such as photos
with their contacts



Enables users to share
pictures and video
whilst speaking



Works on any
device, on any
network

NEW PRODUCTS & SERVICES ON THE RCS PLATFORM

RCS APIs already exist
to make development easier for:



ENTERPRISE USERS
GROUP COLLABORATION IN THE WORKPLACE



GAMERS
MULTIPLAYER GAMING POWERED BY JOYN



HOME USERS
FIXED LINE ACCESS AND SMART TV S



CUSTOMER CARE CENTRES
VIDEO ENHANCED CALLS

Mobile Commerce

NFC IS A WIRELESS TECHNOLOGY THAT CAN:



Replace paper tickets
on transport systems



Replace cash and credit cards
to purchase goods and services



Replace vouchers and coupons



Replace traditional keys to hotel rooms,
offices and homes

100k+

Number of contactless
enabled PoS in the UK

600k+

Number of contactless
enabled PoS in China

\$13 trillion

Total value of global mobile payments predicted by 2017

POTENTIAL IS GROWING

50%

Proportion of all
smartphones
NFC enabled by 2015

50%+

Proportion of spending
put through Visa
in Europe in 2020
via a mobile device

85%

Proportion of new
Point of Sale (PoS)
terminals shipped in
2016 that will be
contactless

1bn

Number of SIM-based
NFC handsets that will
be sold by 2016

\$50bn


Value of transactions
these handsets will
support by 2016

15bn

Number of NFC
tickets delivered
to mobile devices
worldwide by 2014

300m

Number of NFC
smartphones, tablets
and eReaders that
will be sold in 2013

A person wearing a white t-shirt is holding a small, green, needle-leaved tree with both hands. The tree is still in its soil, which is dark brown and has some roots visible. The person's hands are cupped around the base of the tree, and some soil is on their fingers. The background is plain white.

IT HAS BEEN ESTIMATED THAT BY
2017 GLOBAL ANNUAL SMART GRID
SPENDING WILL REACH

US\$65Bn

SMART METERING IN MAJOR CITIES CAN
REDUCE CARBON EMISSIONS BY 27M TONNES
OR EQUIVALENT OF 1.2BN TREES OFFSET

 1,2Bn

A Vibrant and Evolving Industry

The last 20 years have seen huge growth in mobile usage across the globe and in that time the mobile industry has succeeded in addressing all segments serving almost half of the world's population. The younger generation in particular struggles to imagine how life was lived pre-mobile. The idea that meetings were arranged beforehand and plans were kept is hard for them to grasp. Meanwhile grandparents are learning to use video conferencing to communicate with their grandchildren. This is a true measure of just how much we think differently in the mobile age – and with the rise of the smartphone now changing not just the way we access the Internet, take pictures and navigate, the mobile phone and in particular the smartphone has put power in the hands of the user, the consumer and the citizen like never before.

Even the financial downturn in the developed world has spurred mobile industry players to find new ways to adapt and innovate. As technology continues to evolve, the mobile ecosystem continues to build new business models to deliver new services. From inter-connecting the user's world in spheres such as automotive, utilities, health and education, through to finding new ways to transact and bank, from the rise of mobile app development communities to the race to make phones faster, lighter and more innovative, this chapter focuses on highlighting the vibrancy and evolution of the mobile industry via a discussion of new products and services and the related ecosystem collaboration.

KEY POINTS

EVOLUTION

Mobile is a vibrant and evolving industry that is driving the mobile phone's continued status as the 'centre' of everyday life for a growing section of the world's population.

INNOVATION

Mobile network operators are developing a strong value proposition outside of non-core services and products and collaborating with the wider ecosystem to deliver new and innovative services to users.

DIFFERENTIATION

Other parts of the ecosystem are also dynamic and evolving – OEMs and OS players are driving innovation through the race to differentiate themselves, infrastructure stakeholders are driving new efficiencies in the race to support the demand of tomorrow and content providers are harnessing the new hardware and software innovations to deliver their own innovative services and products to the consumer.

COLLABORATION

Mobile operators are developing new collaboration models – both with other parts of the mobile ecosystem and with each other – to seek out win-win opportunities to deliver innovation for the customer.

3.1

Mobile Network Operators

As one of the key drivers of this vibrant and evolving industry, mobile operators are working to continually expand their product portfolio by delivering new products and services to the consumer. They are moving beyond their traditional core voice, SMS and data propositions to embrace new technologies and new business models and are investing in content to leverage their network assets and commercial presence in support of innovation. Mobile operators are also opening up network assets to developers to enrich the content and services provided to users and are working to allow users to access a growing range of other everyday devices via their phone in real-time.

Mobile operators have also worked collectively for the benefit of the entire ecosystem to agree common standards on which the whole ecosystem can build and innovate more effectively and to ensure collaboration both within the industry, with other industries and with governments and regulators. This section looks at all the ways in which mobile operators are contributing to an improved user experience.

3.1.1

Developing a Strong Value Proposition Outside of Non-core Services and Products

The past few years have seen a number of new products and services emerging across the mobile ecosystem that go beyond the traditional segments of the communications value chain, with an emphasis on building connections between the many devices we have come to use daily in the 21st century. The following sections highlight a number of these opportunities and the role that mobile operators are playing in their growth.

CONNECTED LIVING

UTILITIES

Providing a growing population with gas, electricity, water and other essential utilities is a growing challenge across the globe. While access to fundamental infrastructure may be the most important issue in some remote or emerging markets, in developed markets in particular the challenge is how to meet increasing demand for these services in a more efficient and effective way. In this situation, the effective management of limited resources is key both for the benefit of the consumer and for the utilities themselves.

SMART METER PENETRATION (USA)

% of electric customers with smart meters



Smart meter deployments continue to rise. US Energy Information Administration. November 2012

Figure 13

Smart Grids – electrical grids which incorporate information and communications technology – are an important development which will lead to greater energy efficiency. In the first instance they will automate meter-reading, improving the accuracy and granularity of information which enables consumers to make more informed decisions around energy usage. In the longer term, smart grids will also enable dynamic pricing which will incentivise more efficient consumption by the consumer and enable power generators to manage generating capacity more efficiently. Mobile communications will be an important component of this smart technology and mobile operators, in partnership with the GSMA, are working with the wider ecosystem to understand the needs of the utilities sector, to demonstrate how the mobile network can support smart utilities and drive adoption rates¹¹. Challenges that must be overcome include ensuring consistent standards and best practices for the development of smart technologies and the need – especially in liberalised telecom and energy markets – to maintain co-ordination between the many stakeholders in both development and investment¹².

Given the significant benefits of smart metering technology, penetration is expected to considerably increase over the coming years. For example, the installed base of smart meters – a component part and first step of the ‘smart grid’ – represented 18% of all meters in Europe at the end of 2011. This is estimated to increase to 56% by 2017 due to large-scale rollouts in the UK, France and Spain¹³ achieving 100% coverage by 2022¹⁴. In the United States, smart meter penetration was already approaching 25% of electricity customers in 2011 (see Figure 13). In addition, with world demand for primary energy projected by the International Energy Agency (IEA)¹⁵ to increase by one third between 2010 and 2035, technologies such as the smart grid will be required to meet the challenge of delivering more energy to more consumers at a lower cost. This requirement will continue to drive the penetration of smart technologies such as smart meters and must be accompanied by investment both in the development of technology and in infrastructure. It has been estimated that global annual smart grid spending will reach US\$65 billion by 2017¹⁶ and with a wealth of experience in implementing extensive, complex networks, the mobile industry is well placed to be a key player in the secure two-way communication required between utilities and consumers/appliances that will ultimately bring benefits to the consumer in both efficiency and control of usage. In fact, many current pilots of smart technology are being run by or with the involvement of mobile operators. For example, the Jeju Island Smart Grid Test Bed in South Korea aims to demonstrate how mobile communication networks can support demand for new smart grid and transportation related technologies to deliver an estimated 50,000 new jobs annually and generate revenue of 74 trillion won (US\$64 billion) in South Korea by 2030¹⁷.

Providing energy to a growing population will require strong co-operation between the mobile and utilities industries, along with technology providers, governments and regulators. Encouraging progress is being made in many geographies to roll out parts of the required infrastructure and successful pilots are demonstrating and collecting best practices for how smart grids can be successfully implemented. However, given the anticipated future growth in the demand for energy, significant investment is required in order to successfully deliver the benefits of smart grids to the consumer and to the larger economy.

11. mUtilities. GSMA. January 2013.

12. The Smart Meter Mandate. A.T. Kearney. 2010.

13. Smart Metering in Europe. Berg Insight. November 2012.

14. Aided by a EU directive calling for 100% coverage by 2022 – Official Journal of the EU. July 2009.

15. World Energy Outlook 2011 Factsheet. IEA. 2011.

16. Annual Smart Grid Spending to Reach \$65 Billion by 2017. ABIResearch. May 2012.

17. South Korea: Jeju Island Smart Grid Test-Bed. GSMA. September 2012.

CONNECTED LIVING

AUTOMOTIVE AND TRANSPORT

In recent years cars have changed from the mere mechanical to complex computer-enabled machines, with connectivity within the car putting more information and control at the driver's fingertips. Subsequently, there has also been an increase in the number of cars which are externally connected – that is, cars which receive information such as traffic updates or global positioning data and transmit information such as engine performance or driver location in the event of a crash.

As the worldwide penetration of such 'connected car systems' grows – and with penetration forecast to increase globally from around 11% in 2012 to 60% in 2017 (and more than 80% in the United States and Western Europe)¹⁸ – opportunities exist for mobile technology to revolutionise the way we use cars. New and innovative uses of connected car systems have the potential to save lives, significantly improve the driving experience through access to real-time information, provide a step-change in in-car entertainment and to allow remote monitoring of performance and location as part of more effective preventative maintenance measures, supply chain delivery networks and public transport user information.

One such opportunity is to improve the response time of emergency services in the event of an accident. For example, it is estimated that 2,500 lives per year could be saved in Europe if all cars were fitted with a system that alerted emergency services immediately to a crash¹⁹ – the time it takes for first responders to reach the site being a critical determining factor in the rate of survival and recovery from injuries. With 'eCall', an initiative by the European Commission that was backed by the European Parliament in July 2012, all new cars in Europe would be required to have mobile connectivity from 2015²⁰, which would reduce emergency response times to vehicles with the technology by an estimated 50% in the countryside and 60% in urban areas²¹ (see Figure 14). Systems could also be configured to alert police to theft and track the location of a stolen vehicle.

Other innovations include providing drivers with access to real-time congestion, road works, accident, toll, petrol station location and parking availability information. In addition to increased convenience, the time and fuel saved has real economic and environmental benefits. Mobile technology can also lower safe drivers' insurance costs by allowing for more accurate profiling and facilitating Pay As You Drive (PAYD) insurance services. It also provides the ability to monitor technical performance remotely for the early

identification of potential issues. For businesses, it means being able to identify where their fleet of trucks is and when deliveries will arrive, allowing for real-time, in-transit redirection and calculation of optimal routes, which results in more efficient logistics.

Many players in the mobile ecosystem have already been working to develop solutions in these areas. Mobile application ('app') developers, for example, have created a wide range of apps, such as iGasUp for the iPhone, which in the United States allows a user to display the nearest 10 or cheapest 10 gas stations, filtered by available gasoline types, out of around 110,000 gas stations that are registered. The app then connects to the Oil Price Information Service (OPIS) to display real-time gasoline prices as well as location and driving distance to each station²². Similarly, car manufacturers are creating mobile apps to improve the driving experience, such as Audi's 'Roadside Assistance' app. This allows the driver to key in their car's identification number and then the app uses GPS to locate the car and allows the user to explain the problem. The app then connects to an Audi 'Roadside Assistance Dispatcher' and displays information about the roadside assistance provider that is en route including estimated time of arrival²³.

In order to advance the connected car agenda the GSMA has set up the Connected Car Forum (CCF) to enable dialogue between mobile operators (of which there are currently 20 participants)²⁴ and vehicle manufacturers (of which there are currently 16)²⁵. By working together, manufacturers and mobile operators can share information and enable industry competition, resolve barriers to connected car deployment and accelerate the adoption of telematics and infotainment services. The CCF has set targets for connectivity solutions to be embedded at over 20% for global vehicles sales and over 50% for cars to be connected (embedded or otherwise) by 2015 – as outlined in their Mission Statement²⁶ – and hopes to have 'every car to be connected in multiple manners by 2025'²⁷.

Figure 14



18. By 2017 60% of New Cars Shipping Globally Will Feature Connected Car Solutions. ABI Research. July 2012.
19. Motion for a European Parliament Resolution. 2012. (<http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&reference=A7-2012-0205&language=EN>)
20. EU plan for cars to call an ambulance after crashes. BBC. July 2012.
21. eCall. European Commission. January 2012.
22. iGasUp. January 2013.
23. Roadside Assistance App. Audi. January 2013.
24. AT&T, Bell Canada, China Mobile, China Telecom, China Unicom, Deutsche Telecom, KDDI, KPN, KT, NTT Docomo, Orange, Rogers, Softbank, Telecom Italia, Telefónica, Telenor, Telstra, Turkcell, Verizon Wireless and Vodafone
25. Audi, BMW, Chrysler, Fiat, Ford, GM, Honda, Hyundai, Jaguar Land Rover, Mazda, Nissan, Peugeot, Renault, Toyota, Volvo and VW
26. GSMA Connected Car Forum Mission. GSMA. 2012.
27. GSMA Connected Car Forum. GSMA. 2012.

CONNECTED LIVING

HEALTH

It is estimated that 84% of the world's population consumes just 11% of the world's healthcare spending, yet suffers from nearly 95% of the diseases²⁸, with most of these people living in developing countries where 99% of the world's population growth between 2004 and 2050 is expected²⁹ and where large numbers of people do not have access to adequate healthcare. On the other hand, in developed countries populations are aging, putting an ever-increasing burden on healthcare services.

As a result of these factors, the challenge to ensure quality healthcare provision is great across both developed and emerging economies, with demand for healthcare resources often outstripping governments' abilities to provide such services. In this context, a technology that can both cut the costs and expand the reach of preventative, curative and palliative healthcare is an essential investment for governments and providers that will save the lives of millions, improve the health of countless more and have far-reaching effects on social and economic wellbeing.

Given the penetration levels of mobile in developed and emerging markets and in both metropolitan and more remote areas, mobile devices provide one of the most effective conduits for the delivery of innovative health solutions. There are many possibilities, from measures that support preventative healthcare such as remote monitoring of the health of those at risk, to improvements in curative services such as earlier identification of diseases. From enabling improved quality of life for the elderly and infirm by enabling them to be treated and monitored from home, reducing the cost of healthcare for governments and insurers/individuals through prevention, to the requirement for fewer hospital beds and more efficient use of doctors' time, the use of mobile networks is already saving lives and improving patient outcomes and has the potential to have an even greater impact. The mobile health market is projected to be worth between US\$30 billion and US\$60 billion by 2015³⁰. However, care must be taken in the way Mobile Health research is commissioned and researched if these opportunities are to be fully realised – research carried out by A.T. Kearney for the GSMA entitled 'Improving the Evidence for Mobile Health' showed that existing articles and research on mobile health were most often not focussed on these topics that drive adoption and that the majority of such articles did not currently reach the standards required by insurers and governments.



\$400 billion

The amount saved in 2017 from the annual healthcare bill in developed countries as a result of mobile healthcare solutions

Other parts of the mobile ecosystem are developing innovative health services using mobile technology. For example, in 2011 a company called VESAG launched a Mobile-based Personal Emergency Response System (MPERS) that uses the mobile network to monitor a patient's health and summon help in an emergency. Functionality built into a watch can remind the wearer to take medicines and interfaces wirelessly with other VESAG products including blood pressure, haemoglobin and heart rate monitors. In all, 17 health parameters can be monitored, which can then be reviewed by a doctor and preventative action recommended. The watch is connected to a mobile network and allows the user to speak with emergency responders or a helpdesk at a single press of a button. It can even detect a fall and automatically contact the helpdesk and can give the patient's location via GPS. The watch is now available in at least 18 countries including Brazil, Russia, India, China, USA, Lebanon, Jamaica and Dubai³¹. Other opportunities also exist, for example in the field of maternal health. With the World Health Organisation estimating that almost 300,000 women die each year due to pregnancy or pregnancy-related complications, mobile technology can be used to educate and inform mothers and those who deliver children, especially in many developing countries where the majority of births are performed without a health professional present.

Mobile technology is extending the reach of healthcare to remote and underserved parts of emerging economies and is promising significant improvements in healthcare for developed countries – primarily by changing the way we communicate with the healthcare ecosystem and the way we monitor our own bodies. All sections of the ecosystem are working together to gather best practices, reduce barriers to adoption and drive innovation in mobile health technologies and services.³²

28. Improving the evidence for mobile health. A.T. Kearney. March 2012.

29. World Population to 2300. United Nations. 2004.

30. Improving the evidence for mobile health. A.T. Kearney. March 2012.

31. VESAG. January 2013.

32. mHealth. GSMA. January 2013.

CONNECTED LIVING

EDUCATION

Given the rapid pace of technological change over the last decade many parents and teachers have found it challenging to keep up to date with new technologies and fully exploit the exciting educational opportunities that these new technologies represent. Mobile connectivity in learning offers the opportunity to tailor content to a student's ability and deliver it in a more 'digestible' format than traditional educational approaches.

The reach of mobile broadband offers opportunities to extend and improve education in remote areas of developing countries, or in the aftermath of natural disasters. For example, after the 2011 Japanese earthquake, a partnership between an educational services provider, a mobile learning platform provider and a global Information and Communications Technology (ICT) solutions firm allowed school children in Ishinomaki – one of the most affected parts of Japan, where many students had lost both their home and their school – to study via mobile tablet for their high school entry examinations. The students were able to work at their own pace, connect via WiFi or 3G and almost all of the 120 students involved passed their entrance examinations despite the challenges they had faced. By April 2013 the system will be used by at least 5% of domestic Japanese educational institutions and a roll out in Asia, Africa and Central/South America is planned³³.

There are many other examples around the world of the growing use of mobile networks in education – either to extend the reach of high quality education, or to improve the learning experience, or both. For example, in Kenya the mobile operator Safaricom is developing an mEducation proposition whereby any of the country's 7,000 state secondary schools will be able to access online educational content recorded at the Starehe Boys Centre School. Interactive whiteboards are being provided for classroom use and the content will also be available via mobile tablets³⁴. In a different approach focussed more on improving the engagement and interaction with the student, SK Telecom has created a self-directed learning solution for students in South Korea called T Smart. This tool is accessible online and via mobile tablet, combining online educational content with an online community that the student can contact for help and the ability for parents to monitor their child's learning progress³⁵. A similar range of platforms and tools have been designed by Chinese ICT giant Huawei³⁶.

Another development that yields very significant potential to make education more interactive when combined with mobile technology is Augmented Reality (AR). By embedding markers in a textbook and viewing it through an AR-enabled device, the page can come to life with computer-generated images – for example a student learning about the Roman Empire could see marble busts, a soldier's helmet or a model of the Palatine Hill come to life on the page and rotate them on the screen while reading about them.

The mobile industry has a great potential to improve and extend the education of millions of people around the world. However, the global education authority landscape is understandably very fragmented and with the mobile education market projected to grow to US\$70 billion by 2020 according to the GSMA's 'Transforming Learning Through mEducation' report³⁷, it is important that the mobile ecosystem works together to share best practices, to maximise the potential impact of this technology on current educational processes and the lives of students. The GSMA and its members have been working through its mEducation programme to do just this, as well as to understand the opportunities that exist, the approaches that will be required to grow this sector over the coming years and to address potential barriers to adoption³⁸.



180 million

The number of children in developing countries that will have the opportunity to stay in school between now and 2017 due to mEducation

33. Bringing mobile learning to students in the Japanese tsunami disaster area. GSMA. June 2012.

34. Safaricom brings e-learning to Kenya. The East African. July 2012.

35. Press Release: SK Telecom Debuts T Smart Learning in the Global Market; Unveils Innovative Mobile Learning Platform at ISTE 2011. eschoolnews.com. June 2011.

36. eClass Remote Interactive Teaching Platform. Huawei. February 2013.

37. Transforming learning through mEducation. GSMA. April 2012.

38. mEducation. GSMA. January 2013.

CONNECTED LIVING

SMART CITIES

Similar to the way automotive and utilities companies benefit from an accurate two-way, real-time exchange of data with consumers and their devices, a municipal or national government can benefit from a more connected relationship with its citizens in order to provide services and information in a more efficient way. A 'Smart City' makes extensive use of information and communications technologies, including mobile networks, to improve the quality of life of its citizens in a sustainable way. A smart city combines and shares disparate data sets captured by intelligently-connected infrastructure, people and vehicles, to generate new insights and provide ubiquitous services that enable citizens to access information about city services, move around easily, improve the efficiency of city operations, enhance security, fuel economic activity and increase resilience to natural disasters.

For example, by placing sensors on parking spaces and connecting these sensors to a central database, innovative mobile services can be built that would show drivers how many parking spaces are available on each city block, or show the location of parking garages and whether there is space available. Streetline is an example of a company that is already implementing such a service with their 'Parker' app which has already launched in over 30 cities and universities, including the cities of New York and Los Angeles, in partnership with local government³⁹.



**SMART CITIES
INDUSTRY WORTH
US\$39 BILLION
BY 2016**

A number of Smart Cities have already been set up to demonstrate the concept, test technology and gather best practice learnings. For example, Busan Green U-city in South Korea was set up in partnership with the local government, Cisco and KT – South Korea's largest mobile operator – with the aim of delivering smart services and testing smart technology. Built using cloud-based services and integrated into the city's major infrastructure, smart services will be delivered in areas such as education, transportation, environment, disaster prevention, health and tourism. The 5 year old programme has received US\$320 million total investment and is just one of a number of such Smart City pilots globally.^{40 41}

The mobile network and ecosystem with infrastructure already in place is the ideal tool to facilitate the network of information sharing and communication required to operate a smart city. In Busan the mobile operator KT is itself responsible for running the U-city programme and with the growth of smart cities the whole mobile ecosystem can play a large role in an industry expected to be worth US\$39 billion by 2016⁴².

To help drive forward investment and implementation of Smart City technology and build consensus on issues such as data privacy and the need for common standards, a wide range of stakeholders need to come together and co-operate. Smart Cities hold incredible potential for changing the way we live in and run our cities. Through initiatives such as the GSMA's Smart Cities Demonstrator, events such as the 2012 Smart City Expo World Congress in Barcelona (which was supported by mobile operators, stakeholders from across the mobile ecosystem, governments, industry bodies, automotive manufacturers and utilities providers) and through the continued co-operation of stakeholders in rolling out pilots and sharing knowledge learned, the wide-scale implementation of Smart Cities is closer to becoming a reality.

39. Parker app. Streetline. January 2013.

40. u-City. City of Busan. January 2013.

41. Busan Green u-City – A successful example of a Smart City in South Korea. GSMA. Augusta 2012.

42. Smart City Technologies Will Grow Fivefold to Exceed \$39 Billion in 2016. ABI Research. July 2011.

Mobile Commerce and NFC

Mobile devices that enable tap-and-go payments through Near Field Communication (NFC) technology are starting to achieve widespread penetration, with almost one in four smartphones shipped in 2012⁴³ estimated to be NFC-enabled and with strong potential for future growth as pilots begin to transition to wider rollouts. NFC technology has the potential to transform not only the way we buy 'over the counter', but also to revolutionise ticketing – from public transport where NFC technologies have already seen some penetration, to ticketing at music events. In Japan a similar technology to NFC – a proprietary Sony technology called FeliCa – has been around since 2004. NFC m-payment technology has been available in Europe since early 2011 and by 2017 it is estimated that 25% of US and Western European mobile phone users will pay for goods in-store using their NFC-enabled mobile phone. This is in contrast to less than 2% in 2012⁴⁴.



43. Forrester, Gartner. August 2012.

44. Press Release: More than 1 in 4 Mobile Users in the US and Western Europe will pay in-store using NFC by 2017. Juniper Research. May 2012.

