



# Global mobile trends

October 2016

Consumer insights



Future view



Megatrends



Industry performance and mobile ecosystem dynamics



Regional views

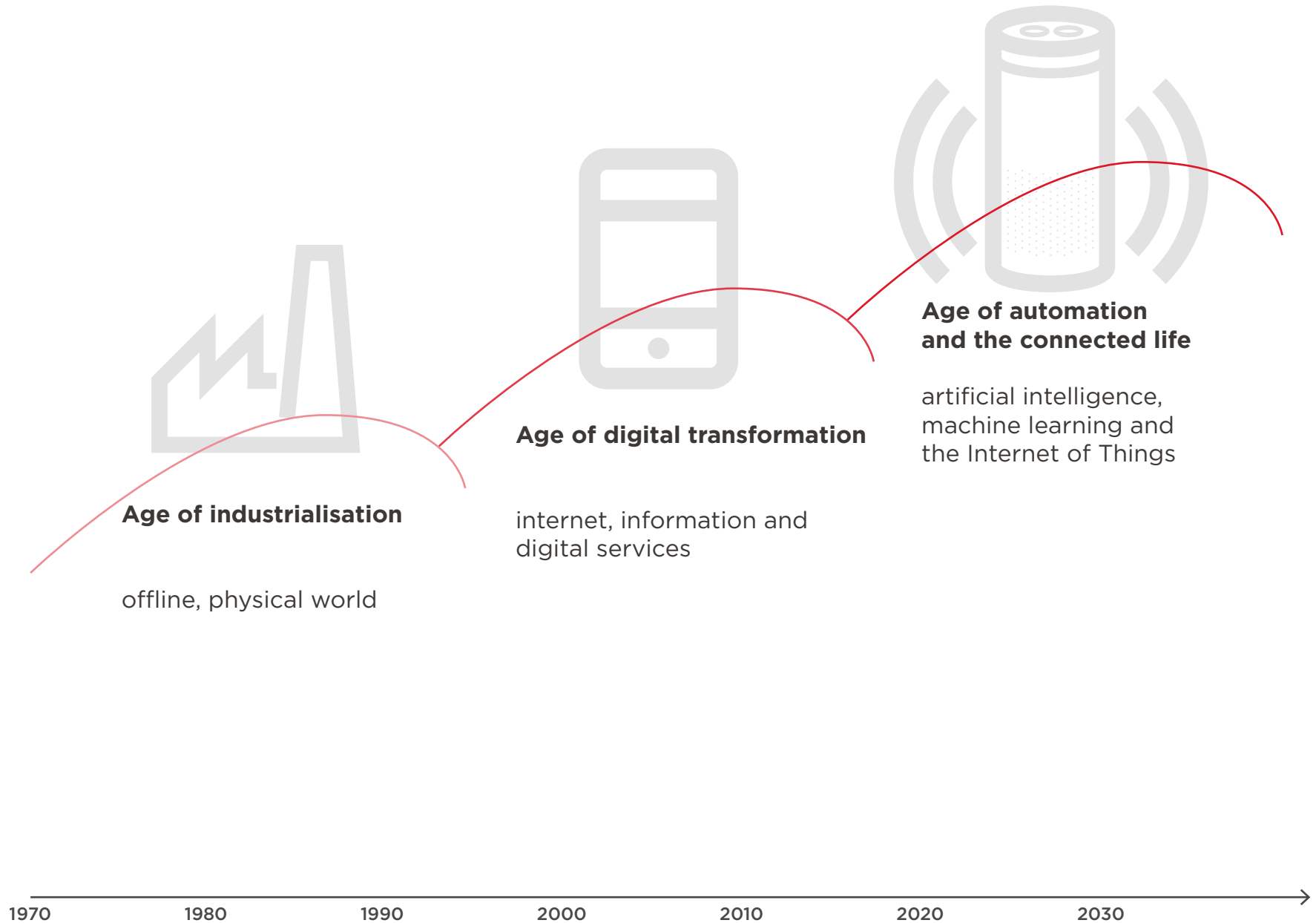


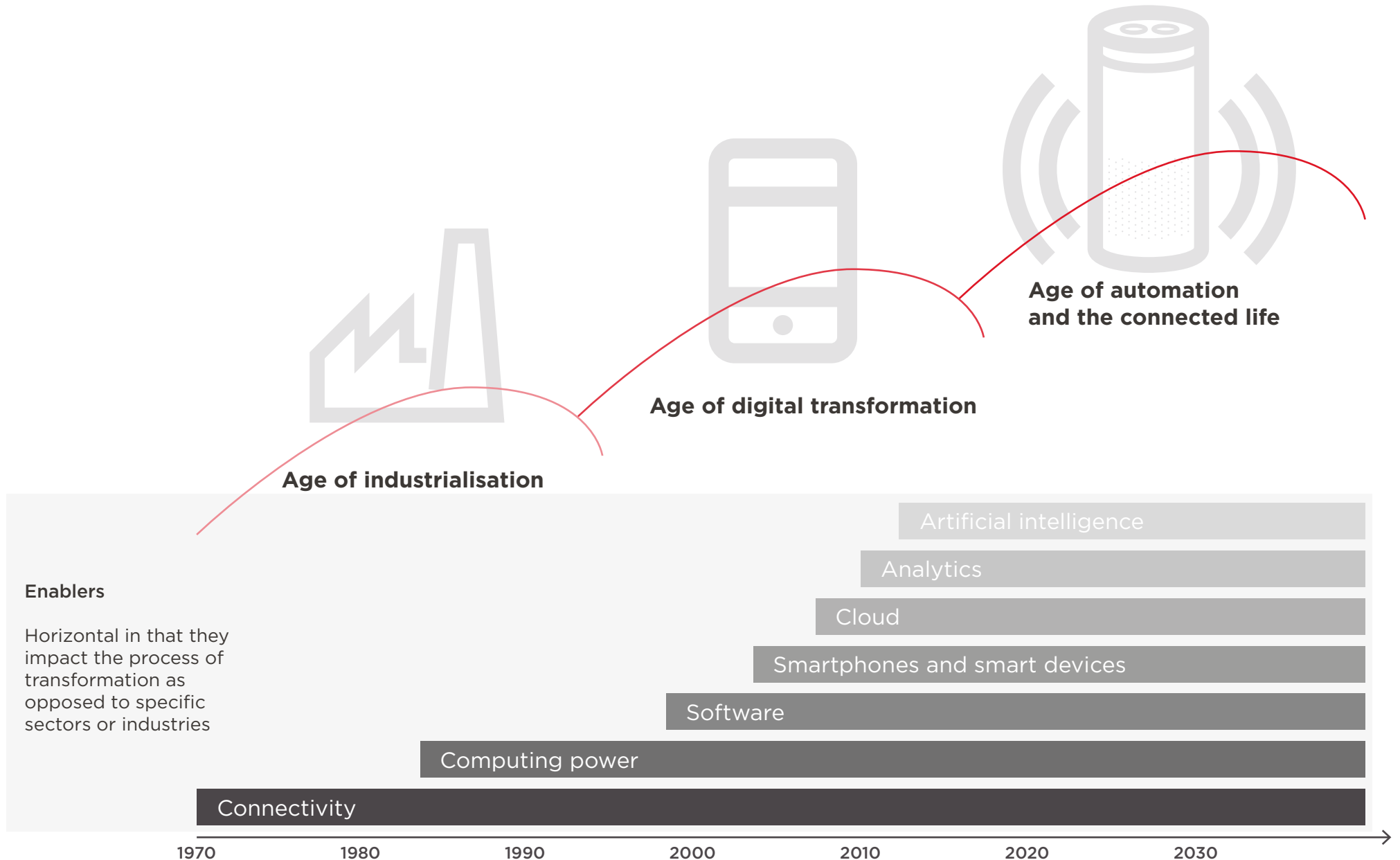
Click tiles to navigate





# Megatrends





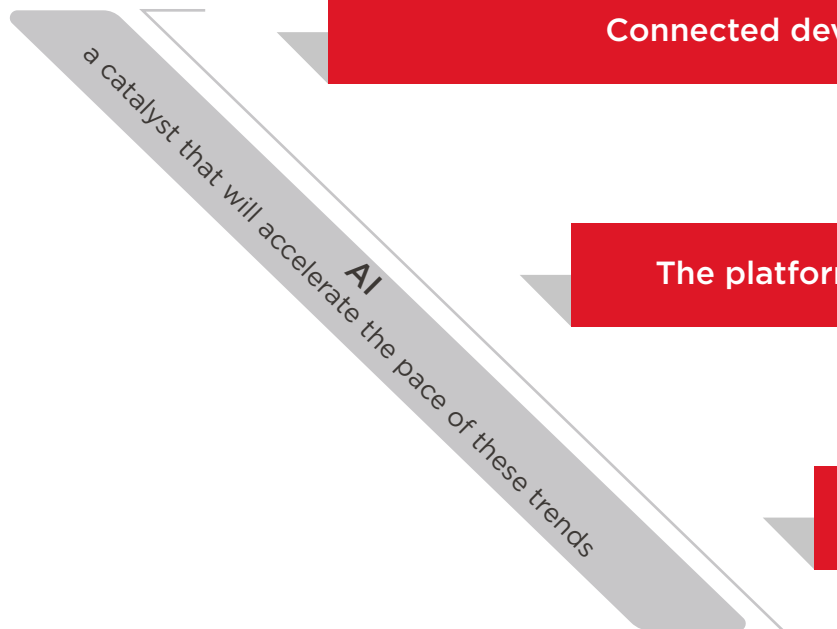
Geographic shift in mobile user growth

The internet is mobile, and mobile is the internet

Connected device explosion

The platform economy: messaging was just the start

'Open' is now moving down to the network level

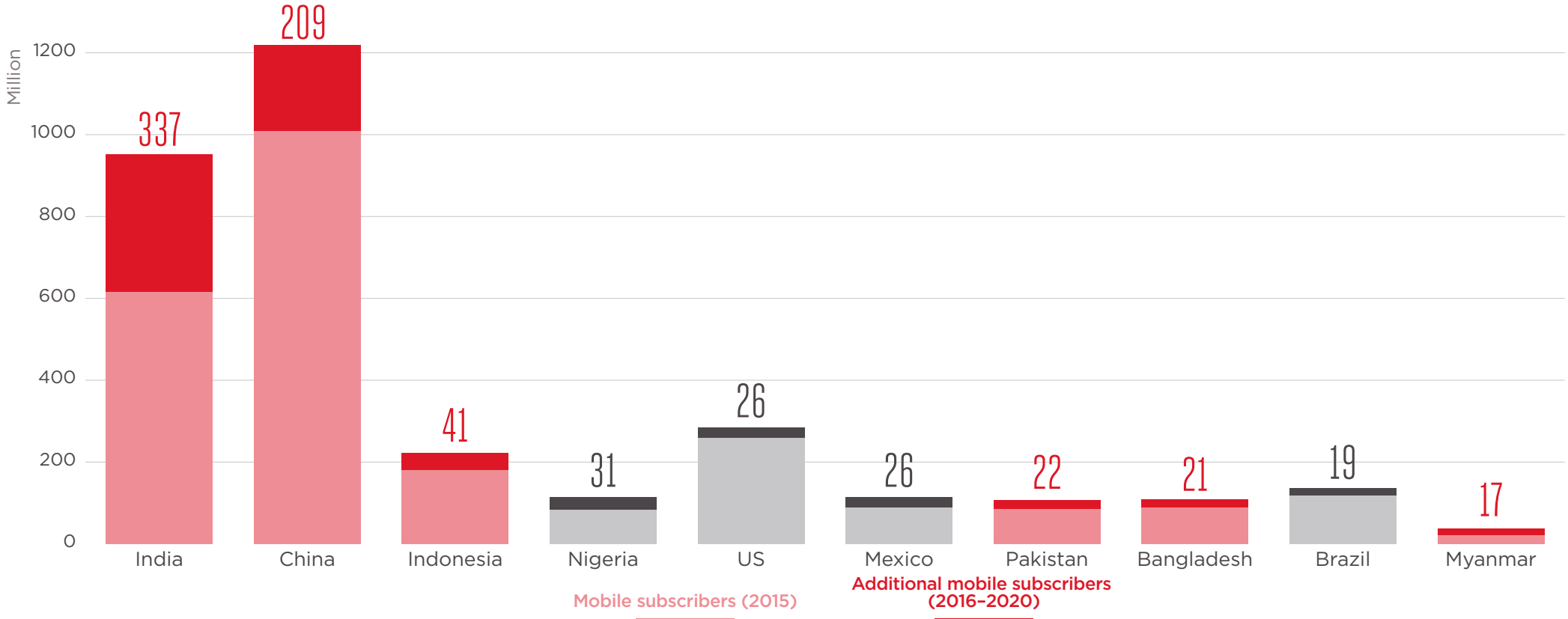


Over 1 billion more people will use mobile phones by 2020 compared to 2015. Ten countries will account for 70% of this growth, with India leading an Asian charge that will account for 55% of global subscriber growth. This will rebalance the concentration of consumer purchasing power and technology innovation.

Note: size of stacked bar equals the total number of unique mobile subscribers in a country by 2020 (e.g. India = 952 million)

## Top 10 countries by projected new mobile subscribers, 2015–2020

Source: GSMA Intelligence, IMF

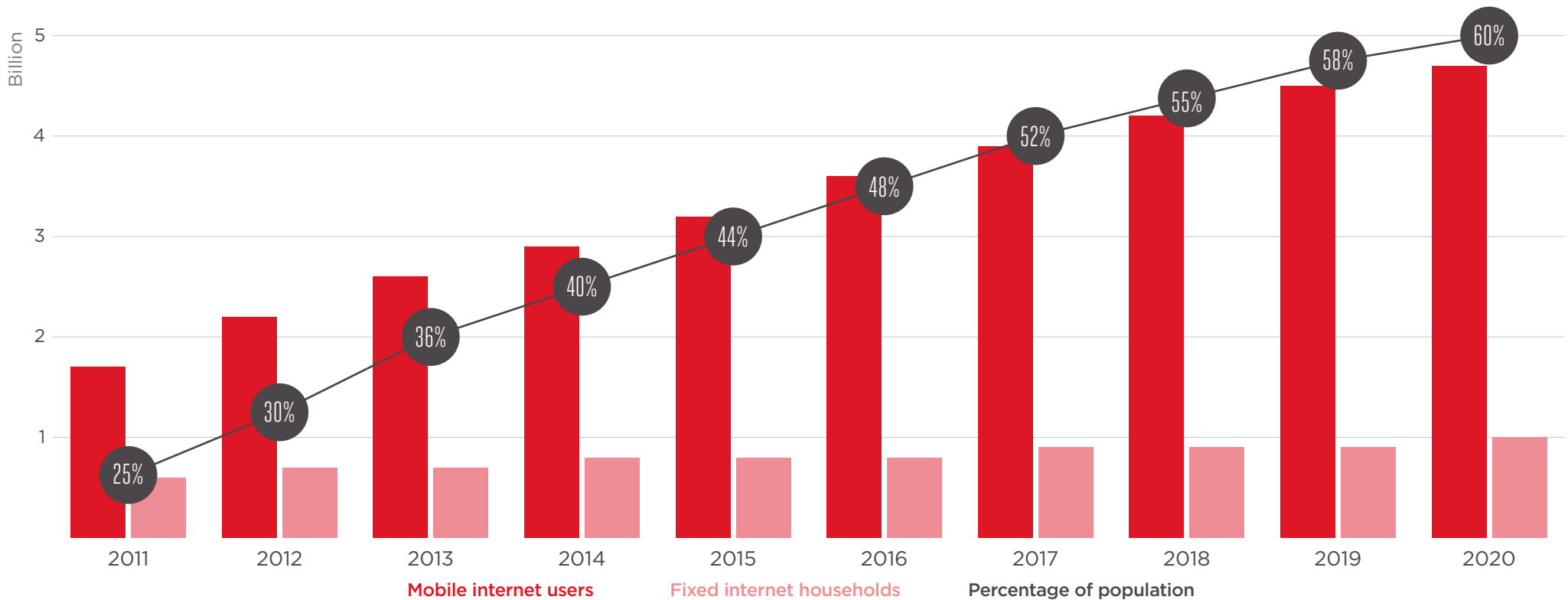


During 2013, access to the internet via mobile phones passed the point of parity with fixed broadband, ending the year at 36% penetration of population against 35% of households with home broadband. This brought 'mobile-first' from concept to reality.

The gulf has since widened, with mobile internet penetration reaching 44% by the end of 2015. By 2020 we expect it to be 60%, with smartphones the *only* access point for many in emerging markets. For an entire generation, the internet is now inextricably linked with mobile and vice versa.

## Projected mobile internet users and penetration worldwide

Source: GSMA Intelligence, United Nations, Telegeography

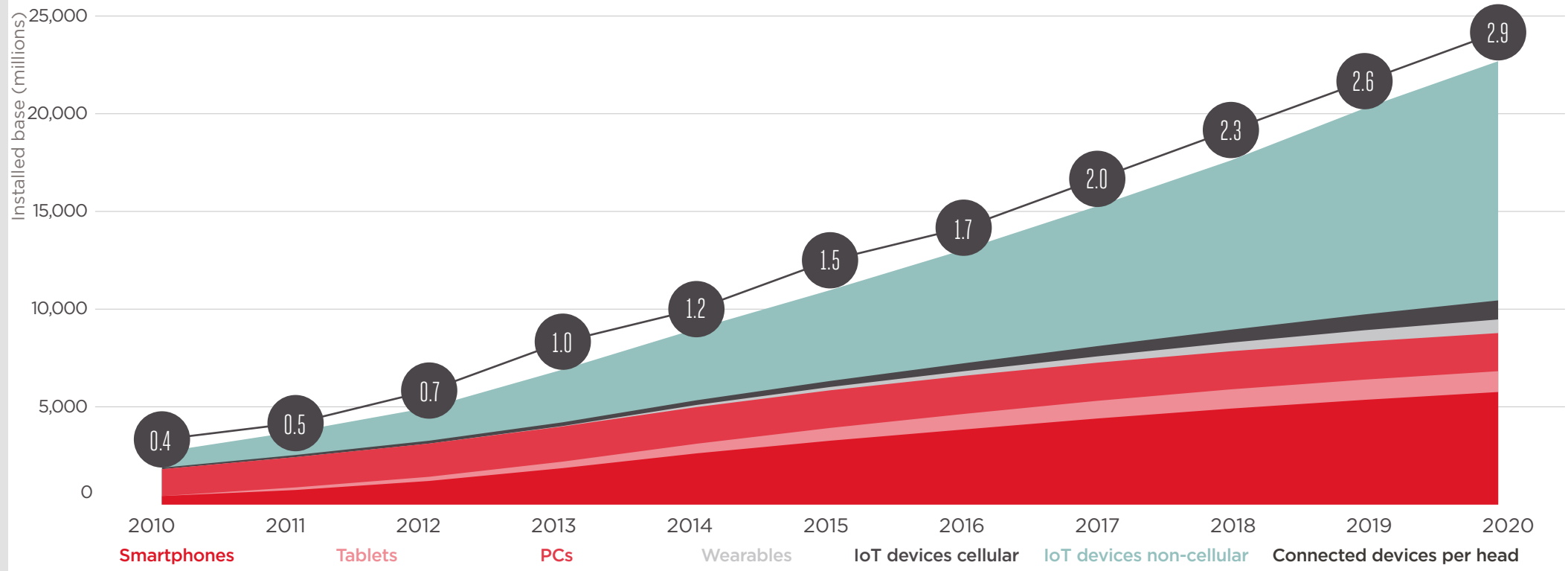




Manufacturing processes are building connectivity into new 'things', in the car, at home and in the workplace, as standard practice. This means the consumer will have a greater variety of connected devices - on average three by 2020 versus 1.5 in 2015 - providing improved efficiency and controlled automation in daily life.

## Connected devices worldwide

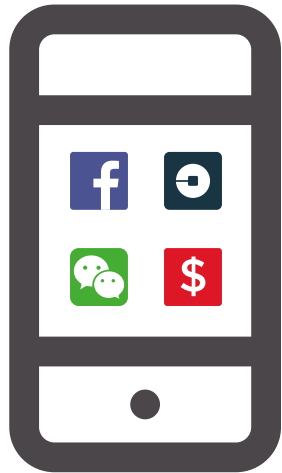
Source: GSMA Intelligence, Cisco, Machina Research, Ericsson



# The platform economy: messaging was just the start

The platform economy uses smartphones, software and open APIs to create and scale new digital marketplaces for a huge range of services and products

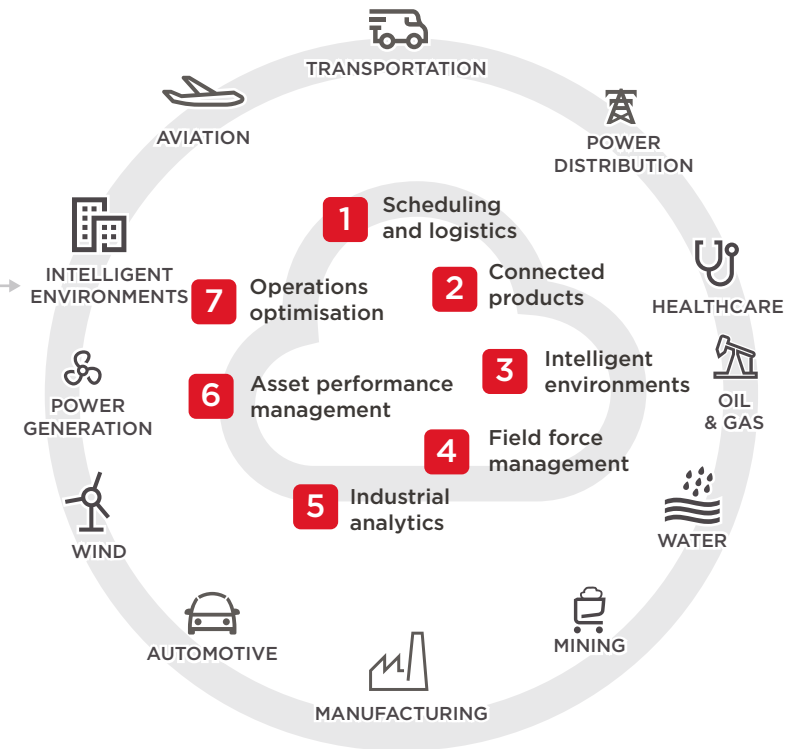
From OTT messaging apps



...to a broad range of consumer-focused sectors reinventing how business is done through digital platforms



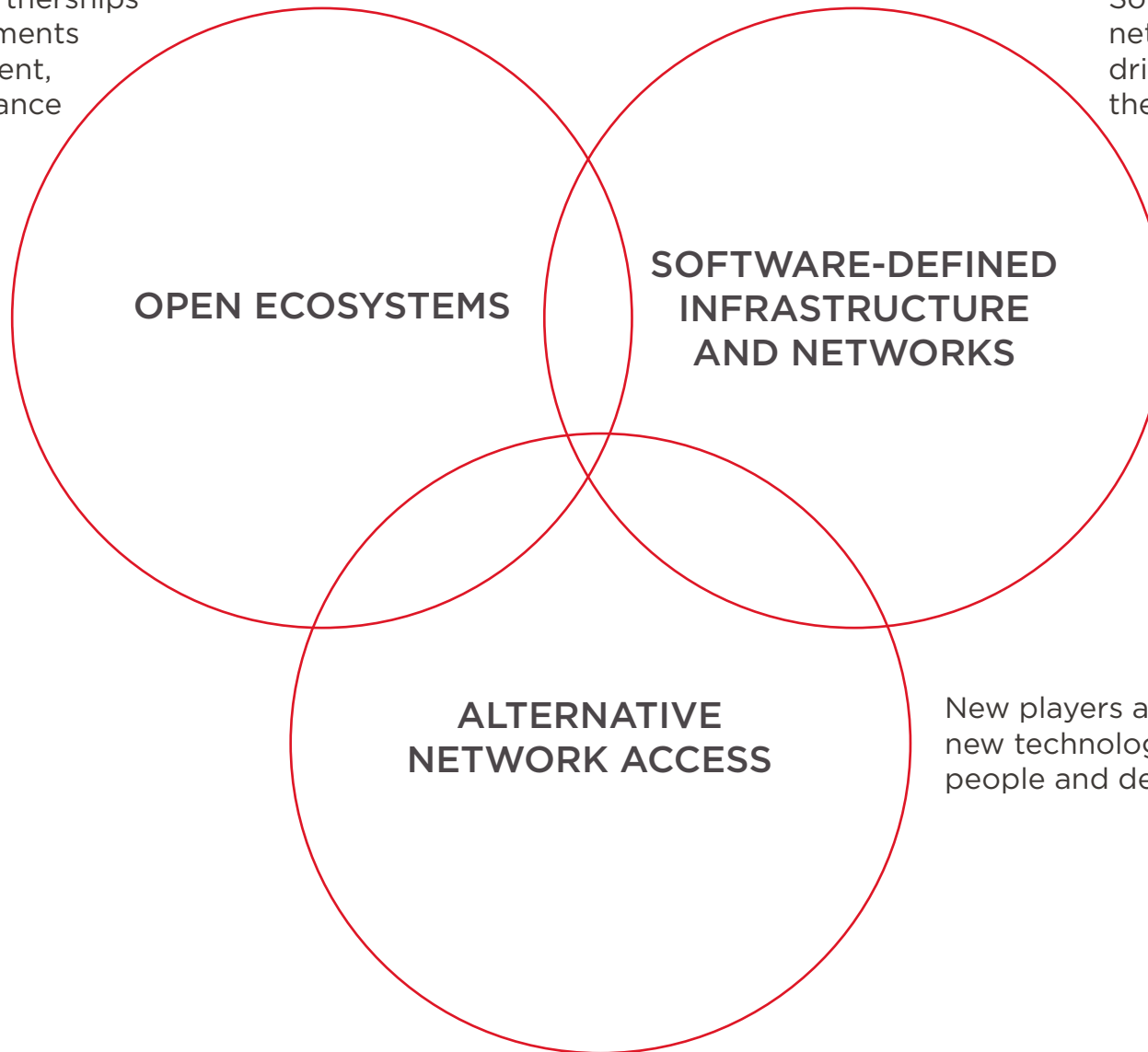
...to major industrial sectors putting analytics and automation in the cloud



Source: Adapted from General Electric

New players and partnerships are driving improvements in network deployment, access and performance

Software-centric networks are likely to drive a wave of innovation: the network as an API



New players are using new technologies to connect people and devices

# Consumer insights



# Consumer insights

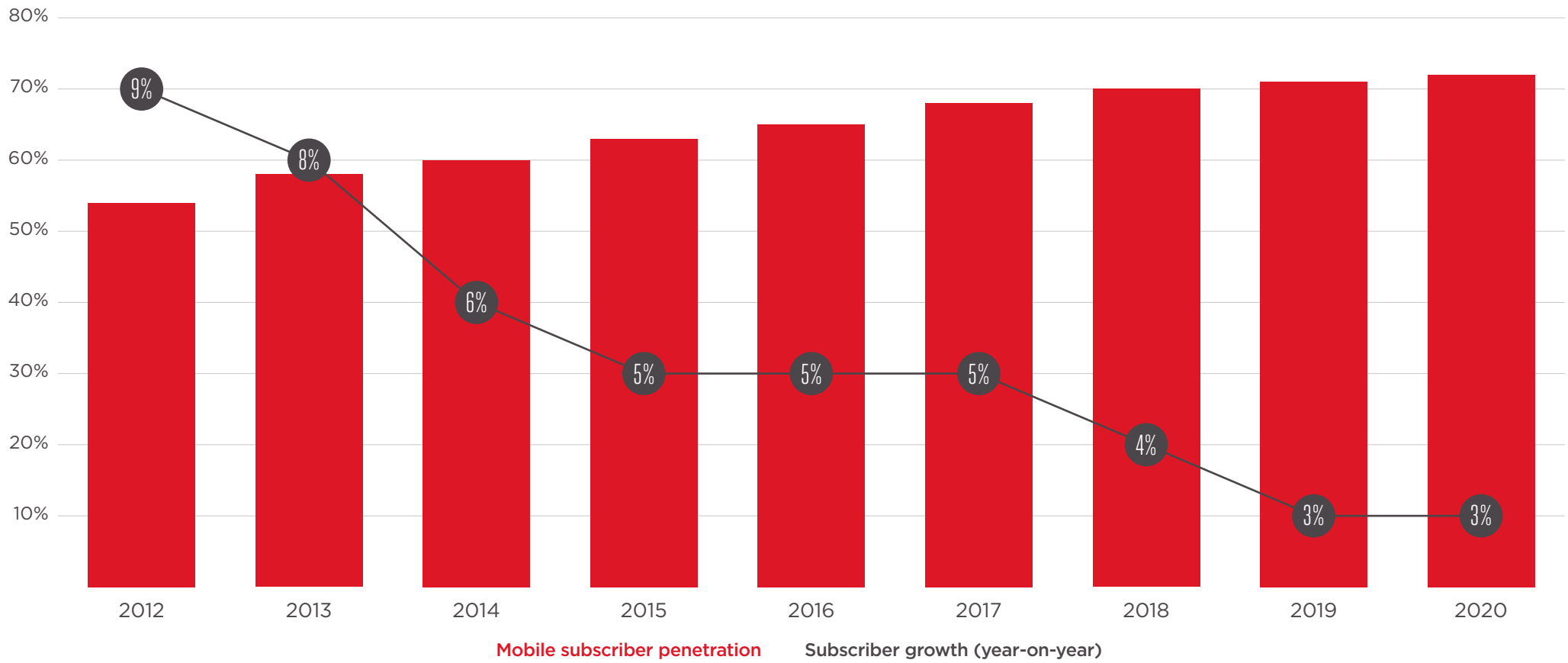
- ↳ Mobile adoption and device ownership



Barring perhaps radio, it is the most prevalent technology on earth.

## Unique mobile subscriber penetration (global average)

Source: GSMA Intelligence

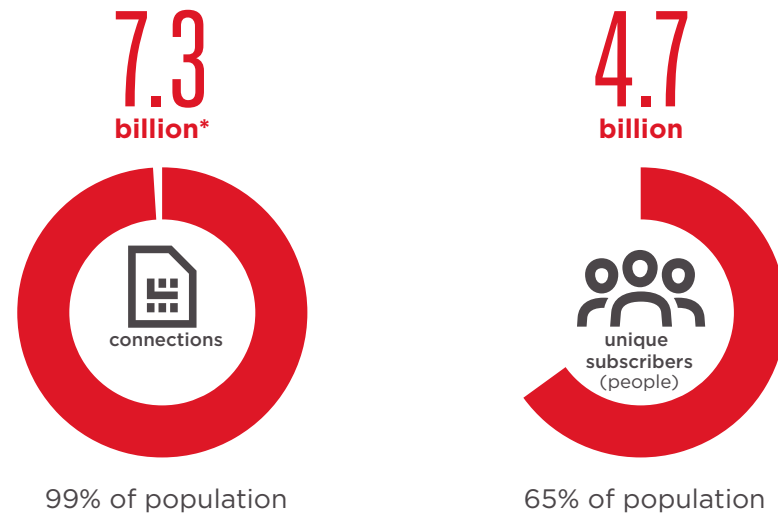


## There is a significant difference between the number of SIM cards and actual people using mobile phones.

There are approximately 7.3 billion mobile connections, which equates to a population penetration of virtually 100%. This overstates the number of actual people (unique subscribers), mostly due to multiple SIM ownership.

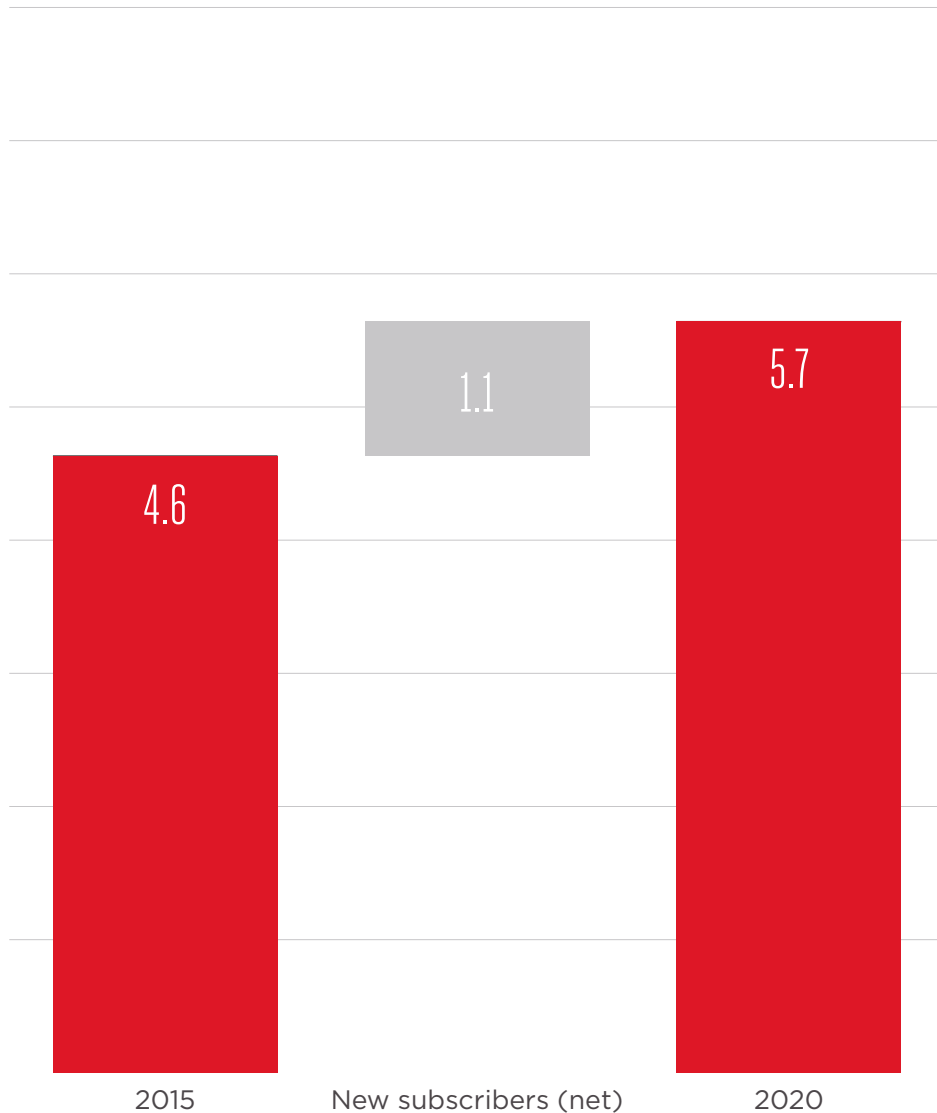
On a unique subscriber basis it is just under two thirds. This is a much better indicator for the actual reach of mobile.

It also implies that there is still headroom for new subscriber growth to the tune of 2.5 billion people.

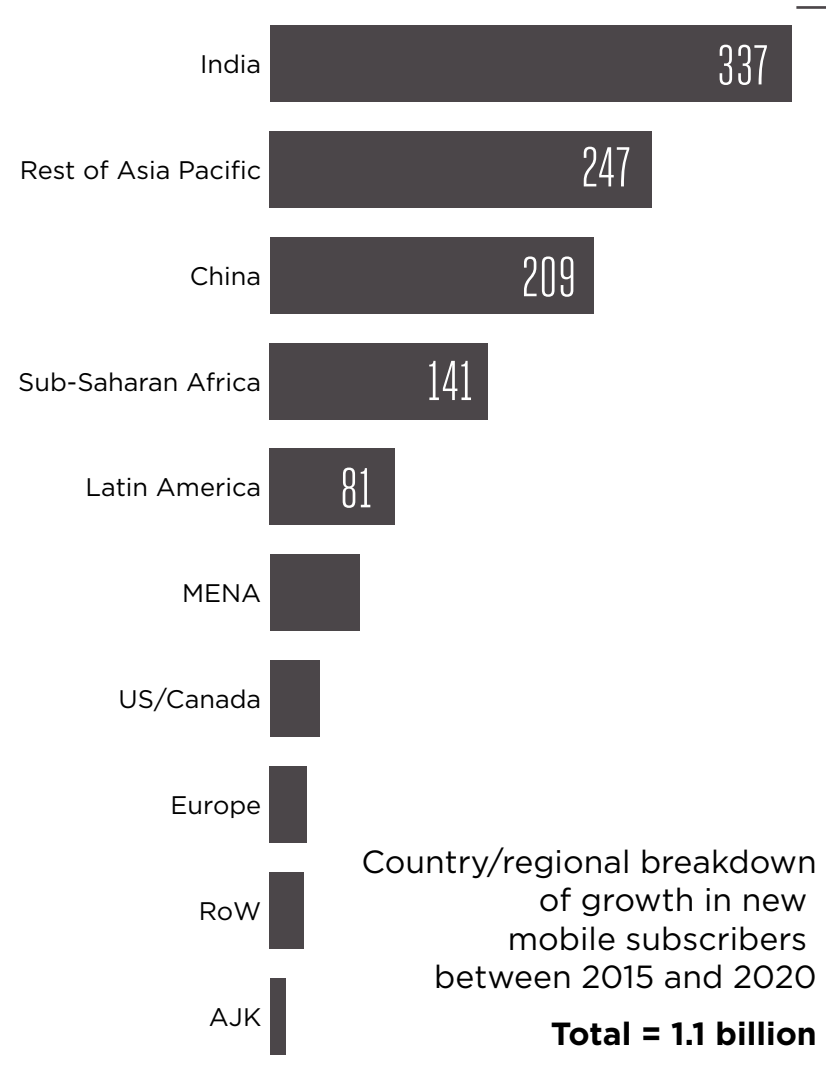


\*Excludes M2M, data as of Q2 2016.  
Source: GSMA Intelligence

**Unique mobile subscribers worldwide, 2015 versus 2020**  
(billion)



**Net growth in mobile subscribers, 2015-2020**  
(million)



Country/regional breakdown of growth in new mobile subscribers between 2015 and 2020

**Total = 1.1 billion**

Note: AJK – Australia, Japan and Korea

Source: GSMA Intelligence

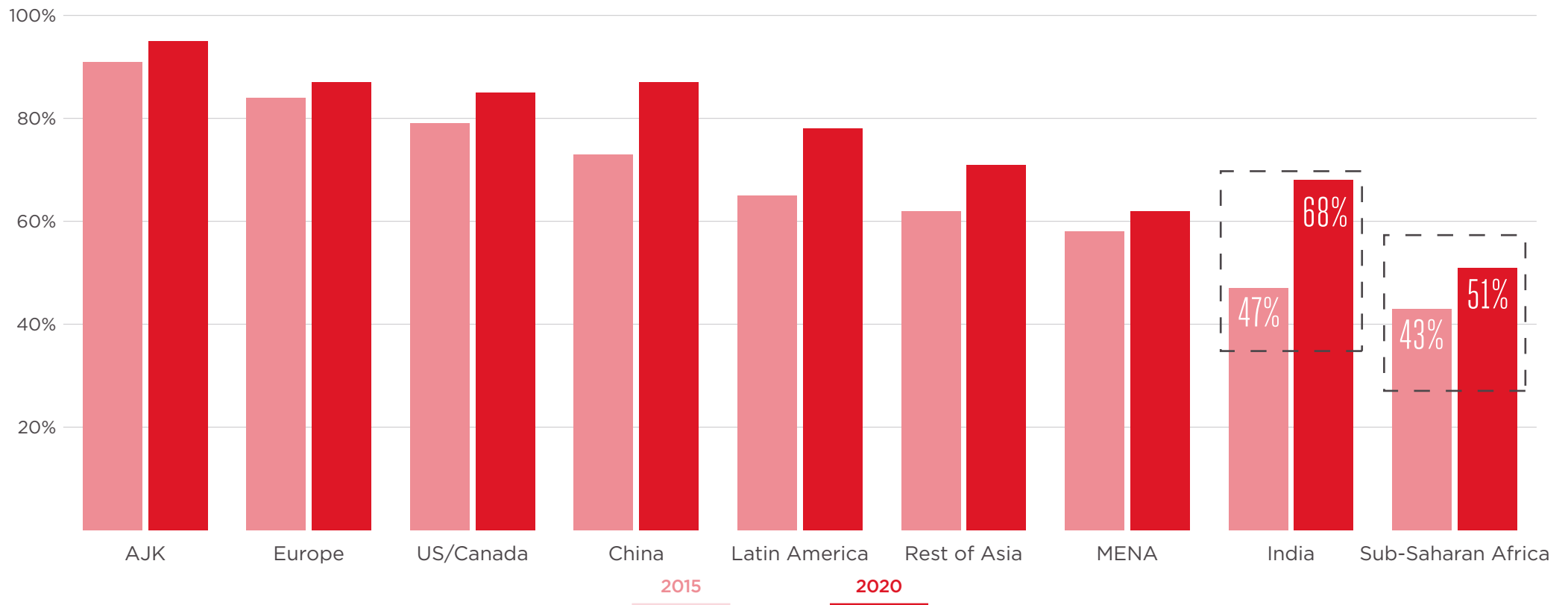


Mobile subscriber growth is falling; we expect it to be on average 3% per annum globally by 2020.

Most headroom exists in India, Africa and a number of other emerging markets, though with greater challenges given tougher conditions to reach populations that are more geographically remote and on lower incomes.

## Unique mobile subscriber penetration, 2015 versus 2020

Source: GSMA Intelligence  
 Note: AJK refers to Australia, Japan and Korea.