The complexity of the ecosystem and the number of stakeholders involved led to modest initial progress in the roll out of NFC technology. However, the momentum for SIM-based mobile NFC services is now growing strongly, driven by payment pilots supported by mobile operators and financial institutions and enabled by an increasing number of NFC-enabled phones. ABI Research estimates 200 million NFC-enabled handsets have been sold globally and that 1.55 billion will ship annually by the year 2017⁴⁵. NFC as a payment method is now becoming better known to the consumer due to these successful pilots and a report by Juniper Research in May 2012 found that worldwide NFC mobile payments are expected to exceed US\$180 billion globally in 2017⁴⁶.

Some of these pilots have been rolled out on a city-wide scale, such as Isis, a widely-promoted joint venture between 3 mobile operators (AT&T, T-Mobile and Verizon) in the United States. In Austin, Texas and Salt Lake City, Utah, the technology is based around a mobile wallet with which users can buy goods or services after loading their existing credit or debit cards. As of October 2012, customers were able to choose from 9 Isis-compatible handsets, with the range set to expand⁴⁷. Another of the many pilots includes Telecom Italia's roll out of an NFC-payment trial in Milan's city centre, with trams for example already accepting payment via their NFC system as well as around 1,000 point of sale terminals in shops around the city centre now also accepting payment⁴⁸. Other NFC payment systems have been introduced in countries including the UK, Turkey and South Korea.

NFC handsets are now widely available and in consumers' hands.

200,000,000

NFC handsets have been sold worldwide.

300,000,000

NFC smartphones, tablets and e-readers to be sold during 2013.

The number of NFC-ready point of sales terminals in service worldwide is set to expand from over 4 million in 2012 to

**43.4 MILLION
IN 2017**

SOURCE: BERG INSIGHT, DELOITTE, STRATEGY ANALYTICS

The opportunities are considerable. Consumers benefit significantly from an integrated and straightforward consumer experience, built around the simplicity and speed of touch-and-go NFC payments. In addition, they will be able to review their spending and budget more effectively using their collated transactional data and could benefit from a more personalised customer experience with relevant advertising and the functionality of an integrated voucher and loyalty programme. Retailers would also benefit from the increased speed of customer payment while for mobile operators it is a platform for new revenue streams and would secure mobile's place at the heart of everyday transacting.

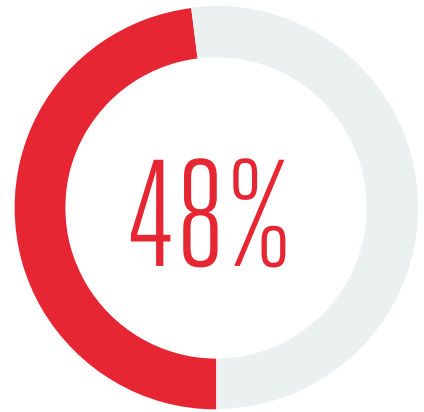
Before wide-scale service rollout can be achieved, there are a number of challenges that need to be overcome, requiring cooperation from across the mobile ecosystem and also financial services regulators. To address user privacy concerns and provide a seamless customer experience, mobile operators will need to work together to ensure the interoperability of the technologies developed. To this end the GSMA has published handset and SIM industry specifications to enable the development and global deployment of interoperable NFC services⁴⁹.

NFC-based commerce has the potential to benefit consumers, retailers and mobile operators alike. While progress has initially been modest to agree standards, with the promotion of NFC technology by handset manufacturers and roll out pilots, the technology's long-term future is gaining industry confidence. René Schuster, CEO of Telefónica Germany, said earlier this year that eventually "...children will only know from history books what a wallet and hard cash are"⁵⁰. As the GSMA discuss in their white paper on NFC in Retail (Oct 2012), for the technology to achieve successful widespread adoption in the near future there must also be cooperation between mobile operators and retailers – such a change to the way consumers interact with retailers will inevitably lead to concerns about ownership of the relationship with the consumer. The more the mobile industry can do to work with retailers to develop win-win solutions to the implementation of NFC as a payment method, the more willing retailers will be to partner with mobile operators to roll out these new technologies on a wider scale⁵¹.

45. NFC will Come Out of the Trial Phase in 2013 as 285 Million Enabled Devices are Expected to be Shipped. ABI Research, November 2012.
46. Press Release: More than 1 in 4 Mobile Users in the US and Western Europe will pay in-store using NFC by 2017. Juniper Research, May 2012.
47. Pay with Isis. Isis, January 2013.
48. Telecom Italia: NFC cell phone payments trial starting in Milan. Telecom Italia, October 2012.
49. Technical Papers. GSMA, January 2013.
50. Telefónica O2 to begin beta testing NFC payments in Germany. NFC World, January 2013.
51. GSMA white paper – NFC in Retail. GSMA, October 2012.

Mobile Money for the Unbanked

Globally, more than 2.5 billion adults do not have access to a formal bank account, the majority of whom live in developing economies according to the World Bank⁵². This means around 48% of the world's adult population is not able to access basic financial services in order to save, borrow or transact⁵³. The prohibitively high cost of a traditional physical bank branch and the lack of other basic infrastructure such as Point of Sale (PoS) terminals has until recently made the provision of such services impossible to a significant section of the world's population. However, with the rapid growth of mobile technology in emerging markets, new technologies are enabling access to banking via a non-traditional route for a growing number of people and in the process driving social development and economic growth.



OF THE WORLD'S ADULT POPULATION IS NOT ABLE TO ACCESS BASIC FINANCIAL SERVICES IN ORDER TO SAVE, BORROW OR TRANSACT.



52. Measuring Financial Inclusion. The World Bank. April 2012.

53. Adult population defined as aged 15 or older. Source: World Demographics Profile 2012. Index Mundi. 2012.

The same World Bank report states that 16% of adults and 31% of those with a formal bank account in Sub-Saharan Africa have reported using a mobile phone to pay bills or send/receive money in the last 12 months⁵⁴. This has been one of the success stories of mobile money and part of the growth that saw a small number of initial programmes deployed 4 years ago rise to around 150 live deployments globally today, a number which is growing quickly with an additional 110 deployments currently planned⁵⁵. With mobile connections set to grow by 35% between 2012 and 2017⁵⁶ in developing economies and significantly higher mobile penetration rates than banking penetration rates in these economies⁵⁷, the mobile industry is uniquely placed to deliver growth in mobile money services to the world's 'unbanked'.

However, mobile money hasn't grown as fast as some had predicted. While Safaricom's well known mPesa service has been very successful with 14.7 million active users in Kenya as of March 2012 (approximately 35% of the country's population)⁵⁸, many other services have not yet seen such a high level of success. In 2012, GSMA counted six mobile money services that have more than 1 million active customers globally, three of which crossed the "1 million active" barrier during 2012.

The GSMA recognises additional work needs to be done to accelerate the growth of mobile money and has identified challenges in four key areas that need to be overcome to more effectively reach the unbanked.

What will it take to go faster?

OPERATIONAL CHALLENGES

- Driving usage
- Building, managing and incentivising agent networks
- Attracting new customers

LACK OF ENABLING REGULATION

- Burdensome customer registration rules
- Limits on types of firms that can provide financial services
- Regulations around mobile money agents

A NEED FOR FURTHER LEARNING

- Lack of best practices in some aspects of mobile money
- Adequate financial investment and resources are required

UNDER-INVESTMENT

- Demonstrating viability at a time of risk-avoidance
- Setting expectations around the investment and time required to make Mobile Money grow and become profitable

Source: *Mobile Money for the Unbanked Annual Report 2012*. GSMA, October 2012.

When such services do take off, enabled by appropriate regulation or partnerships with financial services organisations and supported by best practices and common standards, the potential for growth is significant. To support this potential and drive growth, the Mobile Money for the Unbanked programme is conducting research and building a library of best practices, with support from the Bill & Melinda Gates Foundation, The MasterCard Foundation and the Omidyar Network. By learning from existing deployments and facilitating the discussion, Mobile Money for the Unbanked is working to help build scale in the industry to realise the potential social and economic benefits of bringing financial services to the unbanked.

54. Measuring Financial Inclusion. The World Bank. April 2012.

55. Mobile Money for the Unbanked. GSMA. January 2013.

56. GSMA Wireless Intelligence. January 2013.

57. Financial Inclusion. The World Bank. January 2013.

58. Timeline. Safaricom. March 2012.

3.1.2

Developing Collaboration Models with Other Ecosystem Players

The rise of smartphones, the mobile Internet and above all the introduction of mobile apps have all driven a fundamental change in the relationship between the consumer and the mobile operator. As discussed in chapter 1, traditional voice calls and SMS represent only a small part of consumers' mobile phone usage habits. This change has created opportunities for mobile operators to find and develop innovative content through the support of start-up companies, or for mobile operators to support and work more closely with existing content developers. This section explores how mobile operators are now playing a much more active role within the ecosystem by enabling a wider and richer set of applications to be launched – both via their own innovation and through collaboration with other ecosystem players.

INVESTING IN INNOVATION

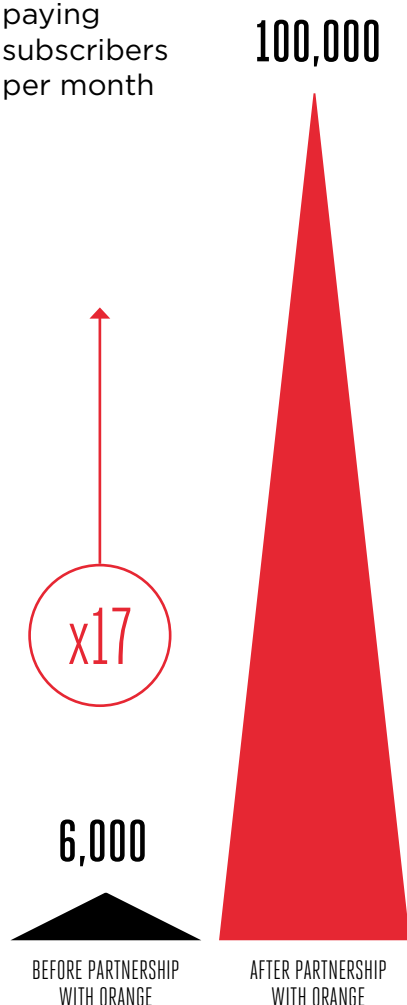
Before the advent of the smartphone, mobile devices were self-contained devices with feature innovation largely driven by handset providers and customer relationships primarily owned by operators. The new reality of the mobile world is that innovation is now just as likely to come from 'value added' services that are designed to operate on a smartphone and normally utilise the phone's mobile broadband connection – sometimes called Over The Top (OTT) services – as from hardware or operating system advances. Mobile operators are uniquely placed to bring their network assets and customer understanding to the table to enrich such content and services in a way that stand-alone developers often can't – and many mobile operators are now investing in such services and bringing their network assets to bear to deliver innovative new products and services to consumers.

For example, when Orange in France withdrew its own music platform WorMee to take a stake in and partner with online music streaming site Deezer.com in July 2010, offering a premium mobile access level as part of its packages to new subscribers, the number of new paying subscribers on Deezer jumped from 6,000 per month to 100,000 per month and as of October 2012 Deezer is estimated to have 2 million paying subscribers (see Figure 15). By leveraging their own customer base and integrated billing platform, Orange was able to break down the barrier of consumers' reticence to pay for such services and by investing in Deezer and demonstrating that it has a future, Orange has been able to open new doors for Deezer and support development of improved services. Other mobile operators who are now also partnering with Deezer include businesses from the France Telecom, Deutsche Telekom, Telenor and Millicom groups across four continents⁵⁹.

59. Deezer: Profitability Down the Line? INA Global. August 2011.

GROWTH IN NEW PAYING SUBSCRIBERS BY PARTNERING WITH A MOBILE OPERATOR

of new paying subscribers per month



Source: Deezer: Profitability Down the Line? INA Global. August 2011

Figure 15

The importance of Over The Top services as part of the overall value chain will continue to grow. By investing in innovation and partnering with the wider ecosystem, mobile operators can bring their assets, scale, technical expertise and operational experience to bear to support the growth of innovative companies – creating jobs and contributing to economic growth – and to deliver new products, services and choice to the consumer.

Similarly, France Telecom recently invested US\$20 million in a mobile security company called Lookout, a provider of security software for mobile phones. France Telecom plans to preload Lookout's software on all its phones and considers this investment as a major strategic move into a new area of mobile security, addressing the privacy and security issues which are becoming more prominent with proliferation of smartphones. The service is expected to appeal both to businesses (especially ones dealing with confidential information) and consumers⁶⁰.

Another approach being taken by mobile operators is to set up their own Venture Capital (VC) funds to invest in start-ups. SK Telecom in South Korea for example has set up a VC fund in California with US\$100 million to invest in both seed and early stage revenue-generating ventures that can leverage SK Telecom's assets and expertise to develop innovative new products and services⁶¹. Similarly Telefónica Digital – a global business division of Telefónica that looks to create new business opportunities⁶² – has set up the 'Amérigo' network of VC funds in Spain, Brazil, Chile and Colombia, with a combined value of US\$378 million to invest in innovative mobile ecosystem start-ups that are looking to expand, complementing its existing 'Wayra' incubators that have supported seed stage start-ups since April 2011⁶³. T-Mobile Ventures, Vodafone and AT&T also have investment initiatives in place to drive growth in technology and content development. T-Mobile Ventures, for instance, operates funds with assets under management of over €720 million in 2011, geared towards investing in start-up companies that present synergies with Deutsche Telekom's various business units. Its 'Connected Life and Work Fund' invests in Internet and media start-ups that develop products and services related to accessing online content through a variety of convergent technologies, products and services⁶⁴. T-Mobile Venture's 15 year track record is one of the largest and most successful corporate venture capital companies in the world with over 170 successful investments such as BelAir Networks, CoreOptics, Danger, Demandware, Flarion Technologies, Jahjah and Starent Networks⁶⁵. In Japan, NTT DoCoMo – one of the country's largest mobile operators – announced in February 2013 the formation of a 10 billion Yen (US\$109 million) venture capital fund to identify and fund new businesses related to mobile⁶⁶.

60. France Telecom Invests Up To \$20M In Lookout, Preloads Its Mobile Security Solutions On To Android Handsets. Techcrunch.com. December 2012.

61. SKVC. SK Telecom. January 2013.

62. About us. Telefónica Digital. January 2013.

63. Why Telefónica Is Acing It With A New \$378M LatAm Fund And A Growing Incubator Network. Techcrunch.com. September 2012.

64. www.t-venture.de

65. Crunchbase.com T-Venture Company Profile: <http://www.crunchbase.com/financial-organization/t-venture>

66. DOCOMO to Establish Venture Fund and Incubation Program. NTT DoCoMo. February 2013.

DELIVERING EXCEPTIONAL EXPERIENCES THROUGH NETWORK APIS

Mobile operators have many network assets that can be used by other players in the mobile ecosystem, such as app developers, to create innovative new products and services for the consumer. For example, access to operator billing platforms can enable developers to offer the benefits of trusted operator services more easily to their customers. In order to make these and other assets available to external developers – who may range from large trusted partners through to individual developers – mobile operators need to develop network Application Programming Interfaces (APIs) that allow a developer to access and use the mobile operator's network assets via a set of defined functions, while still ensuring data security and protecting users' privacy.

The potential to deliver value to the consumer and the wider ecosystem – by allowing access to existing network assets via APIs – is not a new concept, as outlined in a 2012 white paper by Oracle⁶⁷. Many of the major online players follow this route. For example, in January 2012 Netflix saw almost 41.7 billion API calls (requests via the API to execute an operation – such as to request data), up from 0.6 billion two years previously⁶⁸. Similarly, eBay saw 1 billion per day in Q1 2012⁶⁹. With the potential revenue for communications service providers⁷⁰ that could be enabled by APIs estimated to be US\$115 billion per year by 2015⁷¹, more and more mobile operators are now focusing on this area.

To address this opportunity, the OneAPI programme is a global GSMA initiative to provide application programming interfaces (APIs) that enable applications to exploit mobile network capabilities, such as messaging, authentication, payments and location-finding with a cross-operator reach. For example, a messaging network API could be used to enable an app to send an SMS message to another device, while a payment network API could be used to add an in-app purchase to the user's mobile phone bill.

Major operators, such as AT&T, Deutsche Telekom, Orange, Telefonica and Vodafone, Rogers, Bell Canada and TELUS, are working with the OneAPI initiative to expose network APIs through their developer programmes.

OneAPI will significantly reduce the time it takes to develop apps that make use of mobile networks' capabilities. One of the OneAPI initiative's core objectives is to enable network-enhanced apps to be rolled out worldwide without modification. Moreover, OneAPI is designed to enable developers to access network APIs using open and standardised web technologies, which allow developers to easily integrate them in apps implemented with all kinds of software technologies for all kinds of platforms, like iOS, Android,

BlackBerry, Windows and Windows Phone as well WebApps running in the browsers on all these platforms and the native HTML5 platforms from FirefoxOS, Tizen and Ubuntu.

This approach ensures that larger operators can customise the services available on their own platforms, while still allowing mass market reach, and enables smaller operators, who haven't invested in their own APIs, to expose their network capabilities to developers.

As part of the OneAPI programme, the GSMA, together with leading technology provider Apigee and associated operators, has developed the OneAPI Exchange to facilitate operators to federate between their exposed APIs in order to provide cross-operator reach to developers. The OneAPI Exchange does not require mobile operators to discard APIs they are already providing. The new flexible solution architecture gives operators the choice to provide developers with either a standardised API interface or their own proprietary API interface. Using a federated approach, the new GSMA OneAPI Exchange ensures that apps using an operator's proprietary API interface will still have the reach across all operators integrated to the Exchange regardless of whether they expose standardized API or custom APIs on their own.

The OneAPI Exchange forms part of the wider OneAPI programme, which includes the OneAPI Gateway platform. The Gateway was commercially launched in 2012, in partnership with leading Canadian operators Bell Mobility, Rogers and TELUS and is operated by Transaction Network Services (TNS) and Aepona. Since its launch, the OneAPI Gateway has delivered access to apps that use network APIs to 93 per cent of Canadian consumers. The Gateway will be integrated into the global OneAPI Exchange solution.

67. Making Money Through Service Exposure and The New Business Models It Enables - Page 6. Oracle. June 2012.

68. Netflix API Presentation to Paypal Daniel Jacobson. Netflix. May 2012.

69. Founder of ProgrammableWeb. Musser, John. 2012.

70. Extends beyond mobile operators but does not include the wider ecosystem.

71. Making Money Through Service Exposure and The New Business Models It Enables - Page 6. Oracle. June 2012.

3.1.3

Mobile Operators Co-operating to Develop Common Standards

Mobile Operators are working with new partners from outside of the telecoms ecosystem as described in the previous section, to offer greater value through the exposure of mobility to new areas for the global customer base. Mobile operators and their industry partners – especially network equipment manufacturers and device vendors – co-operate in a range of alliances and forums to define common technical standards that are then adopted by the industry as a whole. For example, in NFC mobile payments, Isis has been developed collectively by operators, handset manufacturers and NFC terminal vendors, whilst the GSMA Connected Car Forum has been established to advance the development of mobile technologies in the connected automotive sector, involving operators, chipset makers and major automotive companies.

However, over the last few years there have been two key areas where mobile operators have worked within the GSMA to define industry-changing standards that will underpin the next generation of mobile communication services through the extension of the principles behind the success of mobile telecoms to date. Voice over Long Term Evolution (VoLTE) and Rich Communication Services (RCS) are both IP-based standards, where the GSMA has taken a lead role, developing these next generation technologies to ensure consistency of design and implementation that will ensure that the principles behind voice and SMS services today will extend into the future. These principles are based on interoperability and interconnectivity, to allow a single standard to be used by all operators.

COMMON STANDARDS

SETTING VoLTE AS THE STANDARD

With increasing demands for bandwidth from mobile subscribers, mobile operators have been deploying ever greater speeds of data connections, through the launch of networks supporting HSPA, HSPA+ and most recently, LTE (Long Term Evolution). Until the advent of LTE, voice and SMS were operated on a traditional 'circuit switched' network, whilst data traffic is delivered via a physically and functionally separate 'packet switched' network. However, 3GPP, the Standards body that defined LTE, chose to exclude circuit switch services from the definition of LTE and so a new model for delivering voice and SMS was required.

Initially, a number of competing technologies appeared to fill the gap that had been created. Having multiple options for making a voice call would not have been an acceptable end point for the industry, since the fundamental principle of interoperability would no longer be in place. Interoperability is key to enabling the industry to generate the huge economies of scale that keep costs and prices low. If multiple standards had been allowed to pervade, then anytime a voice call was made between networks supporting different standards, the call would either fail or an additional piece of equipment to interwork between the differing implementations would be needed. Multiple standards would oblige every operator to acquire and operate interworking functions and would also increase the Research and Development costs of equipment vendors since they would need to develop multiple standards to address the full market. As a result, a single option was selected – this option was GSMA's Voice over LTE (VoLTE).

To develop VoLTE, the GSMA took on the work of the One Voice Initiative – made up of a small number of mobile operators, network equipment vendors and handset manufacturers – who had defined a specific implementation for voice calls using IP Multimedia Subsystem (IMS) as its basis and for delivery of voice over LTE radio networks. The VoLTE initiative quickly defined an implementation that was backed by many major industry players and then adopted to promote the same principles that the current GSM world benefits from – all customers using a single technology that works across all networks and devices, thus reducing complexity in both the infrastructure and interconnect ecosystems.

Voice over LTE establishes voice calls using the data path of an LTE network. However, the signalling and voice paths of a VoLTE call are explicitly identified in the LTE network to allow them to be handled with the appropriate levels of Quality of Service to deliver a service that is better than today's voice calling. Voice calls rely on low delay and high levels of reliability for call establishment and so VoLTE call signalling and voice paths are allocated high quality levels both within a mobile network and across an interconnect to another network. In addition, VoLTE calls can use higher quality voice codecs⁷² and even have high quality video included within them – all enabled by the high bandwidths that LTE supports.

The world's first VoLTE services were launched in South Korea and the USA in August 2012 and a number of other markets expecting deployments over the coming months. Some networks have found it necessary to deploy an 'interim' solution whereby voice calls are pushed back on to 2G and 3G networks, but these do not offer the enhanced quality of service of VoLTE and also do not enable the simplification of network infrastructure that having all voice and data service over LTE can offer in the long term. The roll out of VoLTE may take time to cover all markets, but the long term benefits of a consistent approach to voice over next generation LTE networks will benefit the whole ecosystem – and the consumer.



**HD VOICE AND
VOICE OVER LTE**

72. A computer program that encodes or decodes a digital data stream.

COMMON STANDARDS

BUILDING A COMMON PLATFORM WITH RCS

Whilst voice calls and SMS remain the dominant means of mobile communication, many users communicate primarily through Facebook or other social media providers. Alternatively they may use Over The Top (OTT) chat providers such as WhatsApp or the chat functionality built into their phone's software. However, each of these new communication methods is a closed network – that is, the contact on the other end must have the same software installed, the same operating system, or be registered on the same website. Whilst many of these services have huge customer bases, they do not enable the 'call anyone' or 'text anyone' service experience that exists in the mobile ecosystem.

JOYN SERVICES ARE HERE - NOW



Enables users to share instant messages



Enables users to share pictures and video whilst speaking



Enables users to share files such as photos with their contacts

Works on any device, on any network

In response to this, the GSMA and its member operators have worked together to develop a Rich Communication Service – branded 'joyn' – to sit alongside VoLTE. RCS will allow the user to communicate via instant messages, chat and group chat, in addition to voice calls using VoLTE. It will also have the benefit of showing social presence information – in other words the user's status such as 'online' or 'away' – and will facilitate the sharing of live video and files. The major differentiator of this service compared to an 'Over The Top' (OTT) service is the extended reach of the mobile operator community's customer base. There is no need to sign up to a specific app or webpage – the service will be integrated into the handset and will work regardless of what network the user is on, allowing them to contact anyone on any other network in the world. RCS also extends into personal computers, tablets and in the future to other consumer devices to allow a fully connected and integrated communications service.