# India is the new China, symbolising a geographic shift in influence to Asia

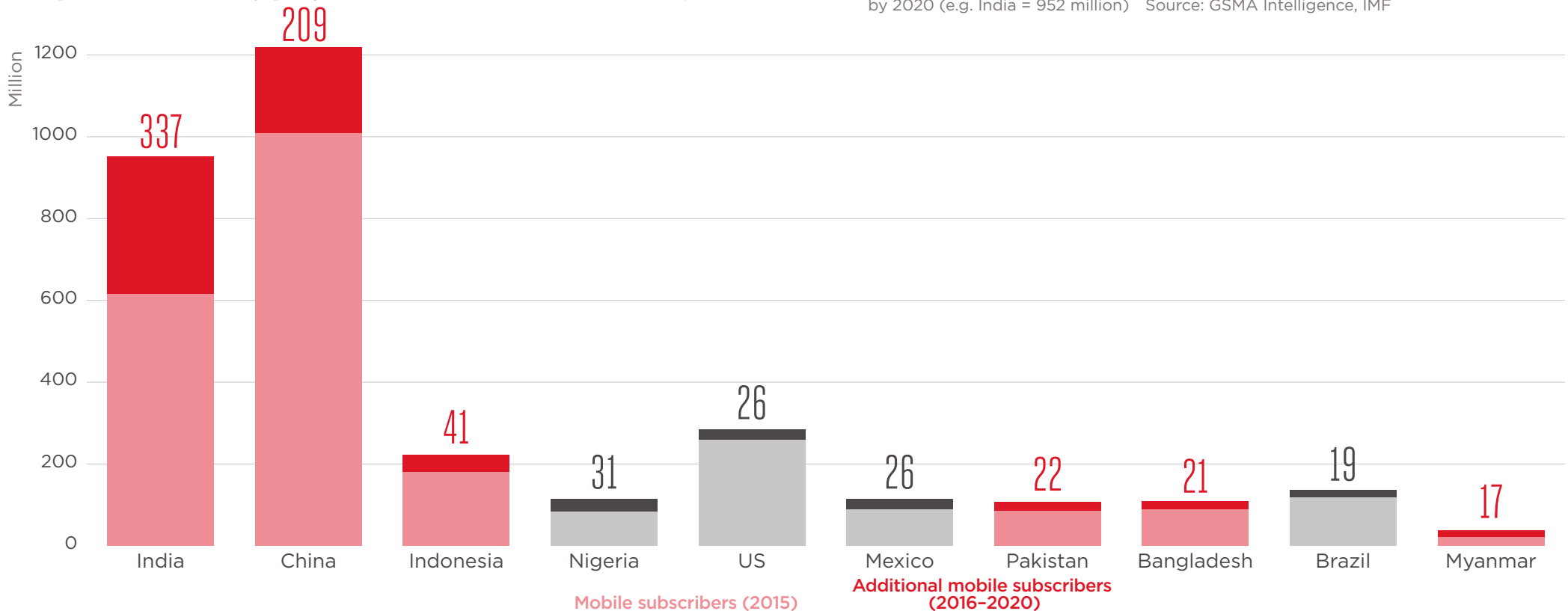
Mobile phone and internet adoption is one proxy for technological and economic advancement.

Ten countries will account for 70% of the growth in new mobile subscribers worldwide, with all bar the US emerging markets.

Six Asian countries will account for 60% of global subscriber growth over the period. India will be the single largest driver, followed by China, but joining these are newer, fast-growth markets – Indonesia, Pakistan, Bangladesh and Myanmar (which only liberalised its telecoms market in 2014).

**Top 10 countries by projected new mobile subscribers, 2015–2020**

Note: size of stacked bar equals total number of unique mobile subscribers in a country by 2020 (e.g. India = 952 million) Source: GSMA Intelligence, IMF



# The Asian consumer: younger, getting richer and using mobile for internet

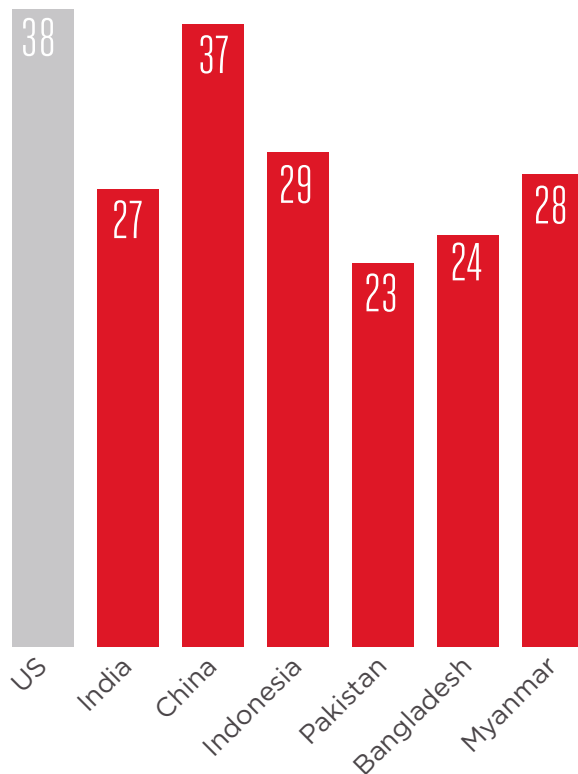
The geographic shift in where the connected consumer resides doesn't just mean more people using mobile phones in new places.

They are younger, own fewer big-ticket items such as cars and houses (and therefore carry less debt) and are more likely to be mobile-first or mobile-only internet users.

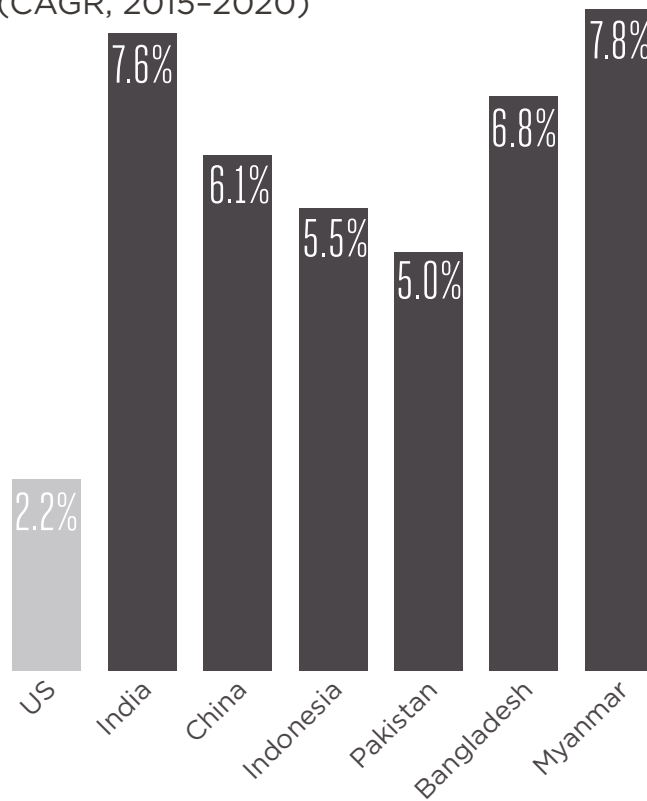
This places an added importance on innovation in how to reach these consumers on mobile, with anything from captivating entertainment to lifestyle and productivity services such as health or employment searching.

Source: GSMA Intelligence, CIA World Factbook, IMF, Trading Economics, ITU

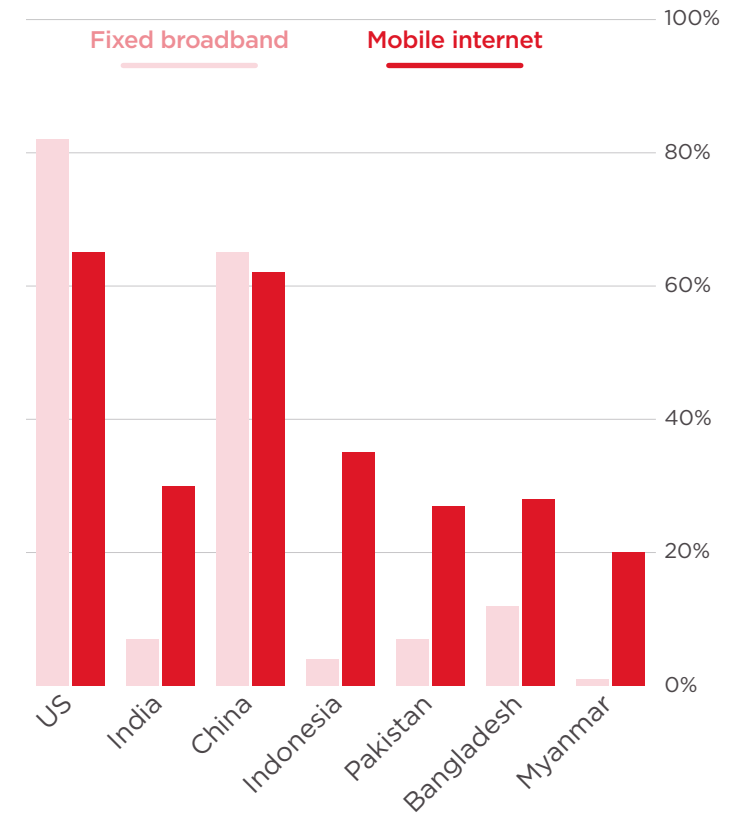
**Median age**



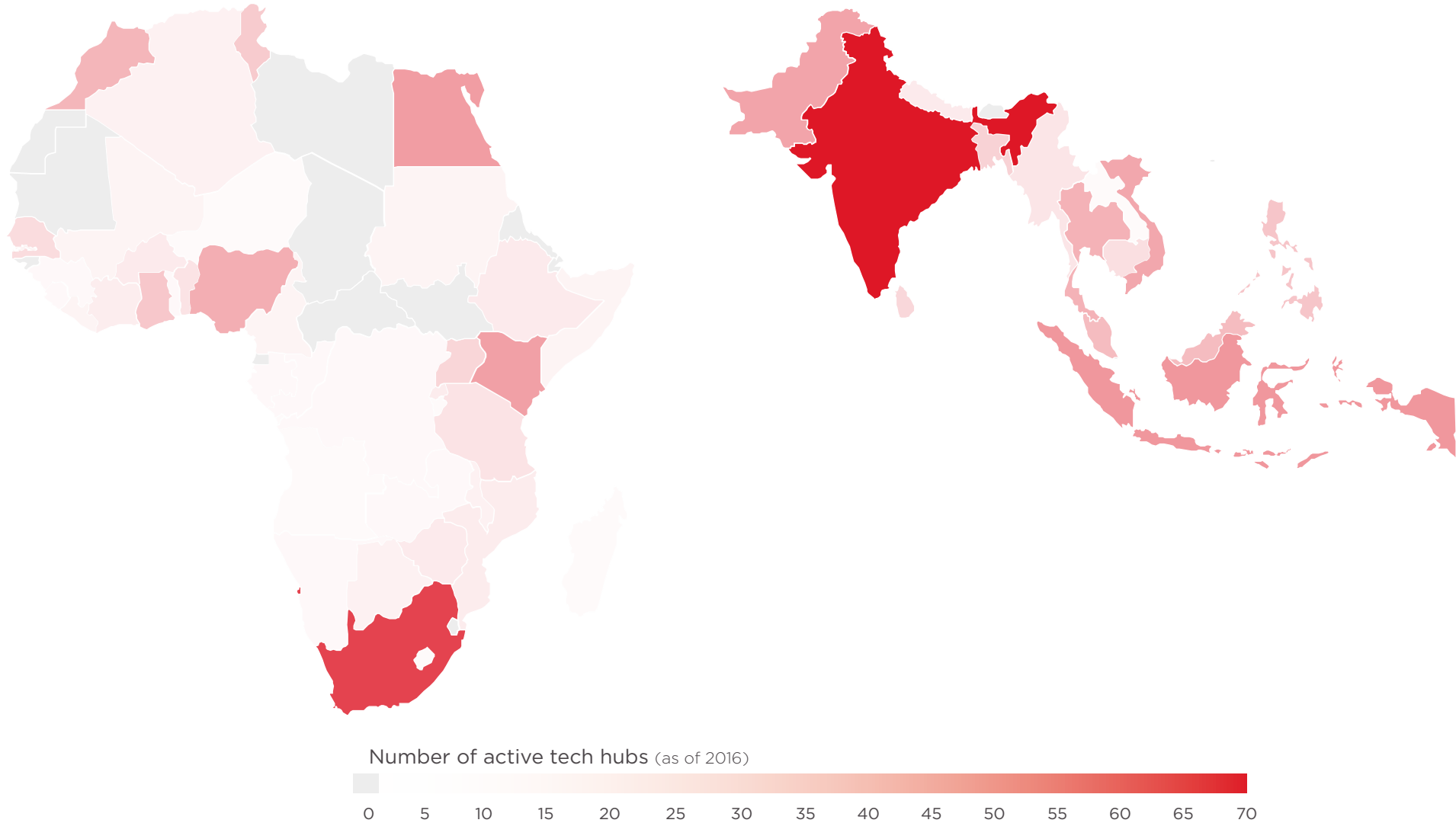
**Forecast real GDP growth (CAGR, 2015-2020)**



**Internet penetration of population**



Source: [GSMA Ecosystem Accelerator](#)

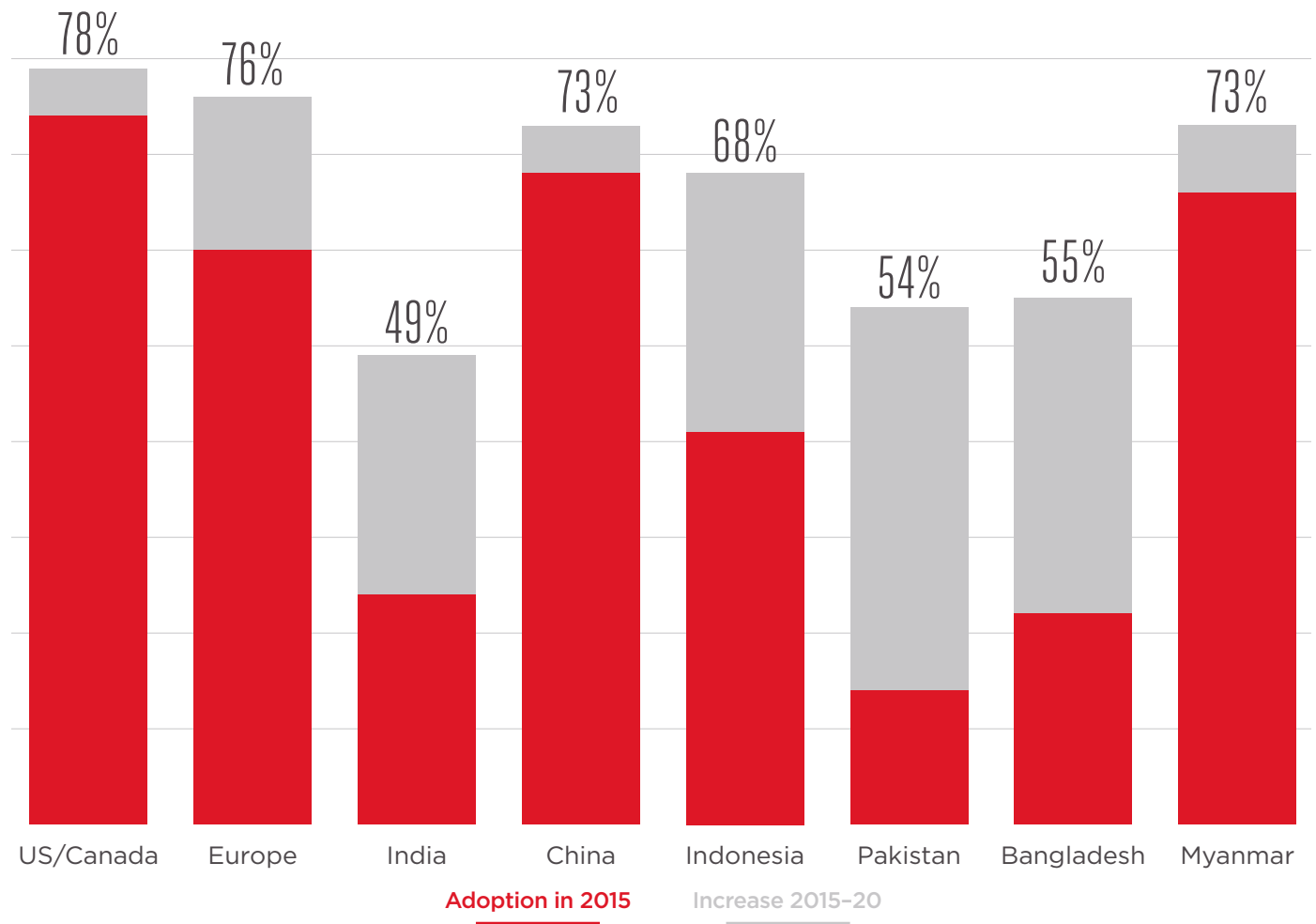


Smartphone adoption is now 60% in Europe, 70% in the US and even higher in the tech-advanced countries of Japan and Korea.

China has reached a similar level, from the homegrown boom in low-cost Android smartphones, while Myanmar has virtually skipped the featurephone generation following liberalisation.

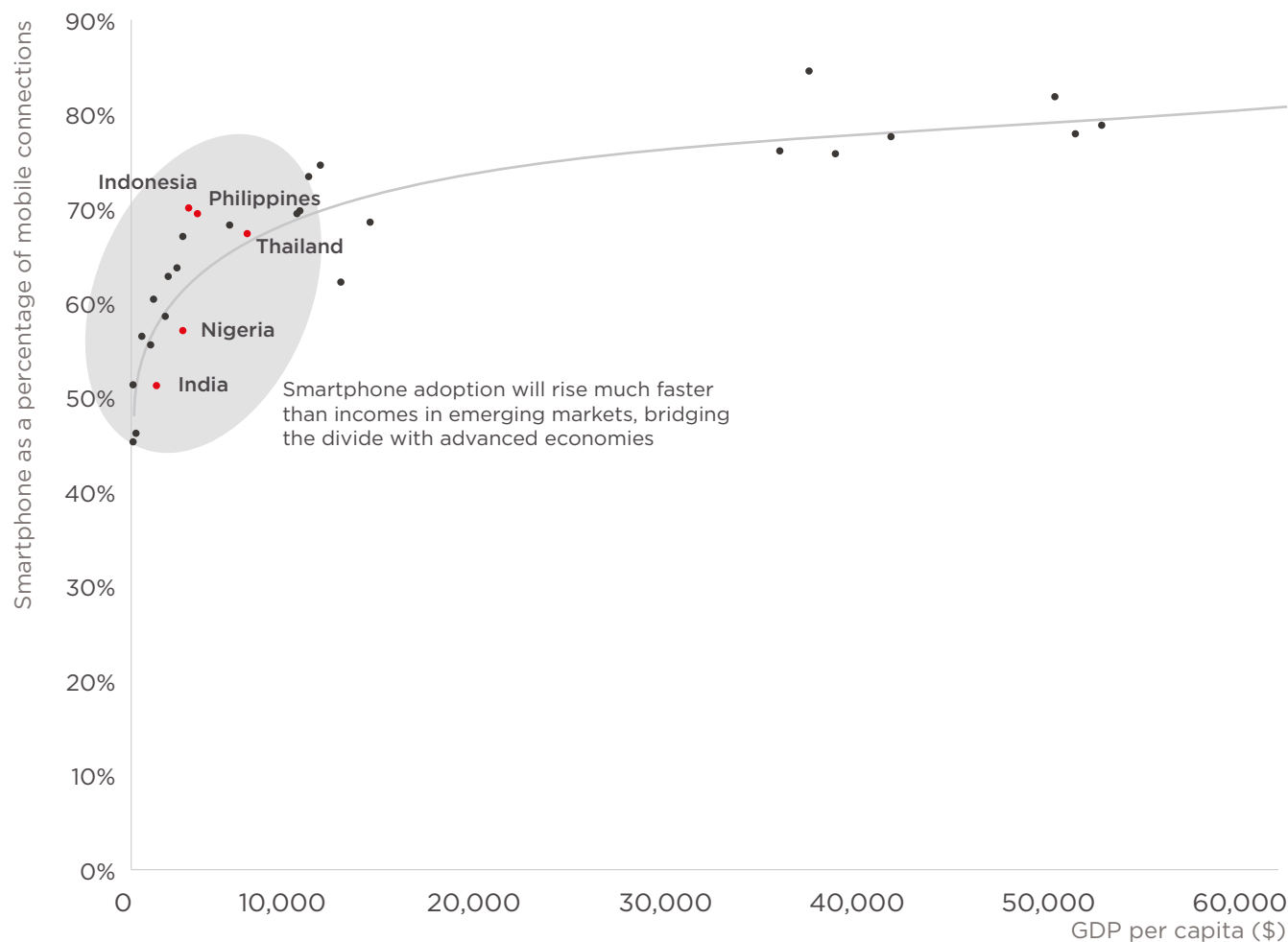
India and the other emerging Asian players are at lower levels but fast growing. We expect adoption levels of 50-70% by 2020, creating a large ready-made base of potential new internet users.

**Smartphone adoption by 2020** (percentage of connections)



Note: figures shown at the top of each bar are projected smartphone adoption in 2020  
 Source: GSMA Intelligence

## Forecast smartphone adoption in 2020



The main sources of future growth in smartphone adoption will be India and a number of other emerging markets (such as Nigeria and Indonesia).

This will be driven by continued falls in device costs and rising incomes.

Several low-income countries (e.g. GDP/capita below \$10,000) will have smartphone adoption rates of 60-70% by 2020, similar to most advanced regions.

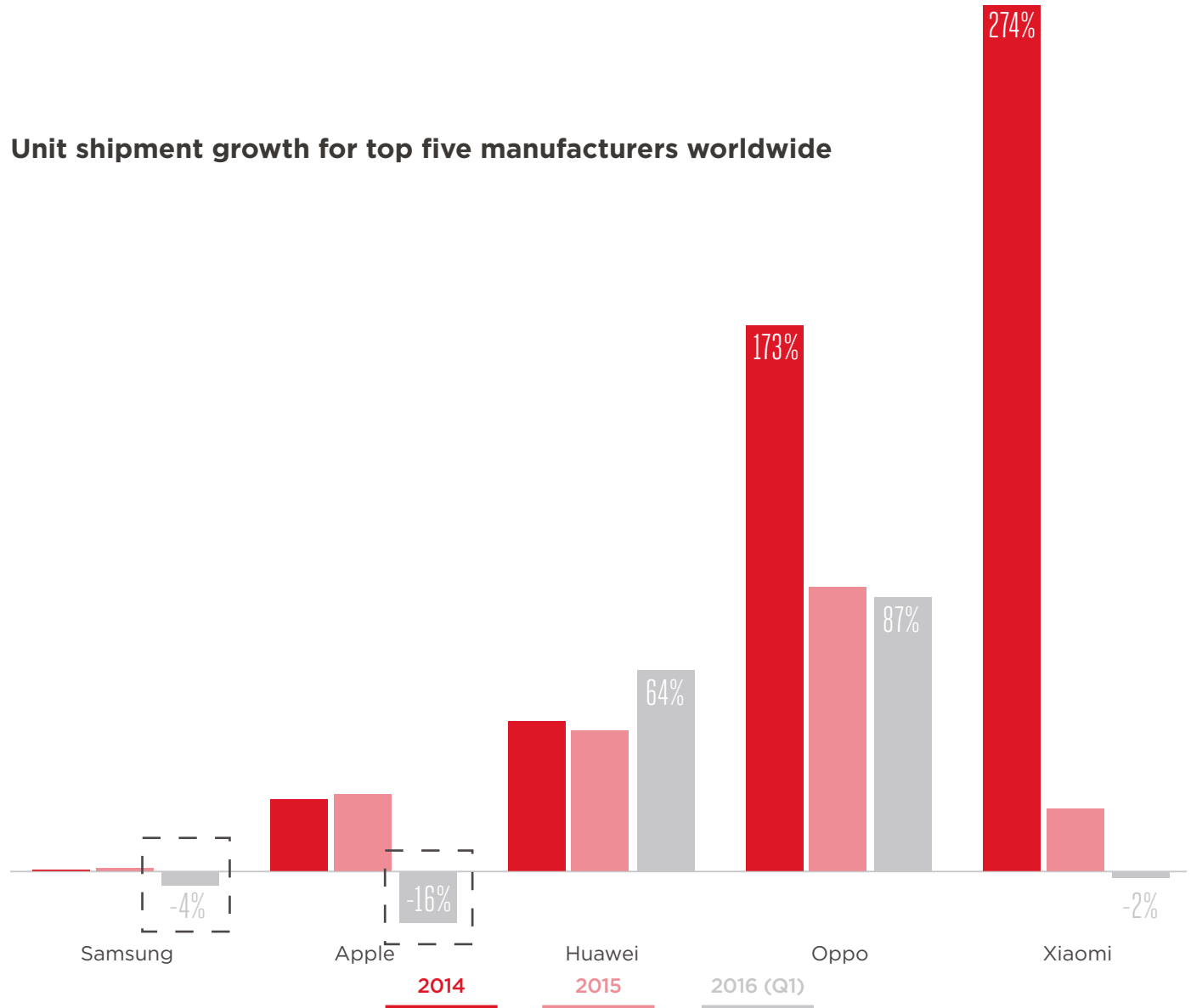
Includes top 30 countries worldwide by population  
Source: GSMA Intelligence, IMF

## Unit shipment growth for top five manufacturers worldwide

The low-cost smartphone story continues to be led by Chinese manufacturers and the Shenzhen ecosystem, notably Huawei, Oppo and Xiaomi.

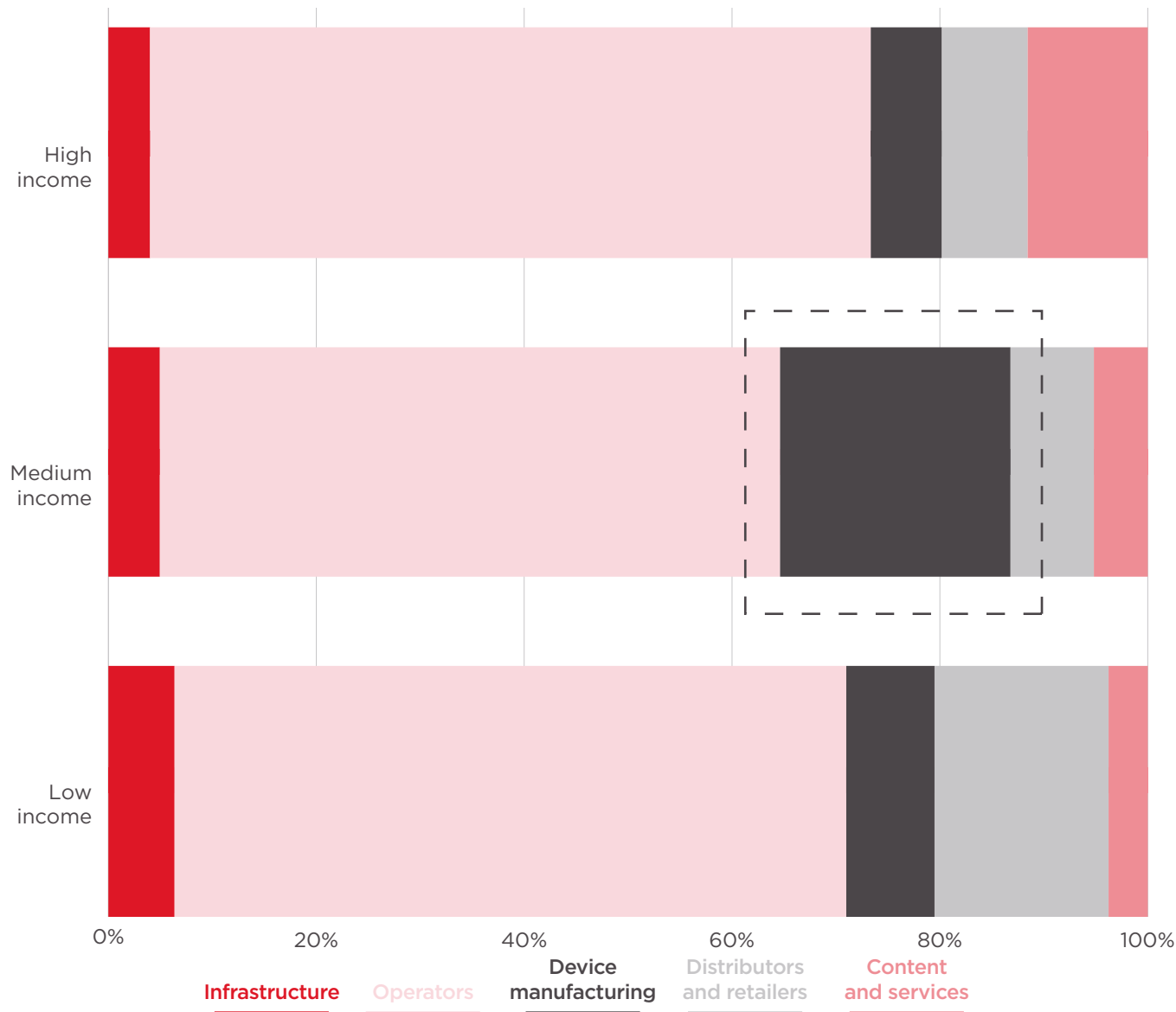
Chinese handset makers took 36% of global smartphone shipments in Q1 2016, up from 28% two years ago, with much of this in the sub-\$200 category.

One of the main losers of this has been Apple, until now a beneficiary of China's rise. The company has now reported two consecutive quarters of negative sales growth for the iPhone in 2016, suggesting that its volumes may have peaked.



Source: Strategy Analytics

## Distribution of value added in high-, medium- and low-income countries



To understand how China has become a powerhouse in handset making, it is useful to examine the distribution of value added across the mobile ecosystem value chain.

Value added is the total income generated by a company or sector, including employee compensation (wages, benefits etc), business profits and payments to government (e.g. tax).

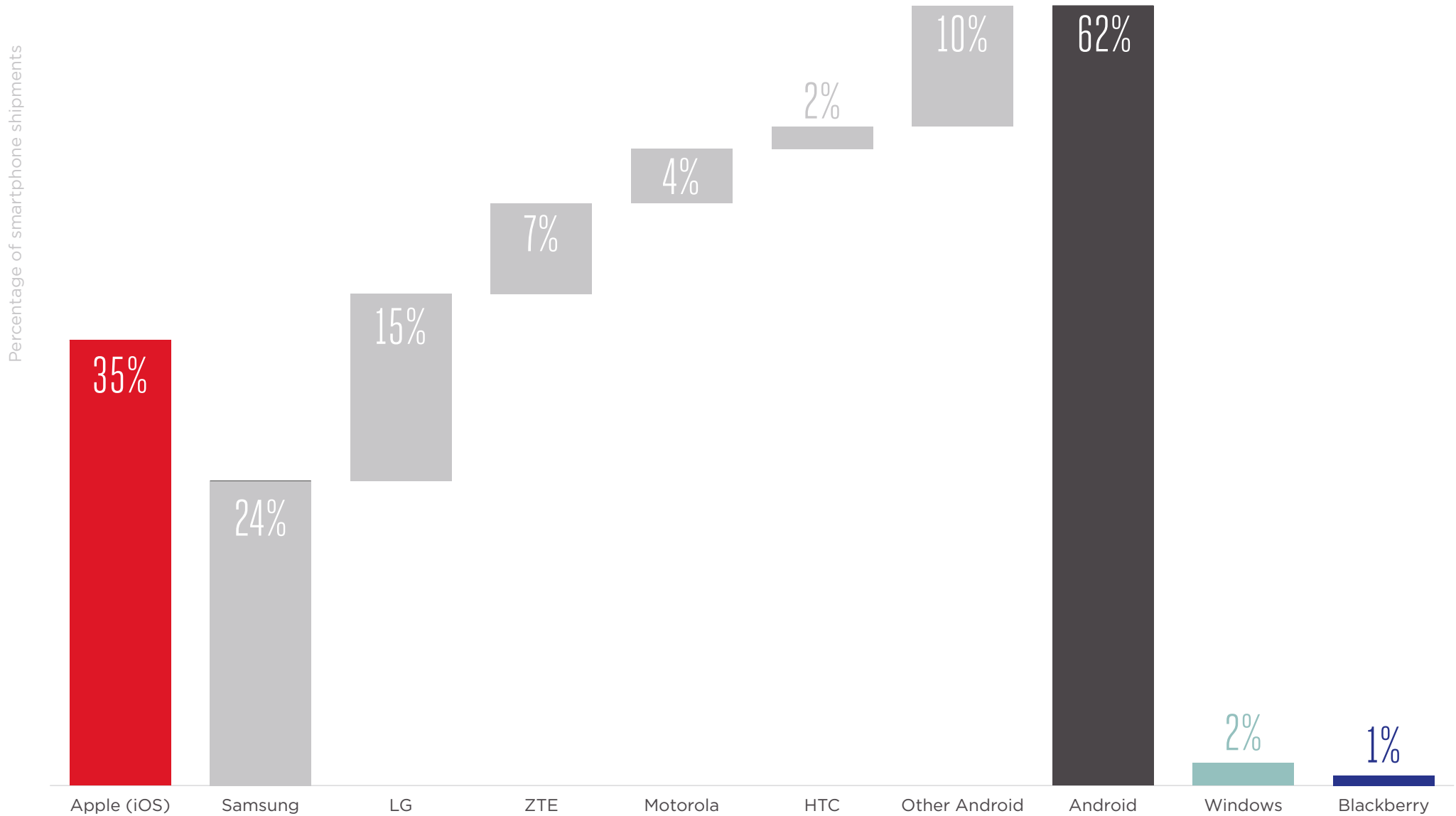
China falls into the 'medium income' bracket; it has engineered a tech ecosystem in Shenzhen comprising handset and chip makers to drive scale, underpinned by skilled yet cheap labour - hence the proportionately larger contribution to the economy from device making.

The declining device prices and Moore's Law make it hard to see many other countries becoming a rival in this space. India will likely be an exception, with many homegrown manufacturers of its own.

Source: GSMA Intelligence

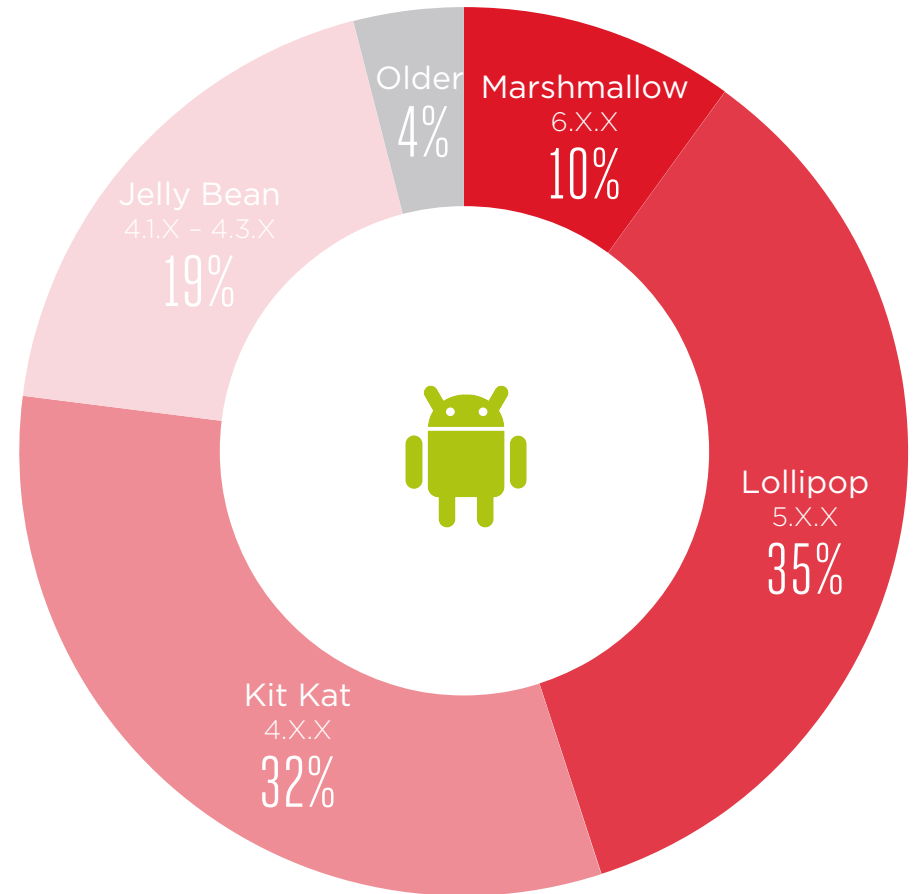
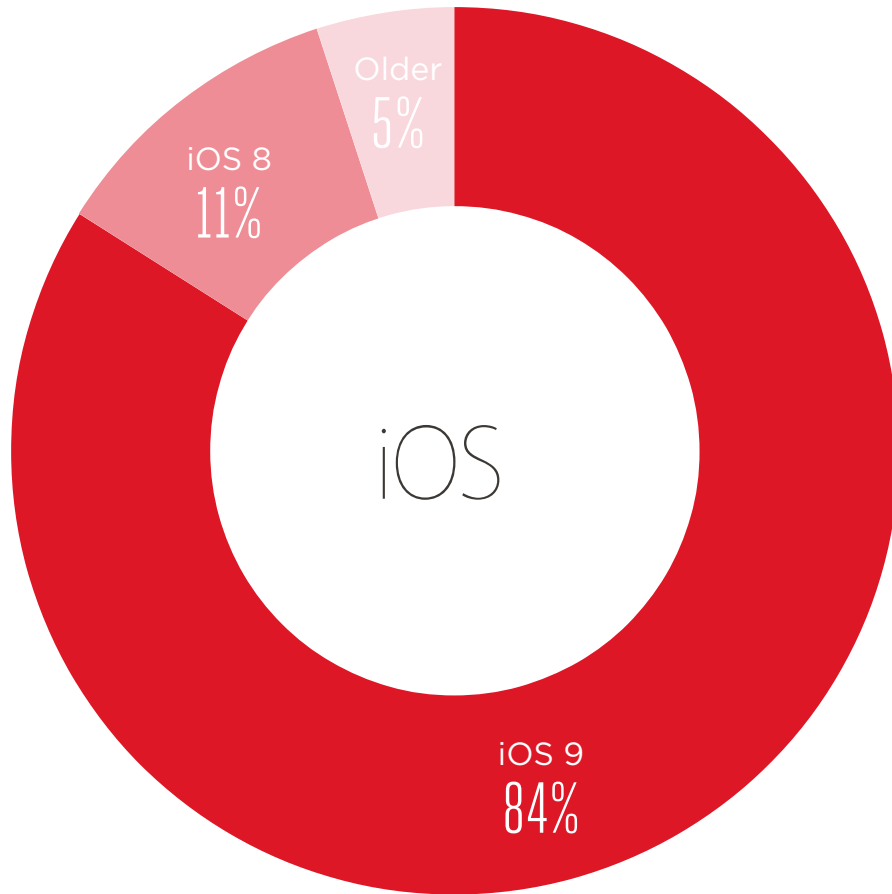


Share of smartphone shipments by manufacturer and OS (US, 2015)



Source: Strategy Analytics, GSMA Intelligence

## Platform version by OS, May/June 2016



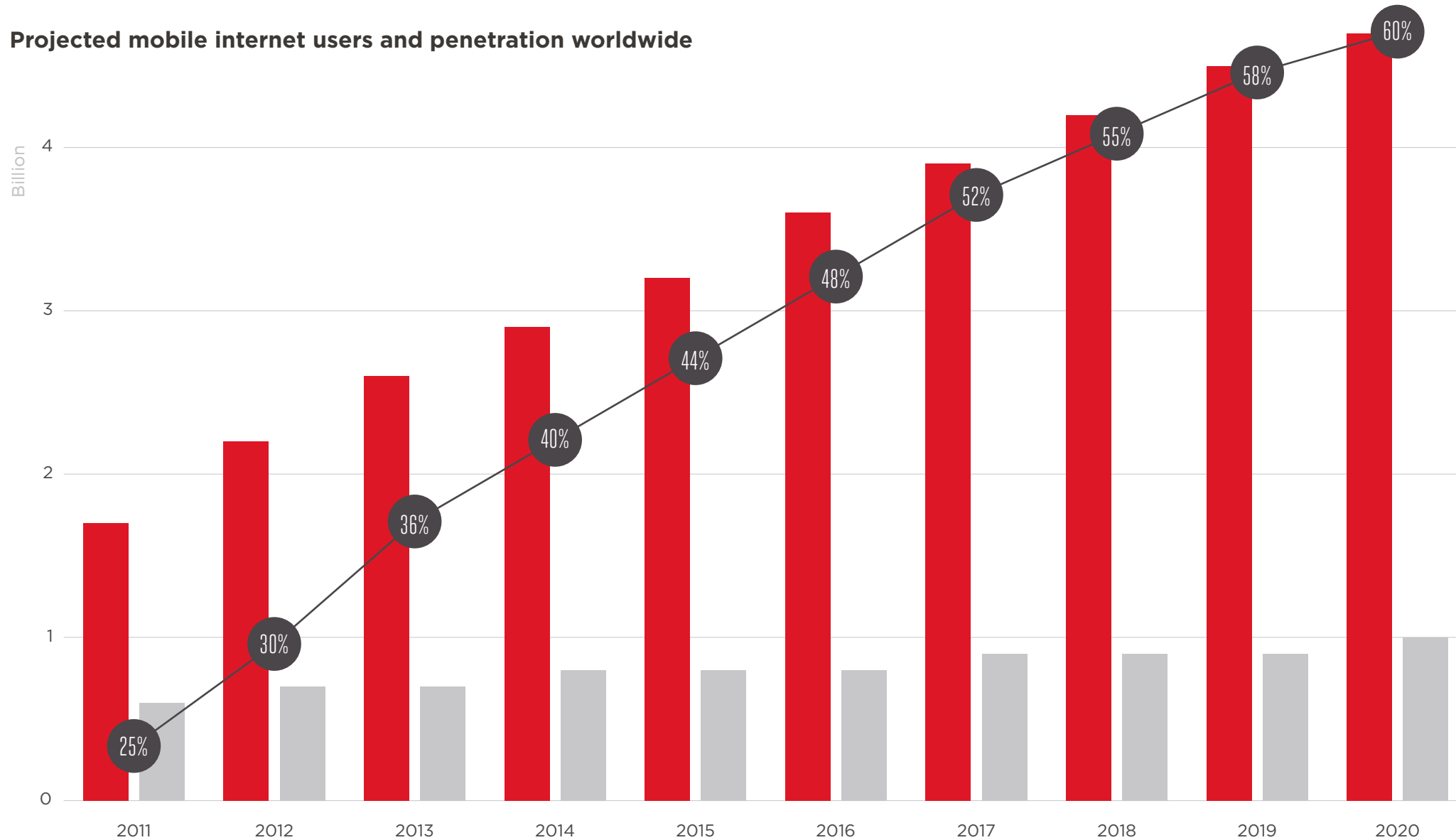
Source: Apple, Google, Strategy Analytics

# Consumer insights

↳ Mobile internet –  
access, behaviours  
and the unconnected



## Projected mobile internet users and penetration worldwide



Source: GSMA Intelligence, United Nations, Telegeography

**Mobile internet users**

**Fixed internet households**

**Percentage of population**

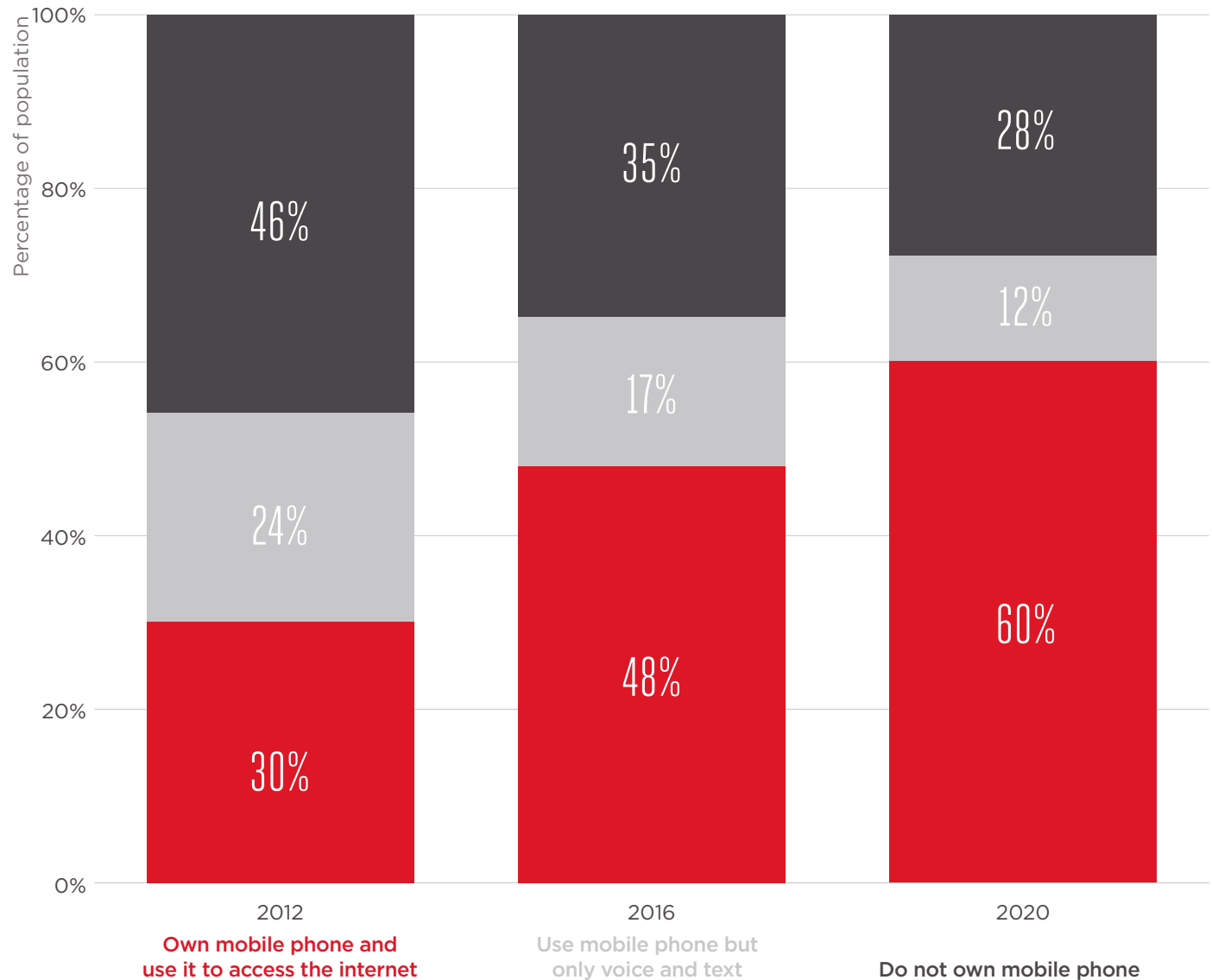
We project mobile subscriber penetration of 65% by the end of 2016.