RCS applications have already been created by third party developers for iOS, Android and Windows operating systems amongst others and it is starting to become available on many

devices straight out of the box. With the technology being interoperable over any network with all contacts that have a RCS-enabled phone, this also means that once phones have RCS installed as part of their standard functionality the user will be able to reach a greater list of contacts with RCS than current chat and instant messaging applications – delivering a more integrated and consistent rich communications experience.

Once RCS-enabled phones reach a critical mass in the market and more RCS services are launched, it should become the natural rich communications choice for the consumer. In fact, commercial implementations have already been launched in Spain, Germany, Korea and USA and launches have been committed to in a number of other markets as the momentum for RCS continues to build.

RCS is a good example of mobile operators working together in a collaborative way to address changes in user behaviour, create new products and services based on agreed standards and ensure maximum portability and innovation by the wider ecosystem – thereby enhancing the value proposition for consumers.

3.2

Original Equipment Manufacturers

Before the rise of smartphones, the mobile device manufacturers were the primary drivers of software and content innovation, as well as new hardware development. However, with the rise of mobile Operating Systems (OS) such as Android, Windows 8 and iOS, finding ways to differentiate themselves in terms of form factor and hardware functionality has become a growing challenge for Original Equipment Manufacturers (OEMs).

This is perhaps one of the reasons why tensions have been running high over the last few years in regard to patents, as form factors converged. Since the introduction of Apple's iPhone in 2007 and the subsequent convergence of form factors for devices, there has been a drive to innovate, differentiate and develop new products such as tablets, mini-tablets (typically a 7 inch screen) and 'phablets' (typically a 5 inch screen aimed originally at the Asian market) of which consumers are key beneficiaries.

Much of this innovation has come in the form of new technology and functionality. For example Apple improved their display with the introduction of the 'retina display', Nokia are offering PureView – a technology that guarantees blur-free photos – and Samsung have created camera functionality called 'Best Photo' that lets the user take 8 photos at once and choose the best one. Innovations have also been seen in the user interface, with Samsung for example developing a technology called 'Smart Stay' in some of their phones that can determine if the user is looking at the phone and if so prevent the phone going into standby mode. Another new piece of functionality that has been developed allows the user to call a contact that is displayed on their screen simply by lifting the phone to their ear – with the movement detected by an internal gyroscope. Other examples of innovation in the wider market include phones that can be rolled up (the Samsung 'Youm' screen which is still in development) and augmented reality tools that turn the phone's camera into a display providing information about the city around the user (Nokia City Lens).

Another development has been the inclusion of NFC technology in most new phones, as discussed in an earlier section. Samsung for example has developed their 'S Beam' technology, which allows two Samsung users to transfer contacts, documents and photos by placing their devices back to back.

Form factor innovation has also been seen in the tablet market. Most tablets have followed a similar design to the smartphones, but a gap in the market between the smartphone and tablet for mini-tablets and 'phablets' has been exploited by a number of OEMs such as Samsung's Galaxy ('phablets'), Google (mini-tablet) and Amazon (mini-tablet). This drove Apple to respond with the introduction of the iPad mini (a mini-tablet). This new market has provided a greater level of choice to consumers and new opportunities for innovation – such as Samsung's 'S Pen' on the Galaxy Note, allowing a user to sketch and take notes on their 'phablet'. OEMs have focussed on form factor and hardware-enabled innovation as a key battleground in the fight to differentiate themselves and protect or grow market share while preserving price points.

3.3

Infrastructure Development

Just as devices have seen constant innovation recently, so too has the mobile infrastructure that supports them. With the continued growth of the mobile Internet, expanding smartphone penetration rates and the roll out of ever faster networks, data consumption is rising exponentially. This will be driven in large part by the full roll out of 4G LTE, given its ability to facilitate the fast downloading of high quality video. Mobile network infrastructure is being upgraded to support 4G LTE technologies and volumes and this will require significant capital investment. The scale of this investment is highlighted by IHS, who projected in January 2012 that global capital spending that year on LTE technology would be US\$8.7 billion, rising to US\$24 billion in 2013 and to US\$36 billion by 2015⁷³.

Although mobile networks may sometimes be viewed as a substitute to fixed, in fact a large part of a 4G mobile network infrastructure is made up of fibre in the ground linking the tower sites to the core network. Where this infrastructure does not already exist, mobile operators are building out fibre networks extensively. This is even true in many developed countries where mobile operators have sufficient traffic demands, especially from the explosion of data traffic, to justify building their own fibre networks.

One result of the significant costs of investing in new technology is a similarly focussed drive for efficiency. As well as upgrading their networks for 4G LTE, mobile network infrastructure players are finding new ways to increase network coverage and improve network speeds for their customers. In the United States for example, mobile operator Sprint is implementing its 'Network Vision' programme – investing between US\$4 billion and US\$5 billion to consolidate its various networks and update its network technologies in a single, more efficient network⁷⁴. Similarly, mobile infrastructure giant Ericsson is preparing for the continued growth

of mobile data consumption by improving the way its equipment uses spectrum. The company recently announced plans to enable the refarming of existing GSM spectrum for use with 3G and 4G services, without affecting the quality of voice calls, to enable their network to better support the anticipated increase in HD video and music consumption⁷⁵. Operators in many markets are also cooperating with each other to build shared networks as well as with vendors to explore more efficient operating models. Consequently A.T. Kearney estimates that total network cost per GB (including the capital investment) will decline by at least 10% p.a. in the years ahead. Mobile infrastructure is the foundation on which the whole mobile ecosystem is built. It has to scale, remain up to date and become more efficient in order to withstand both the growth in usage and on-going pressure to reduce costs and innovate in service quality.

73. LTE Expected to Dominate Wireless Infrastructure Spending by 2013. IHS. January 2012.

74. Sprint Network Vision Information Center. Sprint. January 2013.

75. Ericsson's must-sees at MWC 2013. Ericsson. February 2013.

3.4

Content

Smartphones are increasingly taking their place at the centre of people's lives. They enable us to access content at any time from almost anywhere – something many now take for granted. Once a user starts using a smartphone the act of accidentally leaving it at home can leave them feeling lost! The smartphone has also changed the way we interact with the Internet, with Facebook recently announcing that they have 680 million active mobile users as of 31st December 2012⁷⁶, out of more than a billion active monthly users. Increasingly consumers are using their mobile as their primary device with which to access the Internet, in particular for communication and entertainment services due to the 'always on' nature of mobile phones.

To cater for this explosion in mobile Internet use, app developers have created a multitude of apps that allow the user to do everything from monitoring their stocks, learning the name of the song playing on the radio, to launching cartoon birds at cartoon pigs. App stores supported by business models, tools and communities to encourage developers have been created by a number of different players in the mobile ecosystem including OS giants Apple and Google. These developer communities have enriched the mobile experience for consumers through their development of apps in a 'natural selection' environment where popular apps flourish and unpopular ones are pushed down in the rankings.

As new technology is developed, so new content is developed to take advantage:

- With more and more mobiles now NFC-enabled, app developers are creating applications that let the user share contacts, photos and files in a contactless way with friends. Others are creating 'mobile wallets', which allow the user to store their bank and loyalty cards in a virtual wallet, for use via NFC or Quick Response (QR) codes – a type of matrix barcode.
- With the introduction of gyroscopes (which measure the phone's orientation) and accelerometers (which measure the acceleration of the phone's movement), developers have been able to create much more innovative and intuitive games, where the phone can for example be swung like a golf club or tilted to fly a 'flight simulator' aircraft.
- The introduction of cloud-based systems has allowed for the development of applications that access remotely stored data – such as the iPhone which allows the user to download and play songs bought on iTunes previously via their 'iCloud' technology.
- The introduction of faster 3G and 4G networks have allowed developers to create applications that stream radio and TV, such as tvcatchup.com's app which lets the user watch a wide range of UK Freeview TV channels live on BlackBerry, Android, iPhone and Windows 8.

The role of smartphones at the centre of people's lives may currently only apply to approximately one in seven of the world's population, but this number will surely grow significantly as emerging economies grow and new cheaper smartphones are developed. Analysis from Business Wire estimates that although it took 16 years for the number of smartphones to reach 1 billion, the second billion will be reached in just three years by 2015⁷⁷. Smartphones continue to represent a growing route of access to the Internet and services are increasingly being tailored for mobile as the primary platform. With the growth of application development continuing apace and the promise of RCS as a foundation for further development which can leverage mobile operators' network assets, the degree of innovation and choice for the consumer will surely continue to grow.

76. Facebook.com, December 2012.

77. Strategy Analytics: Worldwide smartphone Population Tops 1 Billion in Q3 2012. Business Wire, October 2012.

3.5

OS Platforms

The rise in the importance of Operating System (OS) platforms over the last few years has been driven by the growth of the smartphone, with consumers looking for innovative and intuitive interfaces and technologies but also a wide range of mobile applications to increase the scope of what the device can do for the user. With penetration rates of smartphones expected to grow strongly, the OS has cemented itself as one of the key purchase decision factors for consumers.

This growth has also seen healthy and dynamic competition as the key players in the market push to maintain and grow their market share. The last couple of years have seen a consolidation at the top to four main players – generally agreed to be Google’s ‘Android’, Apple’s ‘iOS’, Microsoft’s ‘Windows Phone 8’ and BlackBerry’s ‘BlackBerry 10’. As the recent launch of the latter has shown, where 70,000 apps were ready on day one⁷⁸, a healthy developer community and a wide range of apps is now a fundamental requirement for any OS. With a number of OS to choose from, this has only driven the scale and the quality of the application development for the top OS players – delivering more choice and innovation to the consumer.

In terms of market share, International Data Corporation’s (IDC) Worldwide Quarterly Mobile Phone Tracker report from Q3 2012 shows that Android significantly increased its market share of shipments, from 57.7% in Q3 2011 to 75.0% in Q3 2012, as it has done every year since its launch in 2008. In Q3 2012 Android shipped 136 million units representing an impressive three out of every four smartphones. Apple’s iOS on the other hand, saw only a slight improvement on its market share over the same period from 13.8% to 14.9%, although this hides absolute growth from 17.1 million units to 26.9 million units over the period. Given Apple’s focus on the high end segment, its revenue market share is higher at 35% as of the end of 2012⁷⁹.

Microsoft is striving to establish its OS as the third competitor in this key market. However, despite shipping more than double the number in Q3 2012 than it shipped Q3 2011, it currently has just 2% market share globally (based on Q3 2012 shipments of 3.6 million). This may be changing with the release of Windows Phone 8 in October 2012, which was quickly followed by Windows

Phone 8 supported handsets from Samsung, Nokia, Huawei and HTC. It remains to be seen whether consumers will propel it into the league of Android and iOS. An equally important story in the OS space has been the decline of BlackBerry and Symbian. The former is pinning its hopes on the new BlackBerry 10 platform – which has just been released to positive reviews – to reverse its declining market share, which has halved to 4.3%. Innovative new features such as an ability to split work and leisure modes of the OS on the same phone have been developed to try to attract customers back to the company. Symbian is in sharp decline with many key supporters such as Nokia switching their primary focus to other platforms⁸⁰. The fact that Symbian was the number one smartphone operating system until Q4 2010⁸¹ underlines the dynamic and changing nature of this market.

The operating system market has historically been dynamic, with a key role played by extensive developer communities. If the past is any measure, then the future will see the mobile OS impacted itself by future advances in applications, data storage and hardware. To pick just one example: while technologies such as HTML5 are still at an early stage of development, if OS-independent web-based apps were to reach a par with native apps at some point in the future, then the OS may cease to be as fundamental to the interface between the user and the developer.

The promise for consumers is of continued competition and innovation by different parts of the ecosystem, driving new technologies and greater choice. Major OS companies are continuing to develop new services and offerings in order to maintain and grow their market share in what remains a very competitive market.

78. BlackBerry Z10 Selling In “Large Numbers”, Says BlackBerry — Some U.K. Retailers Sold Out Over The Weekend. Techcrunch.com. February 2013.

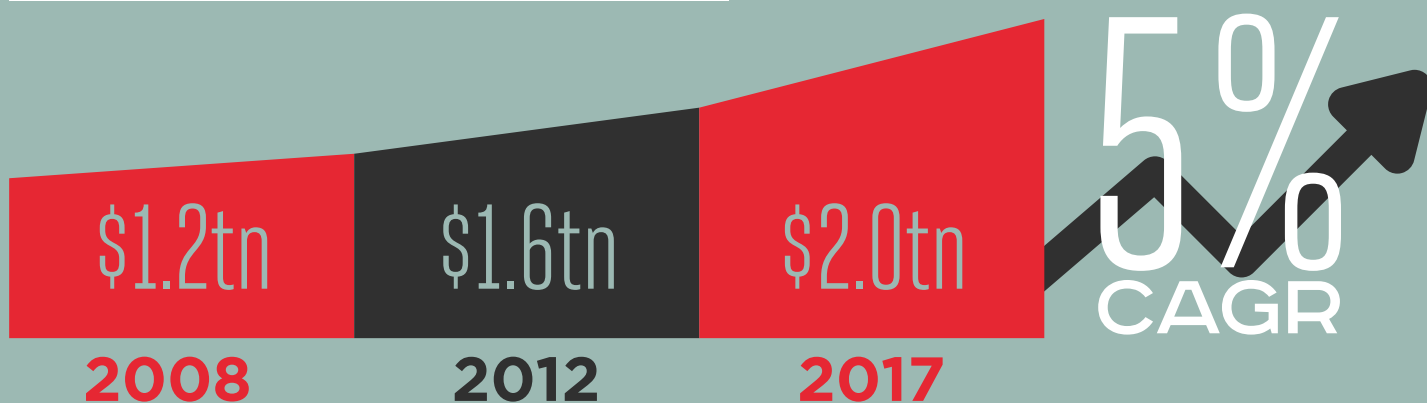
79. Apple/Enders Analysis. 2012.

80. Android Marks Fourth Anniversary Since Launch with 75.0% Market Share in Third Quarter, According to IDC. IDC. November 2012.

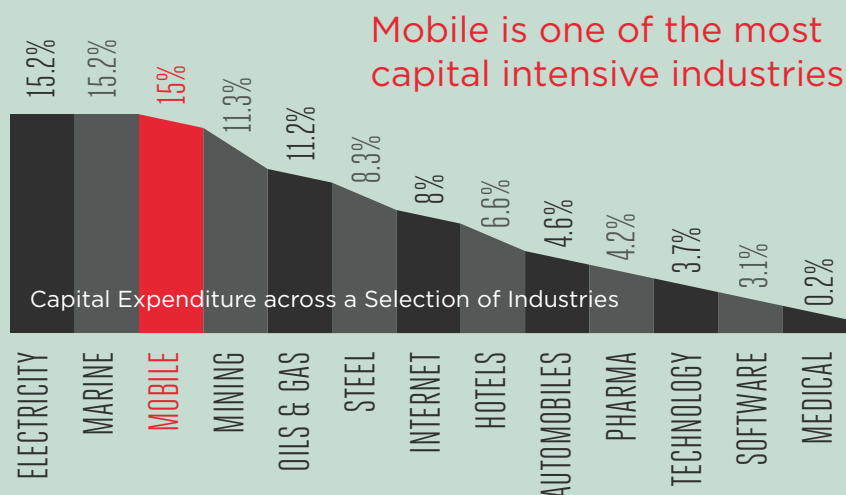
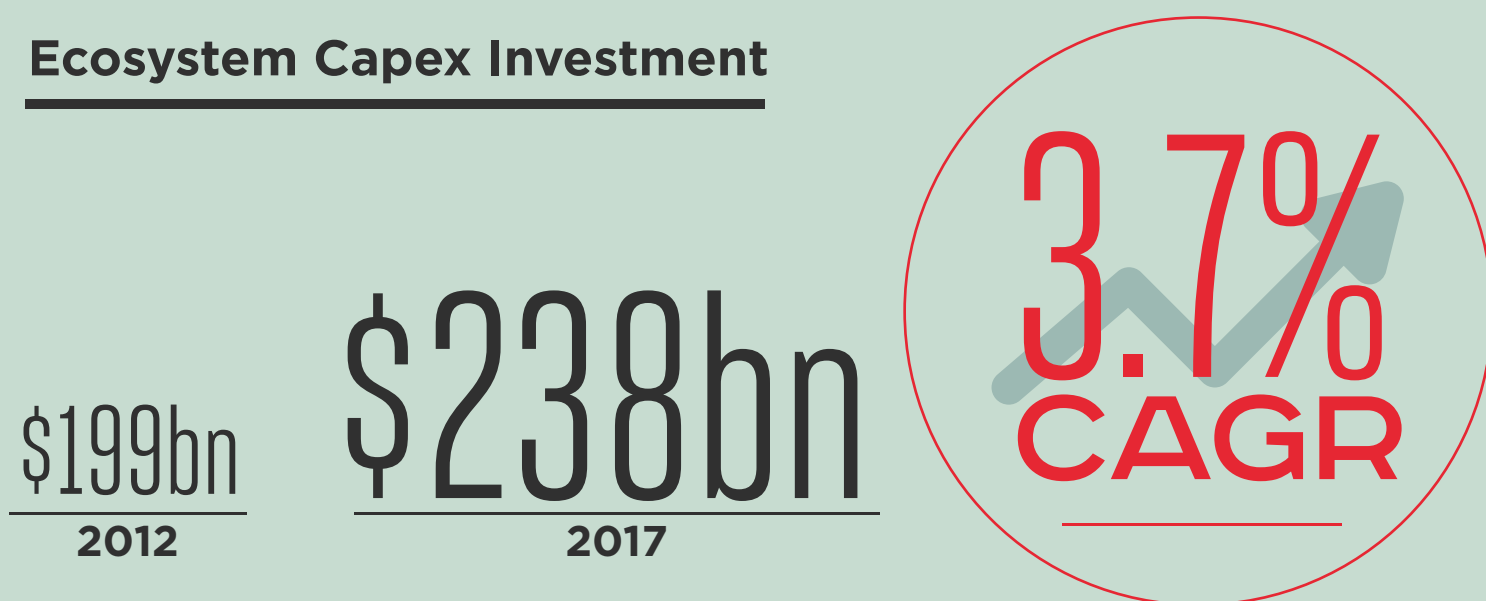
81. Google’s Android becomes the world’s leading smart phone platform. Canalsys. January 2011.

SOCIO ECONOMIC CONTRIBUTION

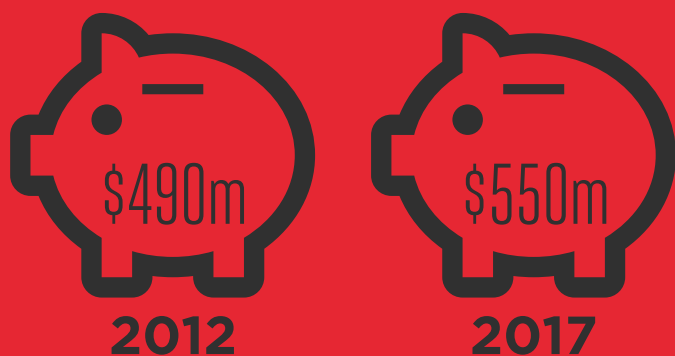
Ecosystem Revenue Growth



Ecosystem Capex Investment



Ecosystem Contribution to Public Funding



MOBILE WILL CONTRIBUTE

\$2.5tn

TO PUBLIC FUNDING OVER THE 5 YEARS 2013-2017

Ecosystem Jobs Created

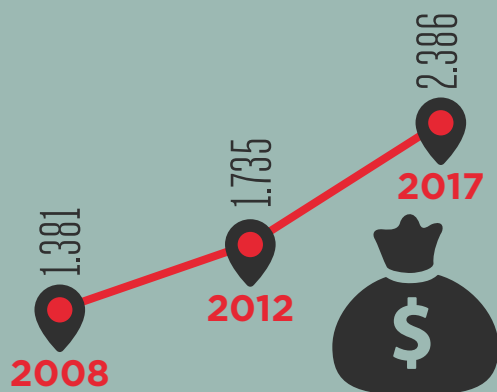


1,300,000

Adding 1.3m jobs in the next 5 years



Ecosystem Contribution to Global GDP



6.6%

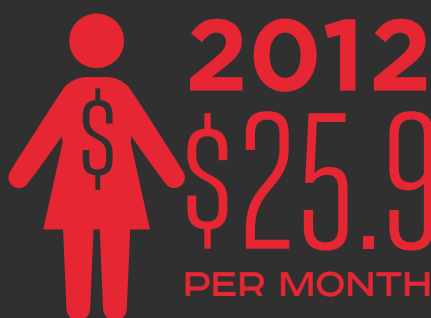
CAGR
2012-2017

Mobile will contribute

\$10.5tn

to global GDP
over the 5 years
2013-2017

Global Average Revenue per Subscriber



Increasing
value for
money for
consumers

ARPS, AVERAGE REVENUE PER SUBSCRIBER STRIPS OUT THE EFFECTS OF MULTI-SIM OWNERSHIP AND M2M

The Mobile Ecosystem's Substantial Socio-Economic Contribution

The previous chapter highlighted emerging trends and growth areas in the mobile industry and how service and product offerings are evolving to meet the changing needs and expectations of consumers. In this chapter we focus in more detail on quantifying the socio-economic contribution that the mobile industry makes to regional economies as well as the role the industry plays in creating a global mobile economy.

KEY POINTS

GDP CONTRIBUTION

Mobile operators contribute 1.4% to global GDP directly via their revenues, which are expected to grow at a robust 2.3% through 2017.

ECOSYSTEM REVENUES

Including the whole mobile ecosystem, revenues are expected to grow at 4.9% through 2017 to almost US\$ 2 trillion.

PUBLIC FUNDING

The mobile industry makes a significant contribution to public funding. By 2017, its contribution is projected to be US\$550 million – primarily as a result of spectrum fees as well as direct and indirect taxes.

EMPLOYMENT

The mobile industry also supports millions of jobs – projected to grow to 9.8 million jobs worldwide by 2017, driven largely by the continued growth of mobile in emerging markets.

4.1

MOBILE OPERATORS MAKE A SIGNIFICANT CONTRIBUTION TO GLOBAL GDP

GLOBAL REVENUES

The mobile industry is a major contributor to the world economy. In 2012, revenues of mobile operators contributed US\$1 trillion or 1.4% of world's GDP. In some regions the impact of mobile operators is even more significant, such as in Africa, where mobile operators generated 3.1% of GDP. Most of the growth comes from Asia Pacific, which is forecast to grow at 4% p.a. to 2017, adding US\$80 billion, or 23%, to its revenue of US\$ 350 billion. While Asia Pacific is a clear leader in terms of absolute growth, Africa shows the highest rate of increase and will increase annual mobile operator revenue by 25% in the 2012 to 2017 to US\$ 70 billion. Globally, operator revenues have been growing by 4% from 2008 to 2012 and are expected to continue this trend, albeit at a lower rate of 2.3% p.a. through 2017 (see Figure 16).