More interestingly, 48% will own a mobile **and** use it to access the internet. That means that around 75% (48%/65%) of mobile users will also be internet users.

The same figure was only 55% in 2012.

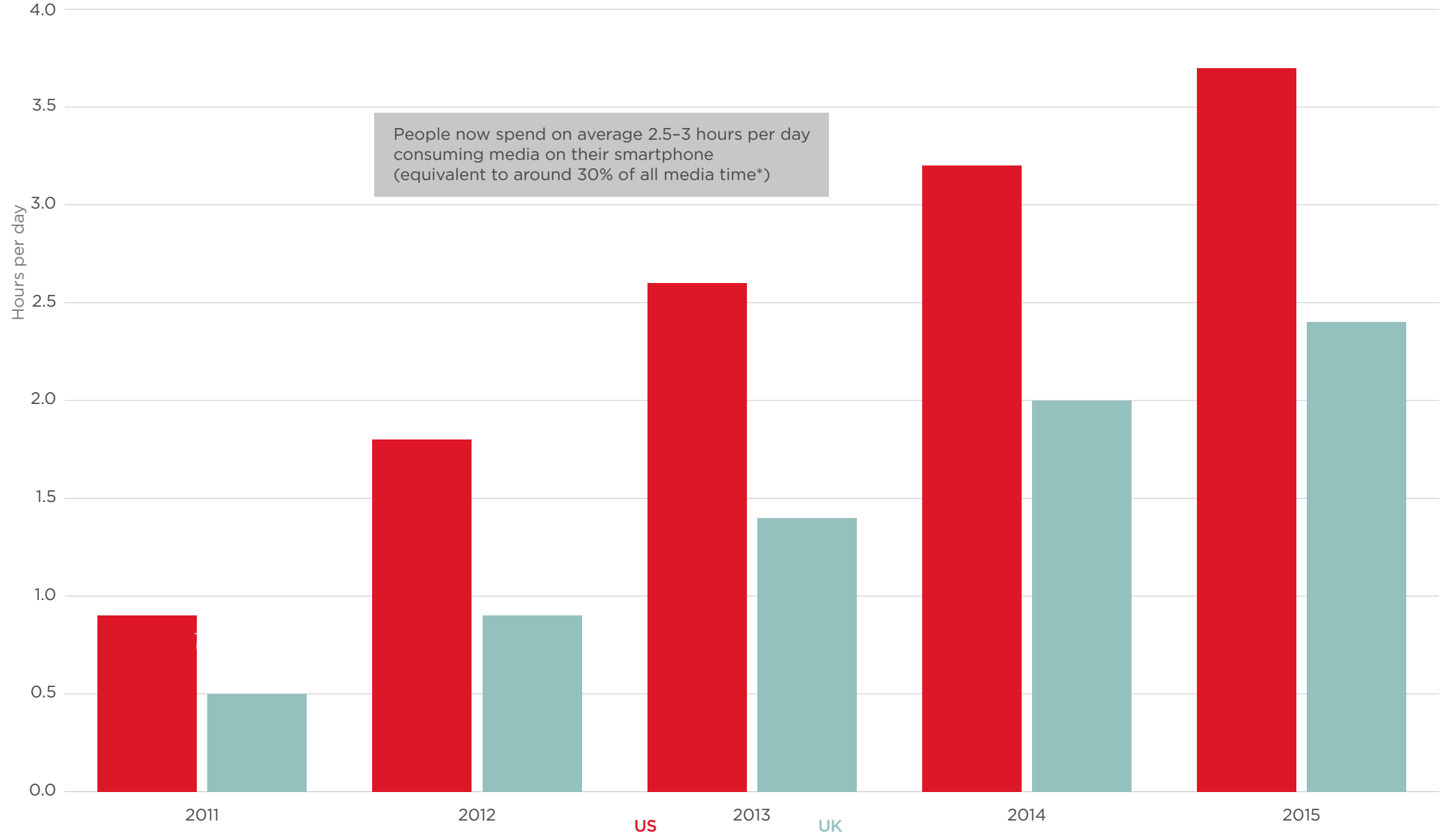
Global internet penetration overall is still lower than that (around 45% including fixed and mobile access), but it will rise as mobile phone ownership increases, and people with mobile phones start using the internet on 3G or 4G.

**Breakdown of global population in terms of mobile phone and internet access**



Source: GSMA Intelligence

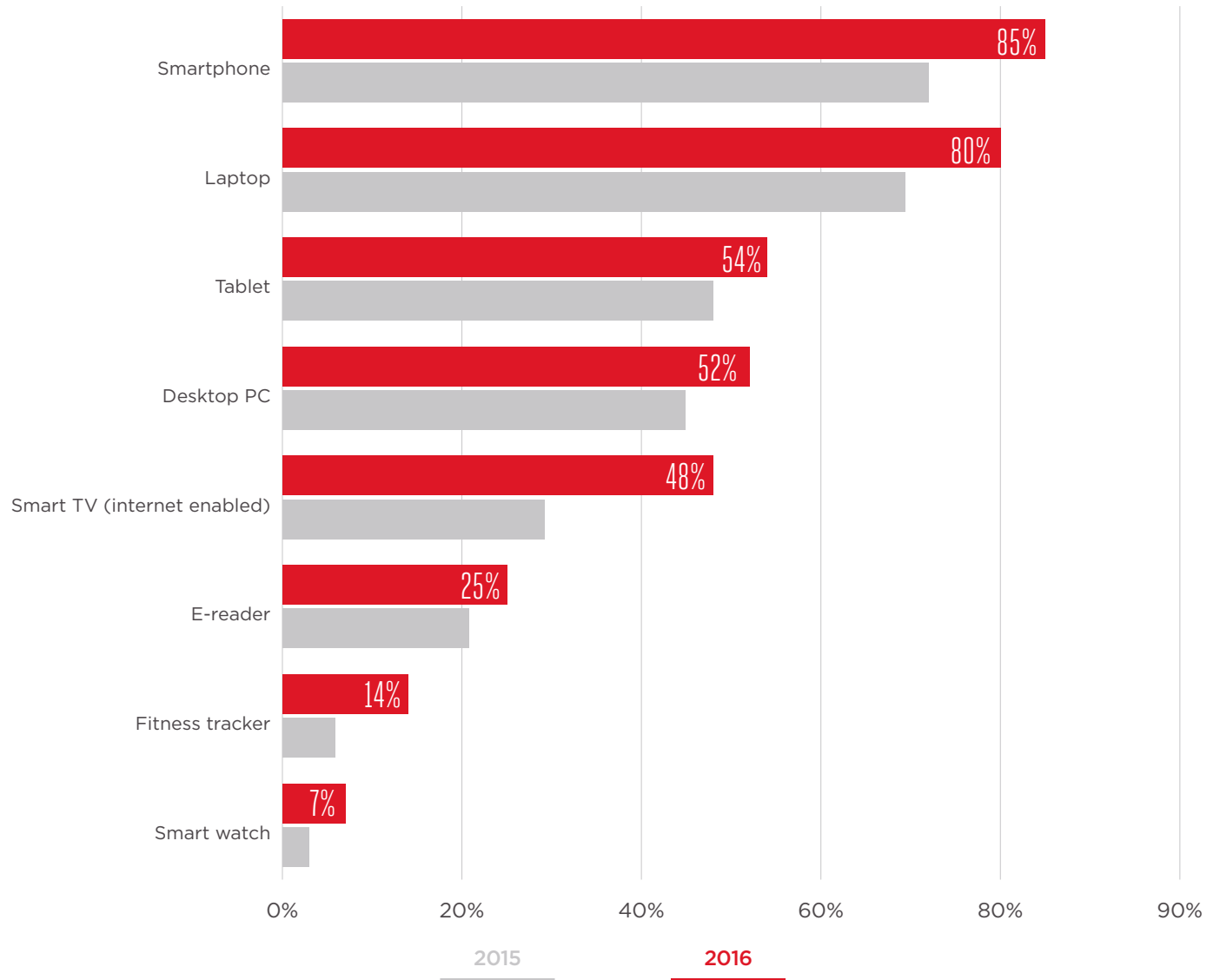
## Daily time spent consuming media on mobile



\*Including TV, PC, mobile, tablet, radio and print

Source: eMarketer, GSMA Intelligence

### Device ownership among UK adults



Smartphones are arguably the most commonly owned consumer electronics device.

In advanced countries, penetration is nearly saturated; taking the UK as an example, ownership is now 85% of adults based on our recent survey.

Tablets have grown to over 50% but this is unlikely to move much further given longer replacement cycles and the fact many of them are shared among several people in a household.

Fitness trackers and smart watches were the subject of much hype in 2014 and 2015, but these have yet to materialise into anywhere near a mass-market phenomenon.

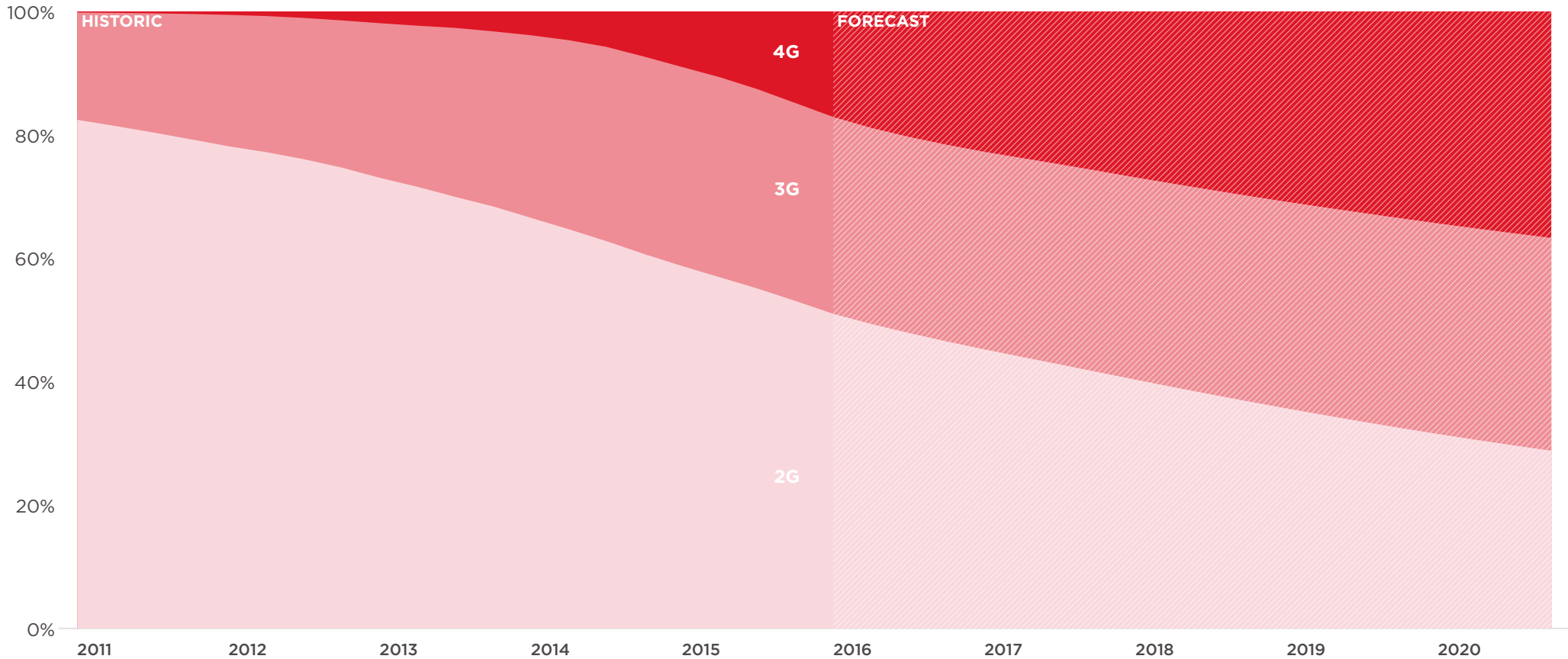
Source: GSMA Intelligence Consumer Survey

Equally important to the device layer is the fact that people are now operating on faster connections.

In 2011, 80% of the world still was on 2G, with 3G the remainder. By 2020, we will have gone through a reversal, with 3G and 4G the vast majority (71%). 2G will not disappear altogether (it still carries much voice traffic) but it will be a minority.

## Generational shift – projected split of mobile connections base

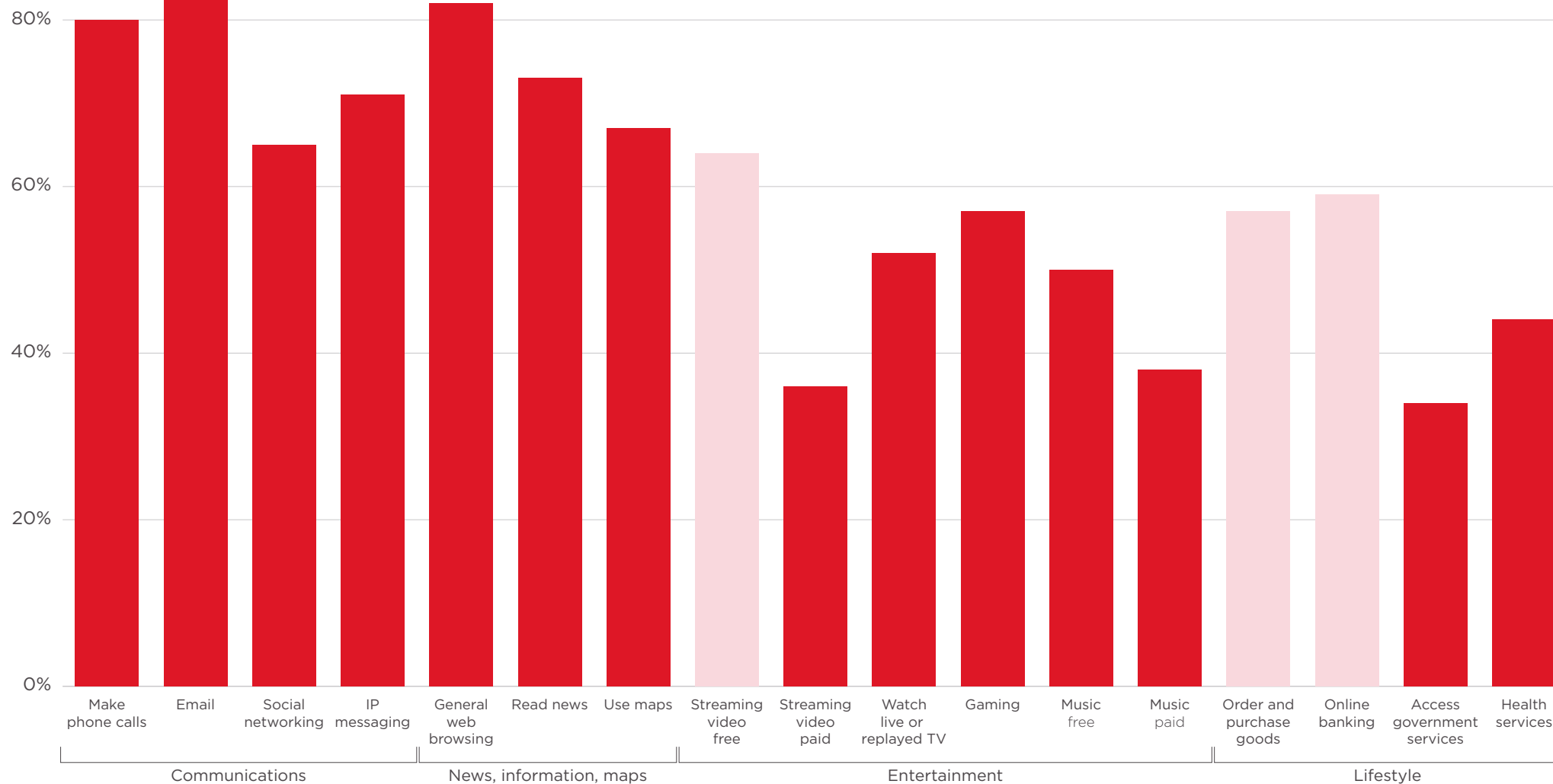
Source: GSMA Intelligence





## Consumer activities on mobile phone: US, UK and Korea (average)

(percentage of mobile owners, at least once a month)



Source: GSMA Intelligence Consumer Survey 2016

# IP messaging apps are taking off faster in some countries

IP messaging apps - WhatsApp, Facebook Messenger, WeChat etc - continue to grow in popularity, although there are notable geographic differences.

Southern Europe is the hotbed, and it is here where the declines in SMS usage are also evident. The trend is much less evident in the US and Canada though (and even the UK and France), where less than 40% of people say they use IP messaging more than SMS.

## Use of IP messaging versus SMS

SMS growth is average of four quarters to March 2016. Figures are based on Vodafone for all markets except Australia (Telstra), Austria (A1) and France (Bouygues). Reported data not available for US and Canada. Source: GSMA Intelligence including Consumer Survey 2016

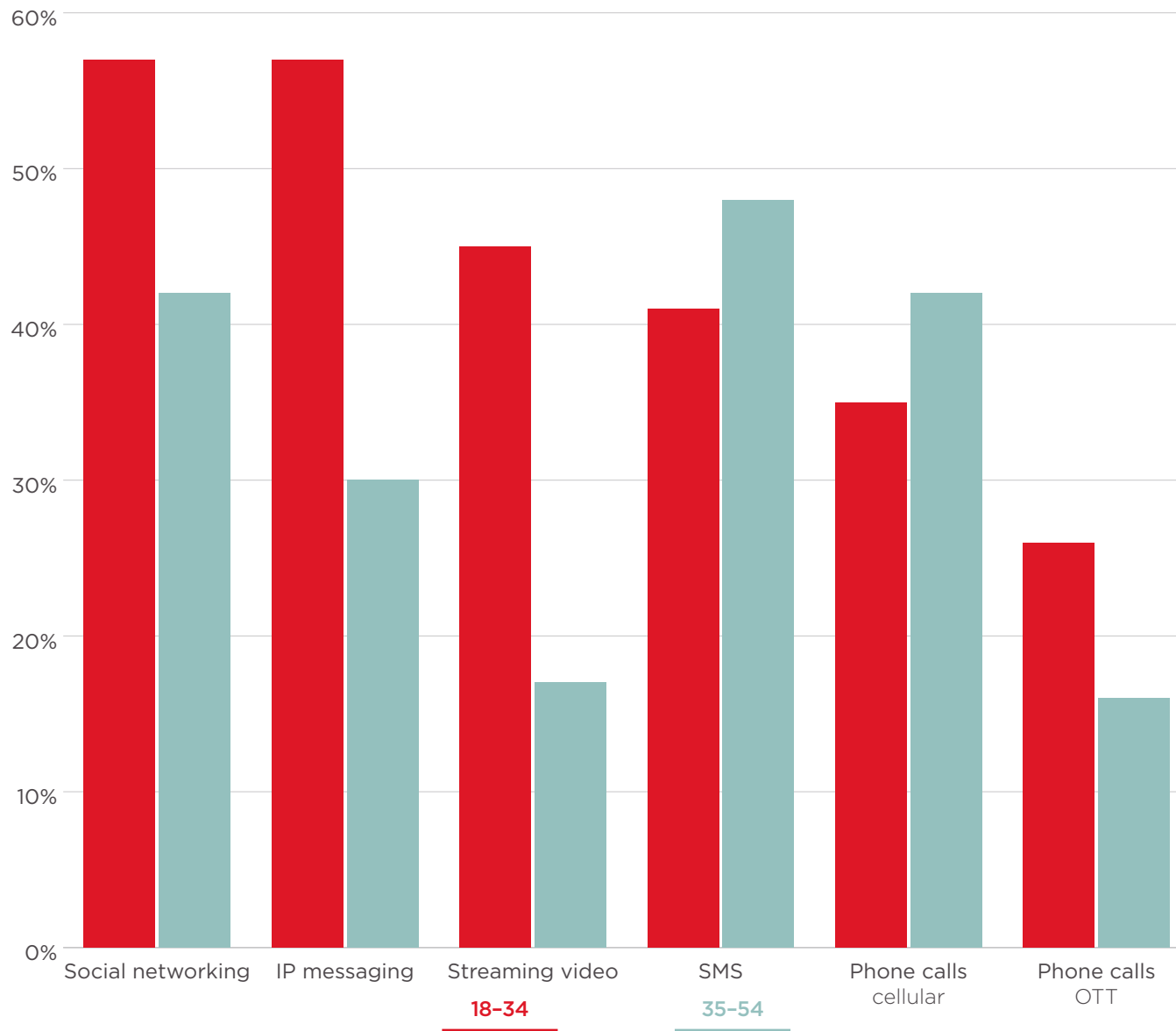


There are clear differences in the internet usage profiles of different demographics.

Age is the most obvious; those in the 18-34 age bracket now use smartphones more for social networking, IP messaging and video than for voice calls or SMS on a daily basis.

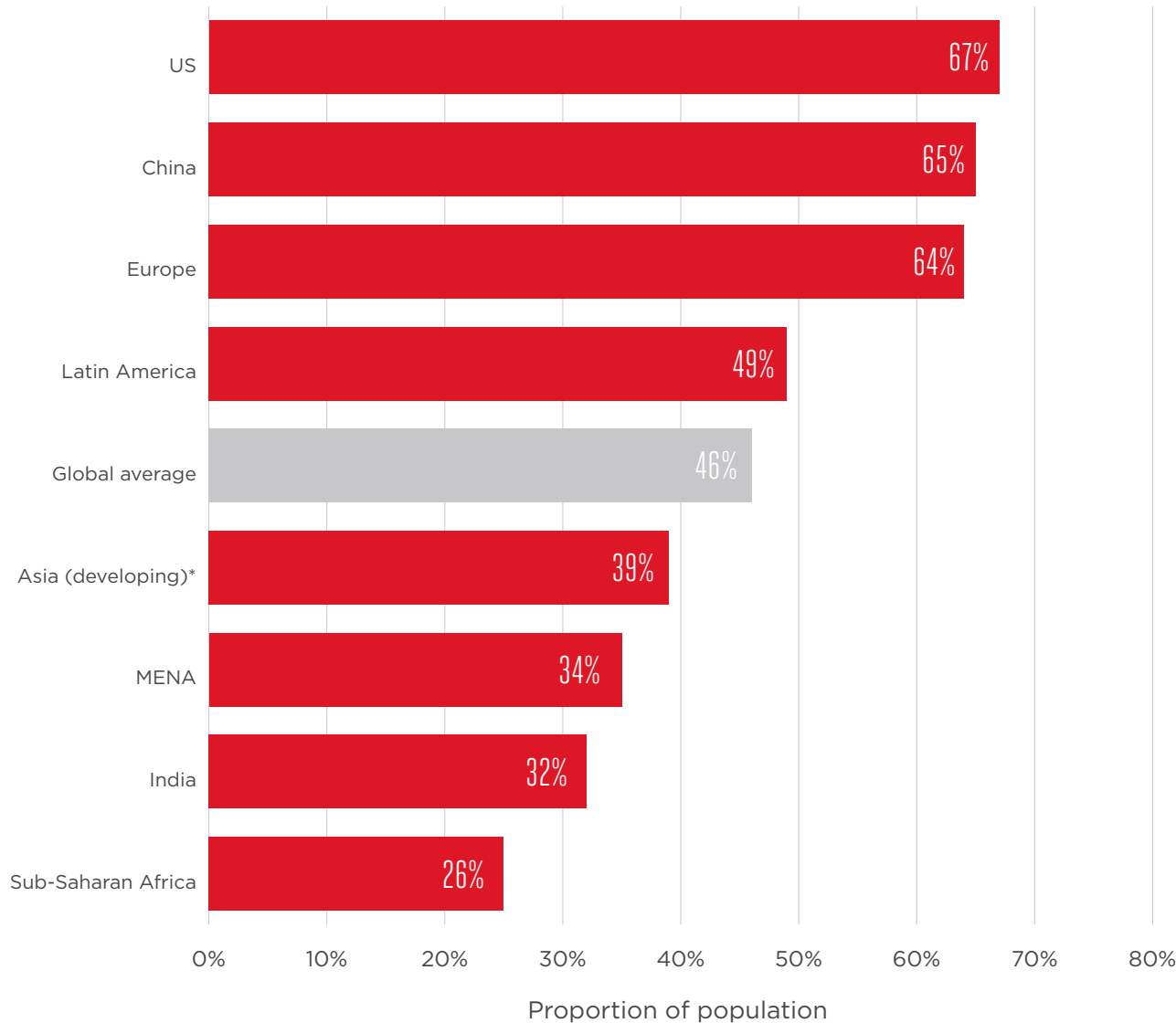
The ranking order is reversed for the 35-54 age group. This likely reflects a degree of comfort using established functions, and also a higher likelihood of using a home broadband connection for things like watching video. Even here though, we are starting to see a growing “data-first” mentality in the older age bracket, particularly in the US.

**Proportion of mobile phone owners who do the following every day (UK)**



Source: GSMA Intelligence Consumer Survey 2016

## Mobile internet penetration, June 2016



Mobile internet penetration is now 46% globally, but this masks a number of countries/regions where adoption is much lower.

Developing countries in Asia (such as Bangladesh), India and Sub-Saharan Africa are all below 40%.

These regions are also highly populous, underlining the scale of the digital divide.

There are 3.4 billion people using the mobile internet against 7.3 billion worldwide, leaving a gap of 3.9 billion.

\*Excludes India, China, Australia, Japan and South Korea  
Source: GSMA Intelligence

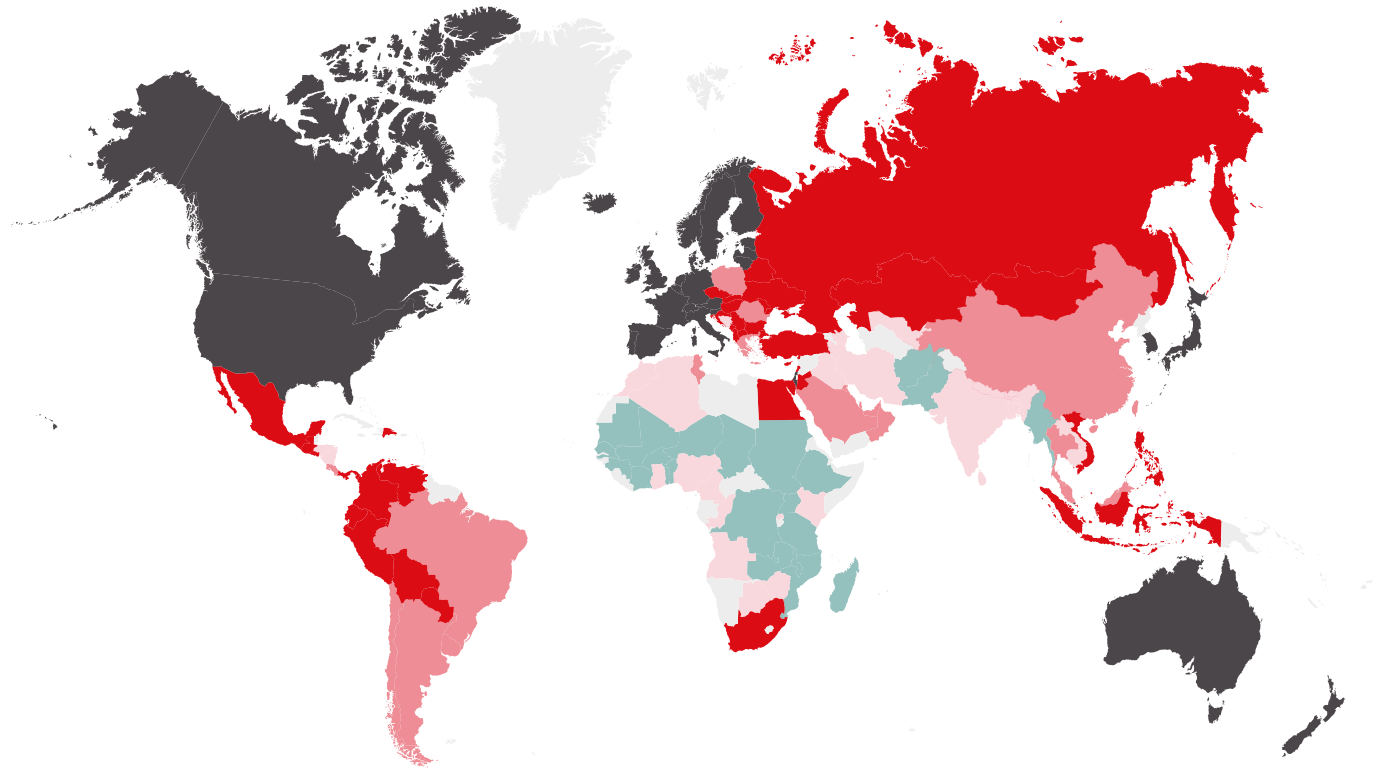
**Leaders (14%\*):** High index scores and high mobile internet penetration. Dominated by countries from Europe and countries with high GNI per capita and urban populations.

**Fast Transitioners (27%):** Mobile Internet penetration scores similar to the Leaders, but achieved with lower index scores. Strong MENA and Latam representation.

**Transitioners (18%):** Typically score well on two or three enablers but still have work to do. Strong representation from Europe and the Americas.

**Emerging (29%):** Score well on one or two enablers and have below-average mobile internet penetration. Strong representation from Asian and African countries.

**Discoverers (11%):** Dominated by countries from Sub-Saharan Africa. Need to work on all four enablers.



**Leaders**

**Fast transitioners**

**Transitioners**

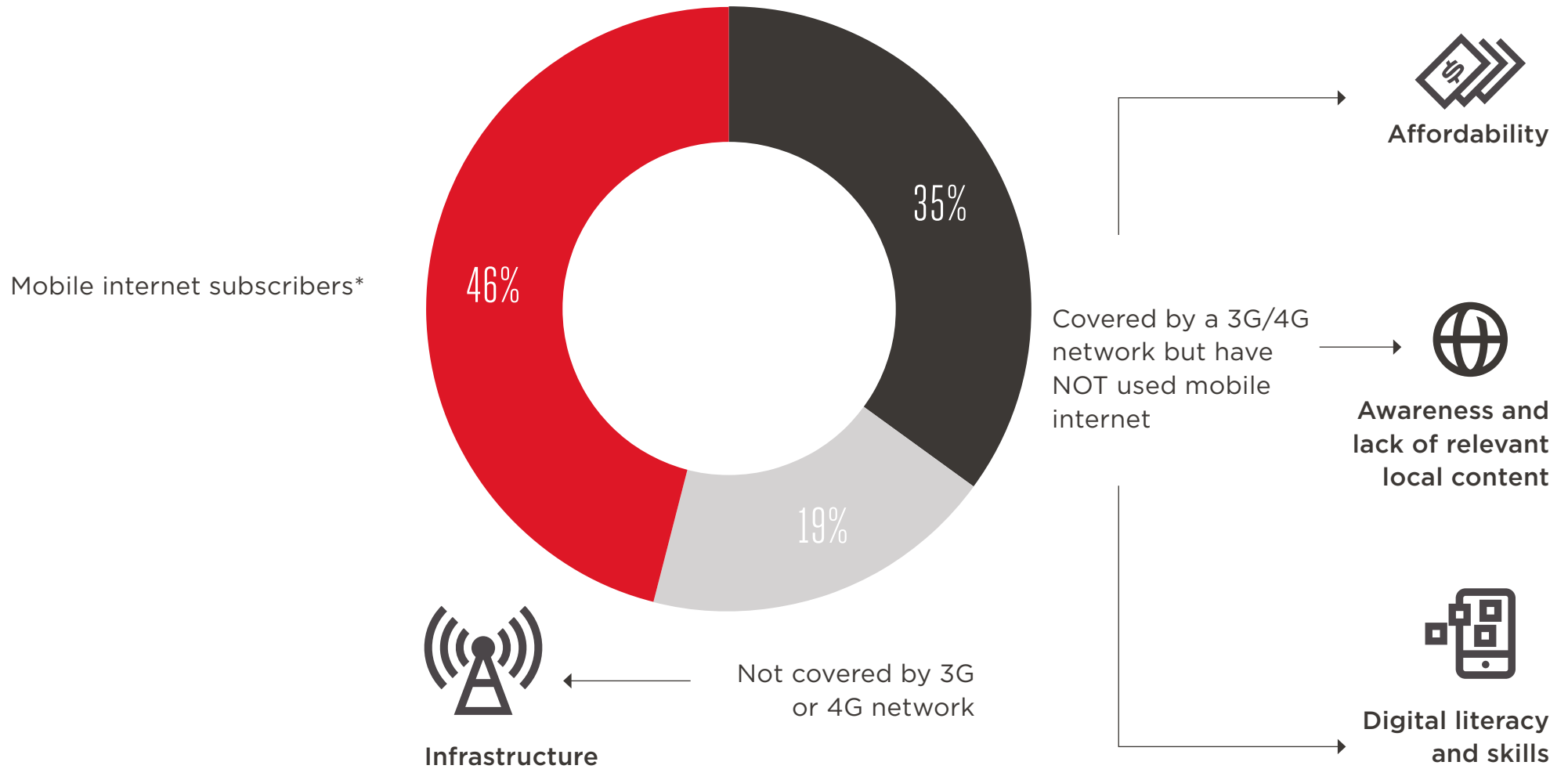
**Emerging**

**Discoverers**

\*Percentage of global population

Source: GSMA Intelligence based on GSMA Mobile Connectivity Index

# 54% of the world have not used the internet. Why?



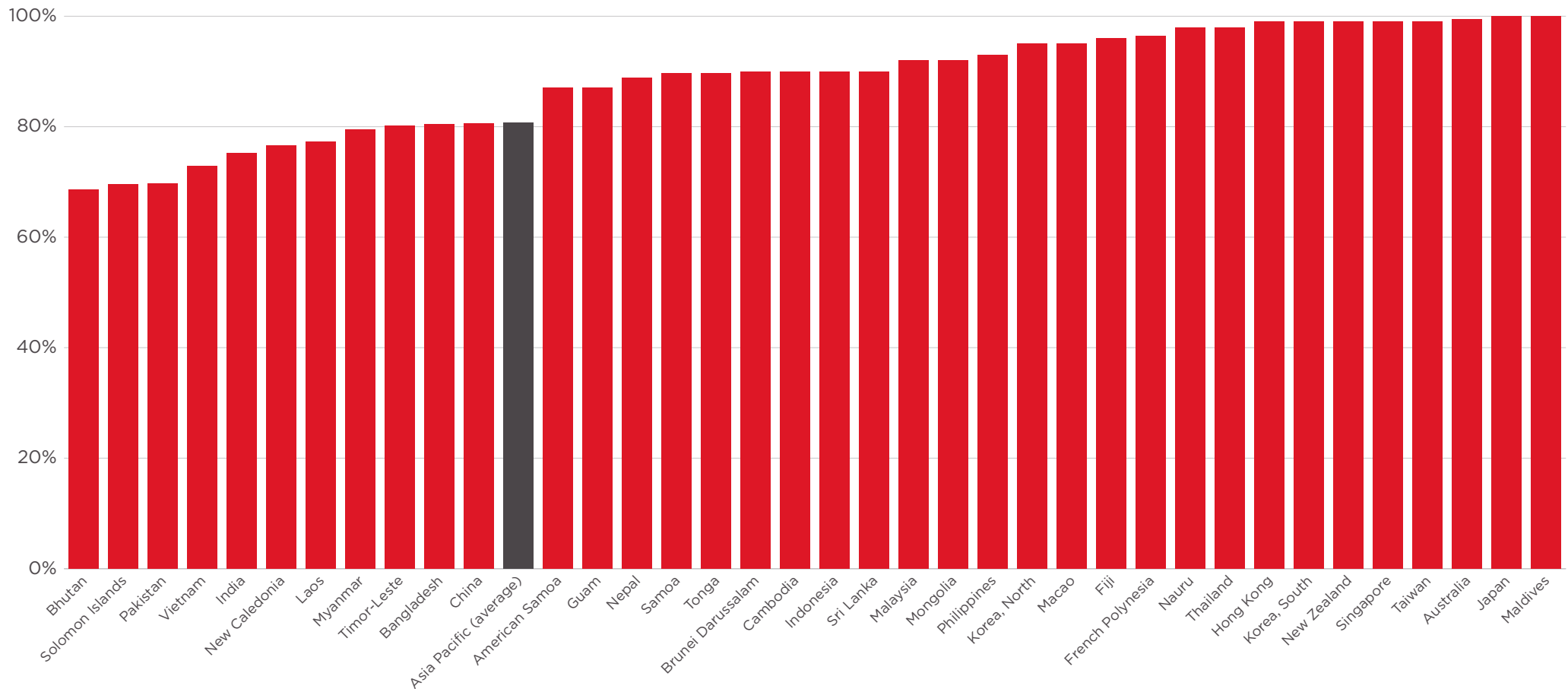
\*includes 2G, 3G and 4G  
Source: GSMA Intelligence

3G population coverage has increased to 80% worldwide, up from around 63% in 2014, driven by investment and network sharing. This puts the majority of people in range of a network fast enough to access the internet, and at a speed and quality of service much better than 2G can offer.

The remaining uncovered areas tend to be rural, often remote locales where the economics of expansion mean different models are necessary.

**Proportion of population covered by a 3G or 4G network (Asia, March 2016)**

Source: GSMA Intelligence



**Cost of mobile ownership as share of income (Africa, selected markets)**

Cost of ownership defined as cost of:

**Voice and SMS**

low-user basket, monthly

+

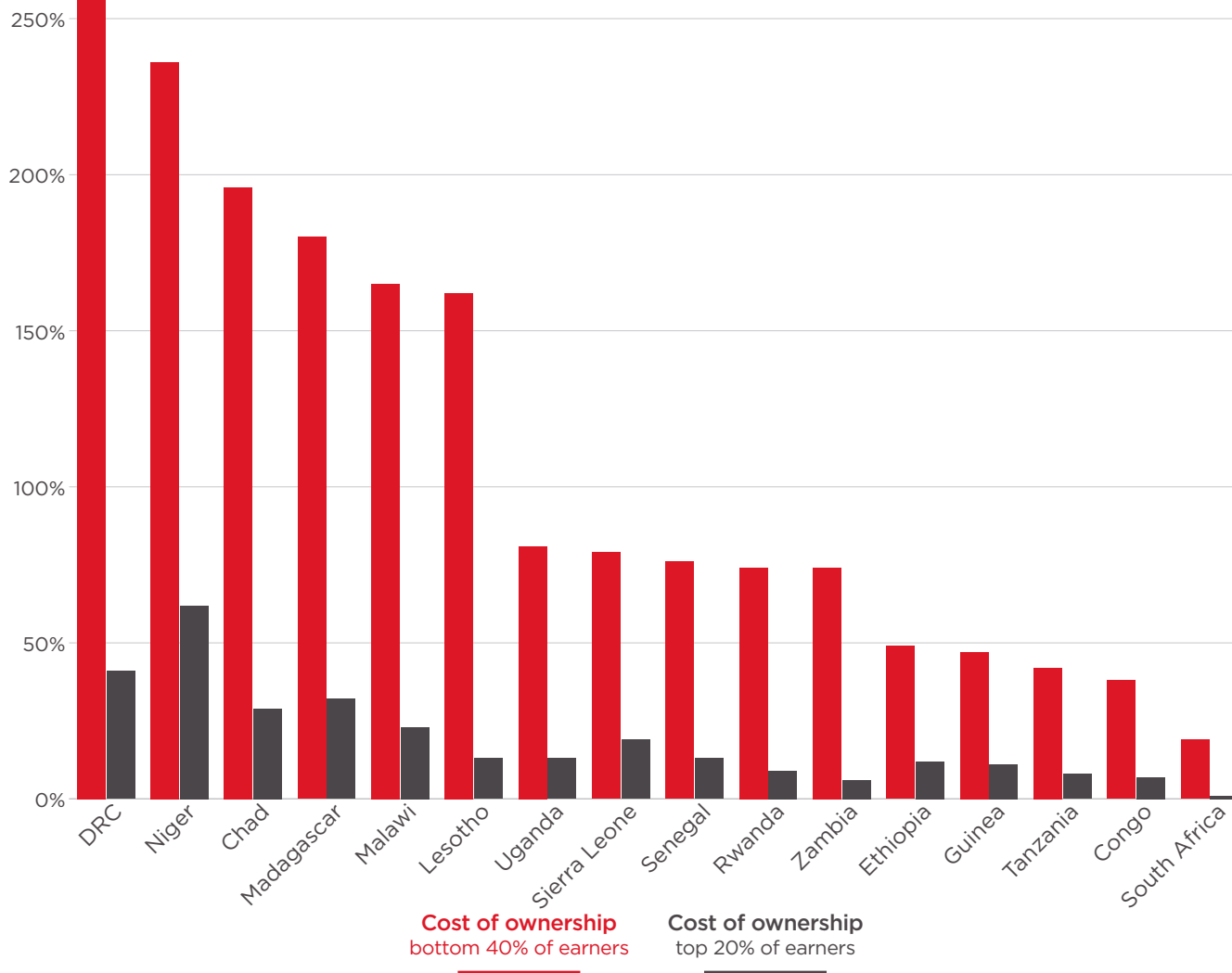
**Data access**

lowest possible price for 500 MB of prepaid data, monthly

+

**Handset price**

which is amortised with a four-year replacement cycle



Source: GSMA Intelligence, World Bank, ITU



## What do non-internet users see as the reasons for *not* getting online?

Barrier	Asia	Northern Africa	Latin America and Caribbean	Sub-Saharan Africa
Lack of awareness and locally relevant content	72%	58%	51%	36%
Lack of digital literacy and skills	24%	39%	39%	38%
Affordability barrier	25%	36%	29%	29%
Lack of network coverage	3%	9%	6%	6%
Security and trust barrier	2%	9%	7%	3%
Other	12%	12%	12%	25%

Source: GSMA Intelligence Consumer Survey 2015

# What is local content and why does it matter?

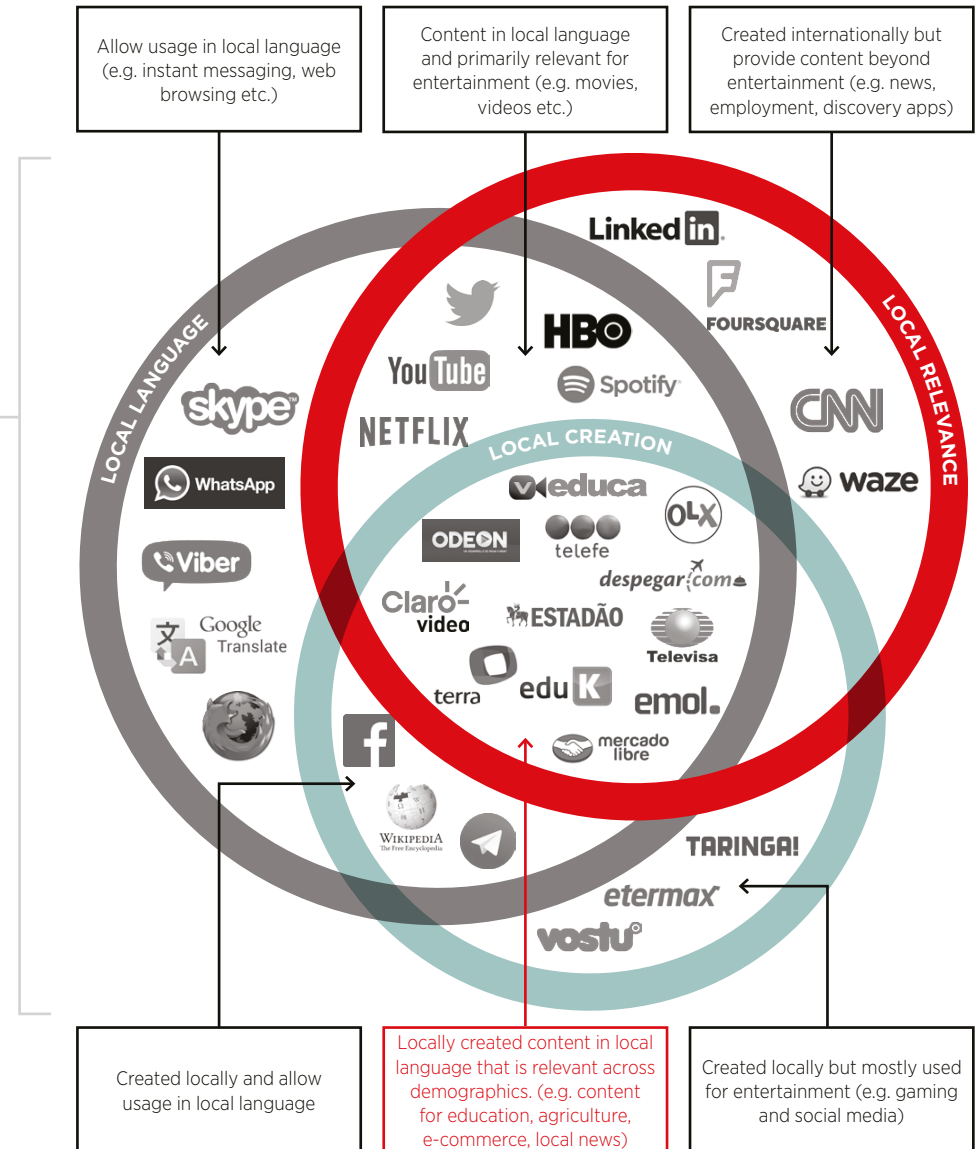
In trying to connect the unconnected to the internet, content has for many years been the forgotten ingredient, with efforts prioritised in expanding coverage and lowering the cost of ownership.

These are, of course, fundamental, but so too is the question: is the internet relevant for me?

The surprising truth is that for many non-users, the answer so far has been no, even if they can access and afford it.

As such, efforts have shifted among mobile operators and internet companies into designing content and services that appeal on a local level, both in language and in the value proposition.

Locally relevant content sits in the sweet spot of language, relevance and creation.  
Example ecosystem shown for Latin America



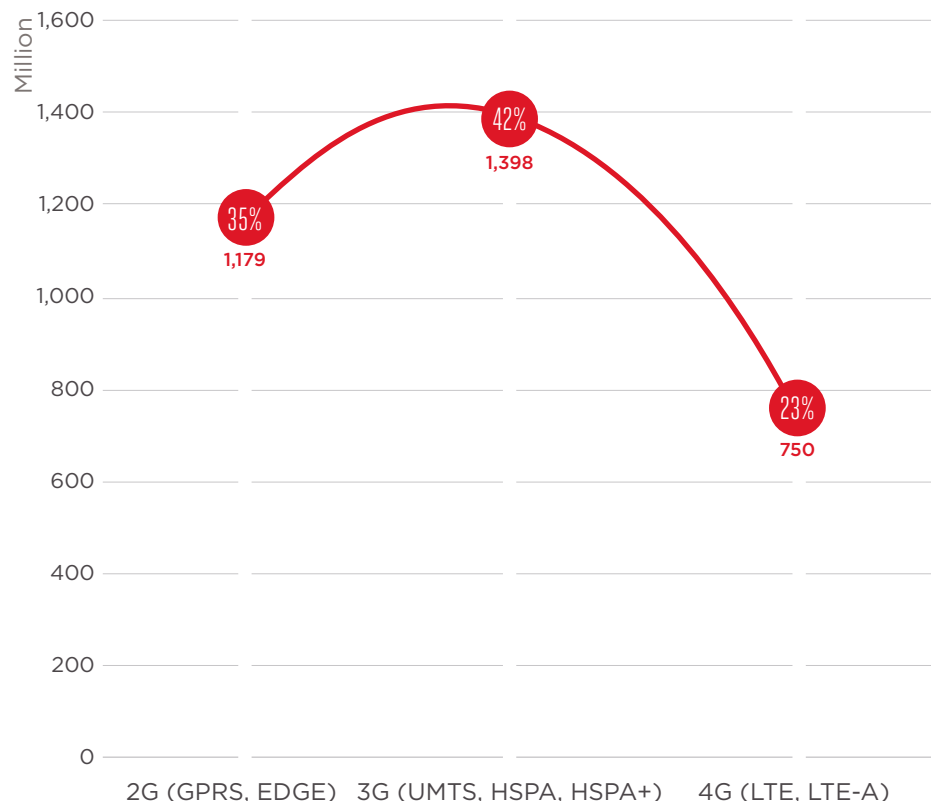
A third of people on the mobile internet still access it on 2G, which includes GPRS and Edge, with most of these in emerging markets such as India.

While technically on the internet, it limits what people can do to mostly text-based interfaces (Facebook has an SMS product for this reason).

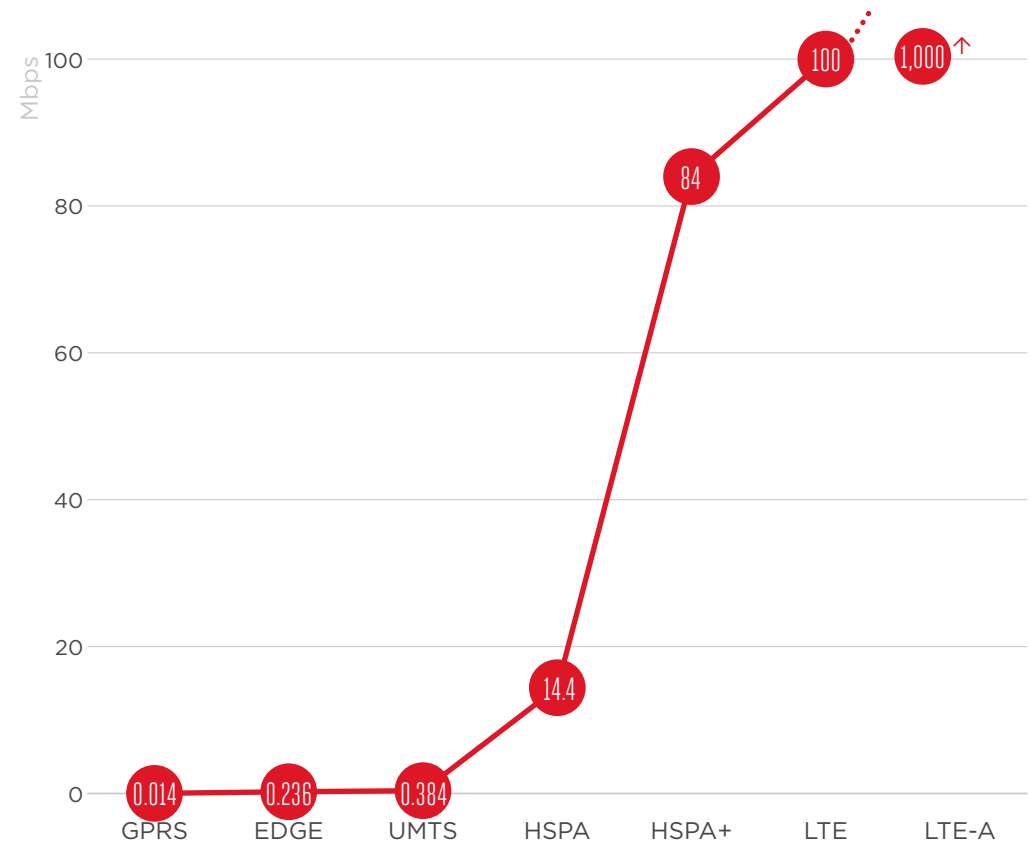
Video may seem like something unimportant, but when you consider that many internet users in such countries will also be illiterate, the higher bandwidth needed to support video as, for example, an educational tool on mobile phones becomes clearer.

Source: GSMA Intelligence

## Distribution of mobile internet users (June 2016)



## Theoretical download speeds



# Industry performance and ecosystem dynamics



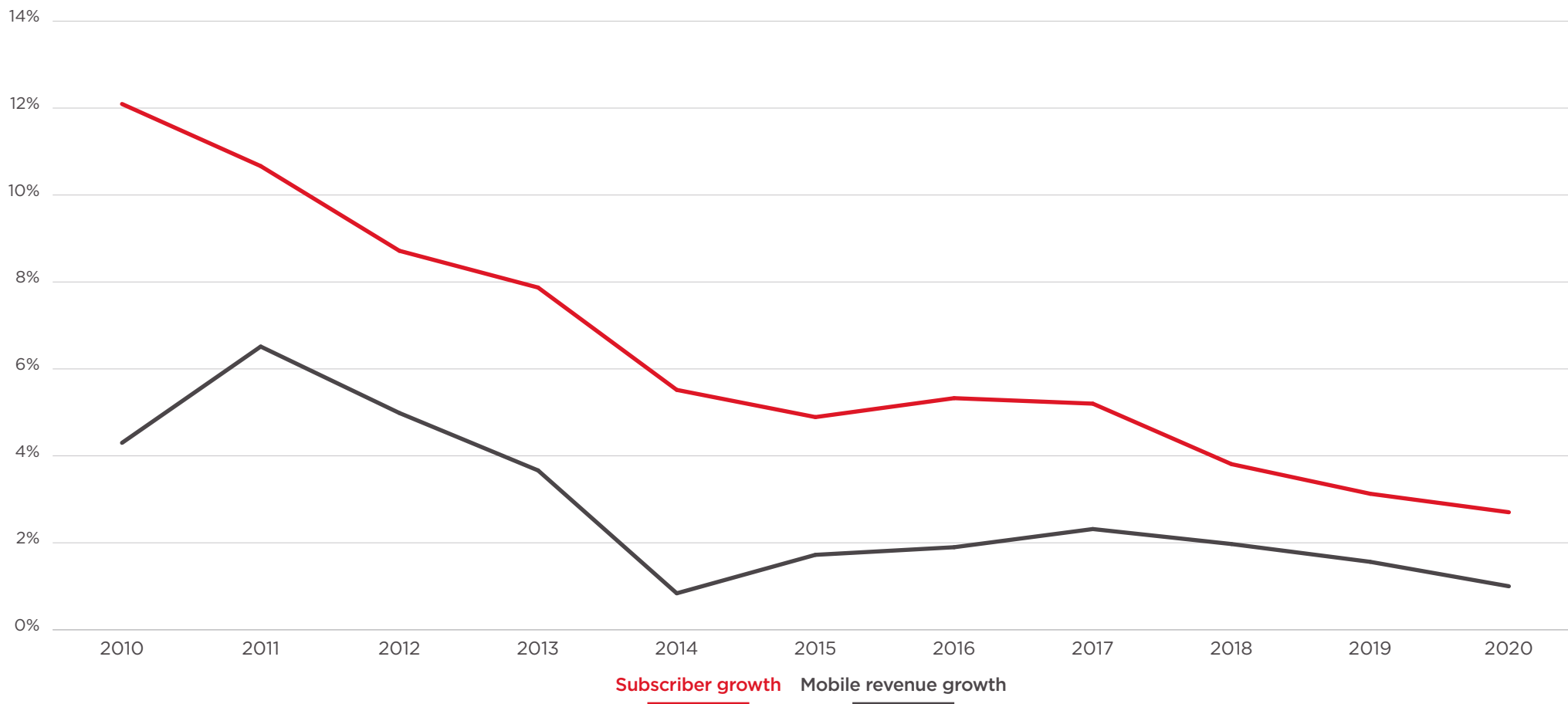
# Mobile revenue growth has stabilised around 2% globally

Slowing subscriber growth means there is less natural growth to come in mobile revenues. Our forecast is for annual mobile revenue growth of around 2% globally out to 2020.

This may seem low but there is plenty of upside potential given rising internet penetration in emerging markets and the shift to higher speed 4G usage more broadly.

## Global mobile revenue versus subscriber growth

Source: GSMA Intelligence

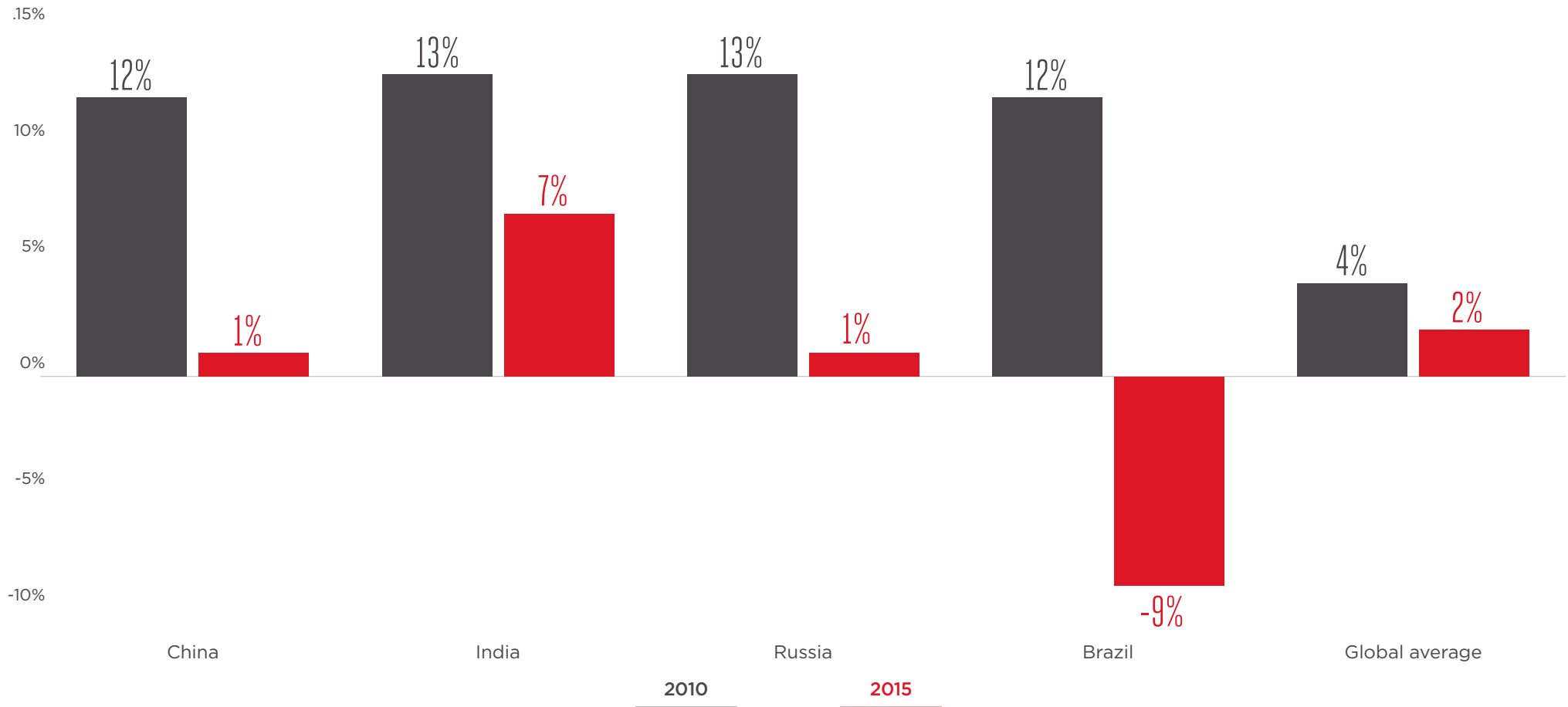


China has slowed down from its heady growth of the last 3-4 years, while Russia and Brazil continue to struggle with a challenging macro-economic outlook.

India is the fastest growing of the four, with its influence in mobile and technology set to increase significantly on a global scale.

## Mobile revenue growth in key markets

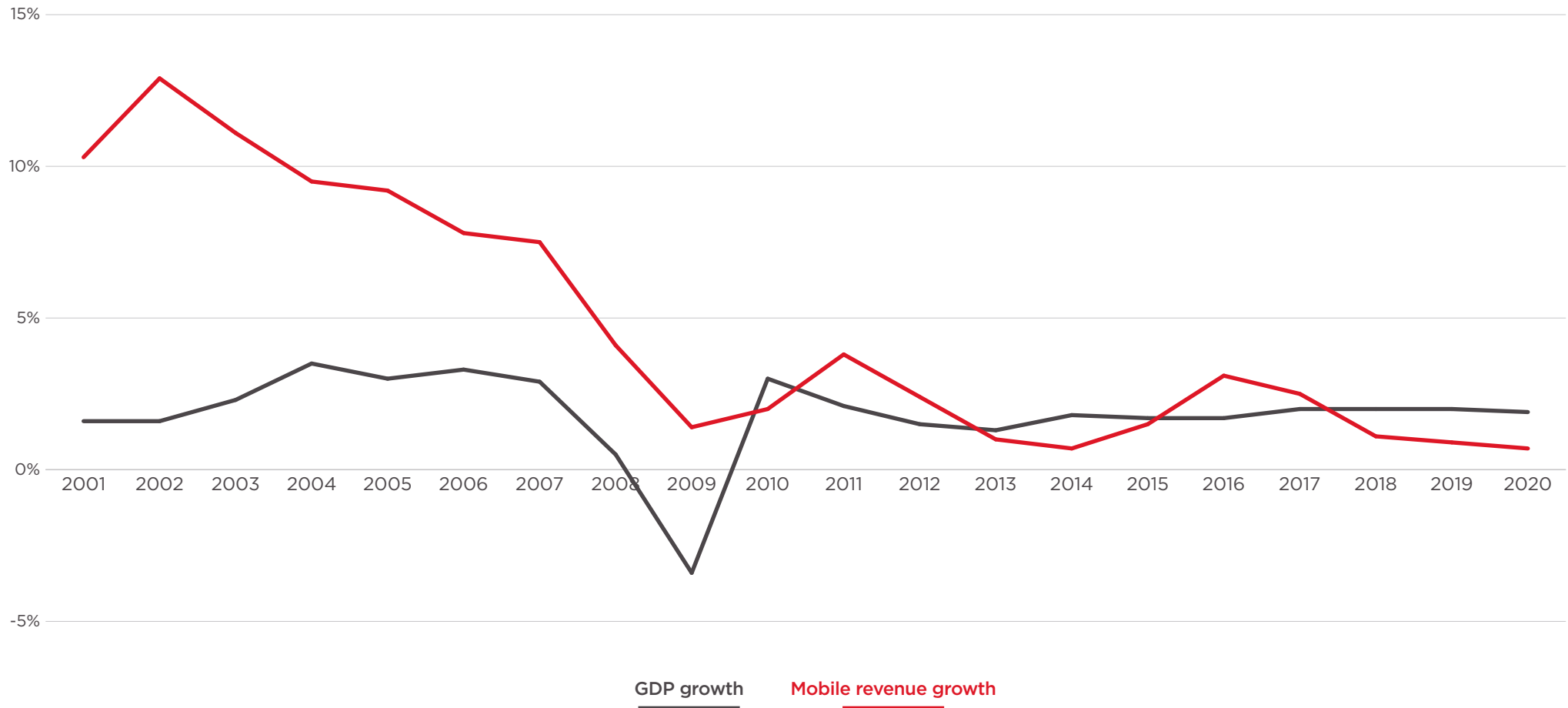
Source: GSMA Intelligence



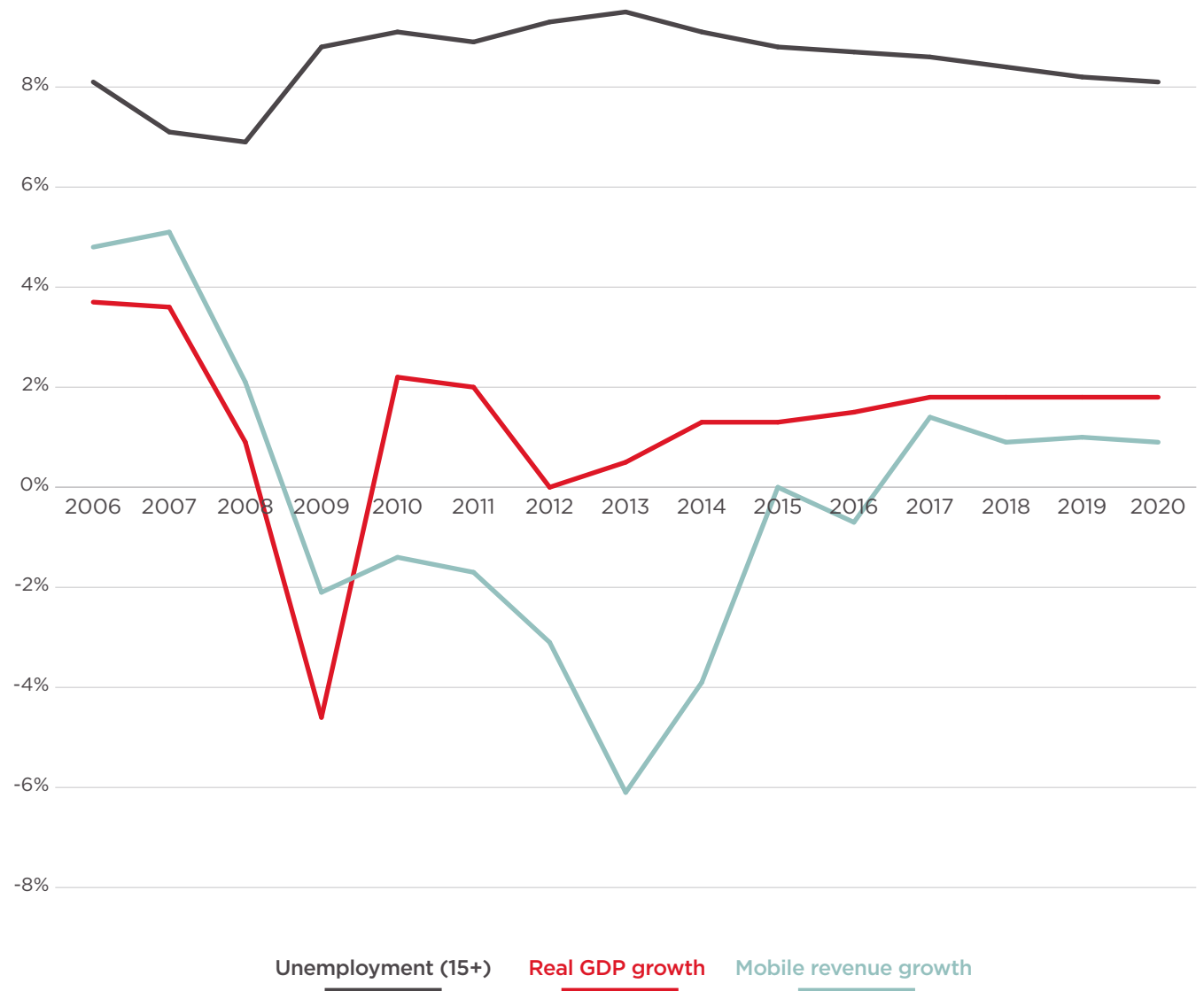
The economic picture is mixed depending on the region. Mobile is susceptible to a downturn as most sectors are, but ongoing LTE adoption and data traffic growth are helping to sustain momentum.

## Performance of mobile revenue growth in relation to GDP growth

Developed country averages shown  
Source: GSMA Intelligence, IMF



Europe: employment, GDP growth and mobile revenue growth, 2006-2020



Europe, and specifically the UK, has an added level of uncertainty following the UK vote to leave the EU, with GDP growth forecasts lowered in the wake of the event.

Mobile has become as close to indispensable as anything, and the UK is one of the most competitive markets in Europe, so the risk to financial performance for telcos is perhaps less than other industries.

However, aside from any direct financial impacts, there will be a number of issues to grapple with in pan-regional regulation and in innovation, especially for London given that it has become the de-facto choice for budding European start-ups or foreign ones looking for a European HQ.

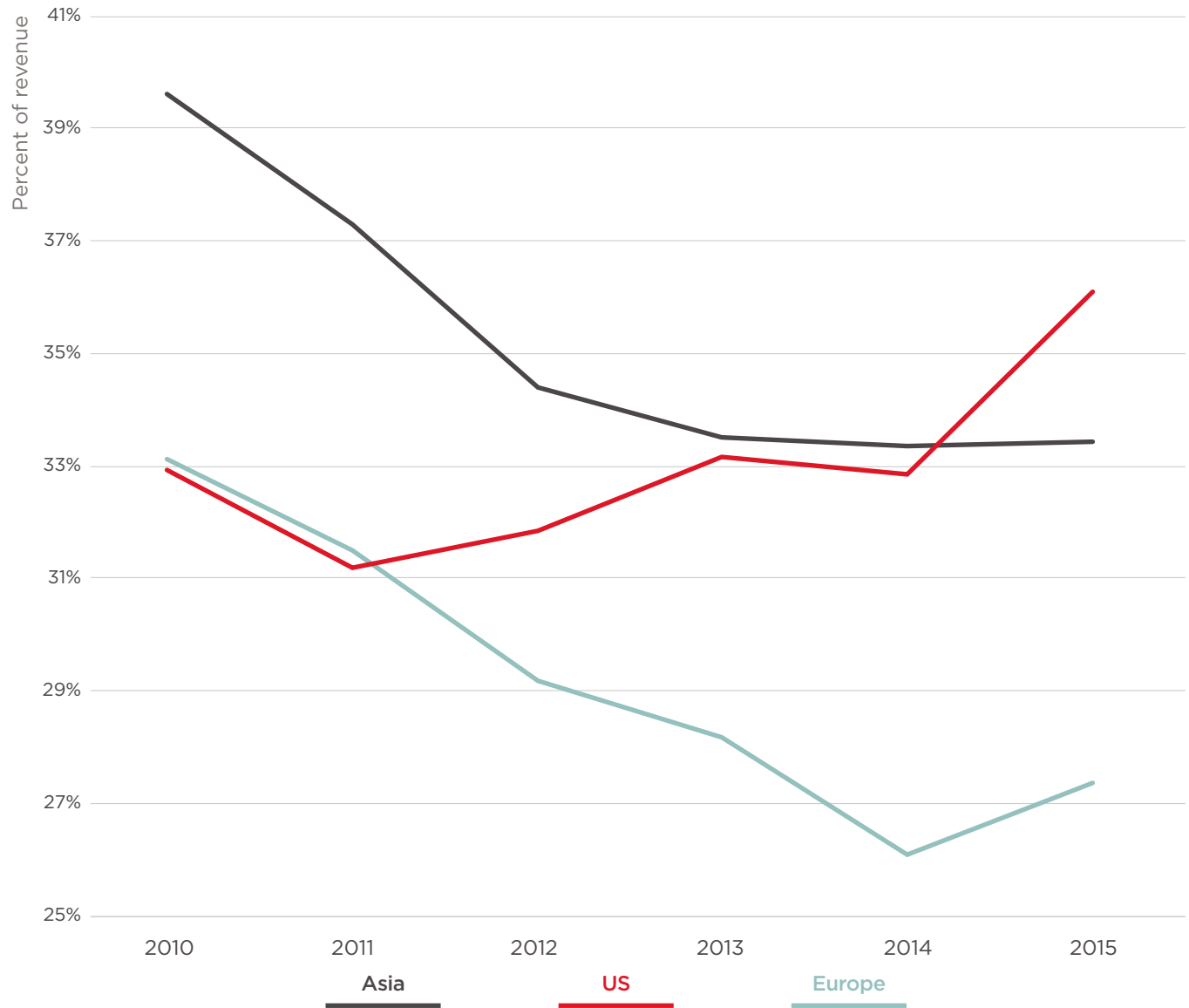
Source: GSMA Intelligence, ILO, IMF



EBITDA margins have risen in Europe and the US in the last year, helped by a recovery in revenue growth and strong cost control.

More broadly, this reflects a more stable competitive environment and continued growth in 4G LTE penetration, both positives.

**EBITDA margins for mobile operators by region**



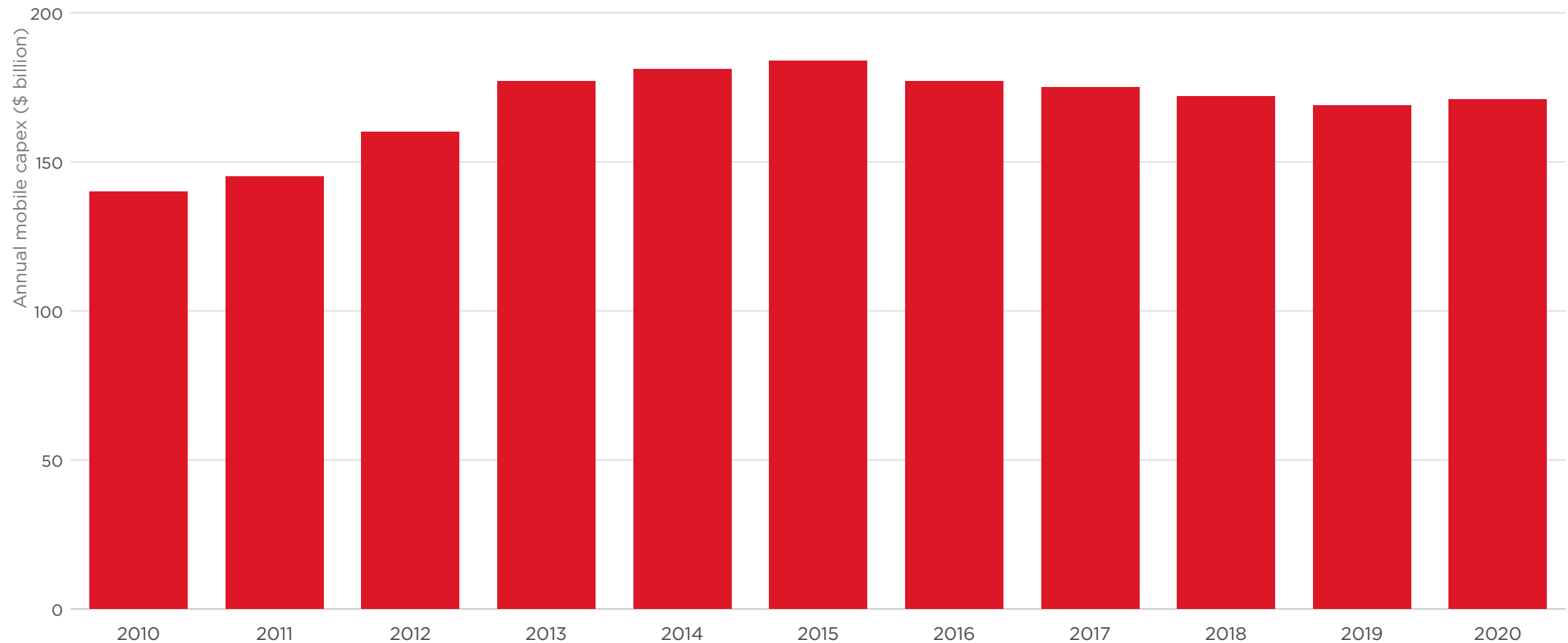
Source: GSMA Intelligence

Capex investment from mobile operators increased markedly in the five years to 2015 to fund LTE coverage expansion.

We expect this to abate somewhat, but that still means a total of \$860 billion between 2016 and 2020 (around 16% of global operator revenues), and even that is likely before most 5G investment given that international standards will not be in place until 2020.