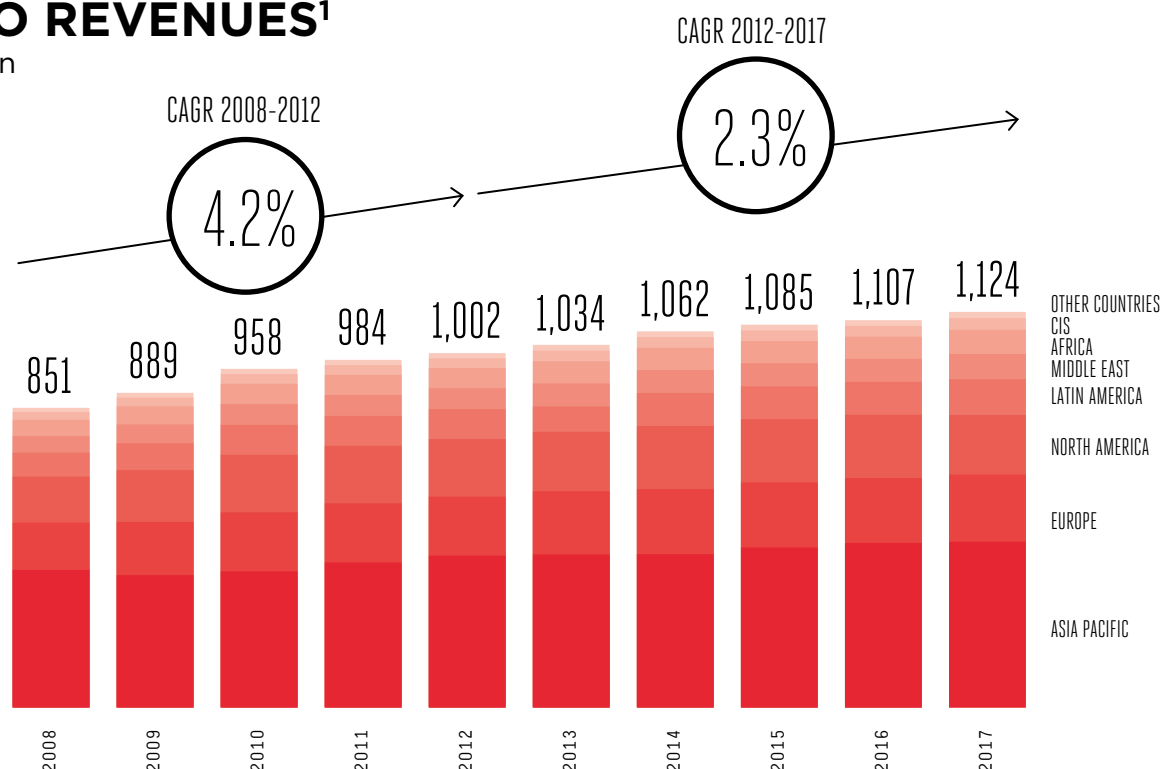
One of the reasons for the slowdown is the decline of revenues in Europe. Heavy regulation of Mobile Termination Rates (MTRs), as well as the Eurozone Crisis, resulted in a decrease over the 2008 to 2012 period from US\$248 billion to US\$216 billion. The mobile operator market in Europe is expected to decrease further by 2 % p.a. to 2017 due to competition and regulation. This trend, together with the growth in traffic, show the increasing value to consumers, who are using mobile services more while spending less.

The roll out of 4G technology offers the potential for operators to enhance the services they provide and potentially increase revenues. In some countries where 4G has already launched, significant Average Revenue Per User (ARPU) uplifts have been achieved, reflecting consumer demand and willingness to pay. This is mostly seen in North America, Scandinavia, Korea and Japan. In Europe it is still too early to judge consumer reaction to the new services but it is certainly true that operators are positioning 4G as a premium service. In Switzerland, for example, Swisscom have launched tiered pricing based on speed of access with download speeds ranging from 0.1Mbps up to 100Mbps, rather than the typical pricing of data services using monthly volume of traffic bundles.

In developed markets such as North America and Europe where market penetration is high for mobile devices, future revenues will be driven by higher rates of smartphone adoption, growth in M2M, new applications and multi-device connections. Faster connection speeds in developed markets are also driving up usage of data as well as adoption of second devices, such as tablets.

MNO REVENUES¹

US\$ Bn



1. Excluding revenues from mHealth and mFinance, which are included in Ecosystem revenues
Source: EIU, Wireless Matrix, IDC, Gartner, A.T. Kearney Analysis

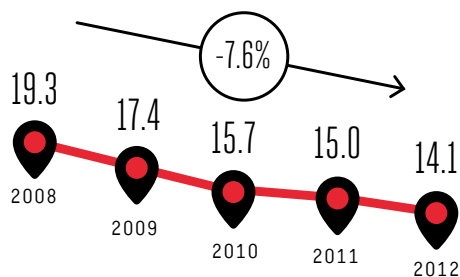
Figure 16

Increasing Accessibility of Mobile Services

Despite the growth in usage of voice and SMS and increasing numbers of data subscriptions, ARPU rates have declined across every region globally. The overall global ARPU rate has fallen by 7.6% p.a. from US\$19 to US\$14 per month, with the highest reductions in 2010-2012 seen in Africa (-10% p.a.) and Europe (-7% p.a.) (see Figure 17). The falling ARPU rates indicate that average mobile tariff prices have been decreasing. In some cases this could reflect price decreases but it is also being driven by the growth of multi-SIM in developed markets, where a user's second SIM is on a lower tariff, perhaps for personal use or data use only. In developing countries it is also a consequence of the market opening up to lower income segments which have a lower ARPU.

GLOBAL ARPU

US\$ Per Month



ARPU BY REGION

US\$ Per Month

	2008	2009	2010	2011	2012	CAGR 2008-12
Africa	12.2	10.6	10.8	8.8	7.9	-10%
CIS	9.8	8.1	8.6	8.7	8.8	-2%
Asia Pacific	11.8	11.1	9.7	9.3	9.1	-6%
Latin America	13.7	12.0	11.9	11.5	11.4	-5%
Middle East	16.3	16.9	16.2	16.0	15.7	-1%
Europe	31.7	29.4	27.1	27.0	23.2	-7%
North America	52.8	51.3	49.9	49.9	49.8	-1%
Others	20.4	14.4	13.0	12.1	10.6	-15%

Source: GSMA Wireless Intelligence, Merrill Lynch, A.T. Kearney Analysis

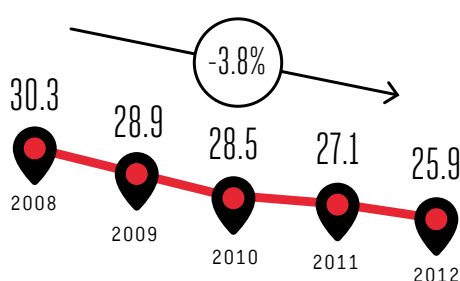
Figure 17

Average revenue per subscriber (ARPS), which excludes multi-SIM and M2M effects, shows a slower decline (see Figure 18). However, in most regions, except for North America and Middle East, it is still less than in 2008. In North America and Middle East strong consumption growth – most notably data – outweighed declines in prices with ARPS growing 1% and 2% p.a. respectively in these regions. Global ARPS fell with a rate of 3.8% p.a. in 2008-2012; here too the largest ARPS declines are in Europe (-5% p.a.) and Africa (-6% p.a.).

Fierce competition in developed markets, along with increased regulation, has resulted in reduced prices for consumers. While this increases accessibility to mobile services for consumers, mobile operators need to find ways to successfully monetise their investments in 4G, otherwise consumers will lose in the long run with investors less likely to repeat for future technologies the significant investment that is committed to delivering 4G services.

GLOBAL ARPS

US\$ Per Month



ARPS BY REGION

US\$ Per Month

	2008	2009	2010	2011	2012	CAGR 2008-12
Africa	18.6	15.8	16.2	15.4	14.8	-6%
CIS	15.8	13.7	14.7	13.5	14.3	-2%
Asia Pacific	20.8	21.2	21.2	20.8	19.7	-1%
Latin America	26.7	24.0	24.9	23.9	24.1	-3%
Middle East	24.7	27.3	27.6	26.5	26.7	2%
Europe	53.5	51.1	50.6	47.1	44.1	-5%
North America	62.0	61.9	62.8	63.4	64.8	1%
Others	19.4	13.7	13.4	13.0	12.5	-10%

Source: GSMA Wireless Intelligence, Merrill Lynch, A.T. Kearney Analysis

Figure 18

One of the emerging trends, especially pronounced in developed markets, is increasing post-paid Subscriber Acquisition & Retention Costs (SAC/SRC). With the increasing penetration of smartphones and their rising cost, the contract subsidies paid by operators are increasing. A.T. Kearney estimates that for a typical Western European operator's postpaid business, total SAC/SRC (which includes handset subsidies and commissions) increased by 5pp of revenue between 2009 and 2012⁸². While the picture for post-paid SAC in other regions is likely to be similar, this trend itself is less relevant for largely pre-paid regions, such as Africa or Asia Pacific, where the volume of contract additions is relatively small compared to pre-paid. In fact, the overall Global SAC trend is estimated to be flat at slightly over 15% of total revenues from 2009 to 2012⁸³, as rising post-paid SAC is being balanced out by reductions in pre-paid acquisition costs as operators scale back their willingness to subsidise devices and move to lower cost distribution channels. Continued focus on the balance of usage pricing and upfront spend on the device is likely to be a key success factors for operators in all markets, as is the emphasis on the cost of distribution and the effectiveness of sales and service channels in finding and retaining customers.

82. A.T. Kearney sanitised estimates based on Global Competitive Benchmarking results.

83. A.T. Kearney analysis based on Wireless Intelligence and published operator data.

4.2

The Mobile Ecosystem Benefits the Global Economy

MOBILE ECOSYSTEM IMPACT

Overall, the whole mobile ecosystem's revenue was US\$1,551 billion in 2012, equivalent to 2.2% of global GDP.

Mobile operators are part of a larger mobile ecosystem which also includes handset suppliers, infrastructure companies, distributors and content providers. These sectors together deliver mobile communication services and products to consumers and businesses⁸⁴. The ecosystem revenues include the value

retained within the mobile value chain – for example only mobile specialist mark-up on mCommerce transaction is included – rather than the total value of transactions. Mobile operators made up approximately 65% of the entire value chain's revenues in 2012, which is an absolute increase of US\$151 billion since 2008.

84. The ecosystem revenues include the value retained within the mobile value chain – for example only mobile specialist mark-up on mCommerce transaction is included – rather than the total value of transactions.

Overall, the whole mobile ecosystem's revenue was US\$1,551 billion in 2012, equivalent to 2.2% of global GDP (see Figure 19). The proportional contribution of mobile operators to global GDP has been stable over the last few years and is forecast to remain on the same level through to 2017 – reflecting the fact that a fast-growing sector in terms of connections and traffic delivered is facing continued price pressure.

The forecast growth of the ecosystem, 4.7% p.a., is higher than the growth of the mobile operators themselves in the same period (2.3% p.a.). This shows how mobile operators, operating in a maturing industry themselves, continue to prime innovation and dynamic growth in the wider sector. The overall ecosystem excluding operators is forecast to grow by 9% p.a. to 2017 with the most growth coming from sale of handsets (especially in the developing markets), mCommerce and content creation, which includes applications and videos.

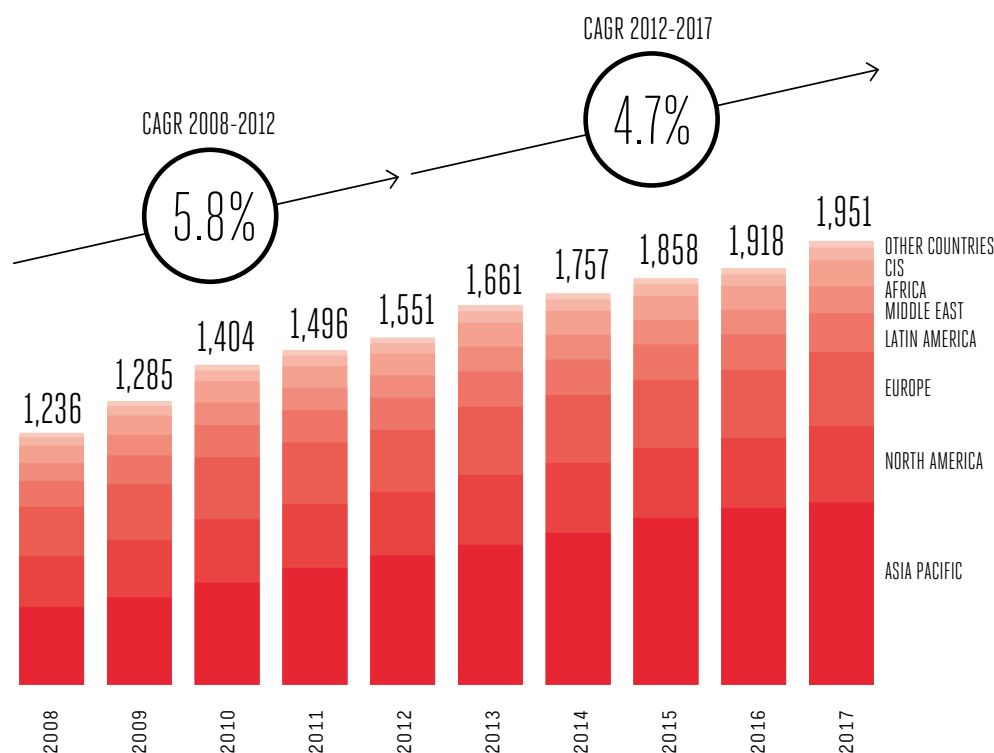
The overall growth hides some important shifts that are taking place on the regional level. For instance, the current economic situation and requirement for cost savings may shift many industries to Asia Pacific. Handsets manufacturers as well as infrastructure companies are beginning to relocate production and R&D centres to developing markets. Good balances of skilled and low cost labour make Asia Pacific an ideal choice. The best known

example is probably Foxconn, a Taiwanese manufacturer which owns the largest factory in the world and manufactures mobile devices for Apple. However, other companies from the developed world have production in Asia Pacific, including Nokia and Ericsson. This fact, coupled with the success of Asian companies in recent years – most notably Samsung and Huawei – is increasingly transforming Asia Pacific from a consumer of mobile services to a major supplier to the industry. More than a third of mobile ecosystem revenue comes from Asia Pacific – US\$ 578 billion – and the projected growth is one of the highest in the world at 6% p.a.

Asia Pacific currently contributes 37% of global mobile ecosystem revenues, while Europe and North America contribute 20% each. In Europe the mobile ecosystem is projected to grow by 1% in revenue terms through 2017, slowed down by negative growth in operators' revenues. The slowdown in Europe, however, is more than compensated by the fast growth in developing markets. Africa and Asia Pacific are showing the fastest growth – 7% and 6% p.a. respectively – which represents US\$240 billion of revenue added between 2012 and 2017. This growth will help the global ecosystem reach almost US\$ 2 trillion in revenue by 2017.

MOBILE ECOSYSTEM REVENUES INCL. MNOS

US\$ Bn



Source: Wireless Matric, IDC, Pyramid, Gartner, A.T. Kearney Analysis

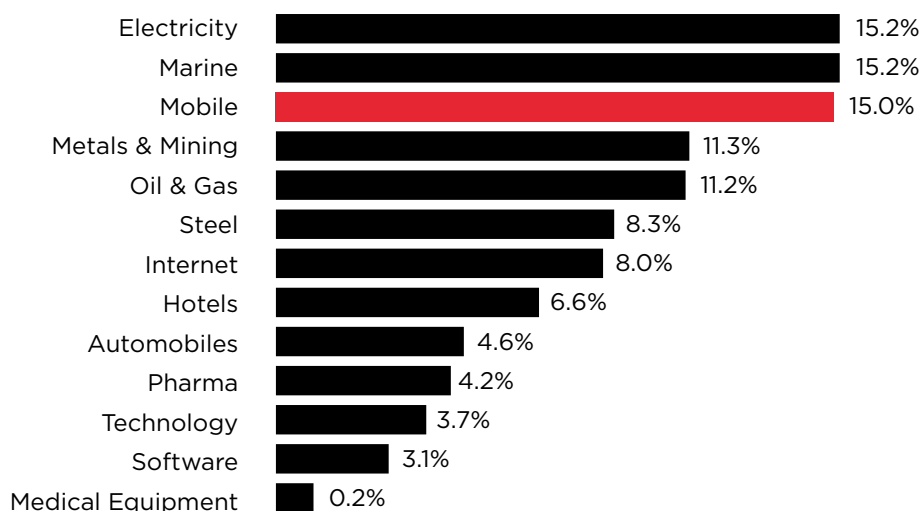
Figure 19

Mobile Ecosystem Capex Investment

The mobile ecosystem and especially mobile operators make significant investments in the economy. In fact, mobile is one of the most capital intensive industries, only slightly behind Electricity and Marine (see Figure 20). In 2012 alone, the global mobile ecosystem invested US\$200 billion, or 35% more, than the global mining industry. To put this into perspective, US\$200 billion is enough to host fourteen London Olympics – each year.

CAPITAL EXPENDITURE ACROSS A SELECTION OF INDUSTRIES

Capex as a % of Revenues, 2012



1. Weighted Average CAPEX / Sales. Selection of 100 companies by sector.
Source: Confidential Operator data; Bloomberg; A.T. Kearney Analysis

Figure 20

The mobile ecosystem continues to invest heavily in the capital base, with estimated capex growth of 3.7% from 2012 to 2017 globally (see Figure 21). Additional spectrum requirements for LTE, 4G and other Next Generation Networks (NGN) will continue to drive investment need in fixed and mobile networks⁸⁵.

In 2009 and 2010 investment slowed down because of the global economic crisis, as mobile ecosystem players were holding onto much needed cash. However, the industry rebounded quickly from the downturn and investments continued to grow through 2012.

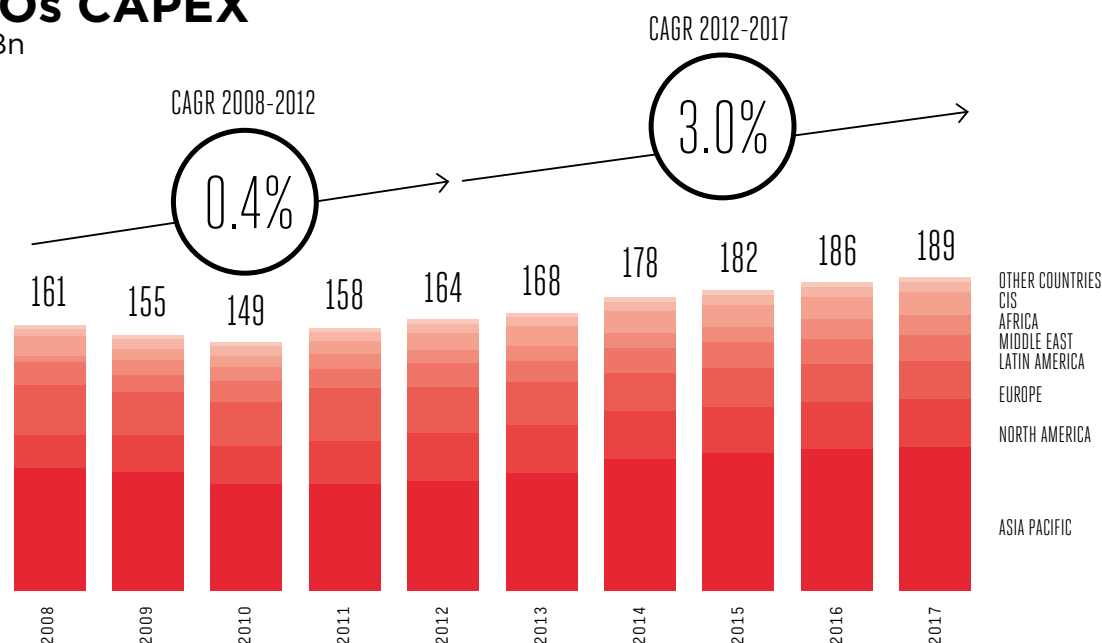
Going forward, we expect mobile ecosystem capex to grow at almost 4% globally. This growth comes largely from mobile operators, which represent US\$164 billion (80%) of the almost

US\$200 billion invested in 2012 and whose investment is growing at 3% p.a. This increase in investment comes from three types of mobile operator capex: maintenance, capacity extension and new services. As the reach of mobile networks grows and they expand to cover an ever-greater proportion of the world's land mass, so the number of connections grows and the capex required to maintain this growing network infrastructure increases. At the same time, as we touched upon in chapter 1, the amount of data that mobile networks must support is growing exponentially, requiring capex investment to increase capacity – especially in radio and backhaul networks. With 4G expected to be rolled out in many markets in the coming years, significant services capex will be required too.

85. CapEx - quo vadis? Managing network ROIC. Delta Partners. May 2012.

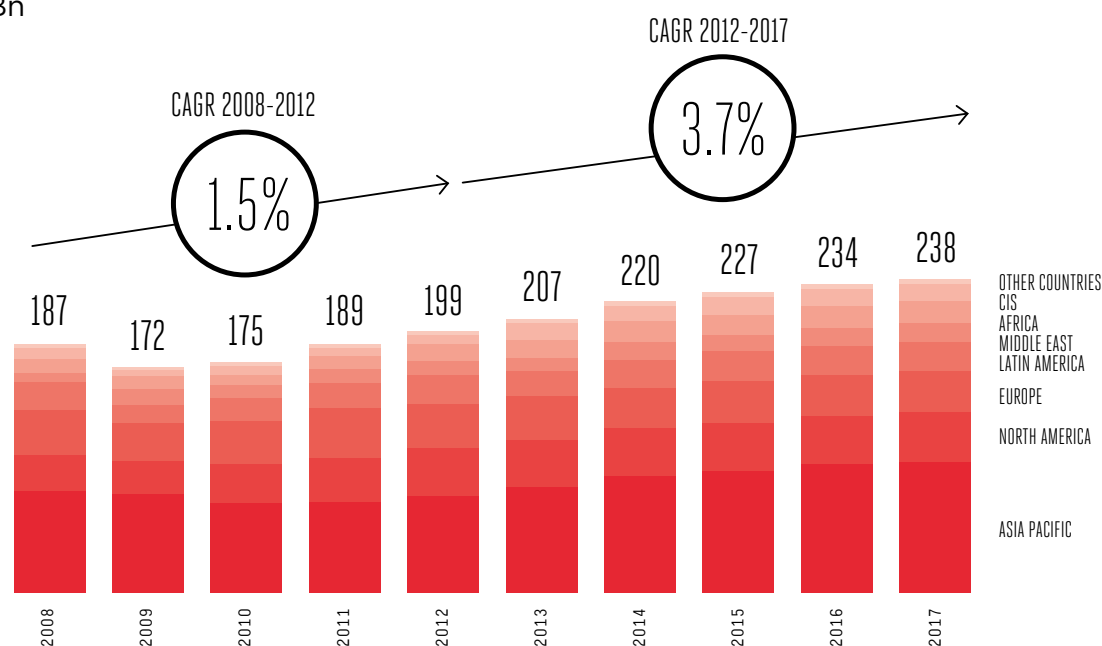
MNOs CAPEX

US\$ Bn



MOBILE ECOSYSTEM CAPEX INCL. MNOS

US\$ Bn



Source: Wireless Matrix, A.T. Kearney Analysis
Source: Wireless Matrix, Capital IQ, A.T. Kearney Analysis

Figure 21

Asia Pacific is set to experience high levels of mobile ecosystem capex investment growth of about 5% p.a. between 2008 and 2017, investing a higher share of revenue than any other region. Greater capex investment is driven by higher projected mobile operator growth rates and the investment required to support strong smartphone adoption in the region. A recent forecast by ABI Research expects about 62% of the mobile capex in Asia Pacific to be invested in core network upgrades, improving in-building wireless coverage for mobile and rolling out LTE networks. While 10 of the 110 operators in Asia Pacific already have LTE networks set up, an additional 58 operators are planning to roll out LTE service in the near future⁸⁶.

86. APAC Mobile Capex to Hit US\$53.3B in 2012. ZDnet.com. April 2012.

4.3

The Mobile Sector's Contribution to Employment

The mobile ecosystem also plays an important role in providing employment. In 2012, almost 9 million people were employed directly in the mobile ecosystem, which was an 18% increase from 7.4 million employees in 2008 (see Figure 22) and 1.3 million new jobs are forecast to be created by 2017. However, not all regions are contributing equally to this growth. While employment related to the mobile ecosystem is growing in Asia Pacific at 5% p.a. from 2008 to 2017, the number of jobs in Europe is decreasing over the same time period as operators and manufacturers look to lower cost locations in response to economic pressures.

In developed economies, one of the fastest growing employment sectors in the mobile industry is the development and marketing of online content, including smartphone applications, games, mobile TV and ringtones. In addition, advertising and distribution of online content is a growing segment and will continue to generate jobs as operators seek new ways to further monetise online content such as apps and social networking sites.