## Mobile sector capex of \$860 billion to come between 2016 and 2020

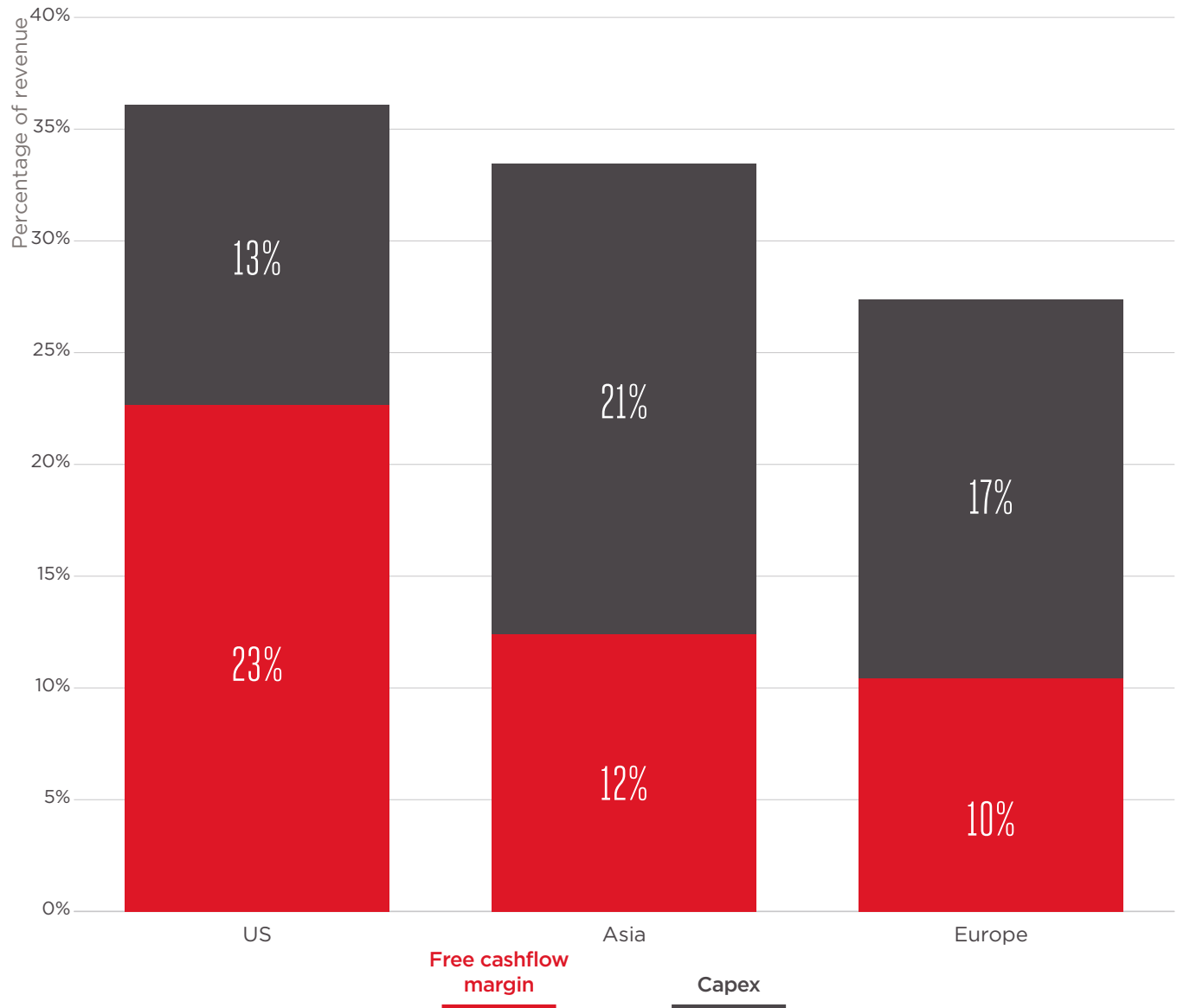
Source: GSMA Intelligence



## Free cashflow being squeezed by rising capex - especially in Europe

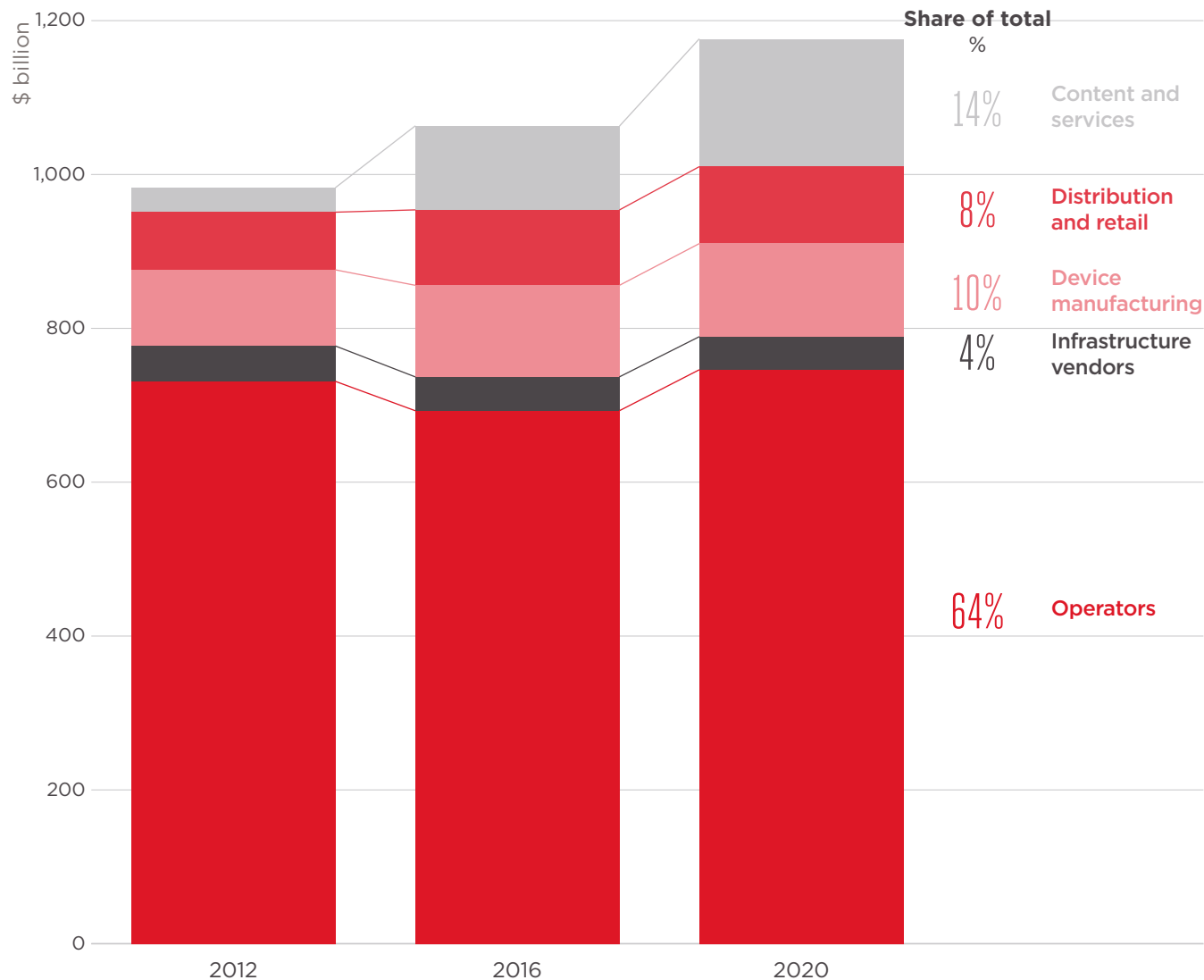
Asian and European operators are spending the majority of their operating income on capex, creating pressure on free cashflow (i.e. what is left after investment).

Perversely, the US actually spends more capex *per mobile subscriber*, but because ARPU levels are much higher (\$50 versus \$30 in Western Europe), this is less of a burn on revenue, leaving a higher free cashflow margin.



Note: figures are for 2015. Free cashflow is calculated as EBITDA minus capex (as share of revenue)  
Source: GSMA Intelligence

## Economic value added in mobile ecosystem



Source: GSMA Intelligence

What does value mean? The term has taken on several meanings as companies seek to redefine business models to compete in a digital era.

Value added is the total income generated by a company or sector, including employee compensation (wages, benefits etc), business profits and payments to government (e.g. tax).

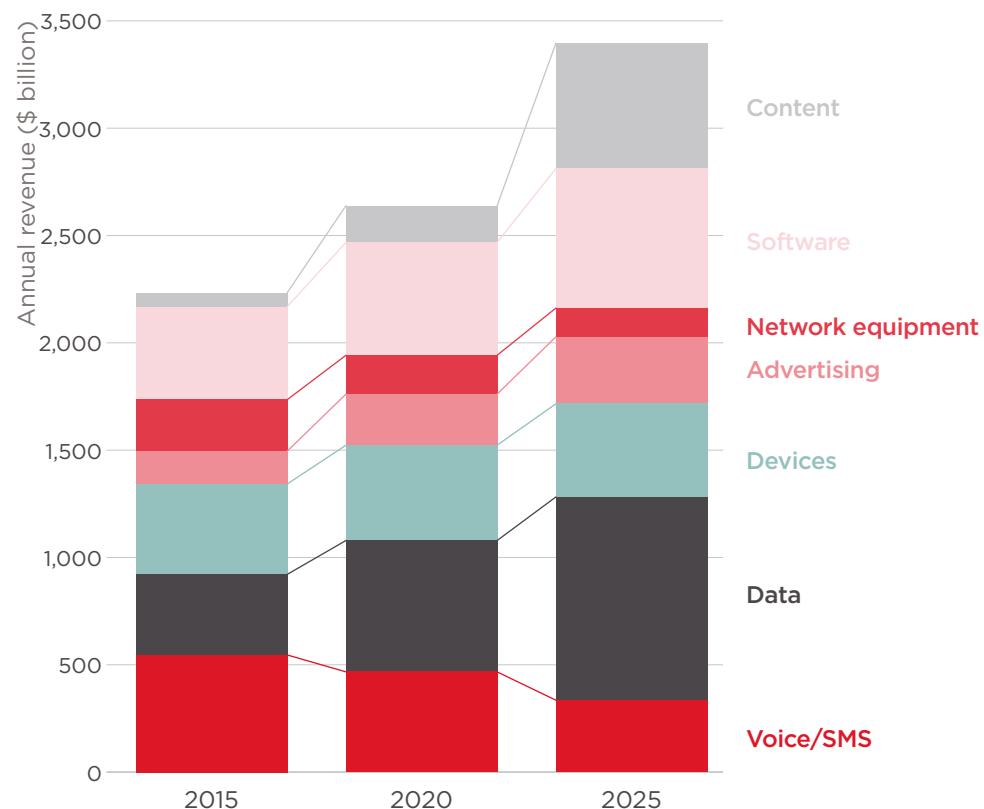
While the mobile operators are one level of a complex value chain that makes up the broader mobile ecosystem (from infrastructure vendors to internet companies), they continue to account for roughly two thirds of value added.

However, growth in value added for the mobile ecosystem as a whole is now being driven by the content and services layer (which will increase from 10% to 14% from 2016–2020) as more time is spent on apps consuming video content.

The same shift can be seen in terms of revenues. Using the current run rates of growth as a base case scenario, we project communications revenues (voice, SMS and mobile data) to fall from 41% of the overall ecosystem in 2015 to 38% by 2025.

## Projected revenue distribution across mobile ecosystem

(base case forecast extrapolating current growth to 2025)



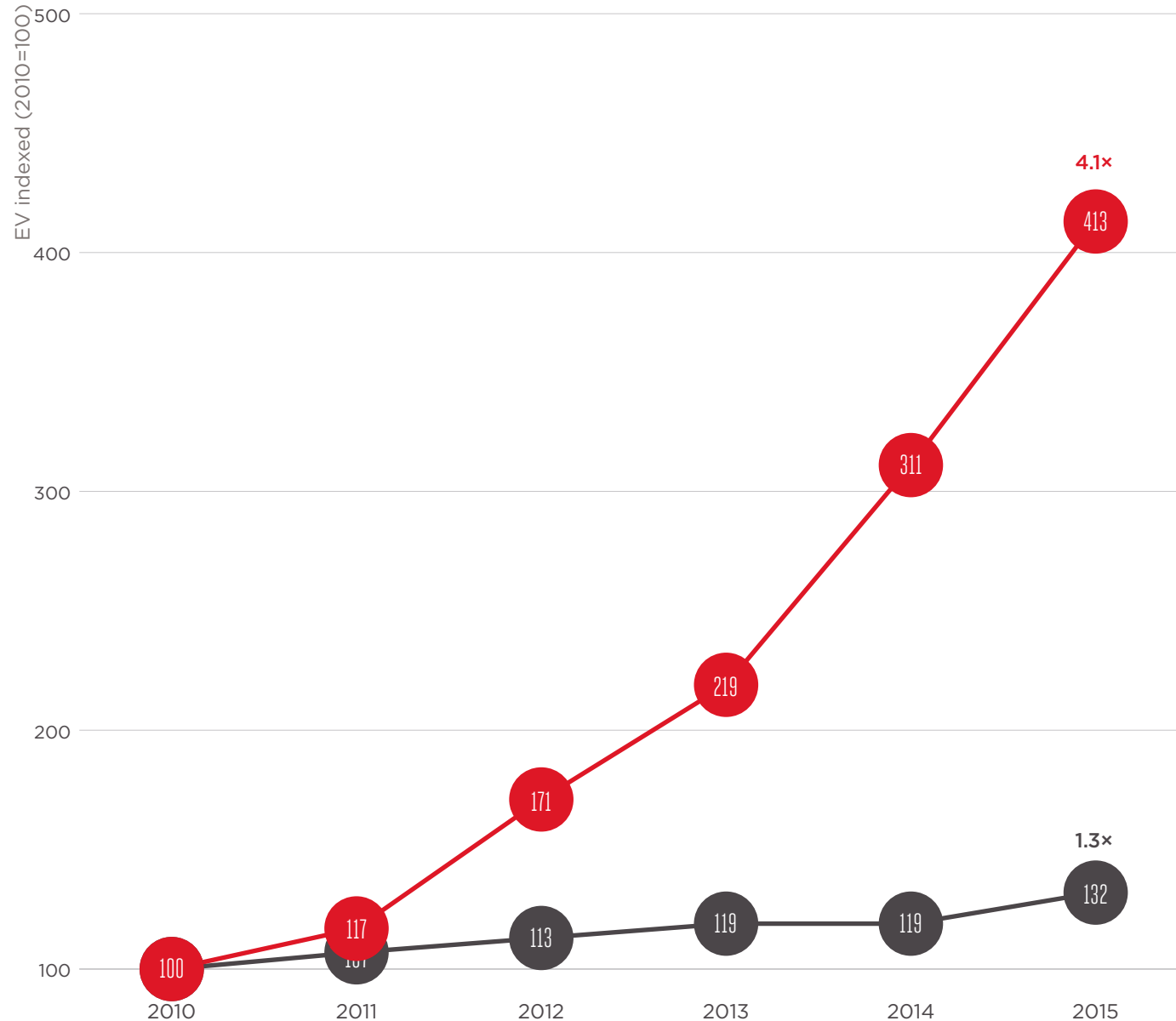
By contrast, OTT content (e.g. Netflix, Spotify) will increase from 3% to 17% over the 10-year period.

Source: GSMA Intelligence

	Description	Major companies
<b>Voice/SMS</b>	Revenues associated with voice and SMS messaging	Mobile operators
<b>Data</b>	Revenues associated with mobile internet services	
<b>Devices</b>	Revenues from smartphone and tablet sales	Apple, Samsung, Huawei, Xiaomi, ZTE, HTC, BlackBerry, Micromax
<b>Advertising</b>	Total digital ad spending on internet-connected devices	Facebook, Google, Tencent, LinkedIn, Yahoo, Twitter
<b>Network equipment and services</b>	Spend on telecoms equipment and services contracts	Ericsson, Nokia/Alcatel, Huawei, ZTE, Cisco, Qualcomm, Tyco
<b>Software</b>	Revenues associated with software licensing	Microsoft, Oracle, SAP
<b>Content</b>	Revenues from online video and music streaming services as well as e-book sales	Amazon (excluding e-commerce), Netflix, Hulu, Spotify

## Enterprise value (EV) - fourfold increase for large cap tech since 2010

Note: EV data as of 12 November 2015  
Source: Yahoo Finance



Large cap tech  
\$1.74 trillion

Apple  
Google  
Facebook  
Amazon  
Netflix

Large cap MNO  
US/Eur/Latam  
\$1.24 trillion

AT&T  
Verizon  
Vodafone  
Deutsche Telekom  
Orange  
Telefónica  
TIM  
América Móvil

Telco appetite for fixed/mobile convergence has grown in the last three years, with cross-sector M&A helping to accelerate the shift to all-IP networks – an important underpinning to operate a convergent business model.

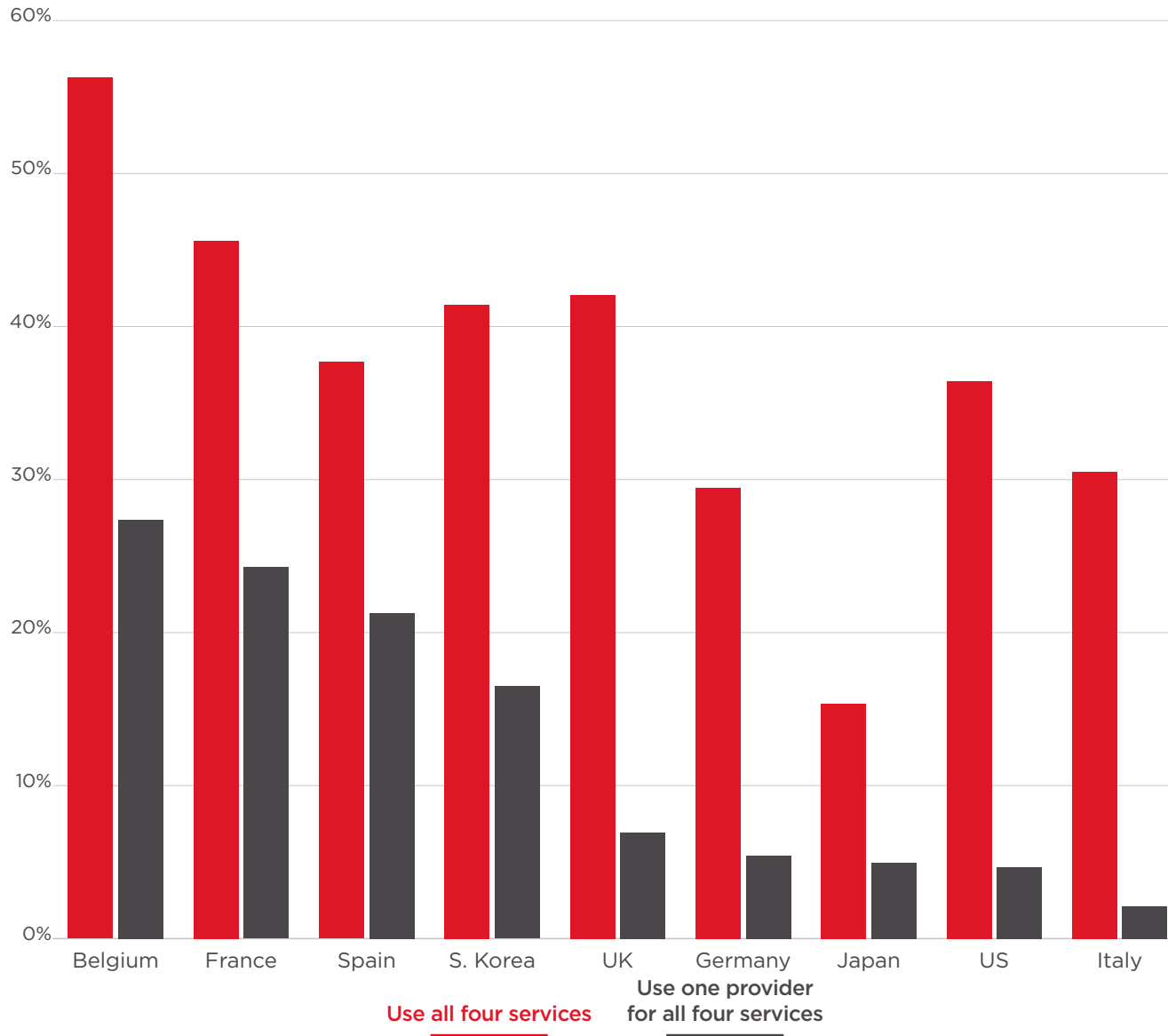
A quarter of telco mergers over the past five years involved mobile operators purchasing (or combining with) cable companies or satellite pay-TV operators. Prominent examples include Vodafone’s purchase of cable firms in Germany and Spain, and AT&T’s purchase of DirecTV.

Most of this has happened in Europe, the US and to some extent parts of Asia and Latin America. Most emerging markets have yet to embrace this trend in the absence of extensive fixed/cable network infrastructure.

## Notable telecoms M&A deals in last three years

Country	Acquirer	Target	Month	Year	Currency	Acquisition price
Germany	Vodafone	Kabel Deutschland	June	2013	EUR	8,374
Netherlands	Liberty Global	Ziggo	January	2014	EUR	10,875
France	Numericable (Altice)	SFR	February	2014	EUR	18,488
Spain	Vodafone	ONO	March	2014	EUR	7,830
US	AT&T	DirecTV	April	2014	USD	48,500
Spain	Orange	Jazztel	September	2014	EUR	3,698
Portugal	Altice	Portugal Telecom	November	2014	EUR	8,048
UK	BT	EE	November	2014	GBP	19,038
Belgium	Liberty Global	Base (KPN)	April	2015	EUR	1,441

## Quad-play take-up rates

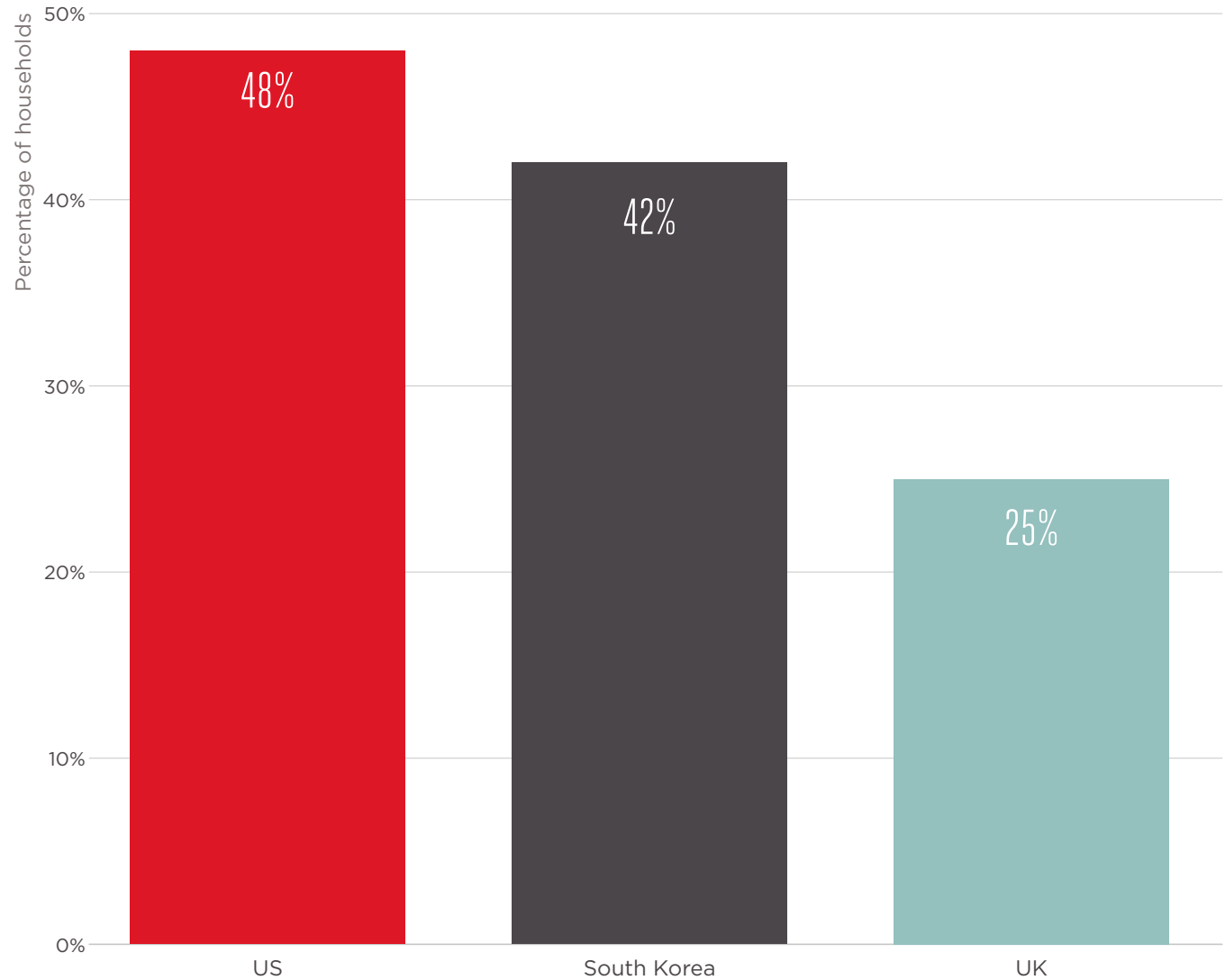


Even in markets where quad-play services (fixed phone, fixed broadband, mobile and pay TV) have been launched, evidence of genuine demand for all four services from one provider is low, at under a third of households.

Source: GSMA Intelligence Consumer Survey 2015



## Streaming video take-up



Operators globally are increasingly investing in the development of exclusive mobile-only or at least mobile-first content to drive data traffic and subscriber loyalty.

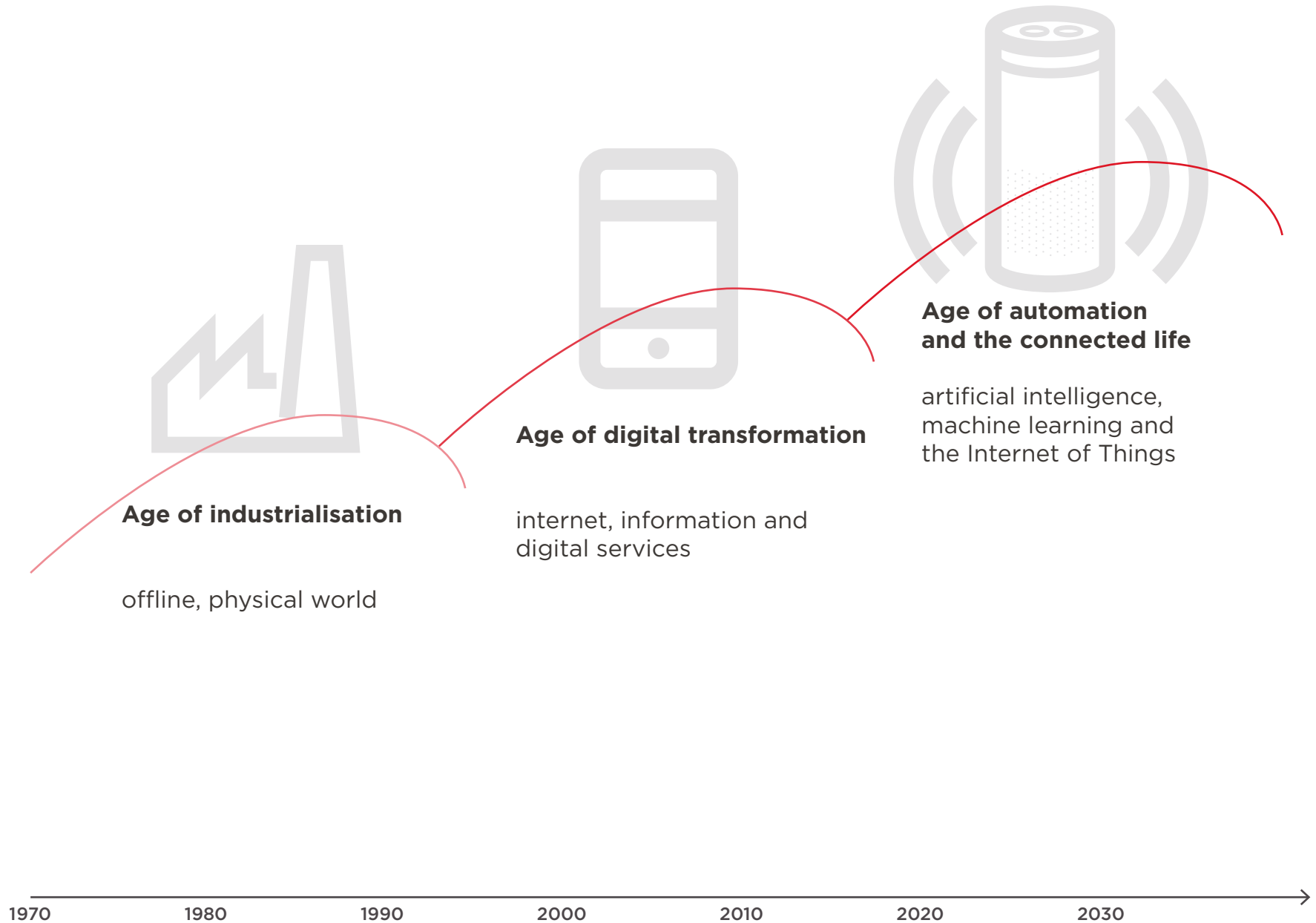
Prominent examples include Verizon's millennial-focused Go90 app, AT&T's planned streaming TV service based on DirecTV content, and Singtel's HOOQ in Asia.

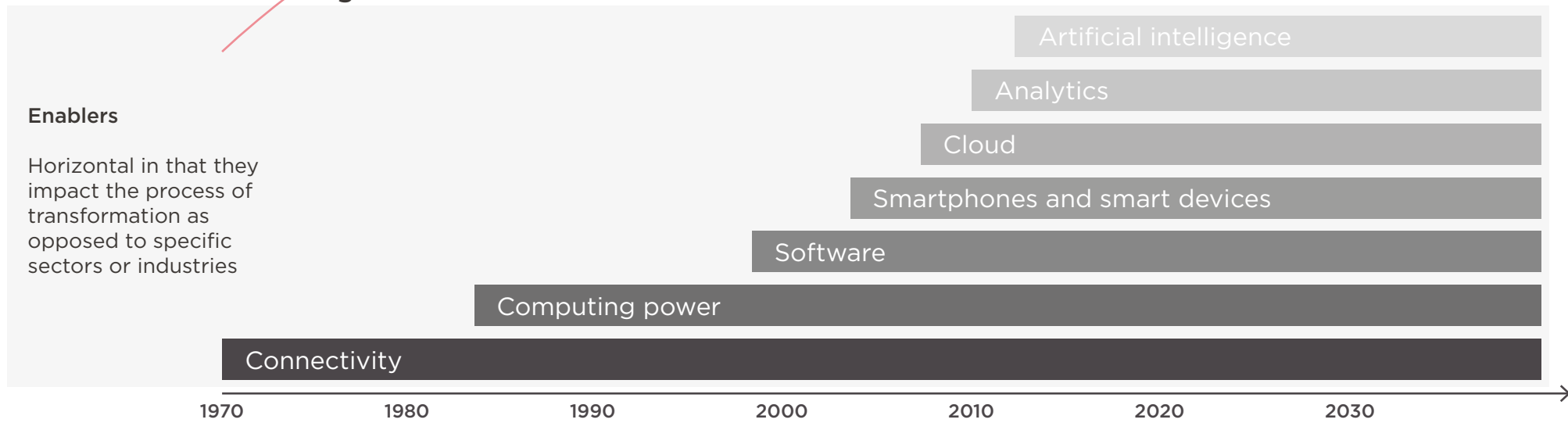
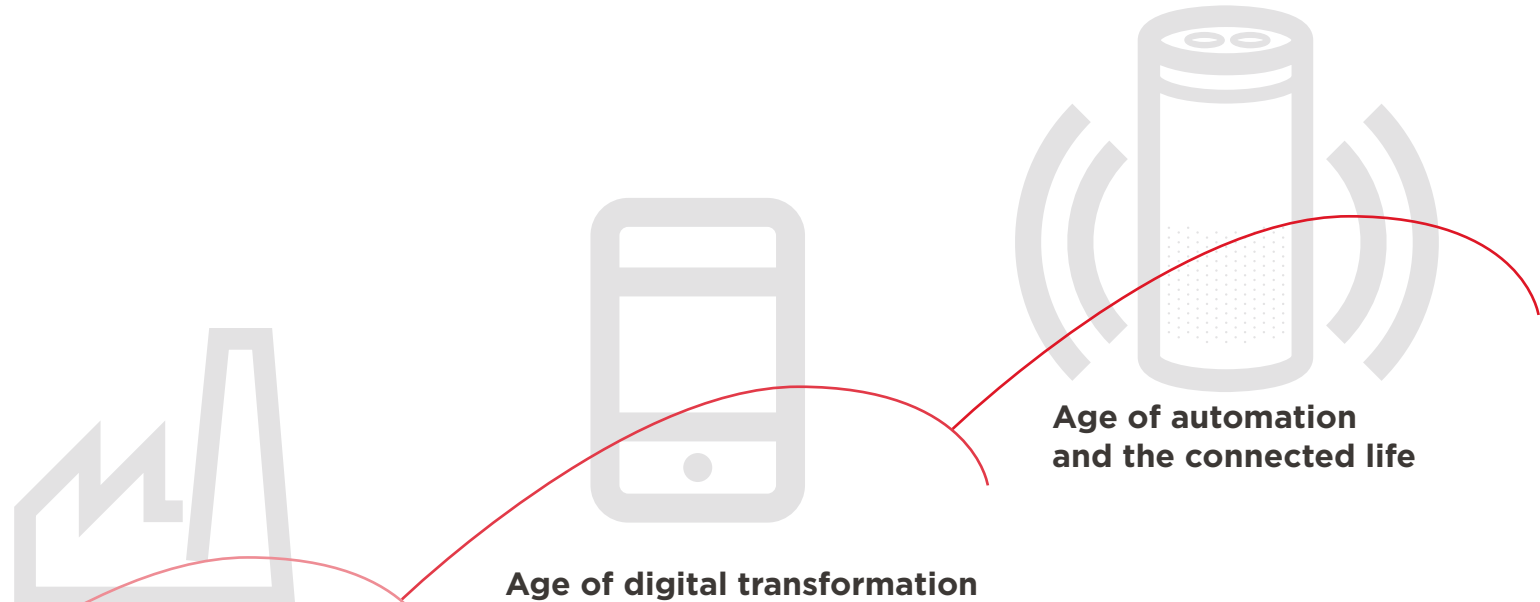
These are very new, however, so the jury is still out on the success of this strategy; companies have said their investments will take time to bear fruit.

Source: Nielsen, Ooyala.com, BARB

# Future view







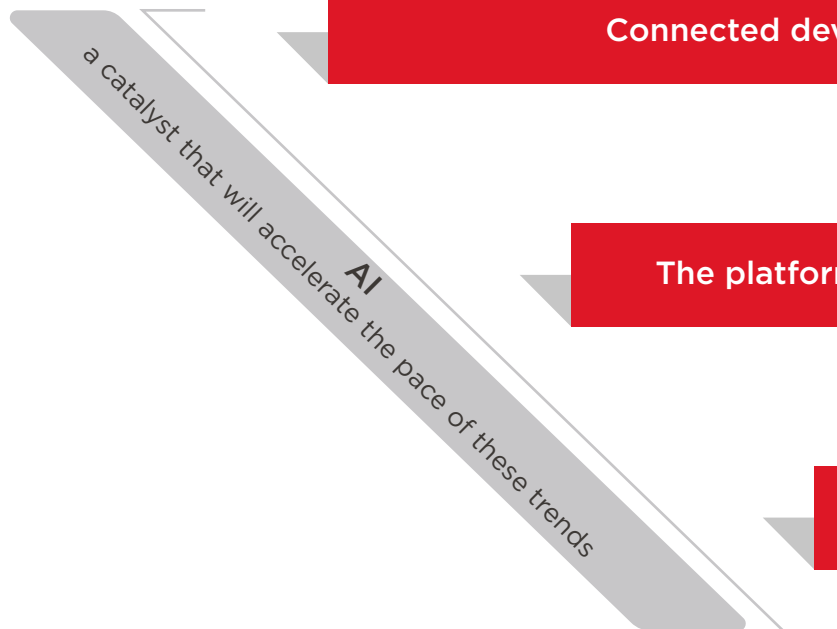
Geographic shift in mobile user growth

The internet is mobile, and mobile is the internet

Connected device explosion

The platform economy: messaging was just the start

'Open' is now moving down to the network level



# Future view

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└ The platform economy



# The platform economy: messaging was just the start

The platform economy uses smartphones, software and open APIs to create and scale new digital marketplaces for a huge range of services and products

From OTT messaging apps



...to a broad range of consumer-focused sectors reinventing how business is done through digital platforms



...to major industrial sectors putting analytics and automation in the cloud



Source: Adapted from General Electric

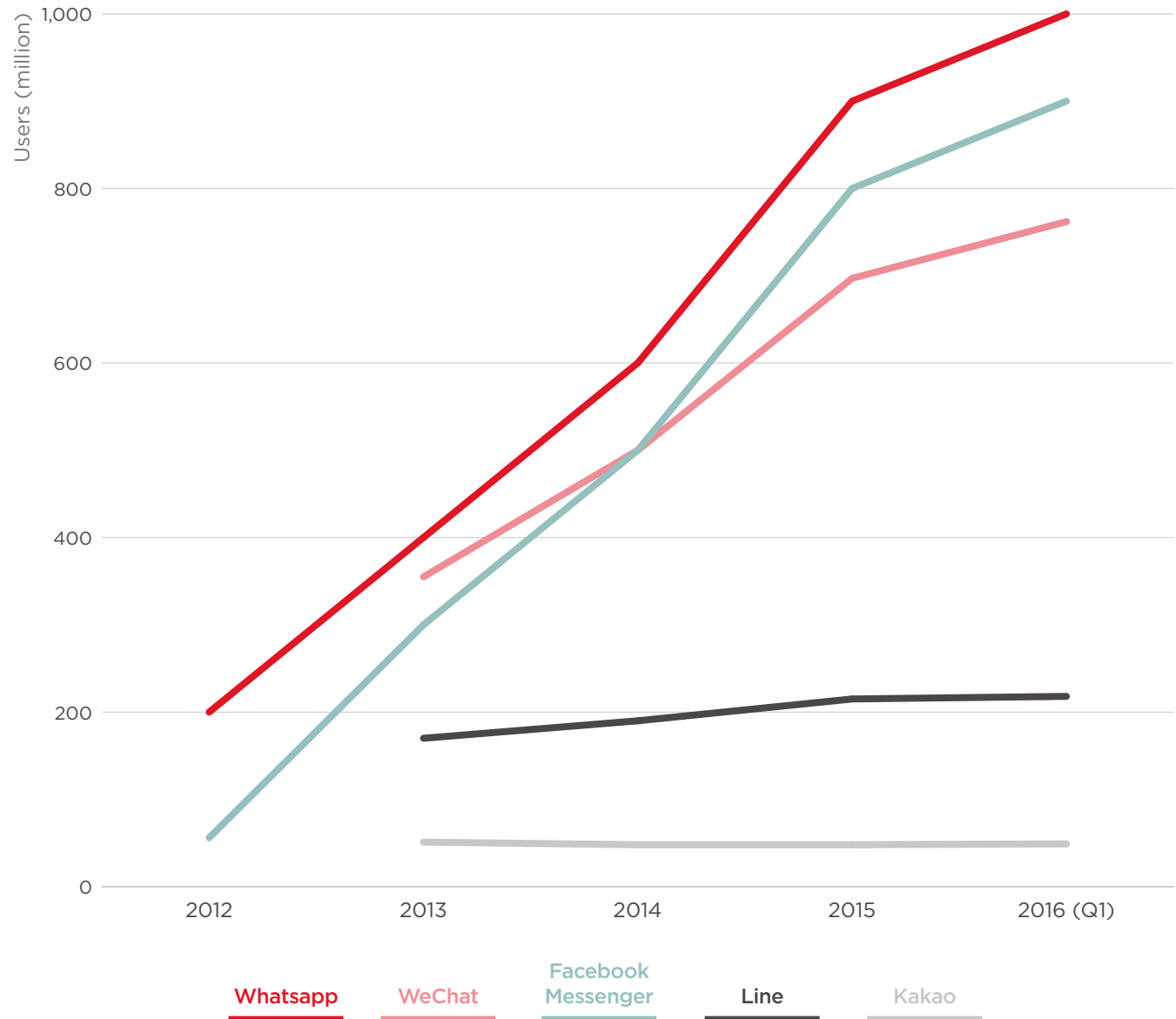
The IP messaging app user base is growing exponentially.

The global user base is approaching 3 billion. Growth will continue with the spread of low-cost smartphones.

Whatsapp was first to hit 1 billion users.

A new wave of apps such as Snapchat is growing quickly.

### Continued rise of IP messaging platforms



Source: company reports, GSMA Intelligence



# The rise of the new app constellations: dominating user engagement...

Millions of apps are now available across the two leading app stores.

But people download fewer apps and engagement is increasingly focused on a handful of apps.

These are the new platforms or ‘app constellations’: Facebook, WeChat etc.

These new platforms integrate a growing range of services, further entrenching their dominance.

	Average number of apps installed on device*	Average number of apps used daily	Average number of apps accounting for 80%+ of app usage	Time spent on phone per day
<b>US</b>	37	12	3	5 hours
<b>Worldwide</b>	33	12	3	4 hours

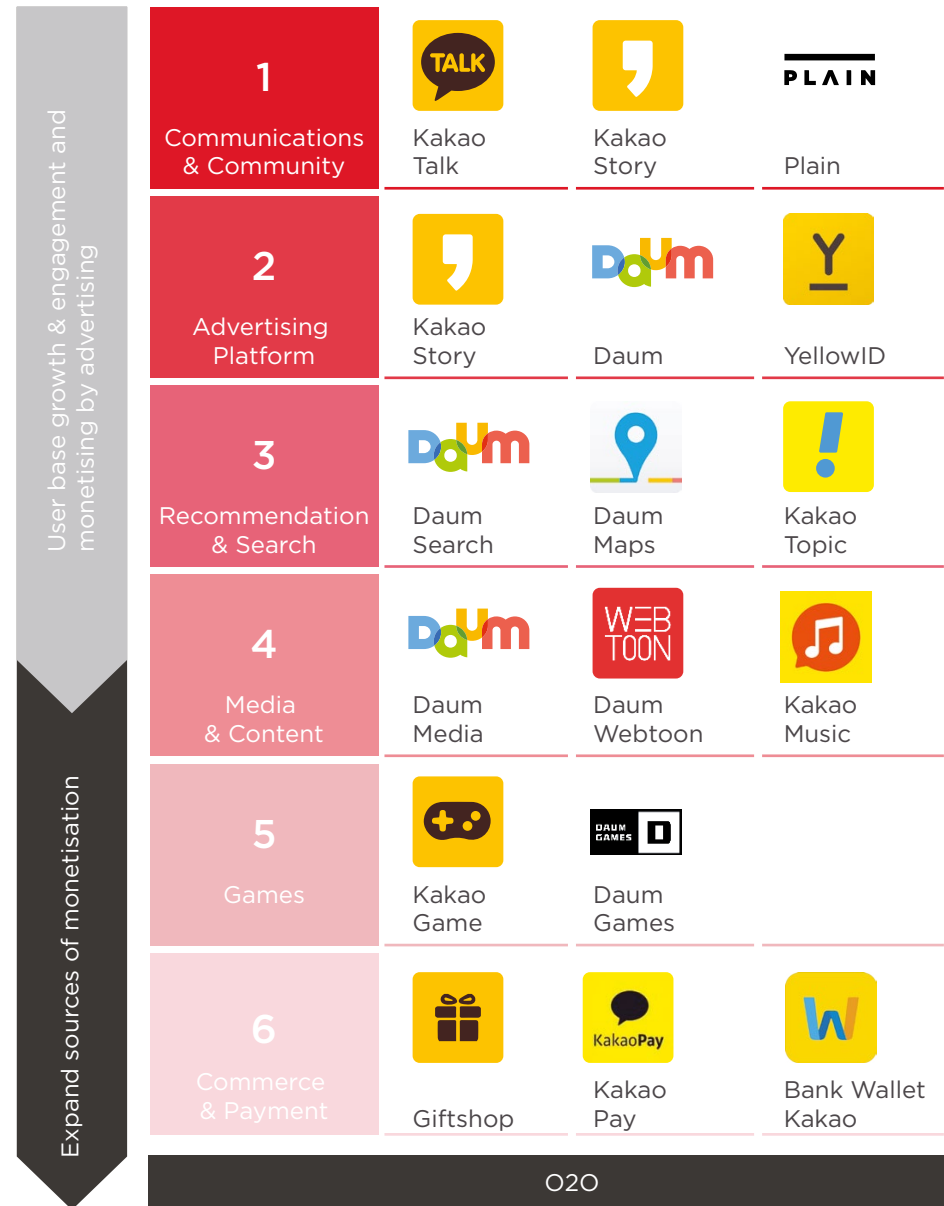
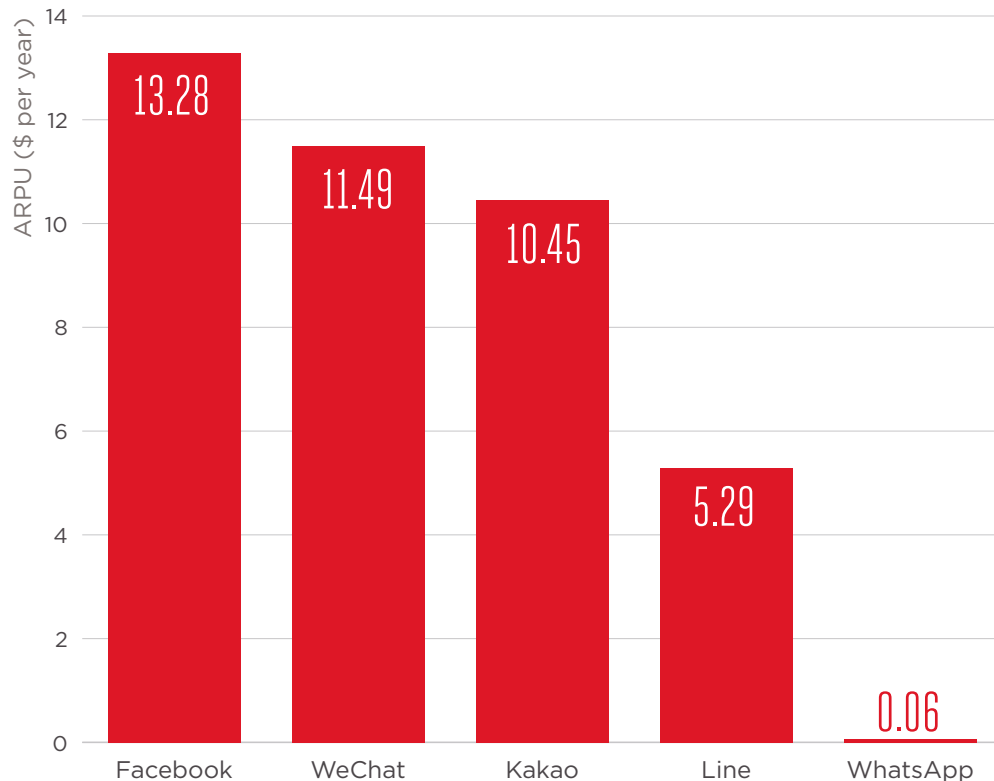
\*Apps installed does not include preinstalled apps

Most successful apps (mainly messaging or social-based) are building ever-wider ecosystems (app constellations), integrating a broad range of services.

ARPU levels are not disclosed for individual messaging platforms. We have made estimates based on associated revenues and user counts.

Note: ARPU expressed as annual equivalents. Data is for three-month period to March 2016 except for WhatsApp (6 months to June 2014). Facebook data is reported, while we have made estimates for WeChat, Kakao and Line. Source: Company reports, GSMA Intelligence

### Messaging platforms making money without charging for communications



Kakao platform (Korea)

Value in automotive is shifting to software and services.

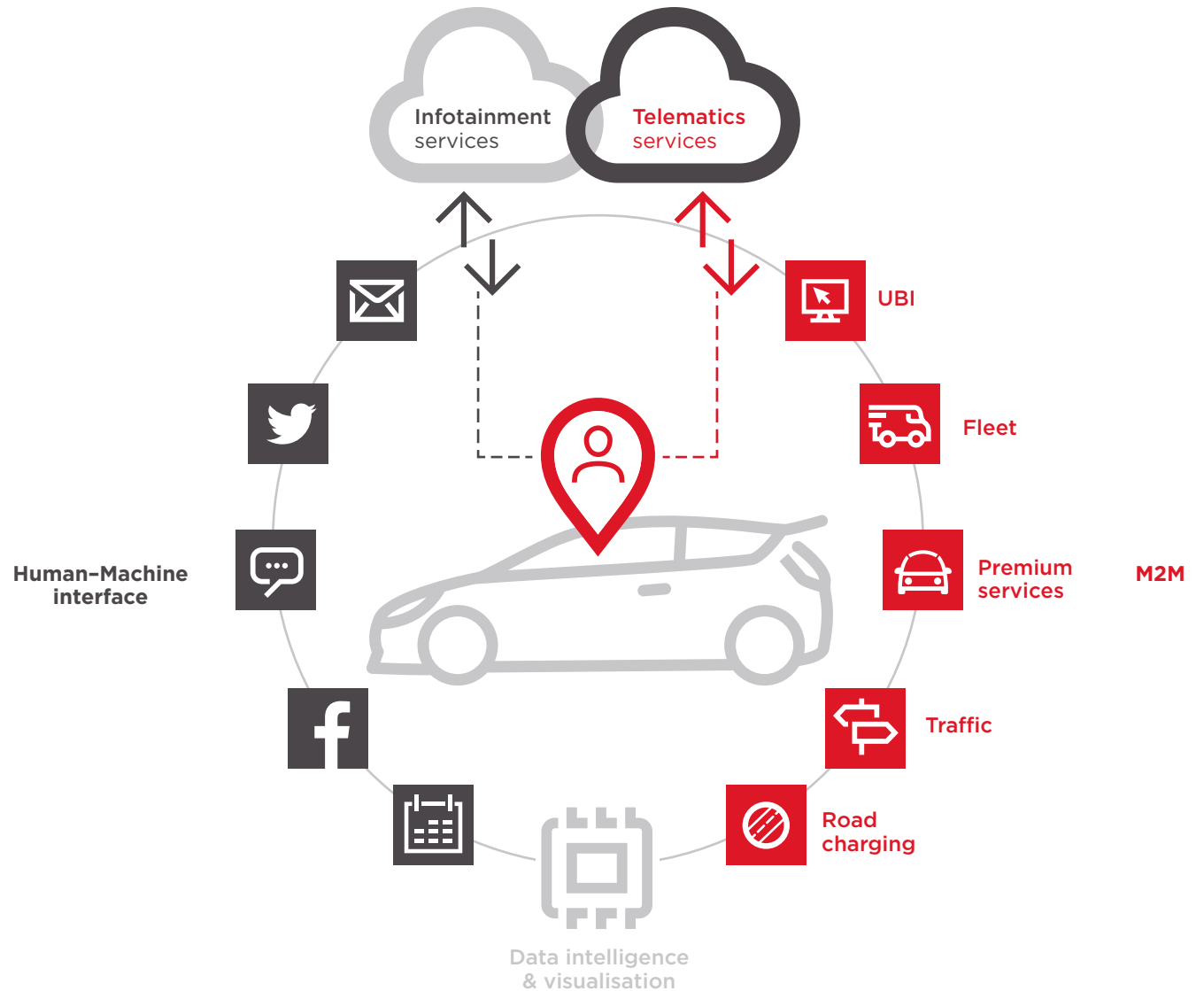
Cars are emerging as new platforms to offer a variety of content and services, ranging from infotainment to telematics.

Developments are being driven by the major mobile ecosystem players such as Google and Apple.

These trends may accelerate with the rise of electric vehicles, which may prove a catalyst for further disruption of the automotive sector.

Up to two thirds of new cars sold by 2025 are expected to be connected (built-in or smartphone-based).

IHS forecasts 20 million autonomous cars by 2035.



Source: Intelligent Mechatronic Systems

## Google Home



## amazon echo

Voice can be the next platform, also described as ‘conversational platform’.

Relies on dumb terminals linked by high-speed networks to intelligence (AI and natural language) in the cloud.

Initial applications are focused on the smart home and personal assistants.

Other use cases could include digital health (diagnosis and treatment plans) and the enterprise space (to automate business communications and improve workplace productivity).

Voice (combined with advances in AI) has the capability to become a super platform that coordinates devices and data across a broad range of applications.

Amazon Echo sales of over 3 million to date, with a target of 10 million in 2017.

Several smart home platforms have emerged, though the overall market remains fragmented.

There are multiple initiatives in place to address fragmentation and enable economies of scale, both at the application level (e.g. AllSeen Alliance) and at the networking level (e.g. Thread).

### Examples of smart home ecosystem players



### Application based



### Hub at the centre

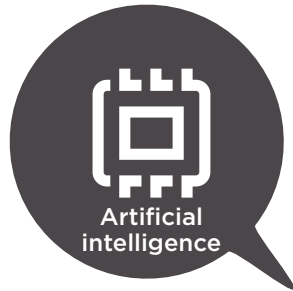


### Voice based



A number of players are trying to establish an ecosystem based around their products, partnering with device manufacturers to link those devices to their smart home platforms.

The latest development in terms of device control point is the voice-controlled hub (Amazon Echo, Google Home etc.), which could be seen as a progression from controlling the device via an application or central hub.



VR expected to have both consumer and enterprise applications.

Initial focus on consumer and gaming:

- HTC Vive sales around 100,000 to date
- Facebook reportedly targets 400,000 Oculus Rift sales in 2016.

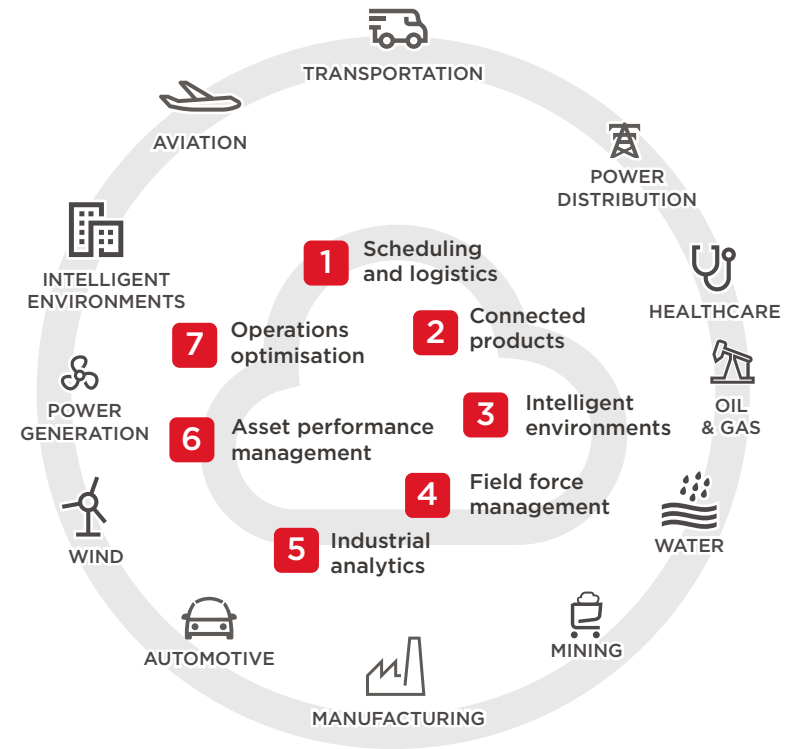
## Industrial internet: the power of 1%

### Potential performance gains in key sectors

Industry	Segment	Type of savings	Estimated value over 15 years <small>(Billion nominal US dollars)</small>
Aviation	Commercial	1% fuel savings	30
Power	Gas-fired generation	1% fuel savings	66
Healthcare	System-wide	1% reduction in system inefficiency	63
Rail	Freight	1% reduction in system inefficiency	27
Oil & gas	Exploration & development	1% reduction in capital expenditures	90

Source: Adapted from General Electric

## Industrial internet platform – GE Predix

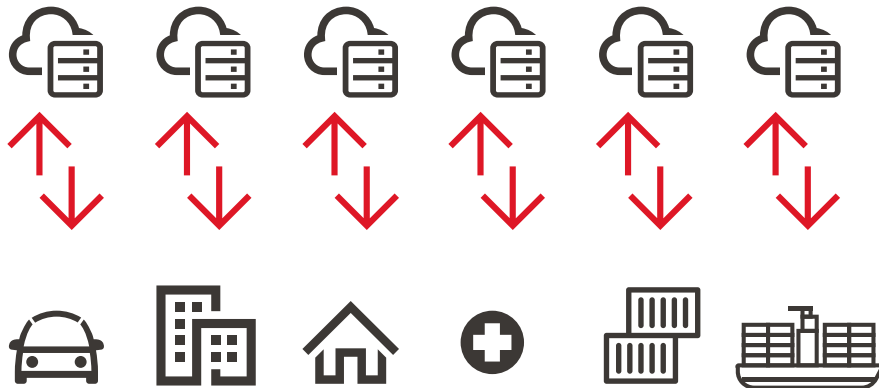


Source: Adapted from General Electric

A number of horizontal platforms have emerged to shift industrial processes into the cloud.

HPE IoT platform, Intel ARTIK Cloud, Alibaba Cloud, GE Predix Cloud and Microsoft Azure are all recent examples.

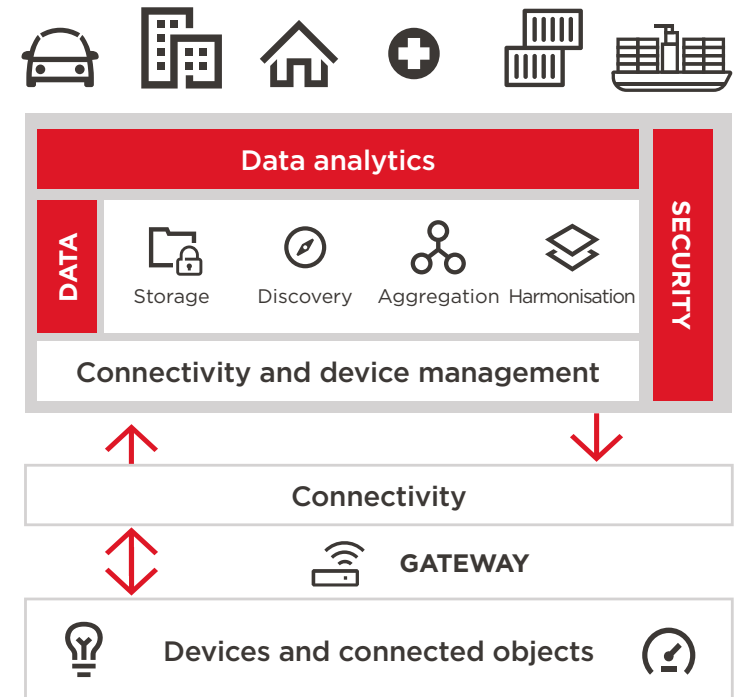
## Vertical platforms



Move from vertical to horizontal platform



## Horizontal platforms addressing different verticals

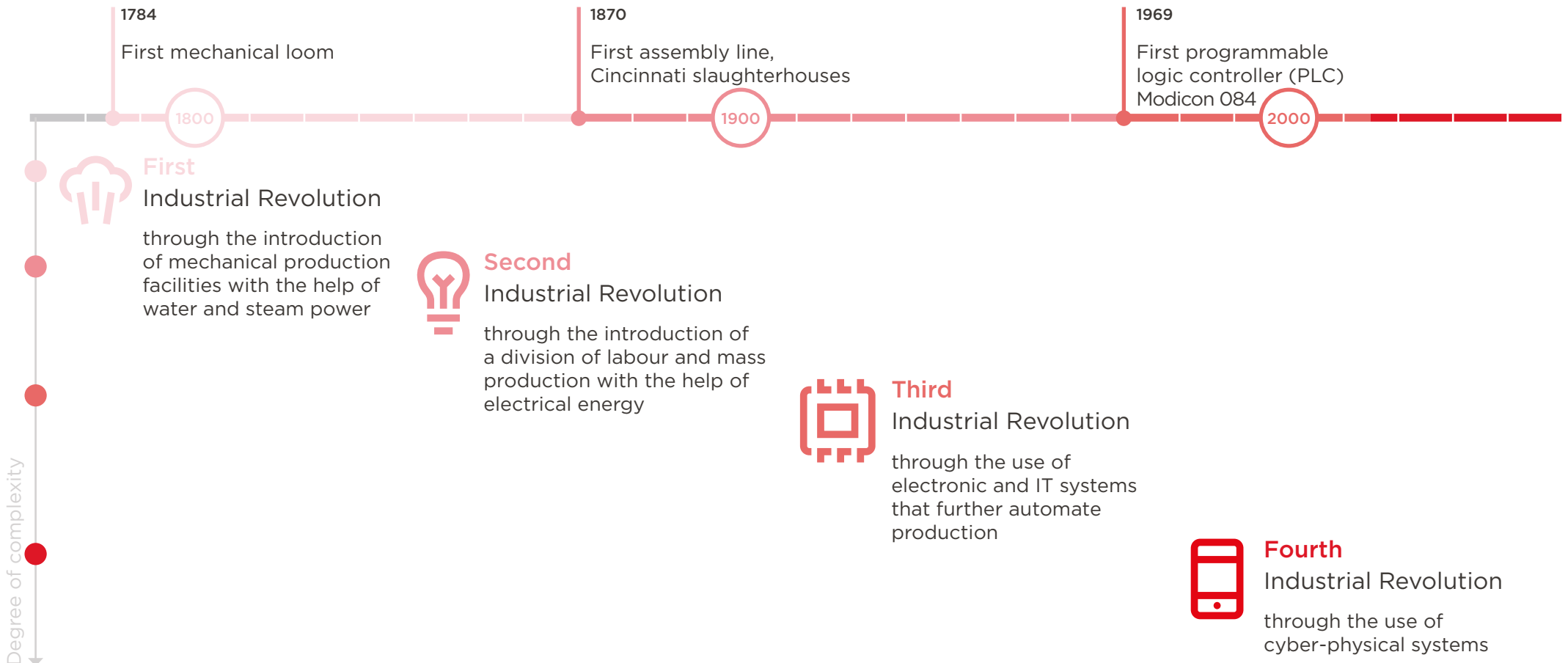




Industry 4.0 or Industrie 4.0 enables business model innovation in manufacturing by combining advanced robotics, AI, sensors, cloud computing, IoT, 3D printing, data analytics, platforms and connected devices to increase productivity and reduce time wastage.

The Industry 4.0 movement started in Germany and is supported by the German government and a number of large companies such as Bosch, Daimler and Siemens to enable the fourth industrial revolution.

## Evolution to fourth industrial revolution



Source: Adapted from DFK

# Future view

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↳ Network disruption:  
APIs and the shift  
to open

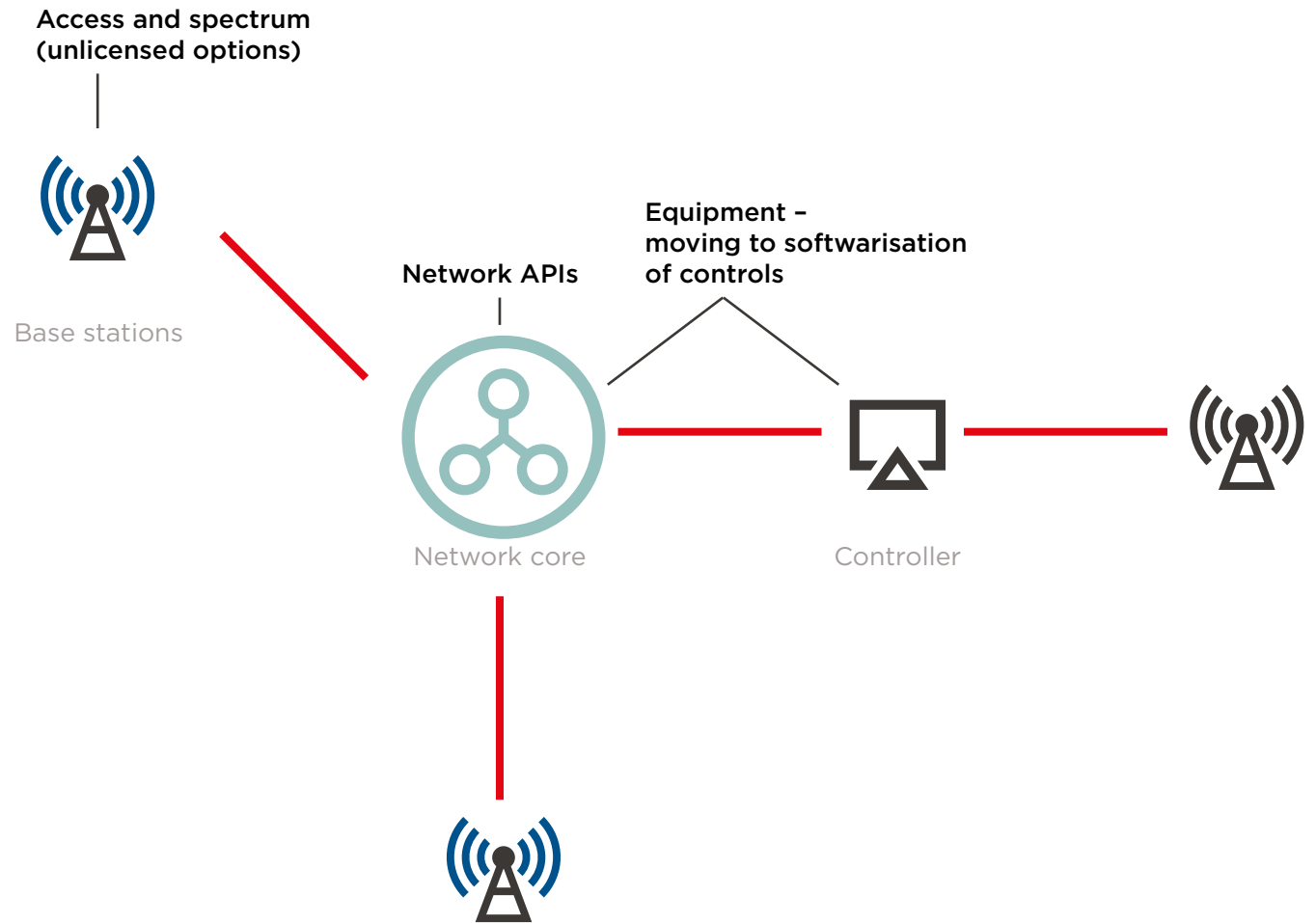


Infrastructure is becoming more open at several levels

- Equipment
- APIs
- Access and spectrum

Key implications

- Easier access for consumers
- Lower cost operating model for network providers
- Faster innovation

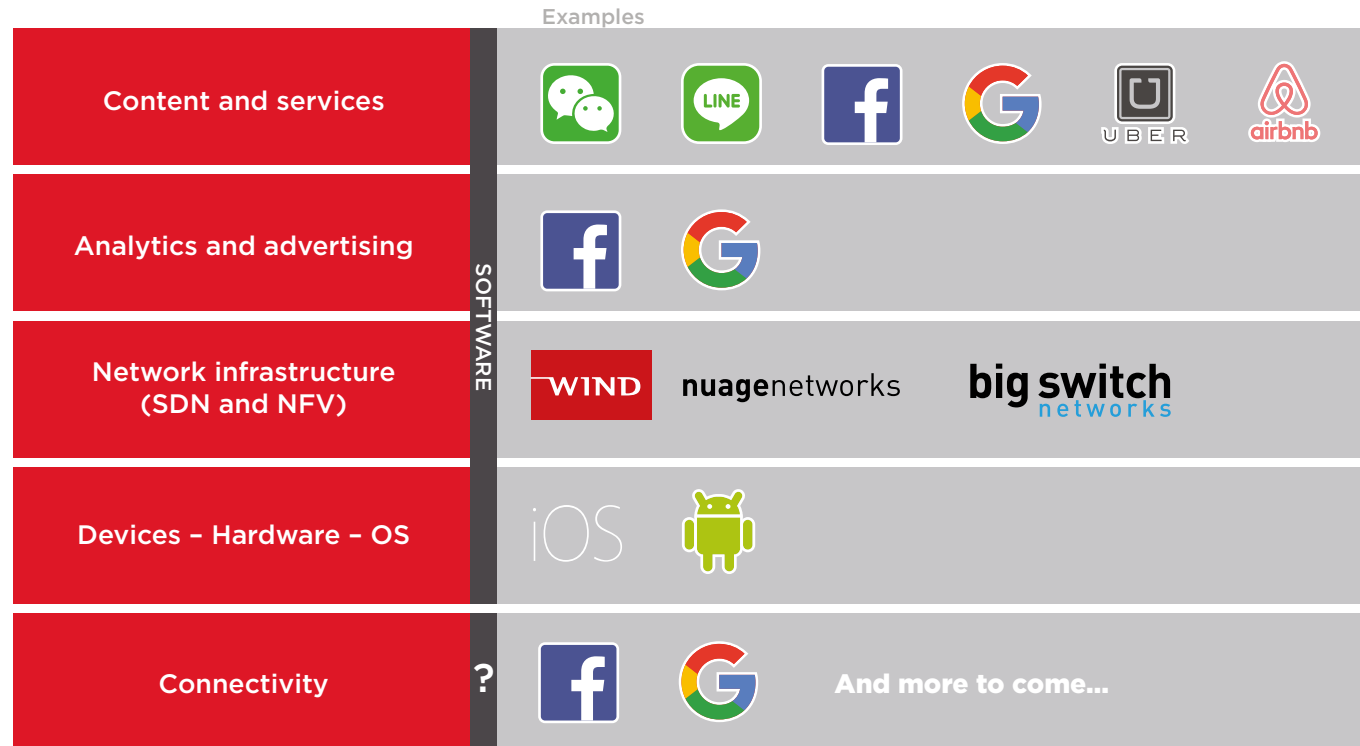


## Software disruption sees new players capture value in the mobile stack

The telecoms industry is now seeing growing momentum in the move to more software-centric and programmable networks, particularly with the adoption of both software-defined networks (SDN) and network function virtualisation (NFV).

The equipment market will be disrupted as network equipment is increasingly commoditised and intelligence moves to the software layer, with a range of innovative new players entering the space.

The move to software-centric networks is likely to drive a wave of innovation and a growing range of new providers offering new services: the network itself becomes an application programming interface (API).



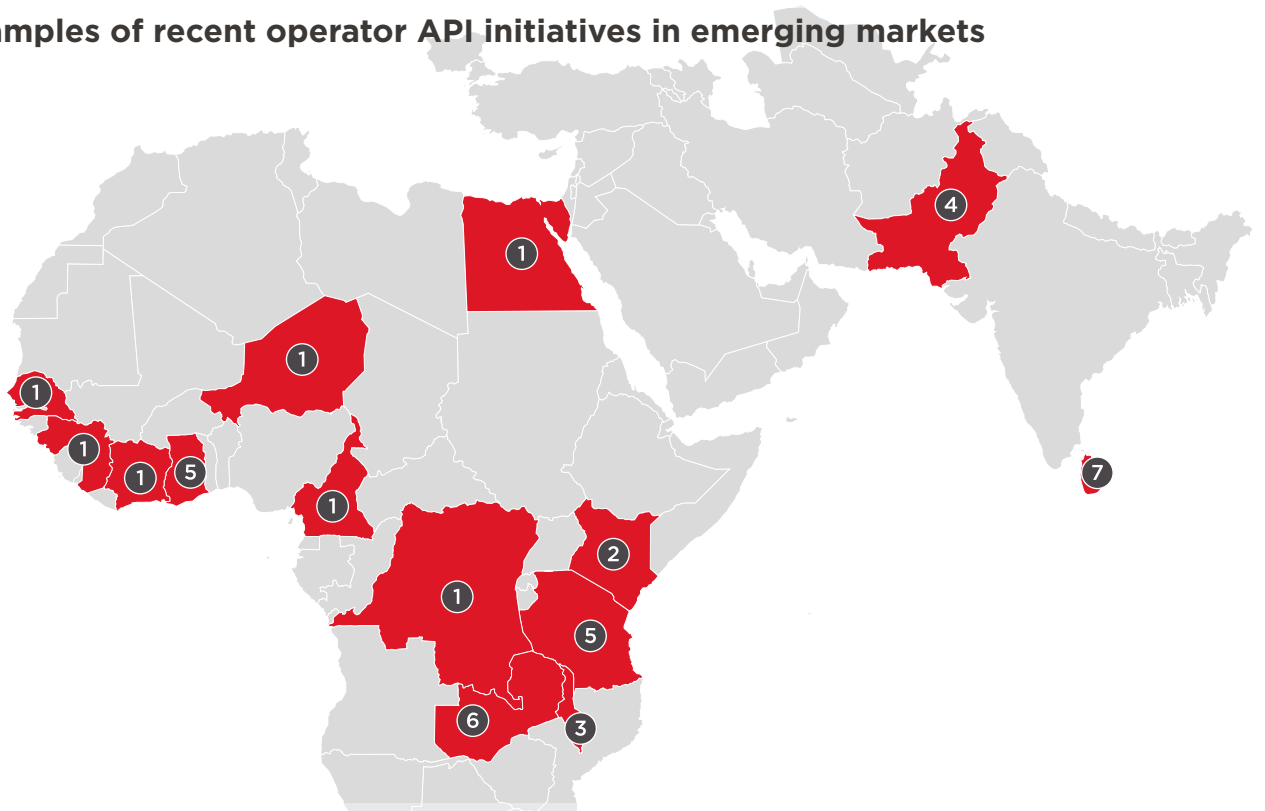
Mobile operators are increasingly opening up their APIs to third-party developers, creating a new dimension of operator-startup ecosystem engagement.

- Today, there are around 15,000 APIs, with 40 new ones created every week.

Operators in North America, Europe and developed Asia continue to focus on use cases optimised for enterprises and IoT such as identity management and authentication. T-Mobile's agreement with Twilio to launch Twilio Programmable Wireless and the AT&T/ IBM partnership on open standards-based IoT tools are good examples of this.

Meanwhile, growth in emerging markets in the Middle East, Africa and Asia is being driven more by the consumer opportunity, including digital payments and e-commerce.

## Examples of recent operator API initiatives in emerging markets



Operator	Date	Region	Initiative
orange	1 Jul 2015	Pan-Africa	SMS API opened to developers and start-ups in seven markets
Safaricom	2 Sep 2015	Kenya	M-Pesa (mobile money) API opened to local third party developers and start-ups
airtel	3 Dec 2015	Malawi	Carrier billing API "Tap 2 Bill" launch announced in Malawi before pan-African expansion
telenor	4 Jan/Feb 2016	Pakistan	Mobile Connect API opened to all. Billing, mobile money and location APIs opened to selected incubated start-ups
vodafone	5 Feb 2016	Ghana and Tanzania	Mobile Money APIs opened to third parties in Tanzania (M-Pesa) and Ghana (Vodafone Cash)
MTN	6 April 2016	Zambia	Presentation of API programme to local tech hub (BongoHive) developers
Dialog	7 May 2016	Sri Lanka	Dialog's API platform Ideamart enters a three-year partnership to power local 'Google IO' event

Source: [GSMA Ecosystem Accelerator](#)

## Redefining connectivity: examples of new network technologies

The mobile ecosystem is seeing rapid innovation in areas of radio access layer and device to device connectivity.

Future connectivity will be provided by multiple networks using different radio technologies.

These future networks will also use a mix of licensed and unlicensed spectrum.

New players will challenge the role of operators as the central providers of connectivity.

	Service/application	Use case	Licensed/ unlicensed spectrum
<b>P2P networks</b>	Firechat	Messaging/bandwidth sharing	N/a
	Jott	Messaging	N/a
	Filament	Industrial IoT	Unlicensed
	LTE Direct	Local discovery Messaging	Unlicensed/licensed
<b>Network enhancements</b>	Veniam (Mesh Wi-Fi)	Industrial and consumer IoT	Unlicensed/licensed
	Artemis pCell	Personal LTE cells	Licensed
	Wi-Fi voice	Consumer connectivity	Unlicensed
	LTE-U, LAA and MuLTEfire	Consumer connectivity	Unlicensed
<b>New networks</b>	Sigfox	Industrial IoT	Unlicensed
	Filament	Industrial IoT	Unlicensed
	Satellites	Consumer connectivity	Unlicensed/licensed
	Drones/balloons	Consumer connectivity	Unlicensed/licensed

## Drones and balloons could offer wide area coverage but limited capacity

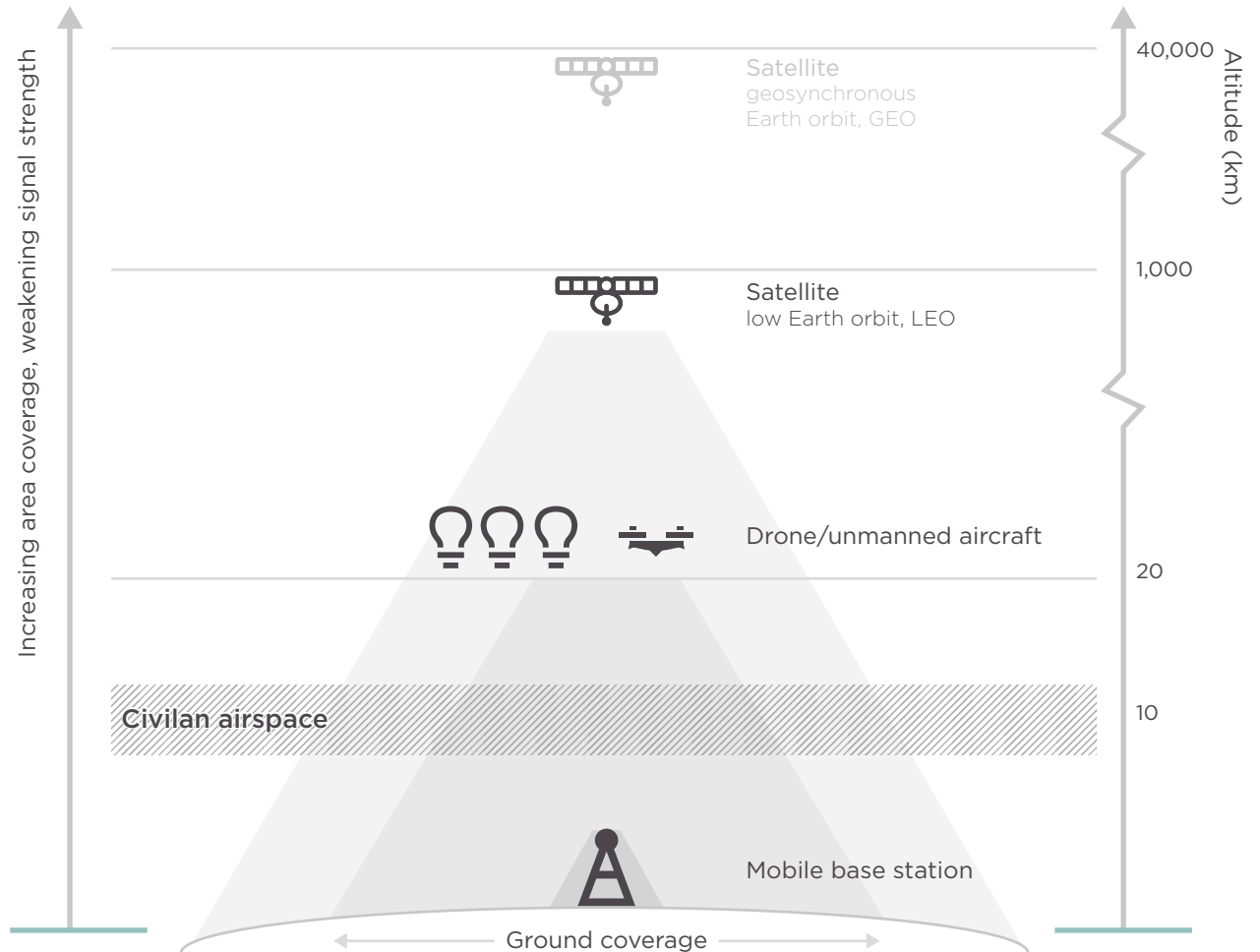
Aerial networks are designed to maximise ground coverage through the advantage of altitude.

- Facebook Aquila uses solar powered planes
- Google Project Loon uses network of floating balloons: trials underway in India
- Satellites

Microsoft White Space Project uses gaps in TV frequency bands: promises significantly greater range than Wi-Fi.

Facebook and Google are highly unlikely to seek to become a mobile operator; instead the focus is on partnering with operators to connect aerial with LTE for ground service.

Australia, New Zealand, Brazil, Argentina, Sri Lanka and most recently Indonesia have all had joint pilots launched through this partnership model, although timelines for commercial rollout are still unclear.



Qualcomm has introduced a standalone version of LTE-U, called MuLTEfire. Unlike LTE-U it does not depend on licensed spectrum and operates solely in unlicensed spectrum - which means holding a licence in another spectrum band is no longer required to operate in the 5 GHz band.

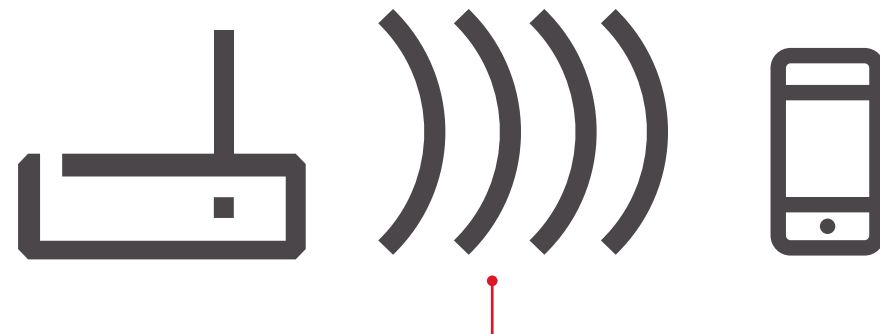
Other uses cases include IoT (in LPWA networks such as LoRA and Sigfox) and the use of TV white space for backhaul.

In the US, Verizon and T-Mobile have been testing LTE-U in co-operation with Qualcomm. AT&T and US Cellular have also showed interest in developing the technology to improve the quality of their services.

Advantages of unlicensed spectrum as technological support for licensed bands:

- Faster download speeds over very short distances without a separate Wi-Fi network – important in case of low-frequency bands (under 1 GHz) which provide more coverage but less capacity in rural areas and indoors.
- Offloading data traffic, reducing strain on main network.
- Expanding the mobile network and complementing currently owned licences with minimal investment structure.

## LTE-U/LAA



Unlicensed spectral waves in 5 GHz band carry voice and data traffic (rather than licensed frequencies in lower bands)

Source: Qualcomm, GSMA Intelligence



## Planned upper bands use worldwide for 5G deployment

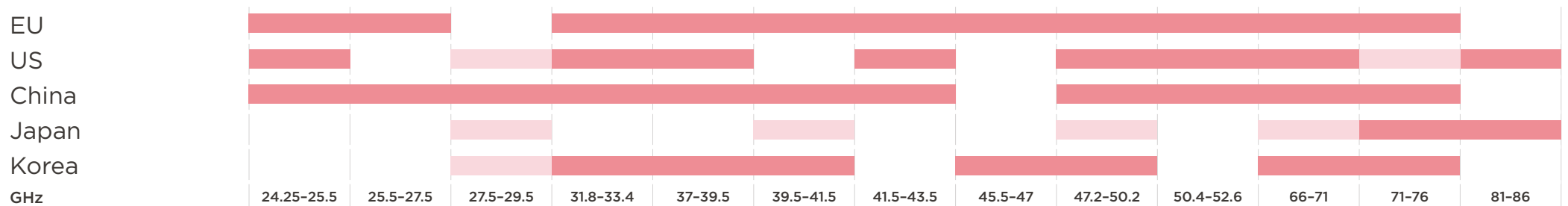
Standards for 5G technology have not been defined yet, but operators and regulators worldwide are already considering potential spectrum bands for 5G deployment.

A balanced release of both sub-6 GHz (470 MHz – 6 GHz) and high-frequency millimeter bands (24.25–86 GHz) will be required, to ensure both the coverage of rural regions and sufficient capacity in more populated areas.