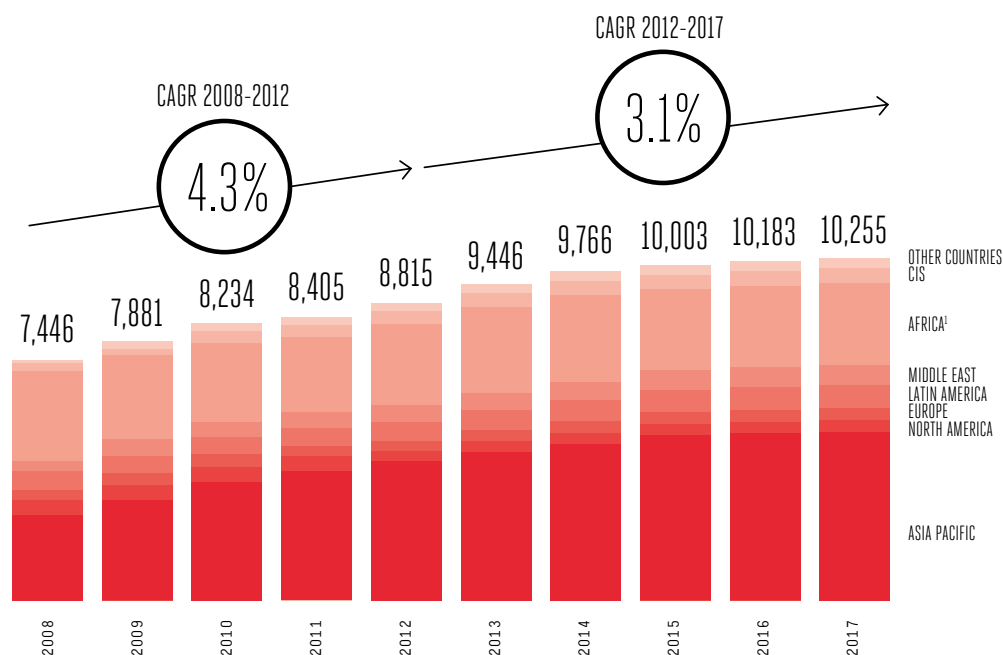
The US is a good example of a market which has seen very strong growth in jobs related to mobile content development. Since the introduction of the iPhone, iPad and Android platforms, over a

million mobile applications have been developed for smartphone and tablet users and this number continues to grow each day, creating jobs in programming, marketing and support roles. According to a 2012 study by TechNet, the “app economy” is responsible for creating over 466,000 jobs in the US alone since 2007 (when the iPhone was first introduced to the market). This includes jobs at companies that are pure app developers such as Zynga, which develops game apps for Facebook, as well as a proportion of staff at larger companies such as Amazon and eBay, social networking companies, financial services firms, etc. The same study estimates that the app economy generated nearly US\$20 billion in revenue in 2011⁸⁷.

Many operators also provide support and investment in the local communities where they operate. Earlier this year Telefónica Digital made an investment in a start-up called Taskhub – an online marketplace that enables people to bid for small jobs posted in their local area, each with a proposed payment amount. Telefónica plans to market Taskhub directly, as well as to encourage local governments and councils to use the site in markets where Telefónica is present⁸⁸.

MOBILE ECOSYSTEM EMPLOYMENT CONTRIBUTION

'000 Jobs



1. Forecast increase in productivity in Africa leads to fewer people being employed in the mobile Industry
Source: Wireless Matrix, Capital IQ, A.T. Kearney Analysis

Figure 22

87. Where the Jobs Are: The App Economy. TechNet. February 2012.

88. Telefonica Digital Makes First Big Wayra Investment. Total Telecom. January 2013.

ECOSYSTEM JOBS**2012**
8,815,000**2017**
10,255,000

In developing regions such as Africa, the rise of distribution channels has driven most of the job growth in the past as distribution channels are highly labour-intensive with relatively low productivity. A.T. Kearney estimates that one in three mobile ecosystem jobs today is in Africa. In the years leading up to 2017 we expect productivity in Africa distribution to increase and begin to converge with the more developed regions. This will result in the number of people employed in the mobile ecosystem in Africa to remain at 2012 levels as productivity growth offsets the effect of customer growth. However, this masks a shift from basic distribution roles to higher value-adding (and likely higher-paid) jobs in other sectors. For instance, many online companies are investing in Africa-specific content and applications development like Deezer, the online music streaming service, expanding into ten African countries⁸⁹.

⁸⁹. Orange's music streaming service Deezer enters Africa's burgeoning music platform market – TV programmes to follow? Balancing Act. June 2012.

4.4

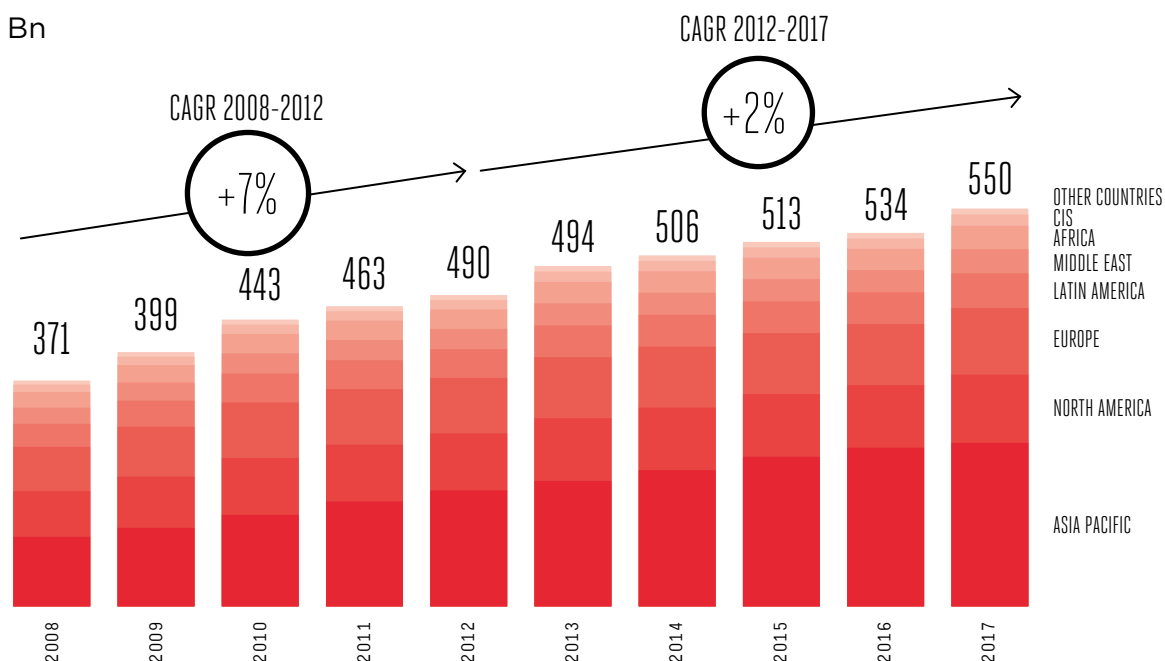
The Mobile Sector's Contribution to Public Funding

THE MOBILE ECOSYSTEM'S CONTRIBUTION THROUGH TAX AND REGULATORY FEES

The mobile ecosystem makes a major contribution to public funding via a number of routes including VAT, sales tax, import duties, corporate taxes on the profit of companies in the sector, social security and income taxes levied on employees, property taxes and a variety of regulatory fees including spectrum fees. We estimate that the mobile ecosystem's contribution to public funding in 2012 amounted to approximately US\$490 billion globally – a 30% increase compared to 2008 (see Figure 23). As the mobile ecosystem revenues grow, the contribution to public funding is expected to increase at the rate of 2% p.a. to 2017, with a projected cumulative contribution of US\$2.6 trillion between 2013 and 2017. The contribution governments get from the mobile ecosystem is a safe and stable source of income. Even during the economic crisis in 2008-2009 the tax paid by the ecosystem continued to grow at a rate of 7% p.a.

CONTRIBUTION OF MOBILE ECOSYSTEM TO PUBLIC FUNDING

US\$ Bn



Source: Risks and safety on the internet: the perspective of European children: full findings and policy implications from the EU Kids Online survey of 9-16 year olds and their parents in 25 countries. Sonia Livingstone, Leslie Haddon, Anke Gorzig and Kjartan Olafsson. LSE Research Online, 2011

Figure 23

A large contribution to public funding comes from so called indirect taxes (60% in Asia Pacific and 70% in Europe) such as VAT tax, sales tax and import duties amongst others. Other sources of tax revenue include Corporation Profit taxes, Social Security (or payroll) tax (paid by employers and employees), income tax on employees' salaries and regulatory fees. Regulatory fees include license fees, spectrum fees⁹⁰ and universal service funds. In order to provide 4G and LTE service globally, mobile operators are currently investing in spectrum fees, often via auctions. The GSMA has called for a reduction in the sector's tax burden in emerging markets to stimulate growth, as discussed in chapter 5.

Spectrum auctions have raised a significant amount of revenue for governments in recent years as mobile operators invest in improving the speed and capacity of their networks. In 2011, Spain raised €1.65 billion, while France raised €3.5 billion in license fees from auctions of 4G spectrum. In 2012 the Netherlands brought in €3.8 billion, which was higher than projected by the Dutch government. In the developing world, India raised US\$14.6 billion in its 2010 spectrum sale. Thailand, more recently, has seen US\$1.4 billion paid in a 2012 3G auction and Brazil auctioned 450MHz of LTE spectrum for US\$1.2 billion in the same year.

90. In this report the methodology of how Spectrum Fees are included in Contribution to Public Funding figures has been amended versus the approach taken in the GSMA's Mobile Observatory series. The fees are now amortised over a period of ten years, which reflects the ongoing value and eliminates spikes due to auction approaches.

4.5

The Mobile Sector's Contribution to Productivity Improvement

As described in Chapter 2, there are many examples of innovations in mobile technology that are transforming other industry sectors such as education, retail and entertainment. One of these rapidly growing areas has been mobile health, which is aimed at reducing healthcare delivery cost while improving the patient experience and outcomes.

In particular, a high impact area has been remote monitoring using mobile devices for patients with chronic diseases such as diabetes or congestive heart failure. As per the VESAG mobile-based personal emergency response system (MPERS) described in chapter 3, mobile devices have the capability to alert physicians in real time if their patient's condition is deteriorating. Routine monitoring which transmits patient data to physicians keeps patients out of doctors' offices for basic testing and results in a more practical and lower cost way to care for many patients. A recent study by the Brookings Institution has found that patient monitoring technology has the potential to save US\$197 billion in the US healthcare system over the next 25 years⁹¹.



91. How Mobile Devices are Transforming Healthcare. Brookings Institution. May 2012.



US\$197Bn

A RECENT STUDY BY THE BROOKINGS INSTITUTION HAS FOUND THAT PATIENT MONITORING TECHNOLOGY HAS THE POTENTIAL TO SAVE US\$197 BILLION OVER THE NEXT 25 YEARS IN THE UNITED STATES.

In emerging markets, mobile technology can have an especially strong impact on productivity. In Brazil, for example, operator Vivo in partnership with ZTE and Qualcomm introduced 3G technology to aid fishermen⁹². The fishermen use 3G-enabled devices with pre-installed customised software to find buyers, access weather information and get updates on market prices. This drastically increases their productivity, helping in such decisions as whether to go to sea on a particular day, what price to ask and where to look for customers. Moreover, the access to mobile Internet and weather forecasts helps with navigation and safety.

Similarly, in Africa mobile technologies have been shown to aid in labour productivity. A paper by the United Nations Development Programme⁹³ has shown that mobile technologies help African farmers by facilitating information flows and thereby increasing productivity. In many African countries, farmers are updated about commodities prices through SMS and voicemail – virtually the only medium (potentially together with radio) through which people in rural areas can be reached regularly and in a short timeframe. The developments in commodities prices help farmers make good economic decisions. Furthermore, some countries allow trade in agricultural products on commodities exchanges through SMS and voice messages. Together with mobile money, which is relatively widespread in some parts of Africa, this further helps farmers to sell their product or buy inputs at fair prices. In addition, in countries like Tanzania, Kenya and Ghana, SMS and voice information services have been established which help educate farmers on the best practices of growing their crops.

In the developed world, a growing area is the usage of apps in professional services firms. The rise of various application platforms on iPhone, Android and BlackBerry has seen a significant boom in the development of various app tools and resources to make professionals more efficient and productive, such as travel apps, expense organising tools and various communication and productivity apps. Arnold Block Leibler, a commercial law firm based in Sydney, Australia, deployed BigHand Mobile digital dictation software on 100 of their attorneys' BlackBerry devices when they updated their outdated tape-based recording system⁹⁴. The application allows attorneys to dictate directly into their BlackBerries and sends a digital audio file to administrative support staff to transcribe into text. As a result, lawyers have additional capacity and flexibility to work outside of the office.

92. Brazil Mobile Observatory. GSMA. 2012.

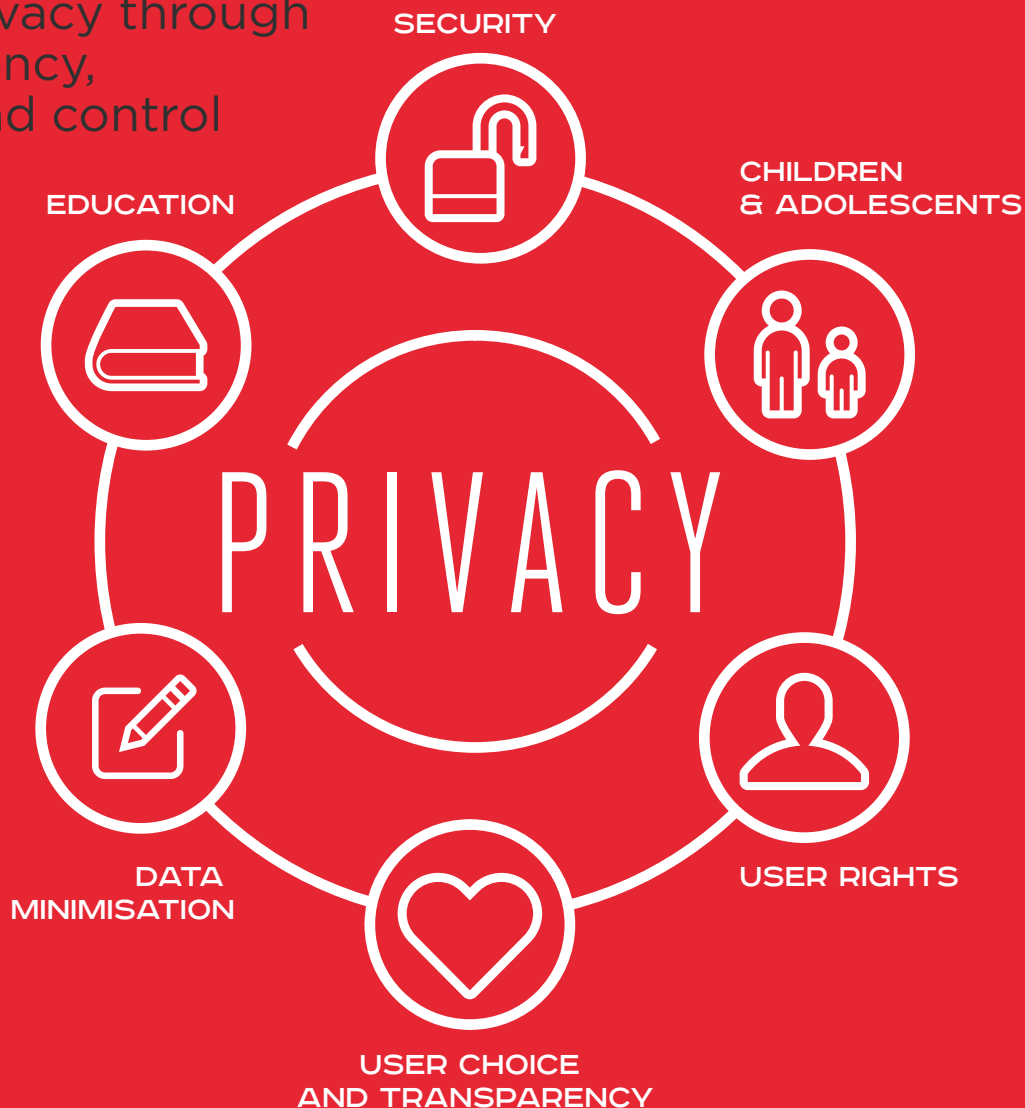
93. The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa. UNDP. January 2012.

94. Case Study: Arnold Bloch Leibler Lawyers and Advisors. BigHand Mobile. 2009.

TRUST, TRANSPARENCY & OPENNESS

Privacy

Protect mobile users' privacy through transparency, choice and control



✓ The majority of people agree to mobile internet privacy statements without reading them...because they are “too long”

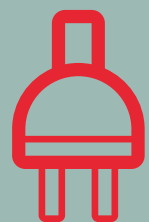
89% of mobile users want to know when their personal information is being shared by an app on their phone and to be able to turn this off or on

Environment and green power:



ENERGY PER GB OF DATA:

33.6kW/GB²⁰⁰⁹
19.1kW/GB²⁰¹¹

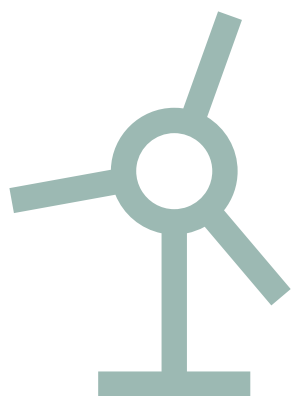


ENERGY USE PER CONNECTION

25.5 kW/CONNECTION²⁰⁰⁹
23.4kW/CON²⁰¹¹



Renewable energy sites



36,000

LIVE AND PLANNED
RENEWABLE ENERGY SITES

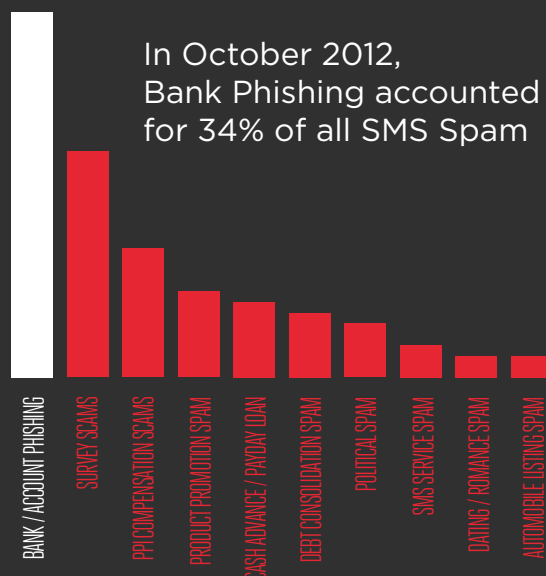
Green house gas savings from these sites is **1.67 million** tonnes per year and the total investment for these sites is estimated at **\$1.06 billion**



Spam



From the **300 million** subscribers covered by Spam Reporting Service, the service captured statistics showing spammers changed their pitches over **52,000** times with over **5,000** unique URLs and over **5,800** different phone numbers to carry out attacks in December 2012



An Industry Supporting and Protecting Citizens

In the previous chapter we discussed the contribution of the mobile industry and the wider ecosystem to economic development, job creation and public funding across the globe. This chapter focuses on some of the many ways in which the mobile industry is supporting and protecting citizens. Mobile operators are taking an increasingly active role in working with governments, NGOs and other players in the mobile ecosystem to increase the safety and security of all citizens in a number of ways. From keeping vulnerable segments of society safe, to supporting disaster management, mobile technology is empowering the vulnerable with information they can use to protect themselves and expand their horizons. Furthermore, by taking steps such as discouraging handset theft, preventing mobile fraud, limiting the proliferation of spam and ensuring the security of sensitive personal information, mobile operators are working to ensure that mobile devices remain a safe as well as indispensable part of everyday life.

KEY POINTS

PROTECTION

Mobile technology has the power to support and protect the citizen in a wide variety of ways – from empowering the underprivileged to protecting the environment and helping in disaster response.

CO-OPERATION

Supporting and protecting citizens is a responsibility for the whole mobile ecosystem and the GSMA is leading the drive to implement innovative new services and implement robust protective measures through the sharing of best practices and by encouraging inter- and intra-industry co-operation.

PRIVACY

As with any technology, there are also risks – in particular around privacy, handset theft and fraud – which the mobile industry is working with stakeholders to minimise.

ENVIRONMENT

Mobile operators are also playing their part to work to reduce their impact on the environment with every tonne of CO₂ emitted by operator networks outweighed by 11 tonnes of emission savings in the wider economy thanks to wireless technology.

5.1

Protecting and Empowering our Society



The mobile industry continues to make a growing contribution to socio-economic wellbeing. But some of the most life-changing impacts are on an individual level, with mobile technology helping to improve and extend education, support the elderly, empower women and help when disasters occur. This section discusses some of these impacts, as well as steps that are being taken to mitigate some of the inevitable risks that the new technology brings.

Empowering Women

With greater reach than fixed line telecommunications in developing countries, mobile phones represent a key tool in efforts around the world to promote equality and drive empowerment through access to information and education.

In order to support the goals of enabling women's access to mobile products and drive the creation of service offerings that could change the lives of millions of women in low and middle-income markets, the GSMA has developed the GSMA mWomen Programme, launched by the then U.S. Secretary of State Hillary Clinton in October 2010 in partnership with USAID, AusAID, the GSMA and Visa Inc. The programme aims to highlight underserved women as a market segment in which the industry should invest through knowledge sharing, seminars and research on the needs of women in emerging markets. It is a good example of how by working together mobile operators, non-governmental organisations, governments and other industries can deliver improvements that could improve the lives and future prospects of millions⁹⁵.

An example of the impact the programme can have is illustrated by the inaugural mWomen Global Mobile Award for Best Mobile Product or Service for Women in Emerging Markets, which was awarded by the GSMA mWomen Global Champion, Cherie Blair, at the 2012 Global Mobile Awards. The winner was a joint entry between Etisalat, Qualcomm, D-Tree International and Great Connection Inc. to create a suite of services (the Etisalat Mobile Baby) designed to reduce instances of death resulting from pregnancy in emerging markets. The tool allows for the remote monitoring of pregnancies by ultrasound and education about warning signs, which enables emergencies to be acted on more quickly. It also supports communication to a medical facility of the needs of the mother on arrival⁹⁶.

In addition, mobile operators and other parts of the mobile ecosystem are also finding innovative ways to bring about positive change at large scale with commercial viability. For example, Iraqi operator Asiacell, part of Qtel Group, performed consumer insights research on the needs of women, who at the time in 2011 comprised 20% of its subscriber base. The result was the Almas line of products, including tariffs suiting women's off-peak usage of the network and a free service blocking potential harassers from calling. Today women comprise 40% of Asiacell's subscriber base and 1.8 million women in Iraq have been connected to friends and family and have the tools to become more socially and financially independent. Similarly, Indosat in Indonesia, also part of Qtel Group, used consumer insights to design Hebat Keluarga, featuring an affordable friends-and-family tariff, an application to locate family members and an extended SIM card validity period. One year after launch, the package has attracted 2 million female customers to the brand.

The reach of mobile phones in remote and emerging markets in particular makes them a unique channel for advancing education and empowering women to protect themselves and improve gender equality. The mobile industry is supporting mobile technology as a vehicle for empowerment and will continue to do so through publicity, new business models and the development of new services.

95. GSMA mWomen Programme. GSMA. January 2013.

96. Etisalat Mobile Baby Wins mWomen Global Mobile Award. GSMA. March 2012.

Empowering the Elderly

The mobile phone is increasingly proving to be a lifeline that allows the elderly to keep in touch with their families and to aid them in an emergency. For example, the charity Age UK has recently launched a 'no frills' mobile phone to help the elderly keep in contact and enable their use of mobiles, which allows eight contacts' names to be printed on the front of the phone to allow easy calling without having to navigate a series of menus⁹⁷. To aid in emergencies many mobile-based services have been developed that allow the user to send a warning message and connect a voice call to a friend or relative, simply by pressing an emergency button on a device they carry – enabling them to receive assistance and attention within minutes should they suffer a fall, rather than hours or even longer if they are not able to raise an alarm.