### 3.3-5 GHz



### Millimeter wave (24-86 GHz)



Source: GSMA Intelligence

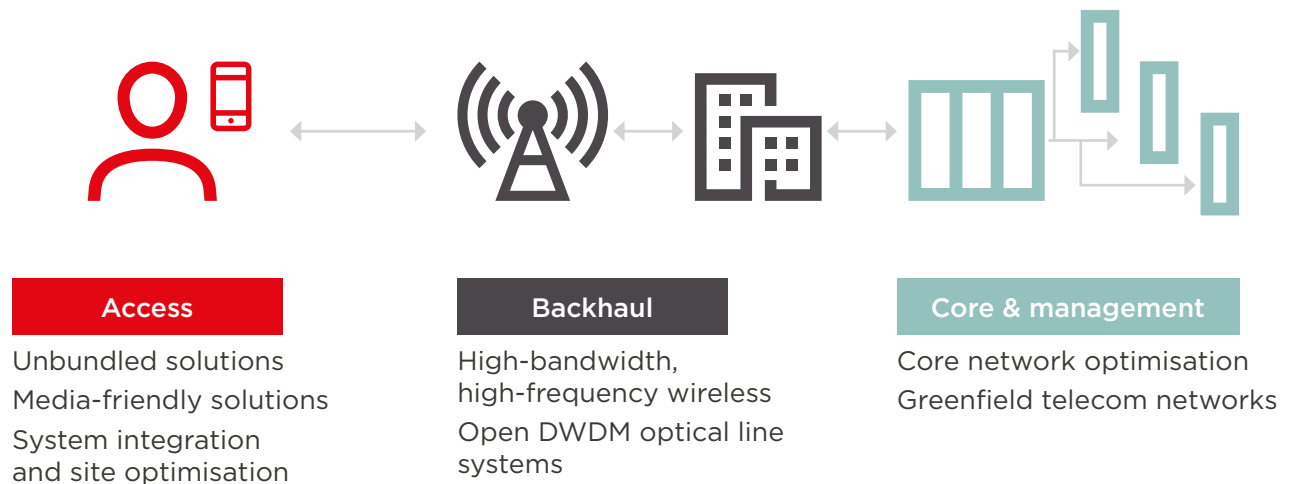
## Telecom Infra Project

In February 2016, Facebook launched the Telecom Infra Project (TIP).

- TIP brings together companies across the value chain, including mobile operators, developers, equipment manufacturers and internet companies, to help solve infrastructure problems worldwide.
- Members, including Facebook, Intel, Nokia, Juniper, Vodafone, Deutsche Telekom and SK Telecom, are focusing on three areas: access, backhaul, and core & management.

It joins a growing range of open source partnerships:

- The Huawei Open ROADS Community
- Central Office Re-architected as a Data Centre (CORD)
- Open Network Operating System (ONOS).



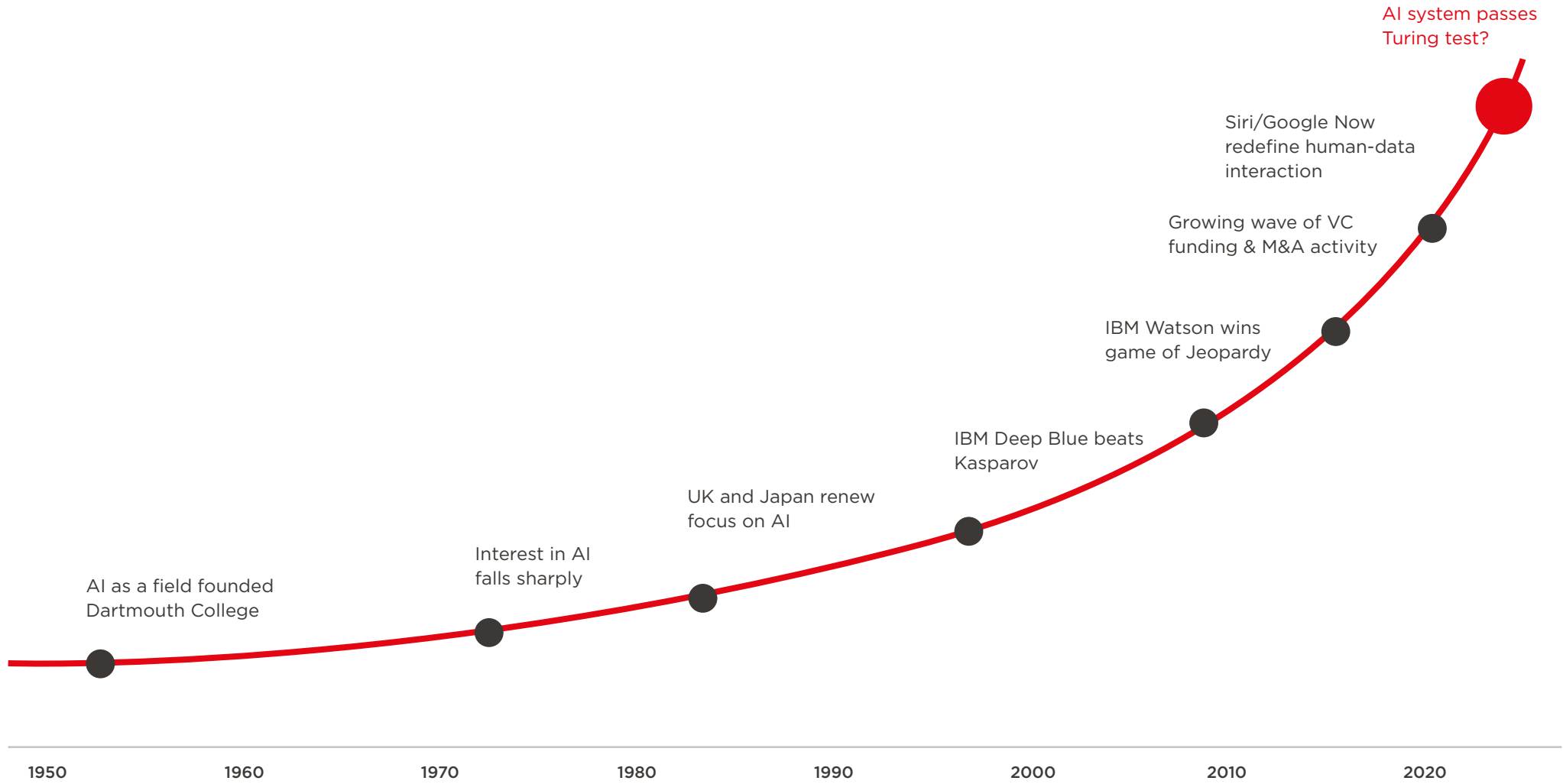
Source: Adapted from Facebook

# Future view

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↳ Artificial Intelligence (AI):  
The super enabler?





## Artificial intelligence



**Venture Capital**  
In last year

**\$2.3bn**  
+53% yoy



**Corporate Venture  
Capital M&A**



DeepMind



Vision  
Factory



emotient

Perceptio



vocaliq



PredictionIO



MetaMind

AI, defined as 'systems that can do intelligent things', has several different strands:

### Natural language processing

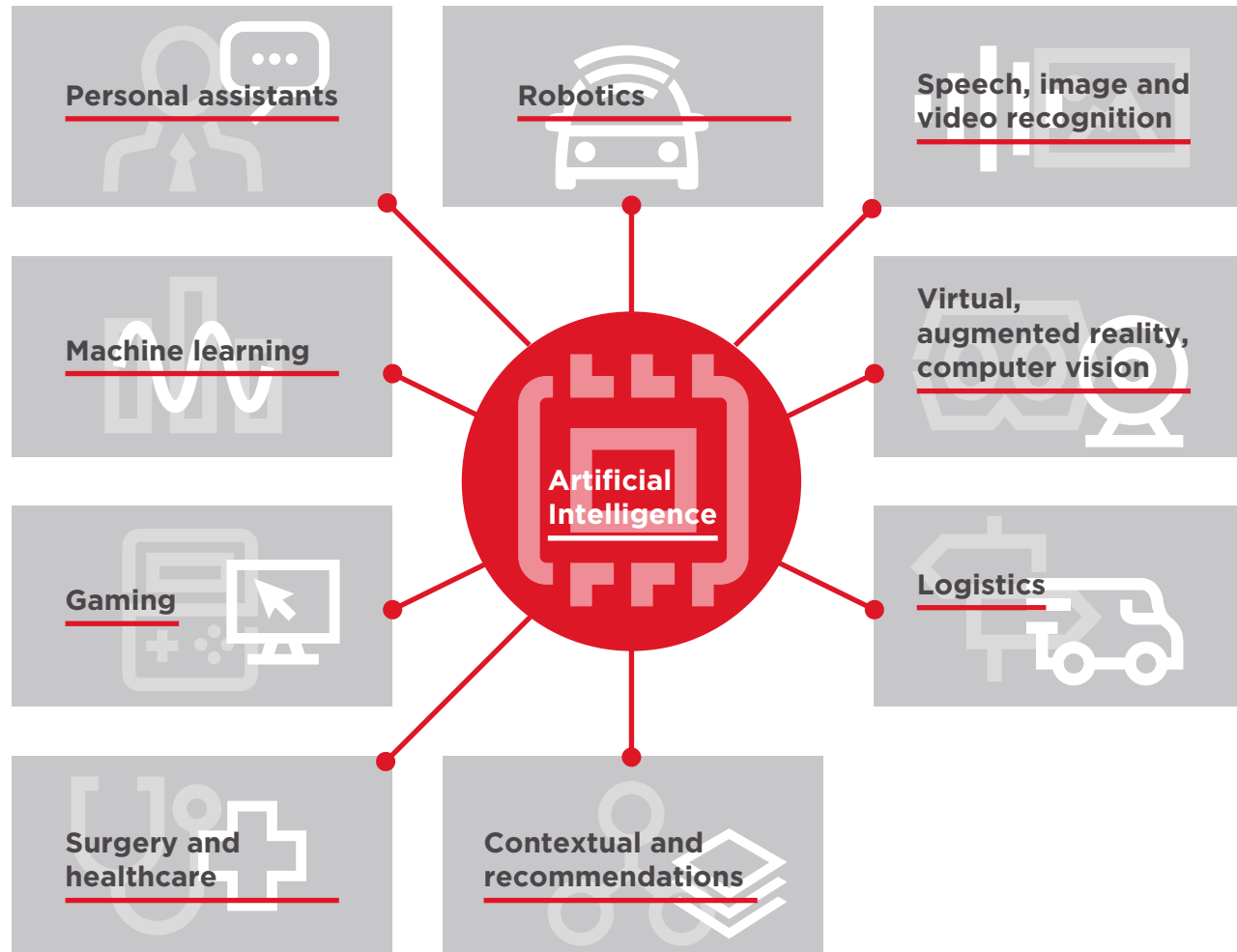
developing systems that can understand human language

### Machine learning

developing systems that can learn from experience

### Deep learning

learning by ingesting huge amounts of data





**Qualcomm** brain-inspired learning

Qualcomm Research is continuing to develop the “brain-inspired” computing platform Zeroth. The deep-learning approach is said to create “human-like pattern-matching capabilities”

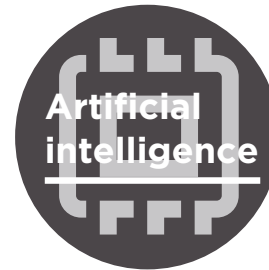
**Weave.ai** AI mobile search

The mobile search company, currently in private beta, adds contextual and behavioral data gathered from a user’s smartphone to a proprietary search algorithm



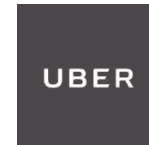
**IBM** cognitive computing

Watson, an AI supercomputer, now works in a range of vertical sectors including healthcare, insurance and personal travel, including iPhone applications



**Uber** predictive logistics

The company’s predictive, real-time, dispatch system enables the shortest time possible to pick-up, and delivers the intelligence behind the ‘Pop’ ride-sharing service



**myDiModa** fashion à la AI

The ‘learning’ application adjusts to a user’s fashion sense over time by analysing ‘selfies’ and making contextual recommendations

**PredPol** algorithmic policing

The machine learning company helps police forces ‘predict’ where crime will take place using crime patterns, behaviour analytics, and location data, presenting the results on mobile devices



**Integrating AI seamlessly**

Recent acquisitions include Emotient, which focuses on recognising emotions by analysing facial expressions, and Turi, which focuses on machine learning.



**AI-centric strategy**

Increasing focus on machine learning and AI. A range of new products are fueled by AI, including Google Assistant, Google Home and Allo chat app.



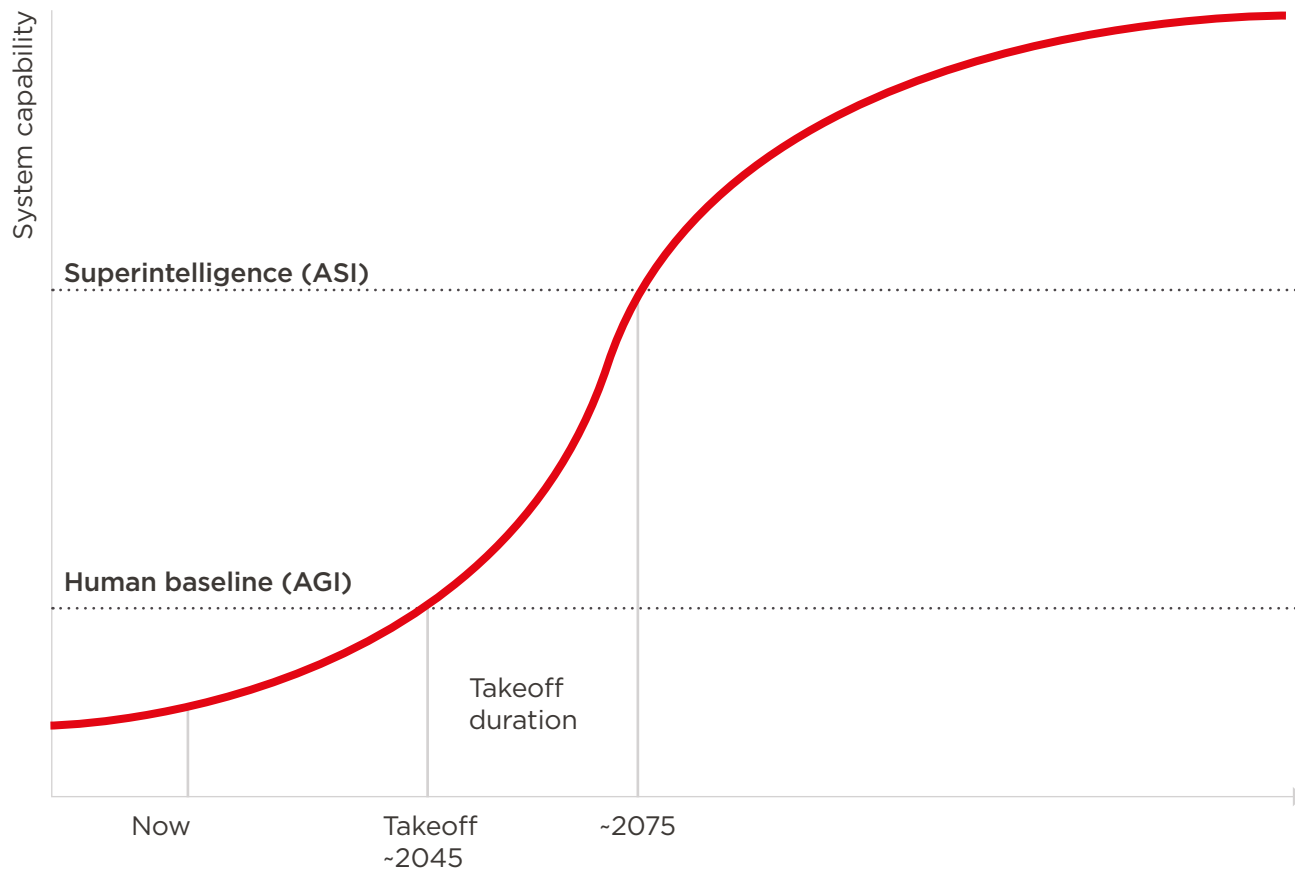
**AI to drive engagement**

Facebook is developing Deep Face, software that recognises faces, and Deep Text, which analyses posts to understand the content. Machine bots could then interact directly with users.

	Company	Launch	OS availability	Device capability	Strategy
<b>Siri</b>	Apple	October 2011	iOS	Smartphone, tablet, watch, TV, car	<p>Improve consumer ease of daily planning and search, with potential to target the home</p> <p>Will increasingly use AI, following recent acquisition of Turi</p> <p>Siri opened to third-party developers with iOS 10</p>
<b>Cortana</b>	Microsoft	April 2014	Windows (global), iOS and Android (US and China)	Smartphone, tablet, PC	<p>Improve consumer ease of daily planning and search</p> <p>Further extension of Microsoft's new cross-platform and ecosystem strategy</p> <p>100 million active monthly users on Windows 10</p>
<b>M</b>	Facebook	August 2015 (beta)	Facebook (proprietary)	Smartphone (Facebook Messenger)	<p>Improve consumer ease of daily planning and search</p> <p>Uses manual human oversight for all queries (unlike competitors).</p> <p>Play is to use these 'trainers' to help AI learn and improve</p>
<b>Google Assistant</b>	Google	August 2015 (beta)	Android	Smartphone, tablet, PC, Google Home	<p>Accessed via chat app (Allo) or via Google Home</p> <p>Accessible across a range of devices</p> <p>New conversational interfaces improve human interaction</p> <p>Extension of Google Now</p>
<b>Alexa</b>	Amazon	June 2015	N/A	Amazon Echo and Dot	<p>Accessed via proprietary devices such as Amazon Echo</p> <p>Growing range of other services can be accessed and controlled by Alexa</p>



## Developing superintelligent AI may be possible in this century



Three stages in the development of AI\*:

- Artificial narrow intelligence: which focuses on only one area (the case today)
- Artificial general intelligence: performs any task a human can
- Artificial superintelligence: more intelligent than humans in multiple areas

Fundamental debate around the future implications:

- AI as a positive force that makes people smarter
- AI 'revolution': more powerful machines make humans largely irrelevant

Note: AI is artificial intelligence, ASI is artificial superintelligence and AGI is artificial general intelligence  
 Source: WaitButWhy.com, Nick Bostrom, *Superintelligence: Paths, Dangers, Strategies*; A.T. Kearney analysis

\* According to Nick Bostrom - [www.nickbostrom.com](http://www.nickbostrom.com)

# Regional views



# Regional views

└ Asia Pacific



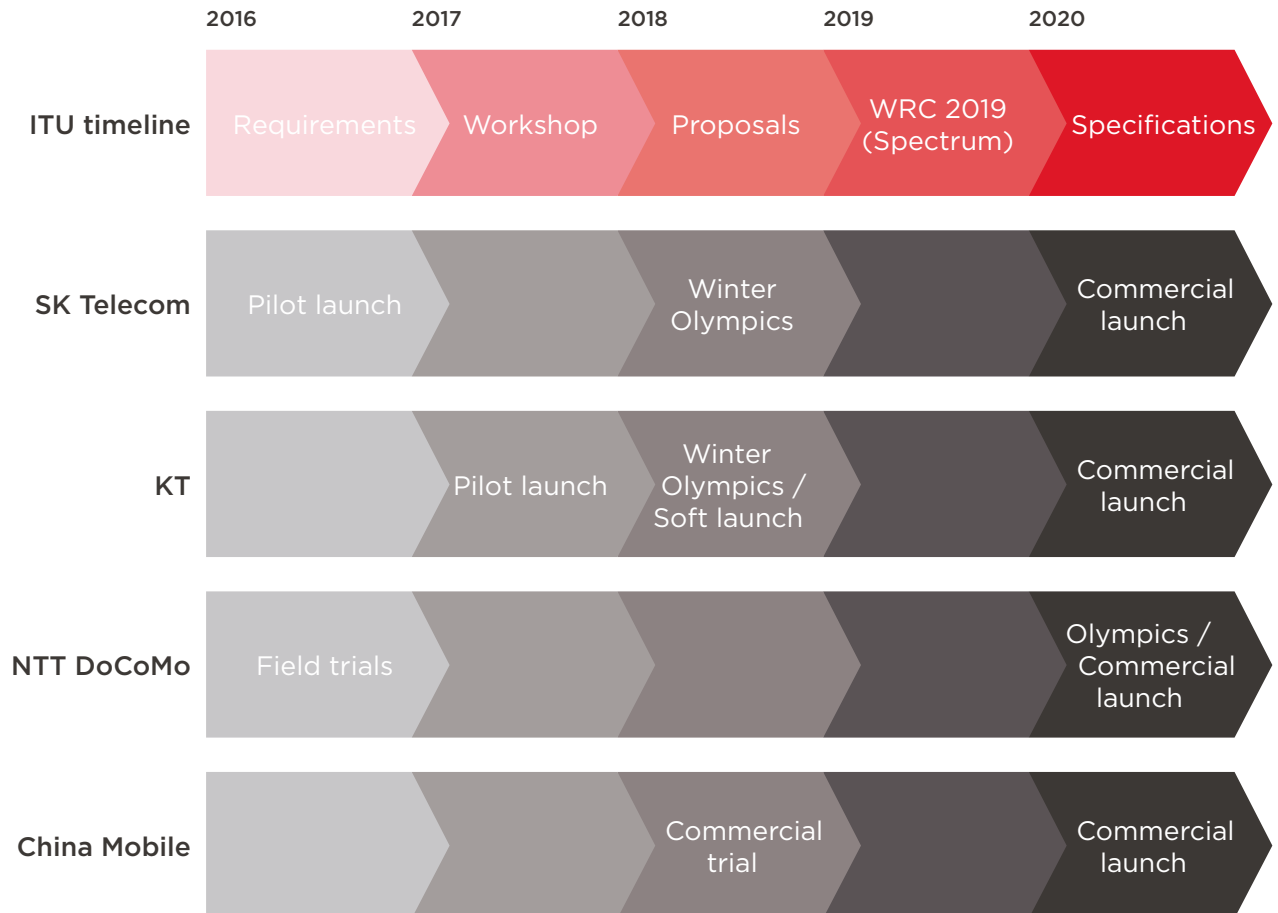
## 5G timelines

The CJK triangle (China/Japan/Korea) is among the most advanced in the world in terms of high-speed fixed and mobile networks.

While the US rolled out 4G coverage at a more rapid pace, operators in CJK appear intent on doing the same for 5G.

Pilots are planned around major sporting events (such as the 2018 winter Olympics in South Korea), using densely populated stadiums as a convenient test-bed for ultra low latency services such as immersive video (augmented reality).

Commercial launches have already been scheduled for 2020 - an ambitious plan given that international standards will only be agreed the same year.



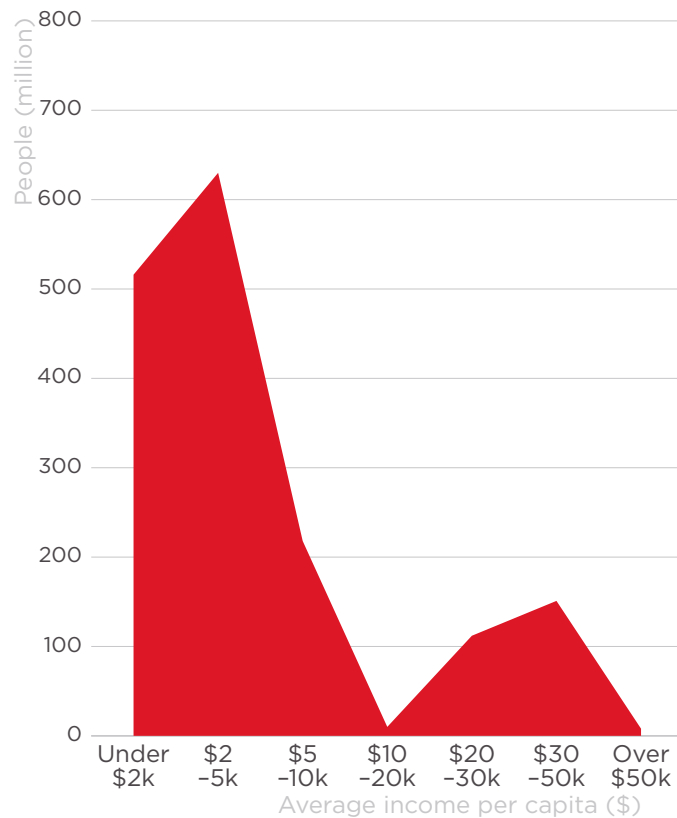
Source: GSMA Intelligence

Most of Asia is low income, with 82% of the population living on less than \$10,000 per year. Poorer households, on average, are less likely to be connected to the internet, and those who are do so at lower speeds.

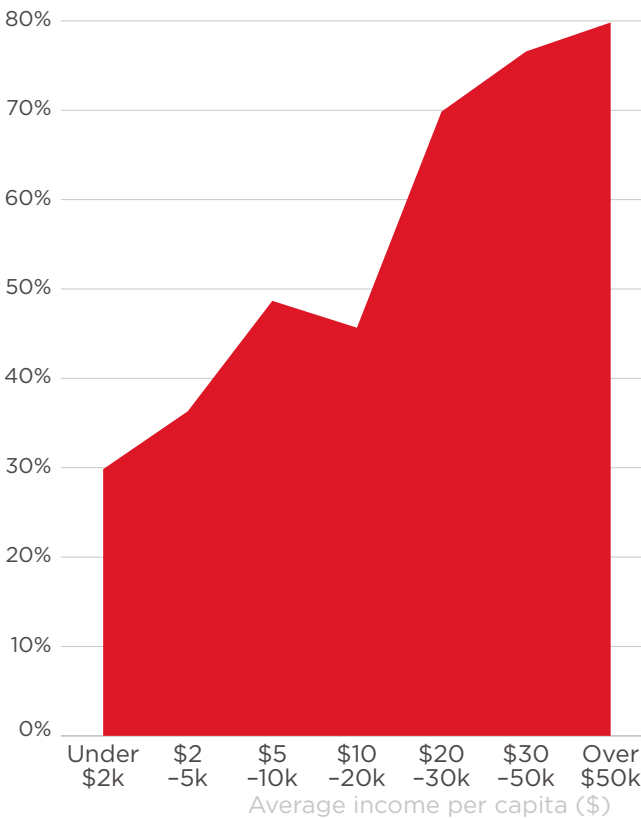
This will change as economic growth filters down to individual income growth, but that takes years and is not an individual effort. For this reason, governments have become increasingly assertive in implementing national digital agendas with remits including anything from updating urban infrastructure, financial services access and transportation to championing homegrown smartphone hubs to help lower device costs. The Philippines, Thailand, Indonesia and Malaysia are all strong examples of this.

Note: population figures as of 2015. Internet and 3G/4G as of June 2016.  
Source: GSMA Intelligence

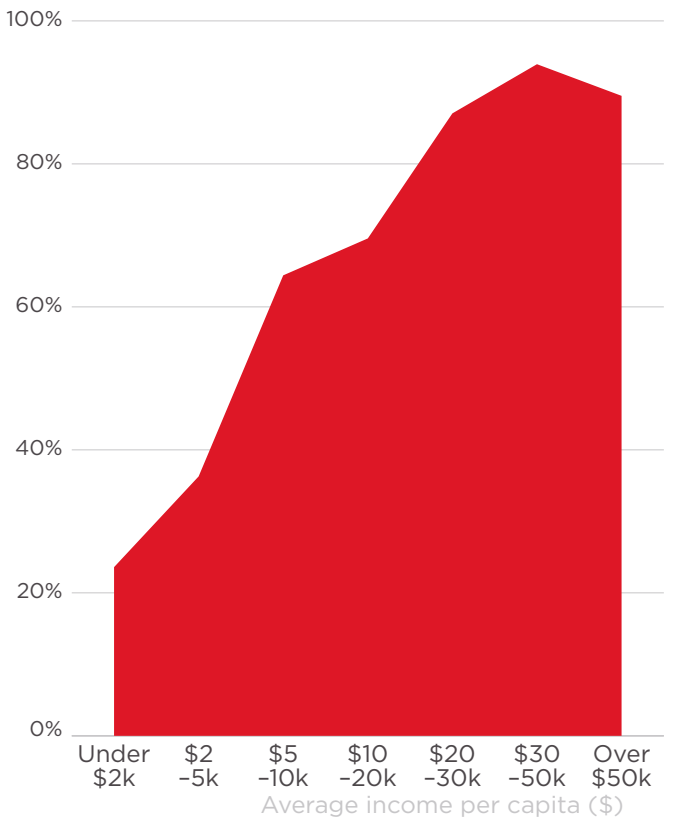
### Population distribution



### Mobile internet penetration



### Mobile broadband penetration (3G+4G)

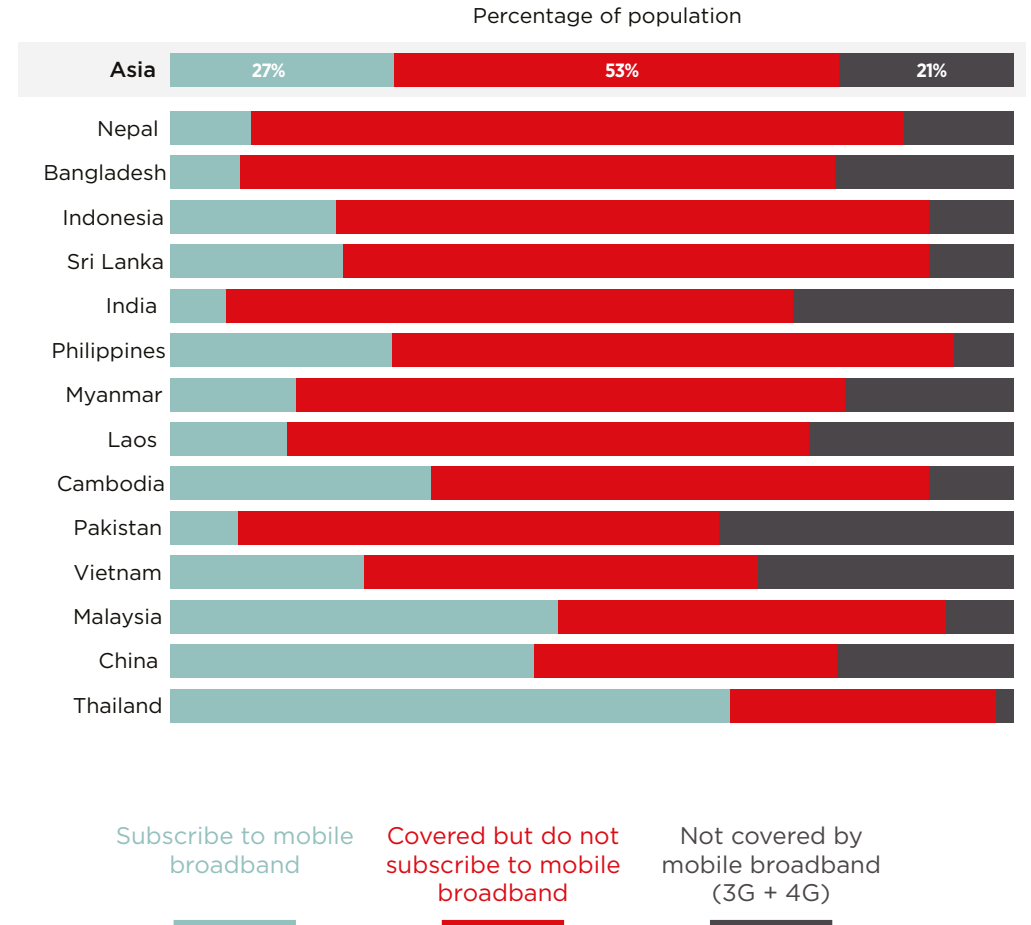


The question of why people do not use the internet is perhaps more interesting than why they do.

Half (53%) of people in Asia live within range of a 3G or 4G network capable of supporting higher speed internet access but do not subscribe to the available mobile service.

Our survey evidence suggests that while affordability is still a problem, it is not the biggest. The main issue is that people do not see the relevance of the internet in their local environment, making local content a priority to reach the 1 billion non-internet adults in Asia - by far the largest source of new internet users worldwide.

Barrier	Lack of awareness and locally relevant content	Lack of digital literacy and skills	Affordability barrier	Lack of network coverage	Security and trust barrier	Other
China	30%	89%	11%	0%	2%	15%
India	80%	21%	23%	3%	4%	9%
Indonesia	75%	10%	46%	2%	3%	12%
Philippines	51%	27%	13%	8%	1%	22%
Thailand	88%	23%	22%	1%	2%	3%
Vietnam	80%	20%	24%	0%	1%	12%
Asia	72%	24%	25%	3%	2%	12%



Source: GSMA Intelligence Consumer Survey 2015

# Regional views

↳ India



Smartphone adoption is plateauing in most advanced markets at around 70–75%, with unit shipment growth near zero or negative.

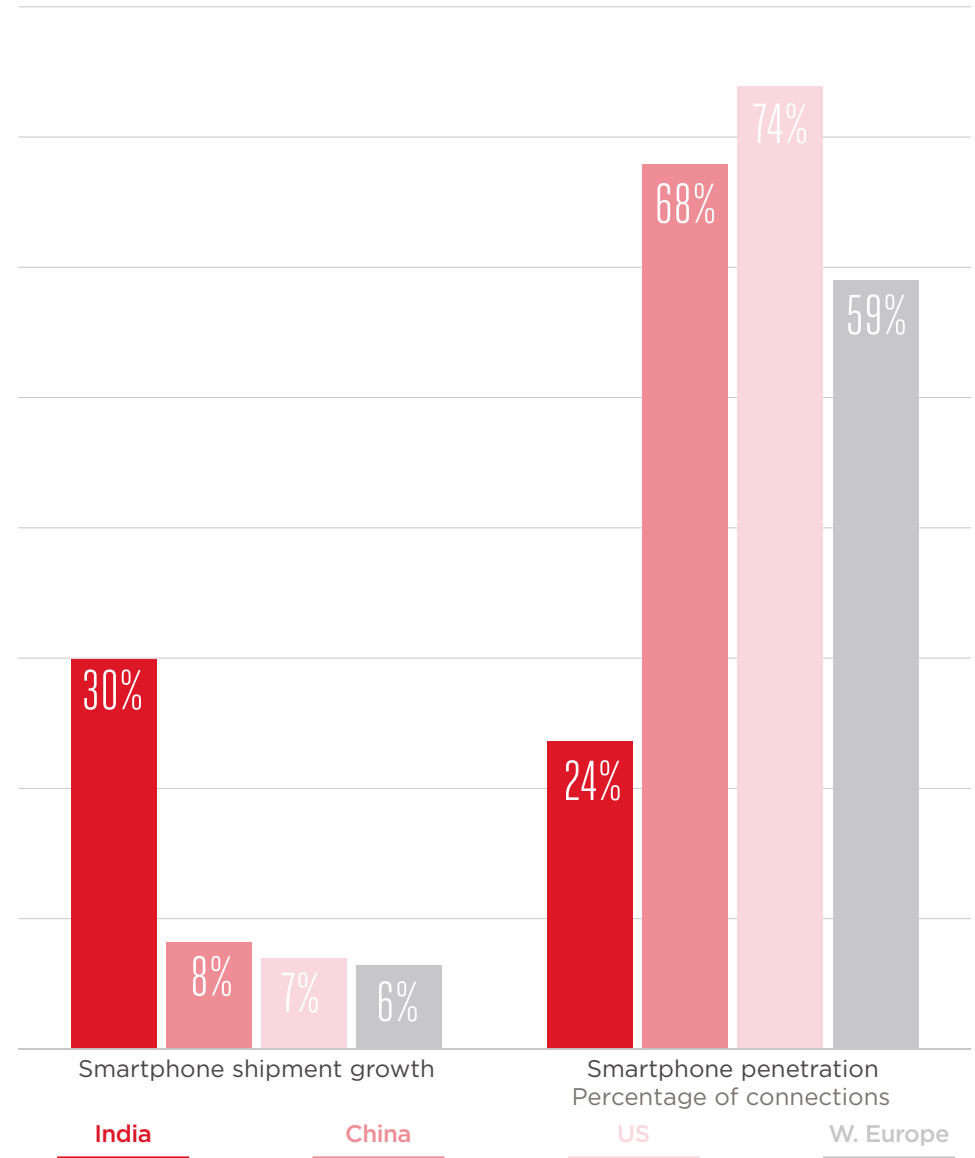
By contrast, India has yet to ride the wave. Adoption is still only around 25%, with unit volumes growing at 30% per year.

Falling device costs are the main driver, with ASPs now below \$150, and an increasing share below \$100 (below \$50 is less common given that previous experiments in this range have largely been unsuccessful due to poor quality).

India has also made local manufacture of devices a priority through its ‘Make in India’ programme in an attempt to reduce its reliance on Chinese-made devices.

Two thirds of smartphones sold in the first quarter of 2016 were made in India. Most input materials are, however, still imported from China, which could slow the pace of decline in device costs.

**Smartphone sales growth (2015)**



Source: GSMA Intelligence, Strategy Analytics

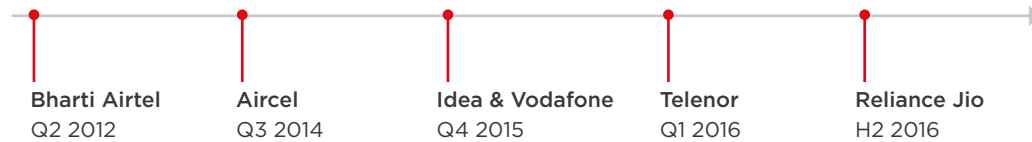


Operators have invested \$18 billion in capex since 2012, with the fruits of this seen in hugely expanded 3G coverage, which has increased from 30% to 75% of population over the period.

4G expansion has eaten up some of the capex as well, although coverage is more limited at 27%.

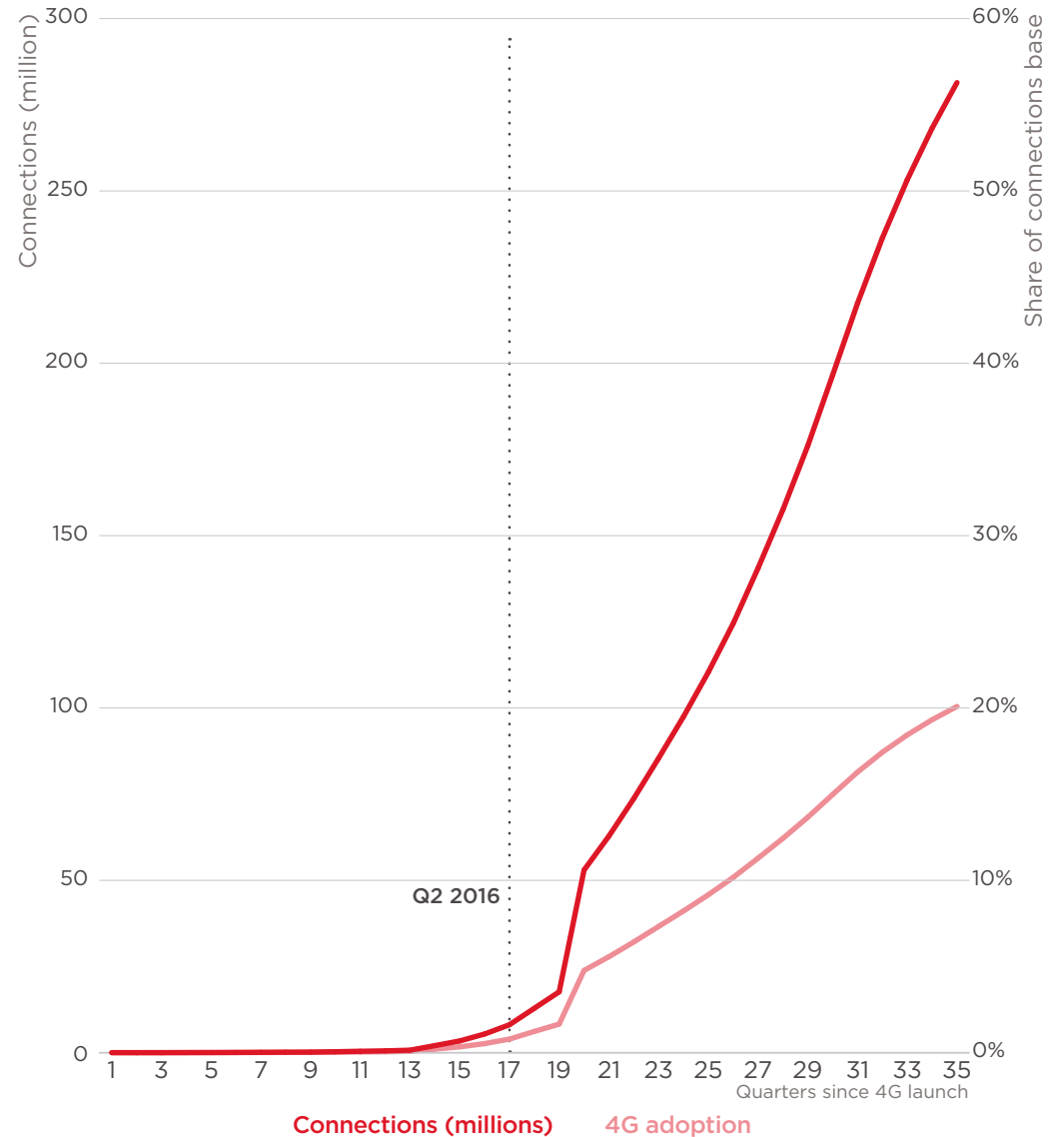
4G is now accelerating. Reliance Jio's nationwide 4G network will add to pricing pressure in a country already in need of consolidation. This will help drive some take-up for price-conscious consumers. Our current forecast is for 4G adoption of 20% by 2020.