97. Mobile Phones. Age UK. January 2013.

Protecting Children

Across the globe, access to mobile phones amongst children and youth has increased significantly. The increased adoption of smartphones particularly by the young has brought many benefits and opened up access to new services and products.

80%

THE NUMBER OF PEOPLE AGED BETWEEN 12 AND 19 IN SWITZERLAND WITH SMARTPHONES HAS DOUBLED TO 80% BETWEEN 2010 AND 2012

A STUDY BY THE LONDON SCHOOL OF ECONOMICS IN 2011 FOUND THAT 41% OF ALL EUROPEAN CHILDREN BETWEEN THE AGE OF 9 AND 16 HAVE EXPERIENCED ONE OR MORE RISK FACTORS

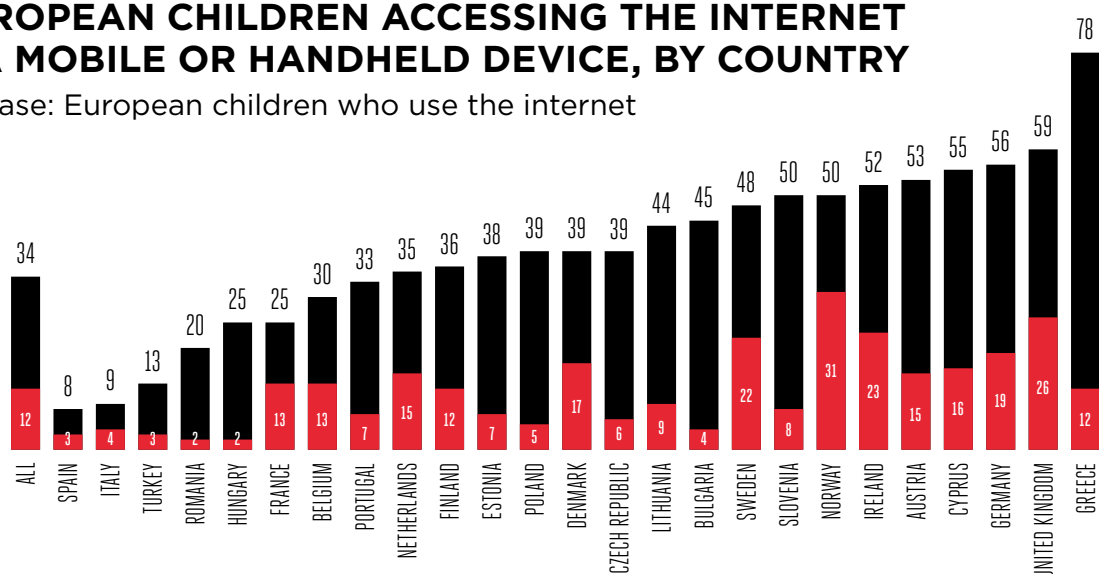
41%



For example, the number of people aged between 12 and 19 in Switzerland with smartphones has doubled to 80% between 2010 and 2012⁹⁸ and in the United States the percentage of 13 to 17 year olds with a smartphone increased dramatically from 36% to 58% in a single year between July 2011 and July 2012⁹⁹. Research in Europe in 2011 showed that on average 34% of children who access the Internet do so via mobile phones, increasing to 50% or more in eight countries (see Figure 24). With children increasingly accessing the Internet via mobile phones, there are great opportunities for improving learning through new educational models, for socialising and for accessing entertainment. However, increased access to the Internet increases a child's risk of exposure to some of the negative aspects of the Internet. A study by the London School of Economics in 2011 found that 41% of all European children between the age of 9 and 16 have experienced one or more risk factors online including sexual images, unwanted messages or cyber-bullying and 12% of all children were "truly bothered" by these experiences.

EUROPEAN CHILDREN ACCESSING THE INTERNET VIA MOBILE OR HANDHELD DEVICE, BY COUNTRY

%, base: European children who use the internet



Source: Risks and safety on the internet: the perspective of European children: full findings and policy implications from the EU Kids Online survey of 9-16 year olds and their parents in 25 countries. Sonia Livingstone, Leslie Haddon, Anke Gorzig and Kjartan Olafsson. LSE Research Online. 2011

Figure 24

Research conducted by the GSMA in 2011¹⁰⁰ in India, Paraguay, Egypt and Japan indicates that nearly 70% of parents worry about their children's privacy and safety when using mobile phones. With mobile usage for children aged 8 to 18 in these countries measured at almost 70% – and 40% of all children in these countries accessing the Internet from mobile phones – the issues of bullying and inappropriate content are of global concern.

To help protect children from the risks that come with increased access to the Internet, mobile operators are working closely with governments and NGOs to ensure that both children and their parents are aware of the risks and to empower them to take appropriate action when required. For example, the GSMA leads initiatives such as The Mobile Alliance Against Child Sexual Abuse Content, which aims to prevent the use of mobile networks by those involved in the distribution of child sexual abuse images and which encourages governments along with all sections of the mobile ecosystem to share information and work together to help prevent the proliferation of child sexual abuse content globally¹⁰¹.

Similarly, since 2008 Telenor Norway has worked together with the Red Cross and The Norwegian Media Authority and Kids and Media (a charity working to protect children in their use of digital media) to develop a number of approaches to reduce risks to children. Since the implementation of these approaches surveys have shown a drop of 10% in the number of 10 to 15 year olds in Norway that have been bullied via mobile phones or the Internet. They developed a 'Use your head' campaign to offer advice and increase awareness of online bullying through visits to schools, with more than 70,000 children and 12,000 parents participating since 2008 and created a free service that allowed parents to block messages to their children's phones from certain numbers. In addition, Telenor have developed a capability to block access via mobile to a list of websites determined by national law enforcement agencies or Interpol to contain sexual abuse images of children. This initiative has now been implemented by Telenor in seven countries¹⁰².

98. smartphone penetration among swiss youth grows to 80%. Telecompaper.com. October 2012.

99. Young Adults and Teens Lead Growth Among Smartphone Owners. Nielsen. September 2012.

100. Children's use of mobile phones - An international comparison 2011. GSMA. 2011.

101. Obstructing the Use of the Mobile Environment by Individuals or Organisations Wishing to Consume or Profit from Child Sexual Abuse Content. GSMA. January 2013.

102. Safe Online Surfing. Telenor. January 2013.

5.2

Delivering Trusted Services

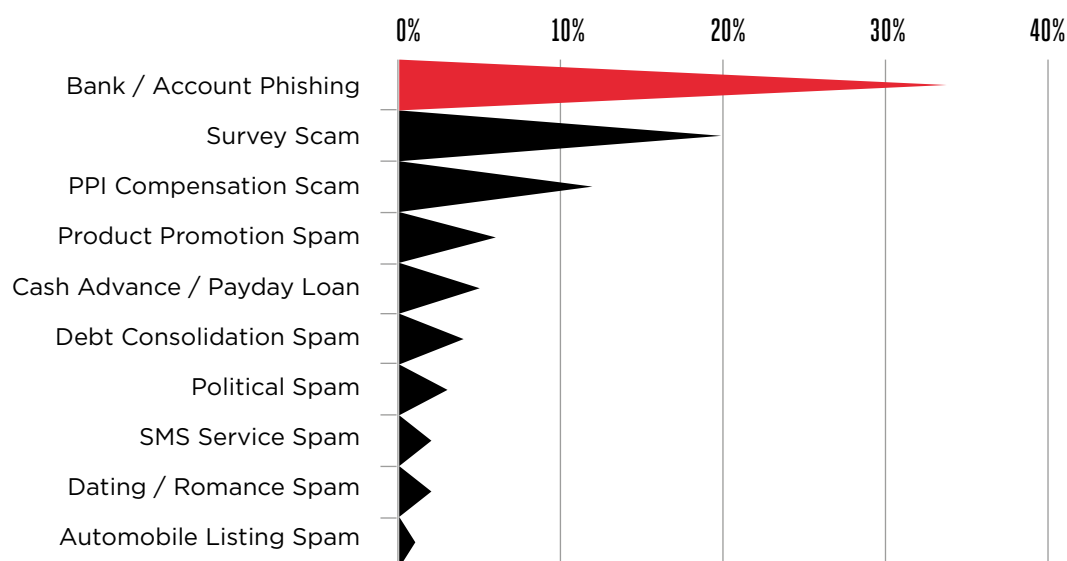
In addition to protecting and empowering society, mobile connectivity has emerged as an important new enabler to help deliver trusted services to consumers. But the growth of mobile, like any new technology, has led to new risks for the consumer including handset theft, fraud, spam and concerns around privacy. In this section we explore these risks in more detail and discuss how the mobile ecosystem is working together with other industries and organisations to help mitigate these risks.

Tackling Fraud

Alongside the huge potential of mobile to deliver innovative services comes certain risks. One of these is fraud. With the ever-growing complexity of the mobile ecosystem there are many evolving types of mobile fraud and mobile operators must proactively take steps to protect consumers and deter crime.

Among the types of fraud more commonly experienced is 'phishing', where an email is received asking for personal details or asking the receiver to follow a link then enter their details and 'smishing', which is essentially the same fraud but with the initial communication via an SMS message. 'Phishing' has been around as a computer-based fraud since before the age of the smartphone and it was an easily transferable approach for those that wish to defraud using the mobile channel. In October 2012, Bank Phishing accounted for 34% of all SMS Spam according to the GSMA (see Figure 25).

TOP SMS SPAM, OCTOBER 2012



Source: Cloudmark / GSMA

Figure 25

SMS fraud has become a problem all over the world as scammers are looking for new ways to replace their declining revenue from email. Scammers change their messaging frequently in an attempt to bypass filters and to keep their pitch 'fresh' in order to hook more victims. Scammers also closely analyse which messages garner the highest response rate from recipients and tweak future messaging accordingly. The GSMA has developed a unique service that allows operators to get real time intelligence on spam directly from their subscribers. The suspicious messages and originating phone numbers are forwarded to a shortcode '7726' which spells SPAM on the device keypad. The GSMA Spam Reporting Service (SRS) analyses all reports received and determines a 'fingerprint' for the attack. Operators can use this information to terminate spammers' accounts, improve policies, develop investigation techniques and enhance filtering intelligence as well as consider revisions to network architecture.

From the 300 million subscribers covered by the SRS, statistics show spammers changed their pitches over 52,000 times with over 5,000 unique URLs and over 5,800 different phone numbers to carry out attacks in December 2012 alone¹⁰³.

However, computer malware (such as viruses, worms and Trojan horses) is generally developed specifically for an operating platform and thus has not yet proliferated on mobiles to the same

degree in the way it has on computers. With recorded instances of mobile malware rising,¹⁰⁴ it has the potential to become a significant future contributor to mobile fraud threats and exploits. In December 2012, new Android malware emerged sporting several characteristics of a botnet. The messages that propagated this malware promised free Android games such as Need for Speed, Grand Theft Auto 3, Angry Birds and Max Payne. To install these malicious games, would-be victims were required to disable key security measures inherent to the Android OS. Swift action led to the takedown of the attacker's command and control server on December 12th, resulting in an almost total eradication of Android malware SMS on SRS protected networks in the last week of December¹⁰⁵.

Underlining this growing trend of mobile malware, a recent report by online security firm McAfee has shown a significant increase in instances of mobile malware detected by Q3 2012 (see Figure 26). Operating system developers will need to work more closely with mobile operators and app developers to ensure that mobile does not become an attractive opportunity for malware developers and miscreants. In addition, operators will need to continuously improve their detection techniques if they are to keep up with the scammers ever-changing tactics.

103. GSMA Spam Reporting Service Mobile Messaging Threat Report. GSMA, December 2012.

104. Malwareonomics: 2012 Mobile Threat. Lookout Mobile Security, December 2011.

105. GSMA Spam Reporting Service Mobile Messaging Threat Report. GSMA, December 2012.

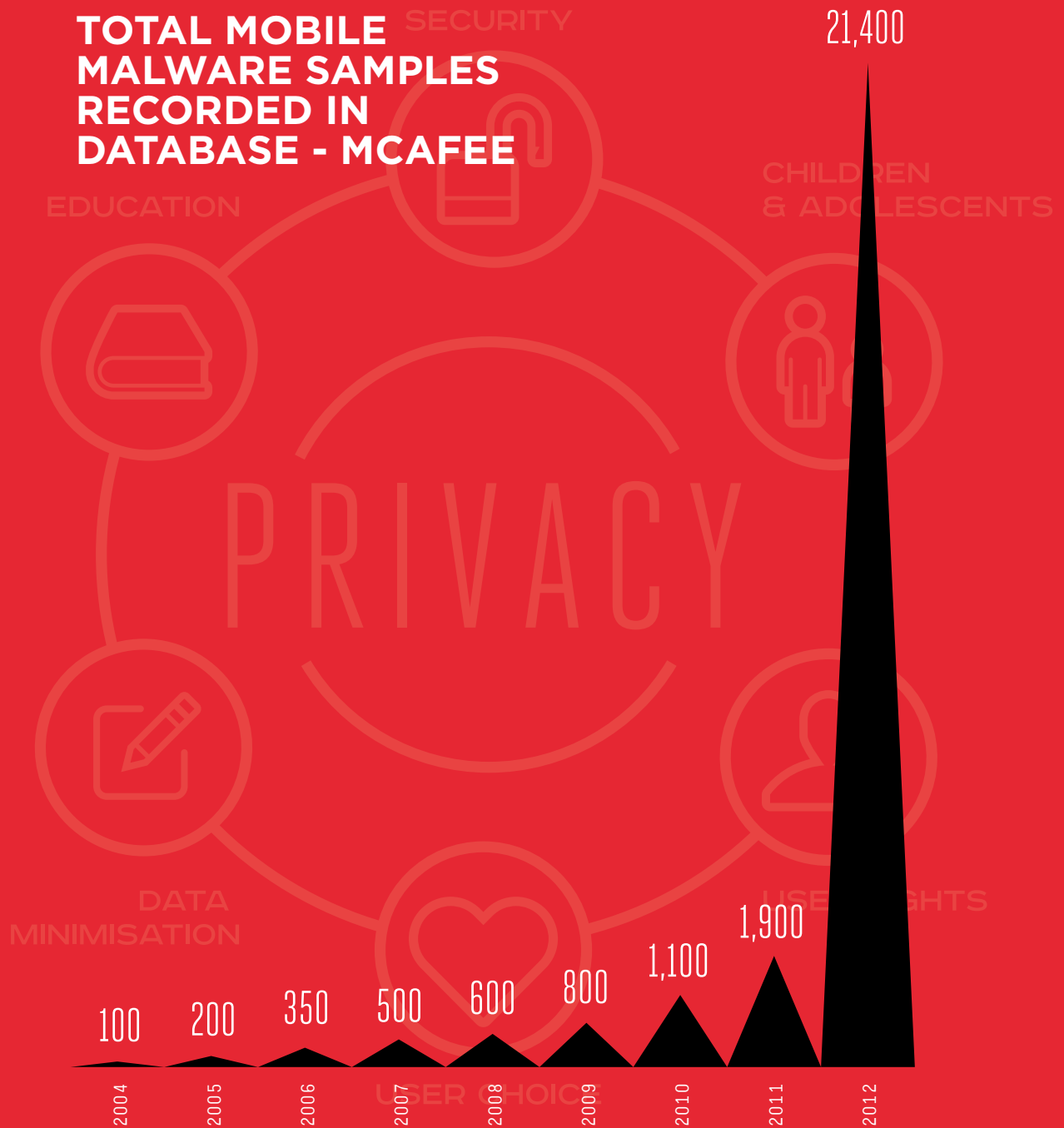


Figure 26

Note: Part of the increase in the numbers detected is down to improved ability to detect malware
Source: McAfee Threat Report: Third Quarter 2012. McAfee Labs. 2012

Mobile operators have responded to fraud by both ensuring that effective technical safeguards are in place and promoting customer awareness – one of the most effective weapons in the fight against an ever-changing fraud landscape. Technical and process safeguards protect the customer's account, for example by deterring and blocking attempts to hijack the account or to open a new account in their name.

In the United States, AT&T is conducting research at their Security Research Centre in New York City to 'ensure security is an enabler, not a limitation, of mobile technology', by looking into emerging mobile threats and ways to contain them¹⁰⁶. As part of this they are looking into ways that SMS-related attacks and spam, as well as mobile 'botnets' (linked networks of mobiles infected with malware) can be detected by a mobile network in real-time, by analysing network performance data¹⁰⁷. By identifying a threat early, the hope is that the mobile operator could then be able to isolate infected phones to prevent the malware propagating, stealing users' information or running up large bills.

Another step that has been taken to improve customers' defence against fraud is the GSMA's 'Security Accreditation Scheme' (SAS). Set up with the support of mobile operators and leading smart card suppliers, it safeguards the integrity of smart cards¹⁰⁸ and the associated user credentials and authentication data, reducing risks such as accidental or intentional cloning during the manufacturing process. 33 supplier sites are currently accredited, covering 23 smart card suppliers in 18 countries¹⁰⁹. This scheme allows all GSM

mobile operators to easily assess whether or not a smart card supplier's security meets industry agreed and audited standards. Suppliers involved in the scheme submit to a comprehensive security audit of their production facilities every two years allowing the operator to be sure that the smart cards they provide to customers have been protected from interference and potential fraud by rigorous security standards. In this way, customers have another layer of protection against the financial and identity consequences of having their accounts compromised.

However, effectively combating mobile fraud requires more than just a vigilant customer and a proactive mobile operator. It is an issue for the whole mobile eco-system and effective and timely co-ordination across the eco-system is essential to protect the customer from new types of fraud.

106. Finding Solutions To Growing Mobile Security Complexities. AT&T, September 2012.

107. AT&T Security Research Center, January 2013.

108. Refers to SIM (2G) and USIM (3G) cards.

109. Accredited Smart Card Plants. GSMA, January 2013.

Tackling Mobile Theft

Another unfortunate consequence associated with the growth of mobile is device theft. As the mobile phone increasingly becomes a ubiquitous part of daily life for people around the world and with handset resale values increasing in both developed and emerging markets, incidents of mobile theft are unfortunately also rising in some countries. In addition, as mobiles are increasingly used to execute banking and other sensitive transactions and with smartphones holding more personal data – for example identity, contacts and communications – than any other single database, the importance of approaches to deter theft and reduce its impact increase.

Against this background, mobile operators in a number of markets have taken an active lead in the effort to fight and deter theft, by blocking the use of stolen phones from their own networks and from other networks via the GSMA-maintained International Mobile Equipment Identity (IMEI) Database for all GSM devices. Mobile operators can connect to this central register of all mobile phone handsets to share details of handsets that have been reported as lost or stolen by customers to their mobile operators. In this way, mobile operators that have a connection to the IMEI Database can ensure that stolen handsets from other networks are blocked from use on their networks and vice versa. In the event of a reported theft, the mobile operator can suspend the account to prevent the customer being charged for fraudulently used services, block the SIM card and then update the IMEI Database to identify the handset as stolen¹¹⁰.

The IMEI Database has been in use since 1996 and every year more mobile operators are connecting to it to share their databases of stolen handsets. In July 2012, thirteen of the main Latin American mobile operators committed to connect to the GSMA database – following the example set by Costa Rica where all operators have done so – and collaborating with regional governments to make the trafficking and reuse of handsets more difficult across a region covering more than 500 million mobile connections.

Similarly, in the United States – where it is now estimated that around 40% of all robberies in large cities involve the theft of a mobile device¹¹¹ – AT&T, T-Mobile, Verizon and Sprint committed in April 2012 to block and build databases of stolen handsets, having previously only tracked stolen SIM cards. They have chosen to use the GSMA database as their platform of choice to share stolen handset data and this has been actively used by AT&T and T-Mobile since the start of November 2012. Sprint and Verizon have committed to connect to GSMA's database to exchange LTE handset details by the end of November 2013¹¹². In addition, it was announced in November 2012 that data sharing by the US operators is to be extended to include Mexican mobile

operators to tackle the illegal trade in stolen handsets between both jurisdictions¹¹³. Mobile ecosystem players have also created innovative new ways to combat theft. Apple for example has created the 'find my iPhone' tool which allows a phone owner to track the location of a lost phone via GPS, lock the phone, erase data remotely and send a message to the phone's screen – resulting in a number of successfully traced phones followed by prosecutions that have been covered by the media, thus creating another deterrent to theft.

Handset theft also represents a significant challenge for new services such as Near Field Communication (NFC), which enables contactless payments to be made via a mobile phone at a retail counter. Challenges exist both in terms of the added technical security considerations, but also in terms of consumer confidence – a key requirement for any technology involved in processing payment transactions. Steps that are being taken to protect customers when using mobile phone-based NFC for payments include the automatic disabling of NFC payment functionality in phones reported stolen (in addition to the standard approach of suspending the account and blocking the handset and SIM) and creating guidelines in partnership with government and banking industries that require the use of PIN codes for transactions above a certain value¹¹⁴.

Mobile operators around the world are proactively working together and with the GSMA, with national governments and with regulators to help build approaches that can effectively and efficiently deter handset theft and make mobile customers safer. The faster that mobile phones can be made unusable once stolen, the less likely it is that thieves will be tempted to steal and sell them.

110. IMEI Database. GSMA. January 2013.

111. Chairman Signs New Bilateral Accord to Combat Mobile Phone Theft. FCC. November 2012.

112. U.S. Wireless Industry Announces Steps to Help Deter Smartphone Thefts and Protect Consumer Data. CITA - The Wireless Association. April 2012.

113. Chairman Signs New Bilateral Accord to Combat Mobile Phone Theft. FCC. November 2012.

114. Latin American Mobile Operators Commit to Combat Mobile Device Theft. GSMA. July 2012.

Mobile Services Privacy

The growth of smartphones and the emerging but fragmented mobile ecosystem has led to mobile app privacy becoming a key concern worldwide. This is an issue for the whole of the mobile ecosystem to address. Key concerns exist around the collection without the users' awareness or consent of device IDs, user behaviour and location data, access to contact lists and other user generated data.

There have been many reports identifying these issues and concerns – for example, a 2010 survey by The Wall Street Journal identified that of 101 popular apps sampled, 47% shared the phone's location without the user's knowledge or consent, and 5% shared age and gender details¹¹⁵. In addition, several high-profile examples of mobile applications collecting data without the user's awareness or consent have served to keep the topic high on the public agenda.

Research shows that users want to be able to choose and control their information and in particular expect to be asked before private data, such as their location, are shared. Equally, they want to be able to turn off sharing of data if desired. Yet the complexity of privacy issues in the mobile space can sometimes make it difficult to effectively convey options and rights to users, as Facebook has similarly found in online social media. For example, November 2012 consumer research in Brazil and Mexico by the GSMA showed that just over half of all mobile internet users who have signed up to a website or an app regularly agree to a privacy statement on their mobile without reading it¹¹⁶.

The global mobile ecosystem is complex and fragmented. It is characterised by a lack of consistency in how consumer privacy is treated. This lack of consistency does not aid users in becoming familiar with the privacy implications of apps or the privacy choices available to them. Even the law may not be consistent. In Europe for example, EU ePrivacy rules apply to the cellular location processed by mobile operators but not to more precise GPS or WLAN location data. Recognising these challenges, the GSMA has taken the lead and established a Mobile Privacy Initiative. Working with members, the GSMA developed a set of Mobile Privacy Principles outlining how privacy should apply in the mobile environment. This was quickly followed by the development of a set of app privacy guidelines which describe how the Principles could apply at a practical level. These guidelines are being implemented by a number of European mobile operators, who also recently agreed and adopted an accountability framework to ensure the guidelines are implemented effectively. The GSMA also conducts research to better understand the types and scale of mobile privacy concerns of consumers.

Privacy and data security are also key for enterprise mobile customers – business depends on confidentiality, with the potential for significant monetary and reputational consequences if it is breached. With employees' expectations for mobile working being driven by their personal mobile experiences, increasingly there is a trend towards a 'Bring Your Own Device' (BOYD) approach whereby employees access their work content via their personal mobile phone. While this can simplify the employee's mobile experience, it creates additional data security and privacy issues for corporate IT departments, as well as for the employee around their adherence to appropriate use policies. A 2012 report by Gartner cited BOYD as the top concern for enterprise mobile security¹¹⁷. Some device manufacturers have taken steps to try to address this issue – most recently BlackBerry with the release of their new BB10 operating system that allows an enterprise user to set up separate work and personal profiles and switch between the two – but this is an area that is going to become increasingly important as more businesses and employees switch to a BYOD approach.

Privacy is an issue that affects the whole mobile ecosystem and therefore requires a coordinated and co-operative response. The GSMA continues to foster dialogue across the ecosystem and with policy makers and regulators, and is seeking to create a forum in which stakeholders from across the mobile ecosystem are encouraged to come together to discuss concerns related to mobile privacy. This will help the development of more effective ways to help users manage their privacy and such efforts and engagement have been reflected in recent initiatives such as the US Federal Trade Commission's report on "Mobile Apps for Kids: Disclosures Still Not Making the Grade"¹¹⁸, the publication of "Good Privacy Practices for Developing Mobile Apps" by the Privacy Commissioners of Canada¹¹⁹ and "Privacy on the Go: Recommendations for the Mobile Ecosystem", issued by the California Attorney General, Kamala Harris¹²⁰. It is hoped that the wider mobile ecosystem and international policymakers will follow the lead of the mobile operators in creating better and more consistent user privacy experiences¹²¹.

115. Your Apps Are Watching You. The Wall Street Journal. December 2010.

116. Privacy Research Latin America. GSMA. December 2012.

117. Gartner Survey Shows BYOD Is Top Concern for Enterprise Mobile Security. Gartner. June 2012.

118. Mobile Apps for Kids: Disclosures Still Not Making the Grade. US Federal Trade Commission. December 2012.

119. Good Privacy Practices for Developing Mobile Apps. The Privacy Commissioners of Canada. October 2012.

120. Privacy on the Go: Recommendations for the Mobile Ecosystem. California Attorney General, Kamala Harris. January 2013.

121. GSMA Announces New Initiative Addressing Mobile App Privacy. GSMA. February 2012.

5.3

Aiding Disaster Management

In 2012, there were 83 reported natural disasters in Asia (the location of nine out of every ten people affected by disasters from 1950 to 2011) killing 3,100 and affecting 64.5 million people, while causing US\$15 billion in economic damage¹²². Worldwide, the World Bank estimates that 780,000 people have been killed in disasters over the last ten years, with more than two billion people affected and costing a minimum of US\$960 billion.¹²³ In addition to this, the social impact of such disasters can be immeasurable, from the immediate threat from the spread of disease through to the impact on education of the young and the psychological impact of uncertainty about the location and welfare of loved ones.

However, with the increased adoption of mobile phones throughout the world and the growth of phones with GPS positioning capabilities, mobile phones and networks are now an essential tool for emergency response and disaster management teams, as well as providing important tools and information to protect and aid individuals. Given the critical and growing role of mobile technology in disaster preparedness and response, the GSMA launched its Disaster Response Programme in 2011 to support mobile operators in coordinating with humanitarian response agencies, improving technical resilience and supporting customers.

Even before a disaster occurs, mobile communications are playing an important role in quickly disseminating information about imminent and potential threats. This can mitigate the impact by allowing people to take action to avoid the worst effects. In Sri Lanka, for example, the mobile operator Dialog Telekom and its partners launched a Disaster and Emergency Warning Network (DEWN) in January 2009. The network allows the Sri Lankan government to send warnings to all Dialog customers' mobile phones – in addition to specially developed alarms that can be fixed in buildings – via a system that was developed on a non-commercial basis in response to the 2004 tsunami¹²⁴.

The Emergency Operation Centre (EOC) of the Disaster Management Centre in Sri Lanka has been given access to the

system and in the event of an emergency can initially send alerts to emergency responders as well as sending a public warning to all those at risk once the threat is confirmed. This message can be targeted based on the individual's location to ensure that the right people receive the information and mass messages are sent via Cell Broadcasting technology that is not subject to network congestion and thus ideal for disaster communications¹²⁵.

In the days and weeks after a natural or man-made disaster, operators can quickly and flexibly set up a temporary mobile network which is an essential tool that enables the emergency response and relief teams to react quickly and get essential help to those most in need. Network operators can assist individuals too by reducing tariffs to allow the affected population to communicate and access vital information, aiding recovery efforts and improving public safety.

For example, after the January 12th 2011 earthquake in Haiti, TeliaSonera ensured that all their customers in the country could communicate globally free of charge between 15 - 29 January and during the war in Georgia in 2008 they launched a number of initiatives to provide information to the people of Georgia, such as 'WAR facts' via MMS/SMS. This 'WAR facts' service provided important updates on what was happening to those affected, at a time when it was very difficult to get information by any other means¹²⁶.

122. Asia 2012 Figures and Trends. naturaldisastersnews.net. January 2013.

123. Natural Disasters. The World Bank. January 2013.

124. Dialog Employs Celltick's CBC Platform for Mass Alert Warning System. PRWeb.com. June 2009.

125. Disaster and Emergency Warning Network (DEWN). Dialog Telekom PLC. January 2009.

126. Disaster Relief Activities. TeliaSonera. November 2012.

With such a large number of people affected, the opportunities for mobile operators to work with governments and Non-Governmental Organisations to save lives and livelihoods are significant. For example, Justin Forsyth, the Chief Executive of Save the Children said recently at London Business School's 'Mobile for Good Summit' that his organisation requires the support of mobile operators to harness the power of mobile technology for emergency response. A key enabler of this, as indicated by research carried out by Jigsaw Consult and funded by the Vodafone Foundation, is finding new and better methods of collaboration between humanitarian agencies, mobile operators and governments¹²⁷. In the aforementioned Haitian earthquake for example, there was a co-ordinated effort between mobile operators, the US State Department, Thomson Reuters, various NGOs and other ICT players to enable post-disaster communications and assistance, including amongst other things the creation of an SMS code for free transmission of text messages in Haiti. A co-ordinated response such as this can maximise the potential impact and make a real difference to the lives of those affected¹²⁸.

With the people most vulnerable to natural disasters often also being among the poorest or most remote, the mobile phone is unique in its potential reach and speed in facilitating the communication of information that can save lives and aid recovery efforts on a very significant scale. Many fundraising appeals also leverage the potential of premium SMS billing and tap into smaller donations that can amount to a substantial boost to funds (not just for disaster relief) – for example £66 million was donated via SMS in the UK in 2012 and this figure is expected to grow to £150 million by 2015, according to the UK's phone-paid services regulator¹²⁹. This has been supported in part by Vodafone's 'JustTextGiving' collaboration with JustGiving, a UK-based online website that facilitates charitable giving. The service allows charities and individuals to easily set up a code with which mobile phone users can donate money by sending an SMS message, with mobile operators waiving fees so that 100% of the donation goes to the charity.

127. Save The Children Research Funded By Vodafone Foundation Identifies Critical Importance Of Mobile Technology In Disaster Zones. Vodafone. December 2012.

128. The Haiti earthquake: breaking new ground in the humanitarian information landscape. Humanitarian Practice Network. October 2010.

129. Charitable donations by premium rate. PhonepayPlus. December 2012.

5.4

Protecting the Environment

Climate change and the impact of greenhouse gases has become an important topic for all industries. The mobile industry is playing its part to reduce its impact on the environment and holds the potential to make a net positive impact on issues such as greenhouse gas emissions.

One step the GSMA has taken to drive more environmentally friendly approaches in the mobile sector is to set up the 'Green Power for Mobile' programme. Launched several years ago, this programme is dedicated to delivering on the potential of renewable energy for mobile networks. So far there are over 36,000 live or planned renewable energy sites – primarily mobile base stations – that are estimated to save 1.67 million tonnes of greenhouse gases per year. This is in contrast to the less than 9,000 such sites that existed just three years ago, but admittedly is still a small proportion of all network sites. To support this programme, the GSMA has run feasibility studies in 24, mostly developing, countries and has published over 50 case studies and reports to share both business and technical knowledge with other industry stakeholders and promote the growth of sustainable mobile technologies.

Another step taken by the GSMA has been to encourage mobile operators to commit to certain targets and then to provide the support and means both to get there and to measure progress and performance along the way. The first of these steps was the release of the 'Mobile's Green Manifesto' report in 2009, which proposed to reduce greenhouse gas emissions by 40% per connection from a 2009 level by 2020. Progress against this has been positive, with emissions per connection being reduced by between 3% and 5% p.a. on average and energy per unit of traffic has in fact been reduced by between 20% and 30% p.a. on average.

The GSMA has launched a Mobile Energy Efficiency (MEE) service to provide the support and measure progress against these targets – with which most leading mobile operators are now engaged. With a target of cutting operator energy costs by over US\$2 billion per year, this service allows the mobile operator to assess their efficiency and benchmark themselves in areas such as CO₂ emissions, energy consumption and cost against other operators in their region. It also offers a follow-on optimisation service that supports mobile operators to identify a path to meet their targets.

For example, Australian mobile operator Telstra has been measuring its carbon emissions for over a decade, but in 2010 made significant changes to its technology to try to achieve mobile energy savings. These included the installation of various temperature control technologies and upgrading of equipment for more effective low power operation. As a result, Telstra achieved A\$1.5 million annual energy savings – and significant improvements in their GSMA MEE benchmarking results¹³⁰.

Similarly (but separately to the GSMA), the Chinese equipment manufacturer ZTE announced in November the launch of an 'Energy Saving Solution' that is reported to be able to reduce the power consumption of LTE base stations by up to 40%¹³¹. However, it's not just major players that are trying to find efficiencies. A start-up called Eta Devices is currently developing a power amplifier that could potentially cut base station energy use by half. To put that in context, the MIT Technology Review which described the technology in October 2012 explained that it will globally cost US\$36 billion to power mobile phone base stations this year using nearly 1% of the world's electricity production¹³². Therefore, a reduction by half would have a significant impact not just on mobile operators' bottom lines, but on global energy needs.

The full potential of mobile lies not just in reducing its own impact on the environment. The mobile industry has the potential to completely negate its own impact and positively reduce the impact of other industries many times over. Analysis by the GSMA has shown that by 2020, the overall potential for greenhouse gas emissions savings enabled by the mobile industry is 11 times higher than the total emissions of the mobile network sector (see Figure 27). The potential to impact other industries covers many areas, but two key areas are increasing the efficiencies of supply chains through smart logistics and improving the efficiency of energy supply and demand through Smart Grids, as described in chapter 2.

130. Telstra achieves A\$1.5 million in mobile network energy savings. GSMA. September 2012.

131. ZTE Launches Innovative Energy Saving Solutions for LTE Networks. ZTE. November 2012.

132. Efficiency Breakthrough Promises smartphones that Use Half the Power. MIT Technology Review. October 2012.



Figure 27

Note: Includes dematerialisation. Excludes double-counting and rebound effects.
Source: GSMA Analysis. Mobile's Green Manifesto. GSMA.

The GSMA together with six major handset manufacturers also launched an initiative to standardise the power interface used for charging and connecting handsets. The benefit of this decision is that once such universal chargers (based on the Micro USB standard) are in widespread use, manufacturers and operators will no longer need to include a charger with every new handset sold. The EU has estimated that discarded phone chargers represent 51,000 tonnes of waste per year and this initiative has the potential to reduce this significantly, saving resources and reducing unnecessary costs.

The examples highlighted in this chapter help to illustrate the challenges that the mobile industry faces in serving a diverse customer base in a complex global ecosystem - and how each of these challenges is being overcome. While by no means exhaustive they demonstrate the continued commitment of the mobile industry to changing lives through the provision of innovative new services in an environmentally friendly way, ensuring the safety and security of the vulnerable and making its promise of 'connected living' one that advances the broadest possible socio-economic agenda.

ASIA PACIFIC CAN UNLOCK US\$1 TRILLION IN GDP THROUGH SPECTRUM HARMONISATION FOR MOBILE BROADBAND

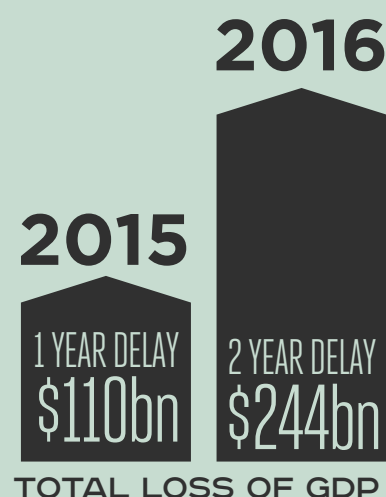
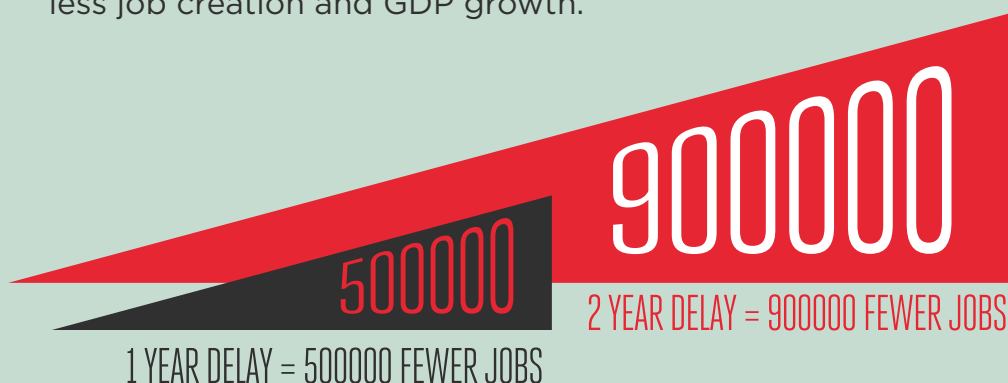
Digital Dividend

Allocation of 700MHz 'Digital Dividend' band to mobile will create new jobs, businesses and government revenues between 2014-2020.



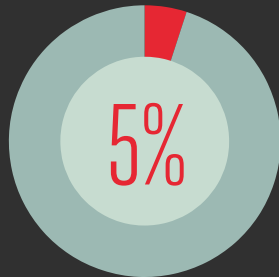
Delay

A delay in the release of harmonised spectrum of even 1-2 years, to 2015 or 2016, would mean significantly less job creation and GDP growth.



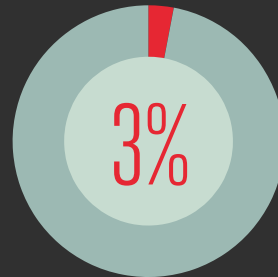
Asia Pacific countries that do not harmonise will experience frequency interference up to 100 kilometres on both sides of their borders, greatly diminishing their own potential gains and those of their neighbours

**NON-COMPLIANT
COUNTRIES WOULD
EXPERIENCE**

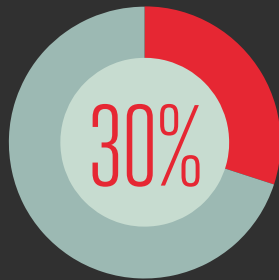


LESS ECONOMIC GAIN

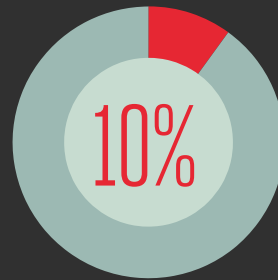
**NEIGHBOURING
COUNTRIES WOULD
ALSO LOSE UP TO**



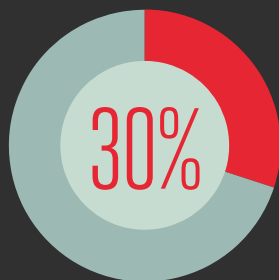
OF GDP GROWTH



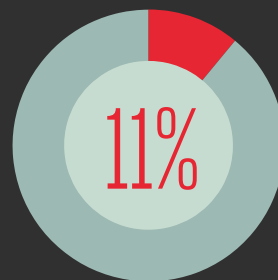
LESS JOB GROWTH



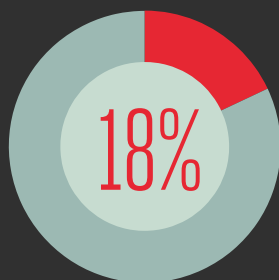
LESS JOB GROWTH



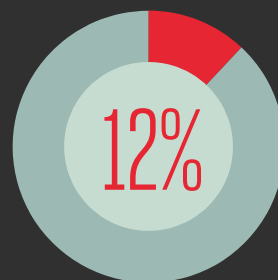
LESS NEW BUSINESS



LESS NEW BUSINESS



**LESS GOVERNMENT
REVENUE**



**LESS GOVERNMENT
REVENUE**

Global Enablers to Spur Further Investment and Growth in the Mobile Industry

KEY POINTS

GROWTH

Mobile infrastructure is as important to a country's economy as the energy grid or transportation network – it is a key enabling infrastructure that drives and supports growth in the wider economy

PLANNING

Given the growth trajectory of the mobile industry – and mobile broadband in particular – planning for future growth must happen now. Allocating spectrum released by Digital Dividend to mobile needs to be a part of this planning.

TRANSPARENCY

A transparent, consultative and predictable regulatory environment – from spectrum licencing through to competition, taxation and intellectual property – is essential for securing investment in the mobile ecosystem required to deliver a stable infrastructure for commerce and new technologies and innovations to the consumer.

The mobile telecommunications industry is a key driver of both economic and social development across the globe. It advances technology, enables new business models that could not have existed without it and improves the efficiency of existing ones, creating jobs in the process and providing an important source of funding for governments. It extends the reach of healthcare, education and finance in developing countries. In doing so, it connects us all more closely, allows us greater access to information and the world around us and empowers the vulnerable. The mobile industry is one of the most transformational industries in the world today, enriching the daily lives of almost half the world's population.

The infrastructure on which the mobile industry relies must be continually developed to support new technologies, services, features and also to scale to meet the growing demand for both connections and overall traffic. Mobile network infrastructure is more than just the technology required to allow the consumer to make calls or access the Internet, it is now as important to a country's economy as the energy grid or transportation network, a key enabling infrastructure that drives and supports growth in the wider economy and needs to be viewed and invested in as such. This is especially true in developing economies without well-developed fixed networks and where the mobile phone has become an essential lifeline for individuals, enterprise and their communities.

Major investment is required to continue the development of this infrastructure so that capacity can be built to meet the ever growing demand and so that new services can be launched which bring greater economic benefits. There are a number of critical areas of regulatory and public policy covering spectrum, pricing and competition which need to be addressed to create the right foundation to attract and nurture this investment. If these areas are not addressed, then it will not be possible to achieve the industry's full potential. This chapter summarises the areas that should be addressed.

6.1

Spectrum Measures to Grow the Mobile Industry

The fundamental building block of any mobile network is radio spectrum. New technologies and coding algorithms are able to squeeze ever greater capacity out of this limited resource but they alone are not sufficient. Spectrum needs to be carefully managed and its usage planned well in advance to ensure that sufficient capacity is available and deployed efficiently in order to meet future demands. This section examines the steps governments and regulators need to take to achieve this.

REMOVING THE BARRIERS TO GROWTH

SPECTRUM LICENCING PROCESS

The process of allocating licences to use given bands of spectrum needs a clear and predictable governance process with the goal of ensuring that this limited resource is put to the best possible use for the benefit of all. The most common tool today for implementing this is an auction process either for new spectrum or existing spectrum if a licence has expired and is not renewed. As an industry, there are two key measures that can be taken to ensure that the spectrum licencing process enables growth, rather than acting as a drag or burden on the industry.

The first measure is to ensure that there is a transparent, predictable and consultative regulatory framework in place which includes a clearly defined approach to renewals and the conditions for change of use (the re-allocation of spectrum for use by other services where this can add value). This is vital so that companies investing in infrastructure can plan for the long term with the certainty that the capital equipment they deploy to use the spectrum will have a long useful life span.

It also allows flexibility so that operators are not bound to continue operating legacy technologies, which may be less efficient. Equally, opaque or unexpected regulatory decisions and changes in rules of auctions, renewals or refarming can create uncertainty which dents the confidence required to invest in an industry where the payoffs on investments extend over many years.

The second measure is to ensure that the spectrum licencing process doesn't in fact represent an excessive withdrawal of investment from the industry. For example, the recent spectrum auction in the Netherlands raised €3.8 billion¹³³ – 8 times the pre-auction estimate of €470 million – but this significant amount of money is effectively being redistributed away from the mobile industry, in a process that is now occurring more frequently around the world. As Neelie Kroes, Vice-President of the European Commission wrote in January 2013, "The revenues are used to finance the budget deficit. It is neither reinvested in the sector, nor in much-

needed infrastructure"¹³⁴. At a time when the mobile industry represents a significant opportunity for future growth – something much needed in Europe in particular – it is vital that governments are looking to maximise investment in the mobile industry. Payments for spectrum should be viewed as an opportunity to secure investment in infrastructure to safeguard future growth rather than as simply a tax on the industry to plug budgetary holes today.

By ensuring that the regulatory framework is clear, predictable and supported by industry, the spectrum licencing process can continue to represent a successful approach for optimising this scarce resource, attracting investment and driving competition. However, governments must share the determination to support investment in mobile infrastructure if they are to realise the significant benefits to the wider economy that will be delivered by having networks which provide advanced services to all who need them.

SPECTRUM CAPS

Spectrum caps, which sought to prevent anti-competitive behaviour by limiting the total amount of spectrum a single mobile operator can hold, were introduced in the 1990s in a number of countries, such as the United States where a 45 megahertz (MHz) spectrum cap was implemented across urban markets in 1994 prior to spectrum auctions¹³⁵.

However, as mobile data traffic continues to grow, operators increasingly require more spectrum. In light of this, while spectrum caps can ensure competition via a predefined minimum number of players, they can also undermine the continuity of services that the biggest carriers will be able to provide to customers when they reach a predefined limit, by restricting access to the required additional spectrum. Furthermore, in a maturing industry which requires high levels of investment

to support the infrastructure and roll out of new technologies such as 4G LTE, consolidation and aggregation of spectrum rights is inevitable and in fact desirable – and new ways need to be found of regulating spectrum allocation to ensure competition but account for changes in the competitive landscape.

In line with this, since 2003 the FCC in the United States has avoided the use of spectrum caps, in favour of limiting the spectrum that can be bought in any particular auction and conducting individual assessments of any changes to spectrum holdings – for example due to mergers¹³⁶. This has the benefit of not arbitrarily restricting the growth of mobile operators and the industry, while still ensuring that any consolidation or changes in spectrum rights are in the interests of a free and competitive industry. This

is also an approach that has been taken by the European Union and many other geographies, but some countries such as the United States are once again discussing the idea of spectrum caps and there are others including many in Latin America where industry growth is currently being restricted by their policies. As Cintia Garza, an analyst with market research firm Maravedis-Rethink explained in a 2012 report, "Latin America has some of the tightest spectrum caps in the world, at an average of 50-60MHz of spectrum per operator in most countries, while operators in Europe hold an average 92MHz and Verizon in the US has 96MHz"¹³⁷.

It should be noted that even if the caps only apply during auctions, this still has significant potential to damage the industry if the caps are set too low. Operators who would have been willing

133. Christmas Present. Neelie Kroes. January 2013.

134. Christmas Present. Neelie Kroes. January 2013.

135. Spectrum cap to make a comeback? RCR Wireless. November 2012.

136. FCC announces wireless spectrum cap to sunset effective January 1, 2003. FCC. November 2001.

to buy spectrum rights are excluded, which reduces the net revenues earned for the government and also restricts the availability of presumably successful services. This was demonstrated by the recent re-auction of Indian 2G licences in November 2012. Although the auction raised US\$1.7 billion, this was reportedly less than a quarter of what the government had been expecting with no bids at all received for important cities such as Mumbai and Delhi. The Secretary General

of the Cellular Operators Association of India, Rajan Mathews, commented “The limited amount of spectrum... was guaranteed to have a very detrimental impact on the auction”¹³⁸.

Just as clear and consistent regulation is the key to both successful spectrum auctions and encouraging investment, so is regulation on spectrum allocation to enabling continued growth in the mobile industry. There will always be

regulation and there must be a process to prevent anti-competitive market behaviour, but this should not be done in a way that risks limiting the natural growth and transformation of the mobile industry. Spectrum caps are inefficient – governments lose potential revenue, operators’ growth is restricted and consumer choice is limited because they are forced to choose operators based on capacity rather than services or prices.

ACCELERATING GROWTH

THE DIGITAL DIVIDEND AND SPECTRUM HARMONIZATION

Spectrum policy also presents a number of opportunities to positively encourage growth. One of these is the ‘Digital Dividend’. The Digital Dividend is the name given to the low-frequency part of the spectrum which is freed up as analogue TV broadcasting is switched off in favour of the much more spectrally efficient digital TV (i.e. more channels delivered using less actual spectrum). It was first identified in 2007 at the World Radio-communication Conference¹³⁹ and with most countries around the world in the process of switching to digital TV, how to use the spectrum which is made available is an important decision that needs to be made soon.

Digital Dividend spectrum is ideal for providing mobile broadband access to geographically remote areas. Given the prohibitively high costs of delivering fixed line broadband to many such remote areas and the comparatively lower costs of delivering mobile broadband at these frequencies, the Digital Dividend is a unique opportunity to ensure that the economic and social benefits of broadband connection can be enjoyed by all – and not just by those in heavily populated areas. It is for this reason that the GSMA has been advocating that Digital Dividend spectrum should be released to mobile communications¹⁴⁰.

Another area that can positively accelerate growth in the mobile industry is spectrum harmonisation – defined by the GSMA as ‘the uniform allocation of radio frequency bands across entire regions – not just individual countries’¹⁴¹.

Harmonisation of frequency bands across countries has a number of benefits. Reductions in the cost of mobile devices can be achieved by equipment vendors since they need to develop fewer models and can produce them in greater volumes. An example of the negative consequences caused by un-harmonised spectrum is the recent Apple iPad and iPhone 5 launches. Due to the different frequencies at which the devices needed to work around the world, Apple were faced with additional development costs if multiple devices were made (as with the iPhone 5) or additional overall handset costs if just one device was made that could work at all required frequencies. With the iPad one device was created but without the capability to cover all frequencies – meaning it was effectively not LTE-enabled in many countries.¹⁴² On the network equipment side, taking an existing product and developing it to perform the same functions in an

alternative band can take up to two years due to chipset and radio circuitry design, which involve lengthy testing cycles, in particular for frequencies further apart from existing designs. Another benefit is the elimination of the interference that would be experienced at borders if the same frequencies were used for different purposes in different countries.

The GSMA and its member operators are working to ensure that the Digital Dividend is allocated in part to the mobile industry to help extend the reach of mobile in remote areas and to ensure that governments, regulators and mobile operators co-ordinate and work towards the harmonisation of spectrum bands around the world. These steps will help accelerate the growth of the mobile industry and change more people’s lives at a lower cost of mobile ownership.

137. 4G Spectrum challenges in Latin America. Maravedis - Rethink. 2012.

138. India 2G telecom auction falls short of target. BBC. November 2012.

139. Digital Dividend Toolkit. GSMA. January 2013.

140. Digital Dividend. GSMA. January 2013.

141. Harmonisation. GSMA. January 2013.

142. iPhone Specifications. Apple. January 2013.

ACCELERATING GROWTH

ECONOMIC EFFECTS OF ADDITIONAL SPECTRUM RELEASE

The GSMA has conducted several studies to quantify the potential economic effect of additional spectrum release. Figure 28 provides a summary of some of the more recent investigations.

Region/Country	Published	Additional Release MHz	Assumed Release Year	Benefits in 2020 USD	Jobs Created by 2020
China	2013	1200	2014	188 Bn	8.7 m
Asia-Pacific	2012	108	2014	243 Bn	2.7 m
Saudi Arabia	2012	200	2013	14 Bn	0.4 m
Sub-Saharan Africa	2011	250	2014	36 Bn	27 m ¹
South-East Europe	2012	72	2013-14	0.1 to 0.6 p.p. GDP growth	not estimated

Figure 28 1. By 2025 Source: GSMA

One of the studies investigated the potential release of 698-806 MHz spectrum band in the Asia Pacific region¹⁴³. It compared the benefits of allocation of spectrum to mobile sector as compared to the next best use – allocation to digital broadcasting. In this case allocating the spectrum to mobile is estimated to result in an incremental US\$242 billion of GDP in 2020 and 2.7 million more jobs in 2020 compared to the baseline (see Figure 19). In addition, it is expected to support 1.4 million new businesses and contribute an incremental US\$52.3 billion to public funding in 2020.

The potential value would come from the increased adoption of broadband by firms and households – enabled by additional spectrum and hence better speeds, coverage, service and lower costs which lead to increased productivity and cost savings. For example, it is estimated that the small manufacturing sector in Korea would experience a 3% uplift in productivity between 2014 and 2015, which would directly translate to increased profit and GDP per person. In addition to productivity and cost effects, the proliferation of mobile broadband would stimulate business activity more internet start-ups created and existing businesses seeing an improved online sales channel with which to reach more customers at a lower cost.

The importance of harmonisation of spectrum across the region through coordinated action of Asia Pacific countries is emphasised in the study. Fragmentation can lead to the loss of the aforementioned benefits through reduction in economies of scale. It is estimated that for a single country not harmonising spectrum allocation to the wider region, the loss of benefits could be as high as 30%.

The study also highlights the economic benefits of releasing the spectrum as early as possible. Delaying by one year and allocating the spectrum in 2015 will lead to an incremental loss of GDP of

US\$40 billion and 200-500k potential jobs. Delaying by two years to 2016 will have an even more adverse effect.

Another GSMA study focused specifically on effects in China¹⁴⁴. Because of the size of population and rapid economic growth China is witnessing a strong demand for mobile services and hence for spectrum. In fact it was estimated that demand for spectrum in China will rise to more than 1,800 MHz, whereas China currently has only about 700 MHz available for mobile. It is estimated that if 1200MHz of spectrum were reallocated to the mobile industry, by 2020 the Chinese economy could be gaining an additional RMB 1,181Bn (US\$188 billion), or 1.7% of GDP. Other scenarios were also considered, for example allocation of half of the required spectrum – 600 MHz. In this case the benefits are estimated at RMB 477 billion (US\$76 billion), or 0.7% of GDP. The study also highlights the potential positive effect on employment: it is estimated that release of 1200 MHz for mobile broadband has the potential to create an additional 8.7 million jobs in China by 2020 (direct and indirect). This number goes down to a still impressive 3.5 million in case of just a 600MHz release.

Sub-Saharan Africa (SSA) is another region where mobile broadband (MBB) has special importance and spectrum is an economic priority. For historical reasons penetration of fixed broadband is relatively low. In 2012 mobile broadband accounted for approximately 90% of total broadband connections. However, the demand for MBB is constrained by the availability of spectrum. According to the GSMA¹⁴⁵, a typical SSA country has 360 MHz available for MBB, whereas most developed countries have around 550 MHz. Release of spectrum in this region could result in additional US\$36 billion of GDP in 2020 alone, an increase of GDP per capita of 2.7% by 2020 and potentially millions of jobs.

143. "The Economic Benefits of Early Harmonisation of the Digital Dividend Spectrum & the Cost of Fragmentation in Asia-Pacific". GSMA and BCG study, May 2012.

144. "The Socio-economic Impact of Allocating Spectrum for Mobile Broadband Services in China". GSMA and China Academy of Telecommunication Research of MIIT, January 2013.

145. The Benefits of Releasing Spectrum for Mobile Broadband in Sub-Saharan Africa". GSMA and Plum, December 2011.

ACCELERATING GROWTH

PLANNING FOR FUTURE GROWTH

Given that changes to spectrum policies can take years to implement, new ways must be developed now to plan for future growth in spectrum requirements and any plan to satisfy this demand will need to combine several approaches. These will likely include reallocating frequencies currently used for other purposes, such as radio and television, to access new mobile spectrum, or refarming existing licence conditions to enable more efficient use of the current mobile spectrum. Another approach is to expand the current capacity to offload data by vastly increasing the implementations and usage of WiFi networks in urban areas, or by using 'Small cells' (Femtocells, Picocells and Microcells) – small radio access points that work on licenced mobile frequencies but cover very short distances. These often cover the inside of a single building and research firm Arc Chart estimate there will be five million shipments of small cells annually by 2017¹⁴⁶.

These and other innovative approaches that are developed, however, require a fair, transparent and appropriate regulatory approach to ensure that they can be invested in to meet the challenges ahead. There is a broad consensus confirmed by all traffic surveys that mobile data consumption will continue to increase at exponential rates. The GSMA is running a global 'Spectrum for Mobile Broadband' campaign to ensure this issue is addressed. Governments, regulators and other industry groups need to be working now to identify and secure mobile spectrum to fulfil future capacity requirements to meet the growing demand and ensure that future growth is not restricted.

6.2

Avoiding Unnecessary Restrictions on Network Management

Net neutrality – the idea that all Internet traffic should be treated equally – is often raised in relation to mobile and fixed communications network management regarding the prioritisation of traffic. One argument is that legislation is necessary to ensure that all data on the Internet is treated in the same way, but the reality is that traffic management is a necessary requirement where capacity constraints exist, as they do – especially in mobile networks. This is not the same as blocking access to content or restricting freedom of speech on the Internet.

Mobile operators already have to prioritise between types of data (i.e. voice vs. data) and types of user (i.e. handset or application type) in order to ensure the levels of service that consumers expect. Looking forward, in order to be able to maintain these

service levels mobile operators need to be free to innovate and create pricing models that are better aligned with the services that the consumer is both wanting to use and willing to pay for, as in any business. By creating pricing models that are based for example on the type of content downloaded, the time of day or the speed of access and by offering premium services such as prioritised downloads, mobile operators can more sustainably provide new services that increase consumer choice.

The mobile industry is a strong supporter of an open Internet, but the flexibility to manage traffic and innovate on the network and in customer propositions is required to keep it open and effective.

146. HetNet Market Summary & Forecasts: Macro Cells, Small Cells & Wi-Fi Offload. Arc Chart. October 2012.

6.3

Enabling Effective Competition through Market Consolidation

Consolidation is an often observed feature of maturing industries that require high levels of capital investment. As the mobile industry has grown, so has the investment required – for example, annual capital expenditure across the mobile ecosystem is expected to reach US\$238 billion by 2017, as described in chapter 3. With the prices realised for each GB of traffic carried in rapid decline, partly due to rapid volume growth and partly due to intense retail price competition in almost all geographies, operators and their vendors are constantly seeking network efficiencies.

In this context, it is important for operators to understand the potential benefits of consolidation, which could enable such efficiencies to be realised. It is of course equally important that regulation ensures healthy competition within the industry, but a balance must be struck that allows for the natural evolution of the mobile industry – particularly in areas with a high proliferation of mobile operators such as in Europe. Neelie Kroes, the Vice-President of the European Commission said in the New York Times “Having a few pan-European operators that are strong in the cross-border market would not necessarily be bad for competition”¹⁴⁷.

Getting this balance right is key to creating an industry that is able to reinvest in the services of the future from which the consumer will benefit. An A.T. Kearney report for ETNO identified that consolidation in Europe could deliver pre-tax savings of approximately €5 billion per annum by 2020¹⁴⁸ – savings that could be used to re-invest in the future of the industry.

Ensuring the mobile industry remains competitive is vital if it is to remain a vibrant and innovative industry. But a trade-off exists between increased competition and the leveraging of economies of scale. In some countries, network sharing agreements or joint ventures are already enabling efficiencies but in many markets there will need to be a reduction in the number of network operators – ideally via consolidation or alternatively via exits. For example, in Cambodia there were at one point eight mobile operators competing in a market of fewer than 15 million people, creating a price war that threatened to make it uneconomic to run a mobile network, especially given the high operating costs of running a network in a country without a ubiquitous electricity network. Eventually the operator Mfone became insolvent and its subscribers were acquired by a competitor, while another operator, Latelz Co. Ltd., was acquired by a competitor as the market starts to undergo natural consolidation¹⁴⁹.

147. Mergers of European Mobile Carriers Expected to Grow. The New York Times. June 2012.

148. A Future Policy Framework for Growth: Keynote Address at the FT ETNO Summit 2012. A.T. Kearney. October 2012.

149. Frenzied competition and unsustainable price wars delight consumers but thin the ranks of operators, with Thaicom unit Mfone among the casualties. Bangkok Post. February 2013.

6.4

Supporting Innovation with a Common Position on IPR

As a result of a number of high-profile lawsuits in relation to the so-called “Patent Wars” in the telecommunications industry, Intellectual Property Rights (IPR) have recently risen in prominence and garnered the public’s attention. The GSMA has set up an Intellectual Property Rights Working Group to bring together the leading IPR experts from major operators and manufacturers across the globe, to address the industry’s approach to IPR and ensure the continued health of the operator community, its suppliers and customers.

The GSMA is also continuing to reach out to the ecosystem in order to muster support for a common position amongst operators,

manufacturers and regulators aimed at maintaining a balanced IPR regime within the telecommunications industry, which will ensure that IPR-related disruption is kept to a minimum for the benefit of the whole mobile ecosystem. A fair and robust IPR regime is paramount in order to encourage innovation. The telecommunications ecosystem must ensure that the IPR regime affords appropriate compensation to those who invest in the development of new technology, while safeguarding against the potential disruptive effects or excessive costs if patent charging is prohibitively high.

6.5

The Importance of Best Practice Taxation

As discussed earlier in the report, mobile usage continues to grow around the world and in particular in developing countries where it can have a profound socio-economic effect. In order to be able to reach the poorest, whose lives the mobile phone has the most potential to change, the cost of mobile technology must remain low. Mobile operators and the rest of the mobile ecosystem have worked to deliver this via the development of low-cost handsets and micro-top-up pricing models, but this effort is negated if government increases the cost of ownership via heavy taxes on mobile use or on the investment in mobile infrastructure.

The GSMA supports a best practice tax approach, encouraging governments not to impose taxes on the mobile industry/consumer above and beyond the taxation levels for other commercial enterprises. While to an observer this might initially be seen as self-interest, it is clearly also in the interests of extending the mobile franchise to the poorest in society, with all the benefits this brings to the individual.

Furthermore, it is also in the interest of the governments in question. By keeping the cost of ownership as low as possible, an increased number of citizens will be able to benefit from the

mobile phone, which will in turn drive economic development – generating more tax than would have been collected via taxing the mobile itself. A recent report by the GSMA in Latin America showed that an increase in mobile taxation in several countries had coincided with stalled growth or even contractions in both mobile penetration and usage in these countries, whereas the removal of taxes on mobile in other countries (e.g. Ecuador and Uruguay) had coincided with dramatic increases in both – with Uruguay for example seeing Minutes of Use per month increase from around 35 to 130 between 2007 and 2011, with a usage tax being abolished in 2008¹⁵⁰.

The GSMA has long argued that there is a clear link between the taxation of mobile services and the rate of growth of the mobile industry in a country. Excessive taxation on mobile services – in the developing world in particular – is ultimately counterproductive. It limits the significant impact that mobile technology can have on the poorest in society, restricts economic development that could otherwise be achieved for the benefit of all and ultimately governments lose out on the benefits of growth which would have outweighed the short-term benefits of tax receipts.

150. 2012 Latin America Tax Report. GSMA, prepared by Deloitte. December 2012.

7 GLOSSARY

2G	2nd Generation Mobile Telecommunications
3G	3rd Generation Mobile Telecommunications
4G	4th Generation Mobile Telecommunications
AR	Augmented Reality
ARPU	Average Revenue per User
ARPS	Average Revenue per Subscriber
Botnet	A linked network of devices infected with malware
BYOD	Bring Your Own Device – the policy of permitting or mandating the use of personal mobile phones in the workplace to access company IT networks
CAGR	Compound Annual Growth Rate
Capex	Capital Expenditure
CCF	GSMA Connected Car Forum
CIS	Commonwealth of Independent States
Codec	A computer program that encodes or decodes a digital data stream
DEWN	Disaster Emergency Warning Network
EB	Exabyte – a unit of measure of data
EEA	European Economic Area
EIU	Economist Intelligence Unit, a research company
EOC	Emergency Operations Centre – Sri Lanka
ETNO	European Telecommunications Network Operators' Association
GB	Gigabyte – a unit of measure of data
GDP	Gross Domestic Product
GPS	Global Positioning System
GSM	Global System for Mobile Communications, second generation standard for networks
HD	High Definition

HSPA	High-Speed Packet Access – a technical standard for mobile communication based on 3G, but with improved network speeds
HSPA+	Evolved High-Speed Packet Access – a technical standard for mobile communication based on 3G and evolved out of HSPA, but with network speeds that are more comparable with 4G.
HTML5	Fifth revision of the HTML standard (a next generation Internet technology)
ICT	Information and Communications Technologies
IDC	International Data Corporation, a telecommunications research company
IEA	International Energy Agency – an intergovernmental energy policy organisation
IMEI	International Mobile Equipment Identity, a unique identifier for a mobile phone
IMS	IP Multimedia Subsystem
Kbps	Kilobits per second – a unit of measure of data transfer speed
LTE	Long Term Evolution, “4th generation” standard for wireless communications technology
M2M	Machine-to-Machine transmission
MB	Megabyte – a unit of measure of data
MBB	Mobile Broadband
Mbps	Megabits per second – a unit of measure of data transfer speed
MEE	Mobile Energy Efficiency – a service provided by the GSMA to support and measure progress against energy efficiency targets

7 GLOSSARY

MEF	The Mobile Entertainment Forum – the global trade association for companies that deliver product and services via mobile
MEP	Member of the European Parliament
MHz	Megahertz
MMS	Multimedia Messaging Service
Mobile ecosystem	Please see Report Methodology Framework section for definition
MoU	Minutes of Use
MPERS	Mobile-based Personal Emergency Response System
MTR	Mobile Termination Rate – charges that a mobile operator pays for terminating calls on another mobile operator's network
NFC	Near Field Communication
NGO	Non-Governmental Organisation
OEM	Original Equipment Manufacturer
Opex	Operational Expenditure
OPIS	Oil Price Information Service
OS	Operating System
OTT	Over The Top, or 'value added' – a type of mobile service
PAYD	Pay As You Drive
PB	Petabyte – a unit of measure of data
Phishing	A type of fraud where an email is received, asking for personal details or asking the receiver to follow a link then enter their details
PIN	Personal Identification Number
QR	Quick Response code – a matrix barcode
RCS	Rich Communications Suite
SAC	Subscriber Acquisition Cost
SAS	GSMA Security Accreditation Scheme
SIM	Subscriber Identity Module
Small cells	Femtocells, Picocells and Microcells – types of low-powered radio access nodes
Smart card	Refers to SIM (2G) and USIM (3G) cards
Smartphone	Typically a high-end mobile device with more advanced computing ability and
Smishing	A type of fraud that is based on Phishing but the initial message is via SMS
SRC	Subscriber Retention Cost
SRS	Spam Reporting Service
SSA	Sub-Saharan Africa
USIM	Universal Subscriber Identity Module
VAT	Value Added Tax
VC	Venture Capital
VNI	Visual Networking Index
VoLTE	Voice over Long Term Evolution, a standard for delivering voice calls over LTE networks
WIFI	A generally-used synonym for WLAN
WLAN	Wireless Local Area Network

8 APPENDIX – DEFINITION OF REGIONS

Africa	Algeria, Angola, Benin, Burkina Faso, Cameroon, Congo, Democratic Republic, Côte d'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Libya, Madagascar, Mali, Morocco, Mozambique, Nigeria, Senegal, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zambia, Zimbabwe
Asia Pacific	Australia, Bangladesh, China, Hong Kong, India, Indonesia, Japan, Korea, South, Malaysia, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam
CIS	Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Mongolia, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
Europe	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom
Latin America	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela
Middle East	Afghanistan, Bahrain, Canada, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, United States of America, Yemen
Other Countries	Åland Islands, Albania, American Samoa, Andorra, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bhutan, Bonaire, Sint Eustatius and Saba, Bosnia and Herzegovina, Botswana, Brunei Darussalam, Burundi, Cambodia, Cape Verde, Cayman Islands, Central African Republic, Chad, Cocos (Keeling) Islands, Comoros, Congo, Cook Islands, Croatia, Cuba, Curaçao, Diego Garcia, Djibouti, Dominica, Equatorial Guinea, Eritrea, Falkland Islands, Faroe Islands, Fiji, French Guiana, French Polynesia, Gabon, Gambia, Georgia, Gibraltar, Greenland, Grenada, Guadeloupe, Guam, Guernsey, Guinea, Guinea-Bissau, Guyana, Isle of Man, Jersey, Kiribati, Korea, North, Kosovo, Laos, Lesotho, Liberia, Macao, Macedonia, Malawi, Maldives, Marshall Islands, Martinique, Mauritania, Mauritius, Mayotte, Micronesia, Monaco, Montenegro, Montserrat, Myanmar, Namibia, Nauru, Nepal, New Caledonia, Niger, Niue, Norfolk Island, Northern Mariana Islands, Palau, Palestinian Territories, Papua New Guinea, Puerto Rico, Réunion, Rwanda, Saint Barthélemy, Saint Kitts and Nevis, Saint Lucia, Saint Martin, Saint Pierre and Miquelon, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tomé and Príncipe, Serbia, Seychelles, Sierra Leone, Sint Maarten, Solomon Islands, Somalia, South Sudan, Suriname, Swaziland, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Turks and Caicos Islands, Tuvalu, Vanuatu, Virgin Islands, British, Virgin Islands, U.S.

8 APPENDIX – REPORT METHODOLOGY

MOBILE ECOSYSTEM

The mobile ecosystem considered in this report includes the following companies:

- Mobile operators
- Suppliers of infrastructure and support services, including public and enterprise network equipment and support services for this infrastructure and ICT infrastructure consultants
- Wireless handset device manufacturers
- Distributors and retailers of wireless handset devices
- Providers for mobile content and service applications, such as mobile internet advertising, mobile TV, mobile music and ring tones, and wireless and mobile games

SOCIO-ECONOMIC CONTRIBUTION INDICATORS

Calculation of economic contribution indicators – namely revenue, capex, employment and public funding – is based on the mix of primary data obtained from mobile operators for previous joint GSMA and A.T. Kearney studies as well as A.T. Kearney research and secondary data from such sources as GSMA Wireless Intelligence, ITU, Gartner, Pyramid and IDC. Where new information has become available that could materially impact the accuracy of forecasts, this has been used and as a result some of the previous estimates made by the GSMA and A.T. Kearney have been updated.

FRAMEWORK FOR CALCULATING THE MOBILE ECOSYSTEM'S VALUE ADD

To determine the mobile ecosystem's supply-side effects on the economy, the economic direct value add of mobile operators and wider ecosystem (content and services, distribution, device manufacturing and network infrastructure) was estimated based on proxy companies across the value chain in various AP17 countries.

A multiplier was then applied to the direct contribution of the mobile ecosystem to estimate its impact on other industries.

However, as mobile devices become a daily tenet of the mobile-enabled working population's everyday lives, the potential for improvement in overall productivity needed to be accounted for. Thus, the percentage of mobile workers in each country's

workforce and their average GDP contribution was estimated (total GDP divided by total workforce) and multiplied by an estimated productivity gain from mobile usage. The productivity gain factor used was approximately 4% for developed countries and 7.6% for emerging countries based on a range of percentages used in previous studies (5-10%). A lower productivity gain percentage was used for developed countries based on the fact that, in emerging countries, mobile phones are often the only form of communication, and thus without mobile phones workers in the developing world would be significantly worse off than their counterparts in developed countries who typically have access to fixed line access in the office, at home and outside the home.

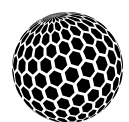
CONNECTION AND SUBSCRIBER FORECASTS

The report has relied extensively on forecasts of customer numbers prepared by GSMA Wireless Intelligence – their methodology is described in detail at wirelessintelligence.com



THE MOBILE ECONOMY

2013



Mobile Economy