## 4G launch timeline



Source: GSMA Intelligence

## 4G in India



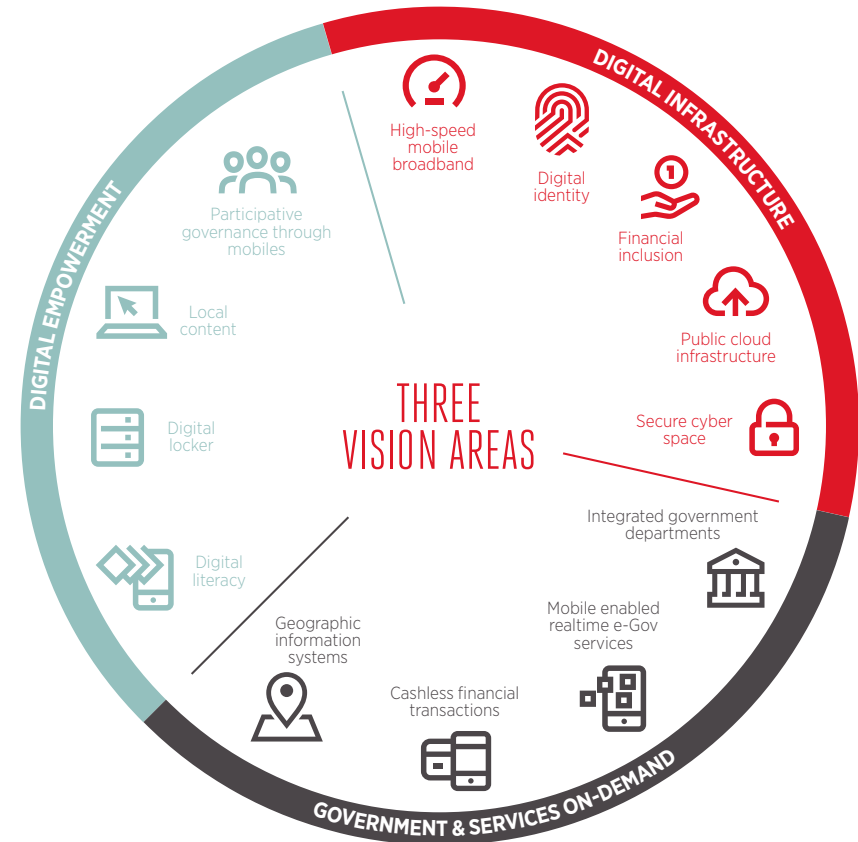
Launched in 2015, Digital India is the Indian government's ambitious plan to provide lifelong unique and authenticable digital identity for all citizens, which would enable them to access a wide range online services within a safe environment.

The mobile industry pledged to invest \$75 billion at the launch of the Digital India programme in July 2015.

Progress since launch:

- Local mobile manufacturing up by 83% in the last two years.
- The Unique Identification Authority of India authenticates over 40 lakh transactions per day via the Unique Identity 'Aadhaar' card. The Aadhaar project is the world's largest national identification project.
- 250 million bank accounts are linked to unique Aadhaar cards.
- More than 40% of all ration cards, LPG connections and rural employment enrolments have been linked to Aadhaar cards.

## Building digital India through mobile



NINE PILLARS				
<b>Broadband Highways</b> <i>Broadband for all</i>	<b>Public Internet Access Programme</b> <i>Ongoing programme</i>	<b>Electronics Manufacturing</b> <i>Existing structures inadequate</i>	<b>e-Governance</b> <i>Critical for transformation</i>	
<b>IT for jobs</b> <i>Ongoing and new schemes</i>	<b>eKranti</b> <i>Ongoing programme to be revamped with new elements</i>	<b>Universal Access to Mobile connectivity</b> <i>Ongoing programme</i>	<b>Information for all</b> <i>Utilise existing infrastructure</i>	<b>Early harvest programmes</b> <i>To be completed within a year</i>

Source: GSMA Intelligence, Department of Electronics and Information Technology, India

# Regional views

└ Africa



Notions of 'Africa's decade' have been made before, but largely proven unfounded.

There are, however, good reasons to believe the next 10 years will be transformative in terms of mobile and internet access.

Mobile subscriber growth in major African markets is among the highest in the world; for example, we expect DRC (population 78 million) and Ethiopia (100 million) to grow at 7%+ per year.

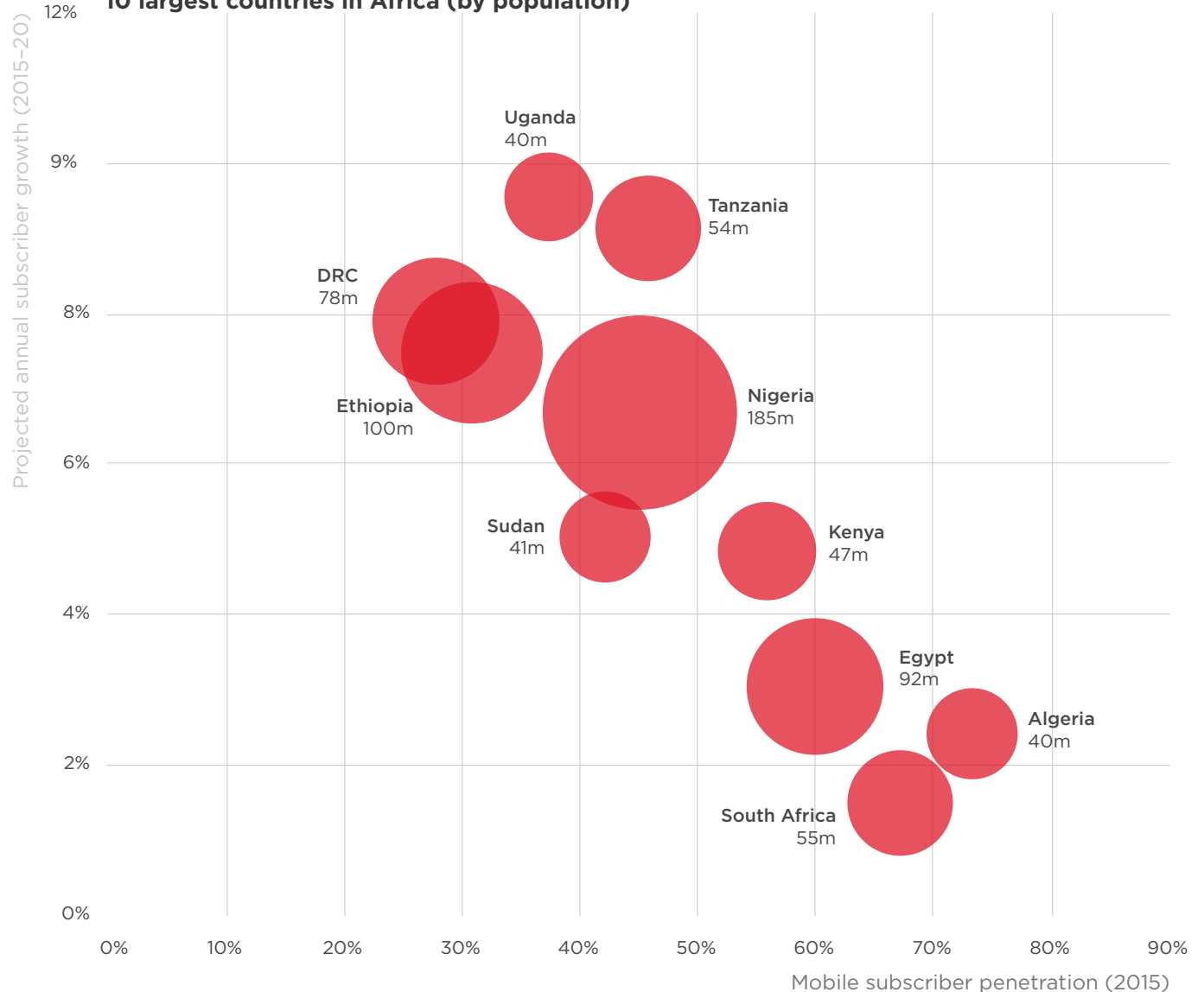
An increase in internet access will need to be balanced with efforts to make online content and services relevant - Facebook is not a panacea.

On balance we are optimistic, and forecast net growth of 200 million mobile internet users between 2016 and 2020 - the largest of any region except Asia.

Source: GSMA Intelligence

## Mobile subscriber growth will be 5%+ per year until 2020

### 10 largest countries in Africa (by population)



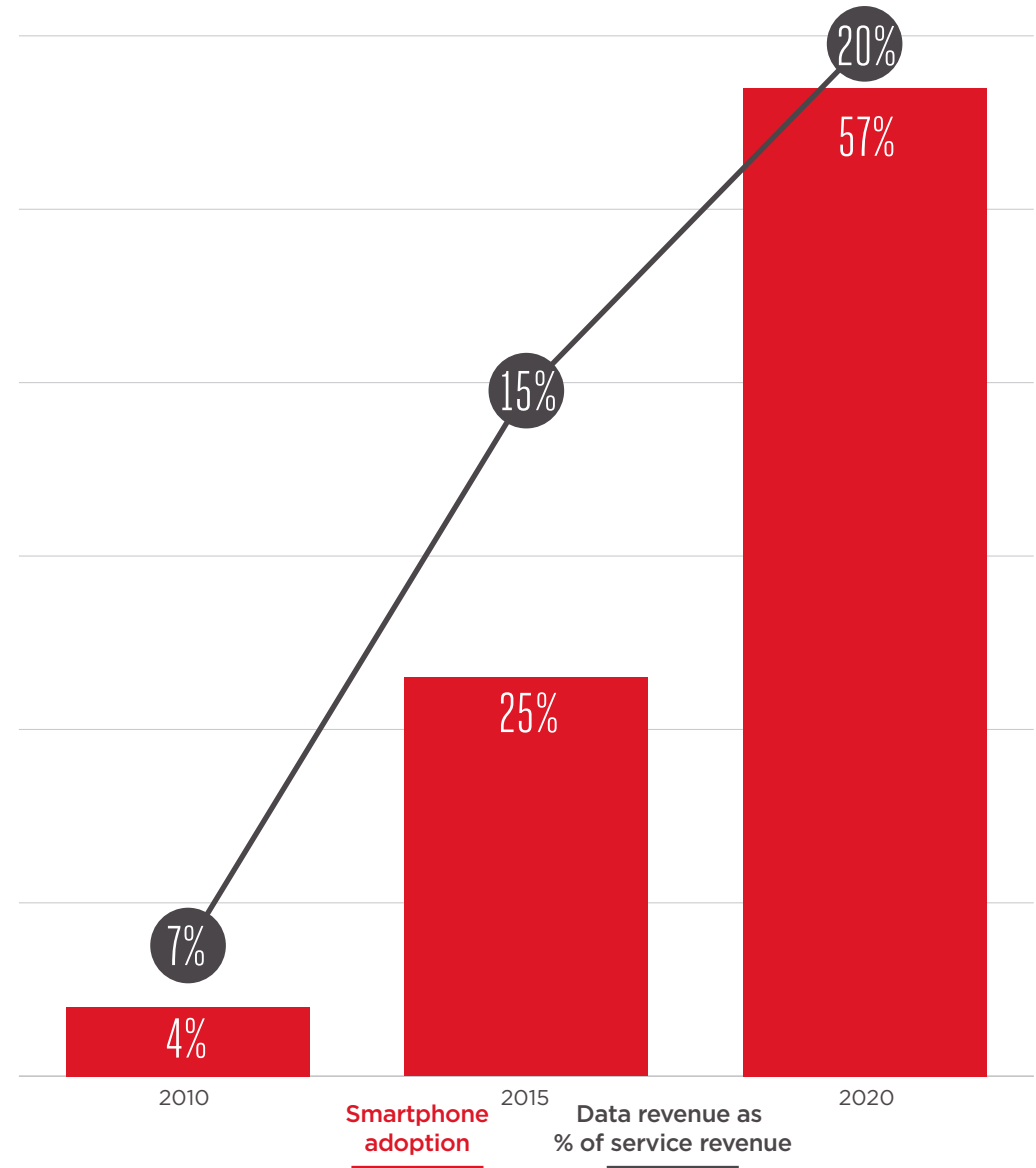
Smartphone adoption remains low, but we forecast it to increase to more than 50% by 2020, driven by falling device costs.

Advanced countries such as South Africa still have headroom, but growth will increasingly come from relatively new 3G markets, notably Algeria, Cameroon and DRC.

For operators, the implications are mixed. Higher smartphone penetration translates into higher data usage, which should be positive for revenue growth. However, internet consumers are increasingly using OTT messaging apps (e.g. WhatsApp is used by around 80% of smartphone owners in South Africa). This will place added importance on bundled data pricing to mitigate direct impacts on lower use of SMS and potentially voice.

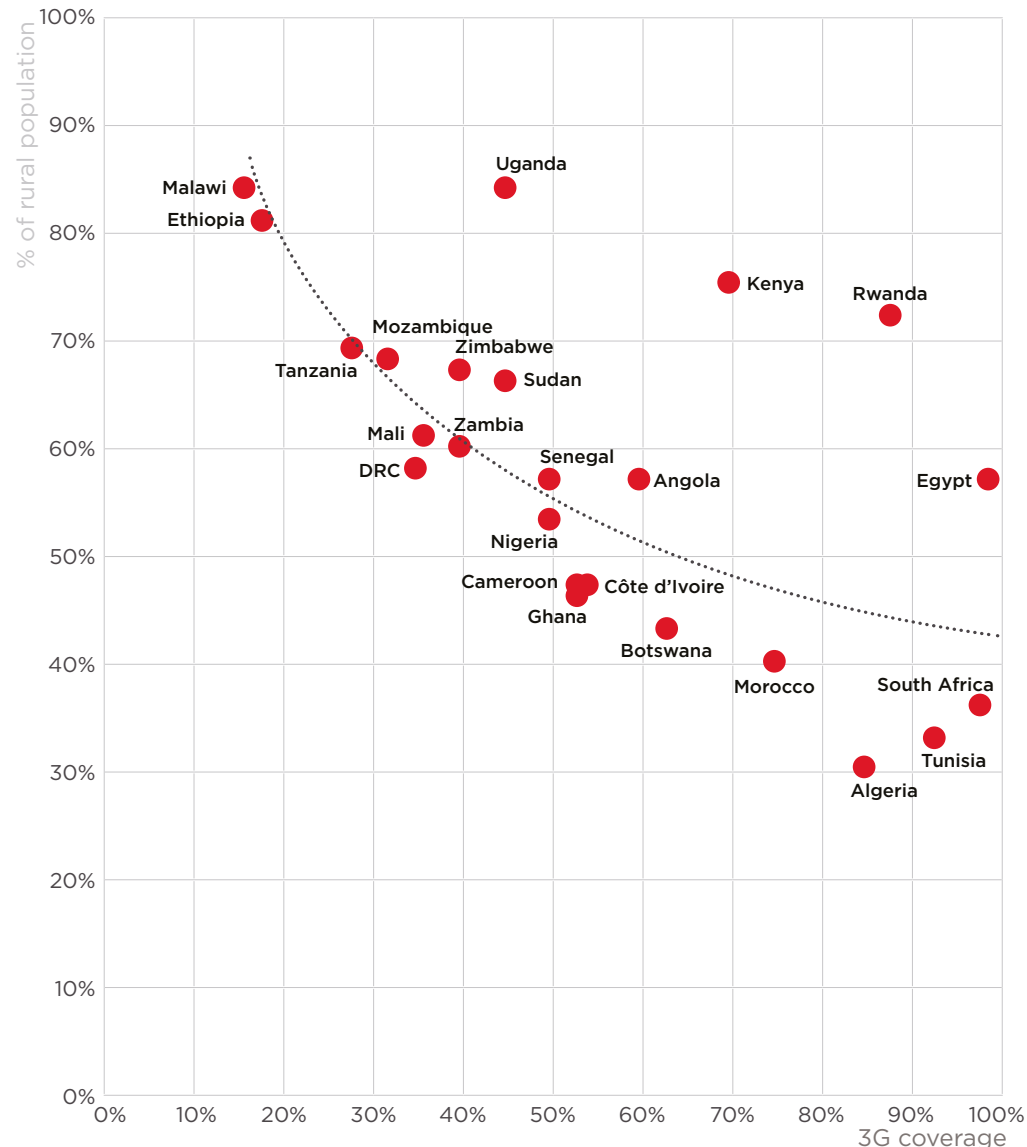
4G remains more of a future proposition. There are now 74 live LTE networks across 32 countries in Africa but penetration is just 1% and our expectation is 7% by 2020. Limited coverage, lack of devices at affordable price points and, in some cases, a lack of low-frequency spectrum are all factors hindering growth.

**Smartphones will cross 50% of connections by 2020**



Source: GSMA Intelligence

## Much of Africa lives rurally - the majority of the unconnected



Mobile and internet access are now universally recognised as important enablers to providing core life service access to rural populations (from financial services access to out-of-classroom education), as reflected in the UN Sustainable Development Goals.

Africa has become a closely watched test-bed for how to reach unconnected consumers because of its heavily skewed rural population.

The challenge is in reaching them: fixed infrastructure is sparse, and 3G coverage is around 50% in Africa - by far the lowest of any region (Asia is 80%).

This is largely a result of the challenging network economics in rural and remote areas. Network sharing initiatives and alternative connectivity solutions - mostly aerial-based - have gained momentum, with Google and Facebook increasingly active in the region in search of partnerships with operators.

Recent macro weakness and currency devaluations have not helped; capex budgets tend to be denominated in dollars or euros, making the efforts to move to a leaner cost model in network expansion that much more prescient.

Source: GSMA Intelligence

# Regional views

↳ US

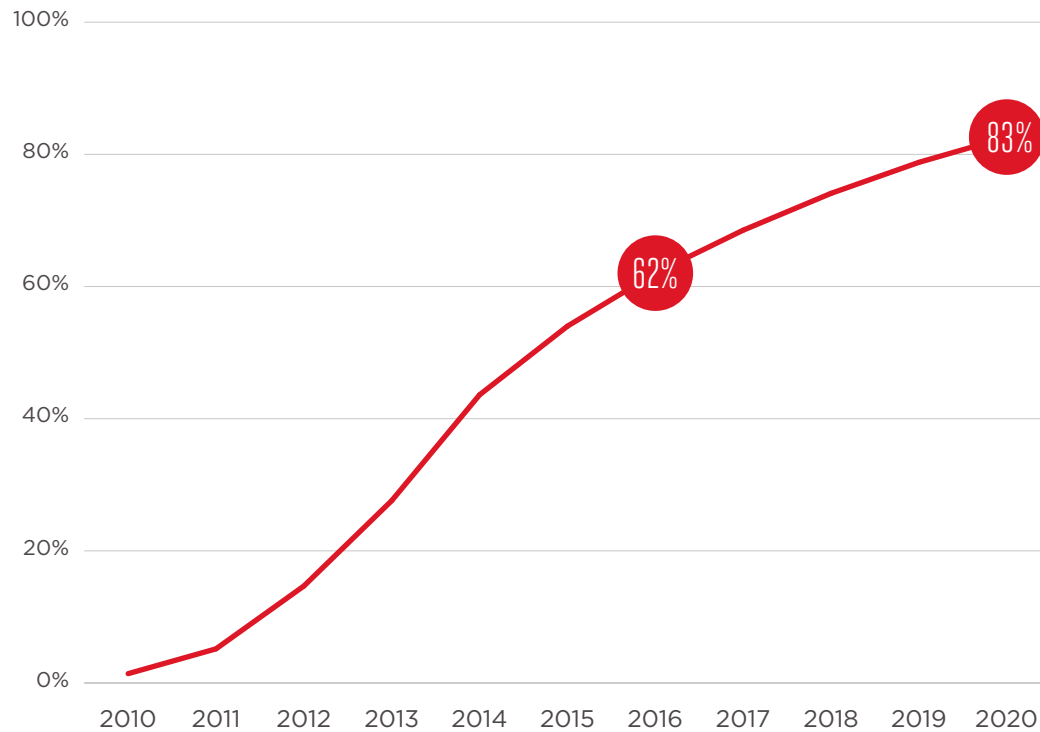


Both the US and Canada have near-ubiquitous 4G footprints at 98% and 92% coverage respectively.

By the end of 2015, US operators on average had 54% of their subscribers on 4G tariffs, leaving significant upside still to come.

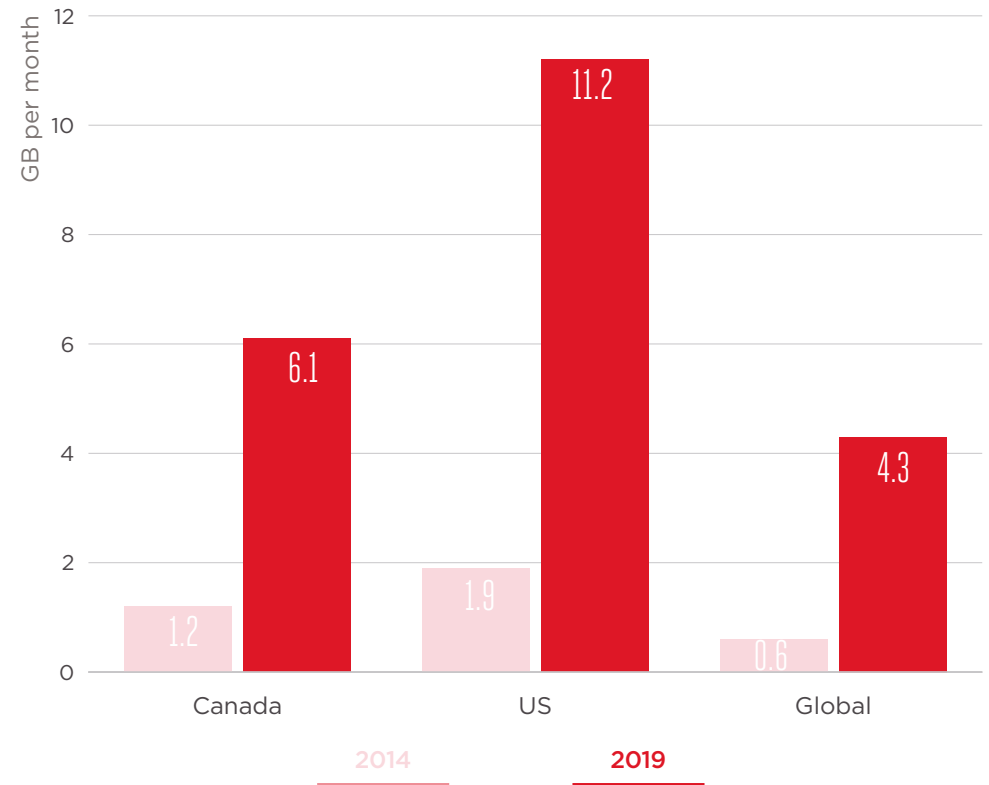
This is reflected in the forecasts for mobile data, with Cisco predicting that per-user traffic will rise from 2 GB per month to more than 11 GB; video will account for the lion's share.

## 4G share of mobile connections in the US



Source: GSMA Intelligence, Cisco

## Projected mobile data use per individual

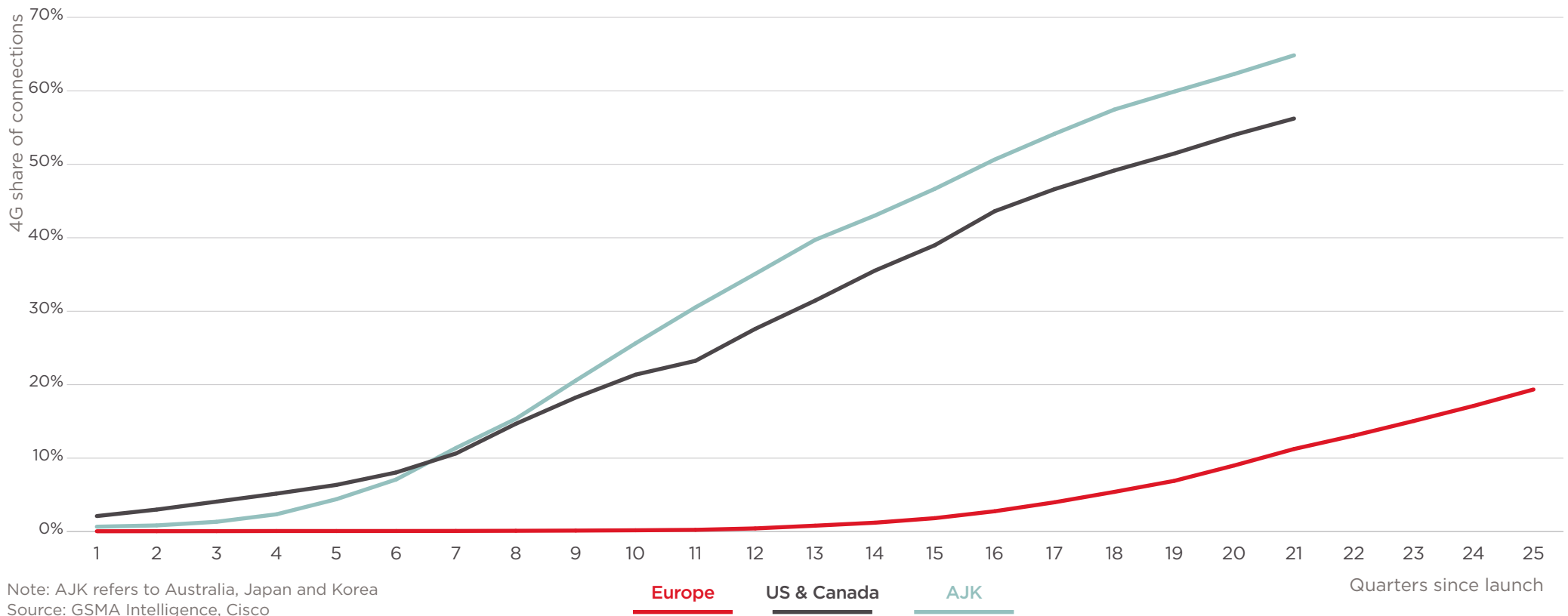




The US has proven to be an early adopter market for 4G, driven by strong network rollout; adoption reached 30% three years after services launched and is now nearing 60%. Europe has been slower (in part because of the timings of 800 MHz auctions), with adoption still less than 30%.

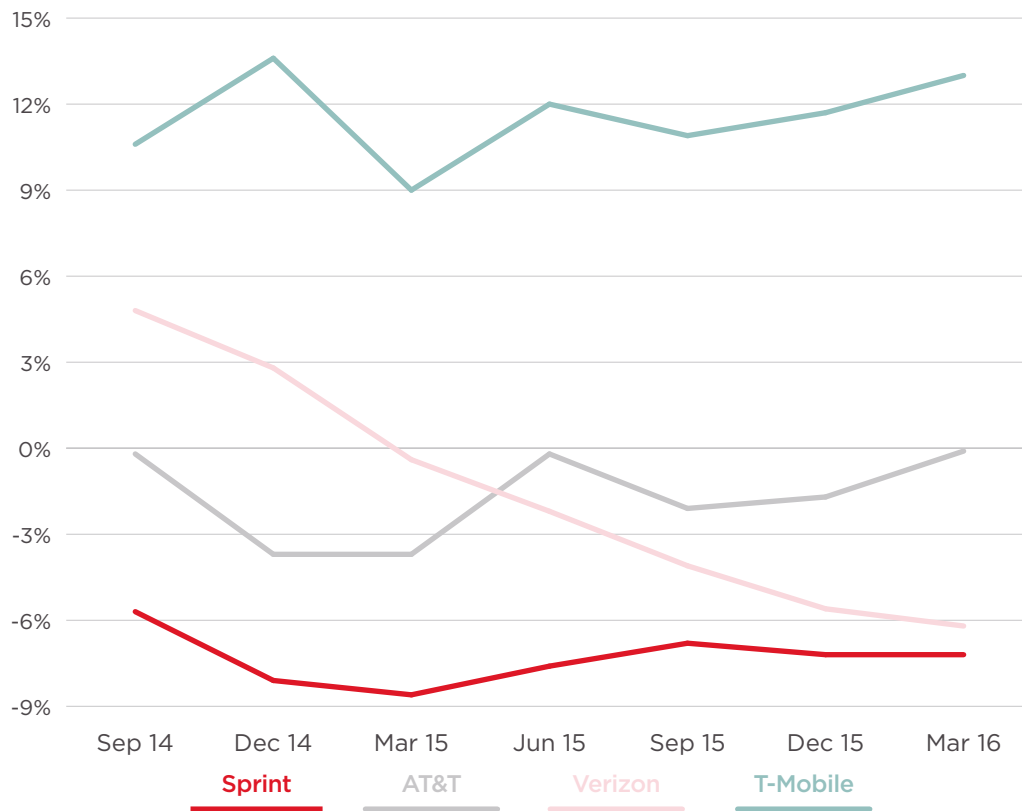
It remains to be seen whether the same will be the case for 5G. Field trials have taken place, using 5G as a last-mile solution for home broadband (presumably because of more favourable economics than fibre). In contrast to Asia, commercial launch timings have not yet been announced, reflecting the need to further explore the consumer demand case and business model from the host of options currently being floated.

## Speed of 4G take-up since launch of the first LTE service

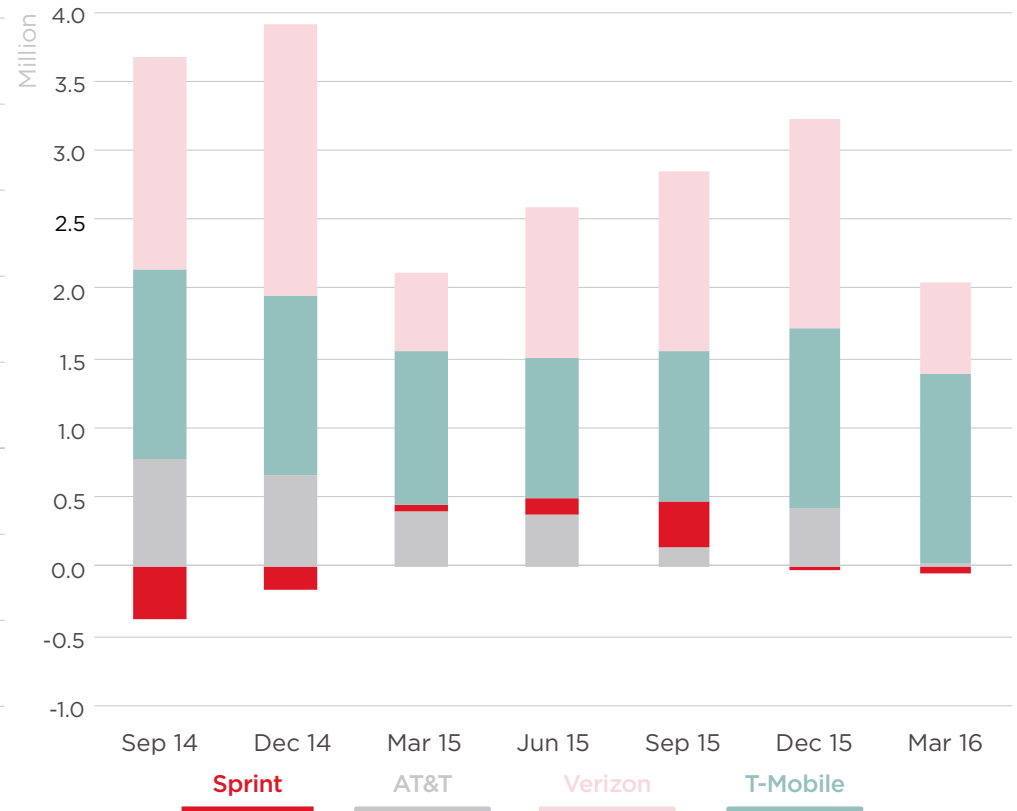


T-Mobile has become the fastest growing operator in the US, with mobile service revenues growing above 10% the last four quarters. This is also reflected in its ability to win new contract customers, taking 44% of net adds over the 12 months to March 2016.

### Service revenue growth in US



### US contract net additions



# Regional views

└ Europe



European mobile revenue growth continues to recover after years in negative territory, helped by a slowly improving economic environment and continued shift to higher usage 4G tariffs.

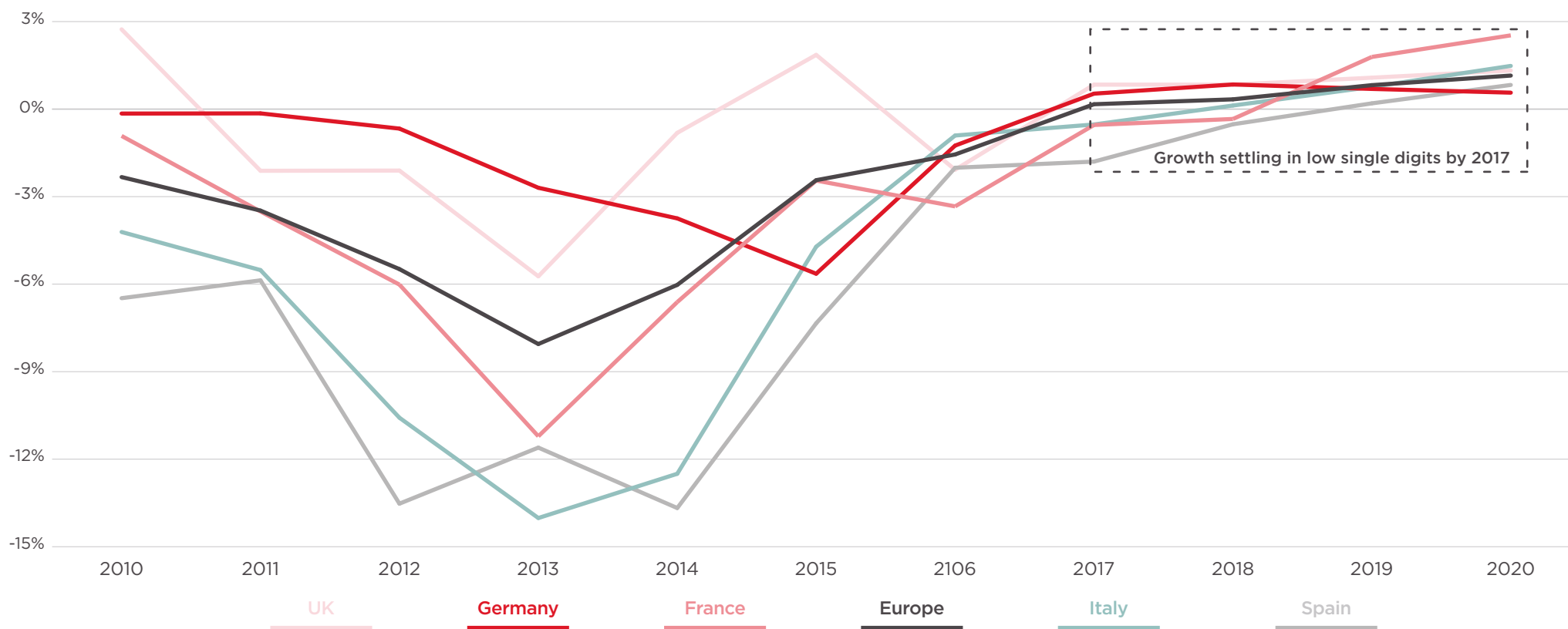
We expect the aggregate market to move back into positive territory in 2017. The mobile market is more resilient now than it was at the time of the financial crisis in 2008, with LTE

headroom, a more stable competition environment and lessening regulatory impact from termination rate cuts all helping.

Europe, and specifically the UK, has an added level of uncertainty following the UK vote to leave the EU, with GDP growth forecasts lowered in the wake of the event.

## Forecast mobile revenue growth, top five European markets

Note: growth figures are year-on-year. Source: GSMA Intelligence

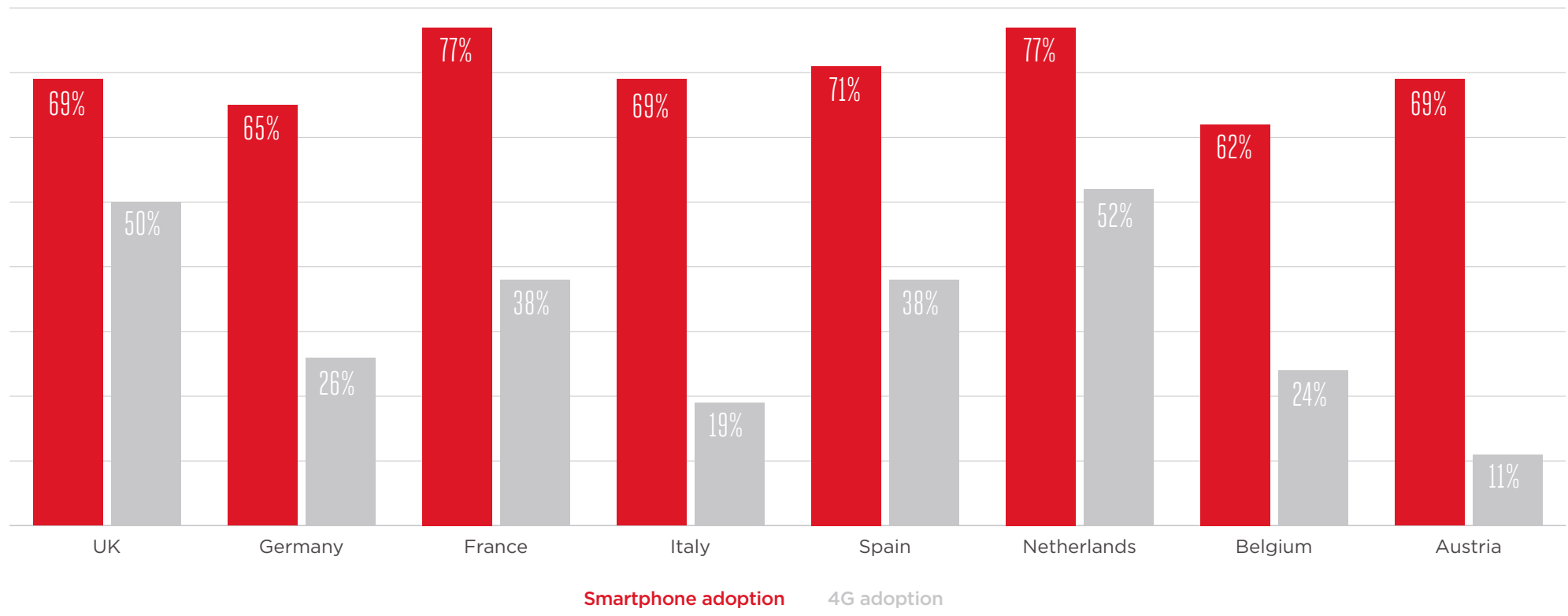


Smartphone take-up is fairly consistent across Europe, with most major markets in the range of 60-70% adoption (as a share of total connections)

The same is not true for 4G. The UK and Netherlands are the two most advanced at around 50% take-up, but it falls off from there, with Italy and Austria below 20%. This leaves a lot of room for growth, which should give a boost to financial performance and consumer satisfaction given increasing demand for always-on connectivity, especially watching video.

## 4G take-up is highly varied across Europe

Note: figures are as of June 2016. Source: GSMA Intelligence



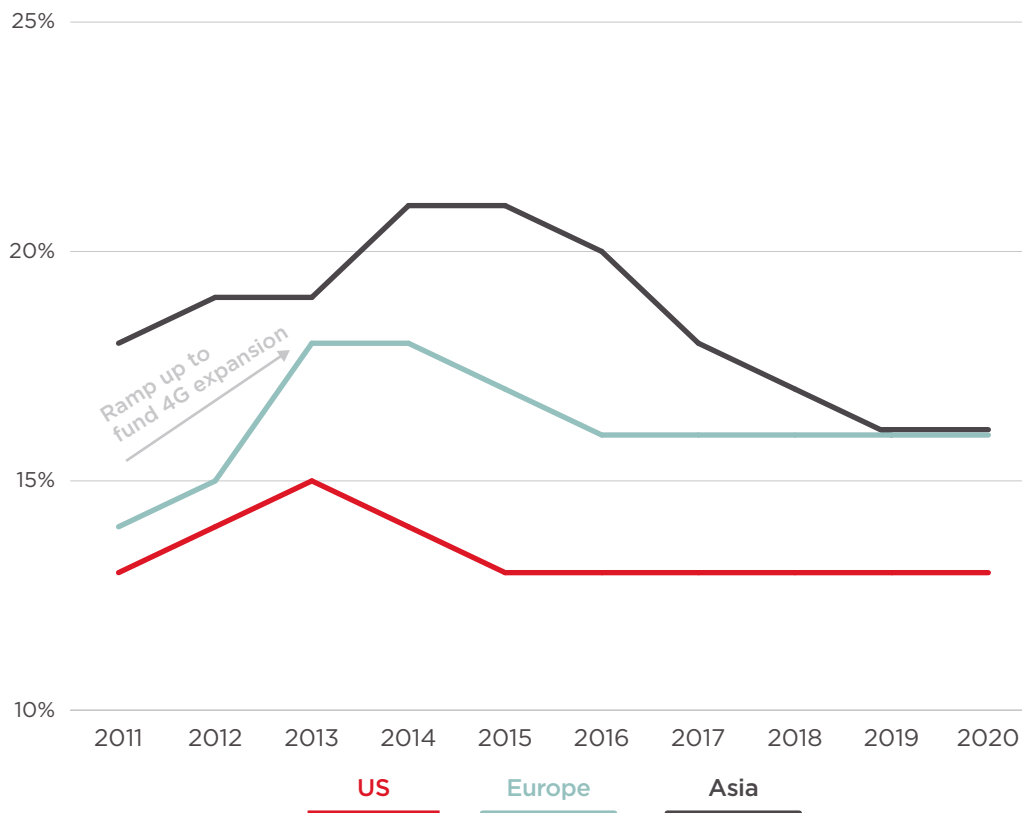
During the height of 4G network expansion in 2013/14, European operators spent nearly 20% of revenue on capex.

This has subsided (as in Asia and the US), leaving an in-between period before the next ramp up for 5G post-2020.

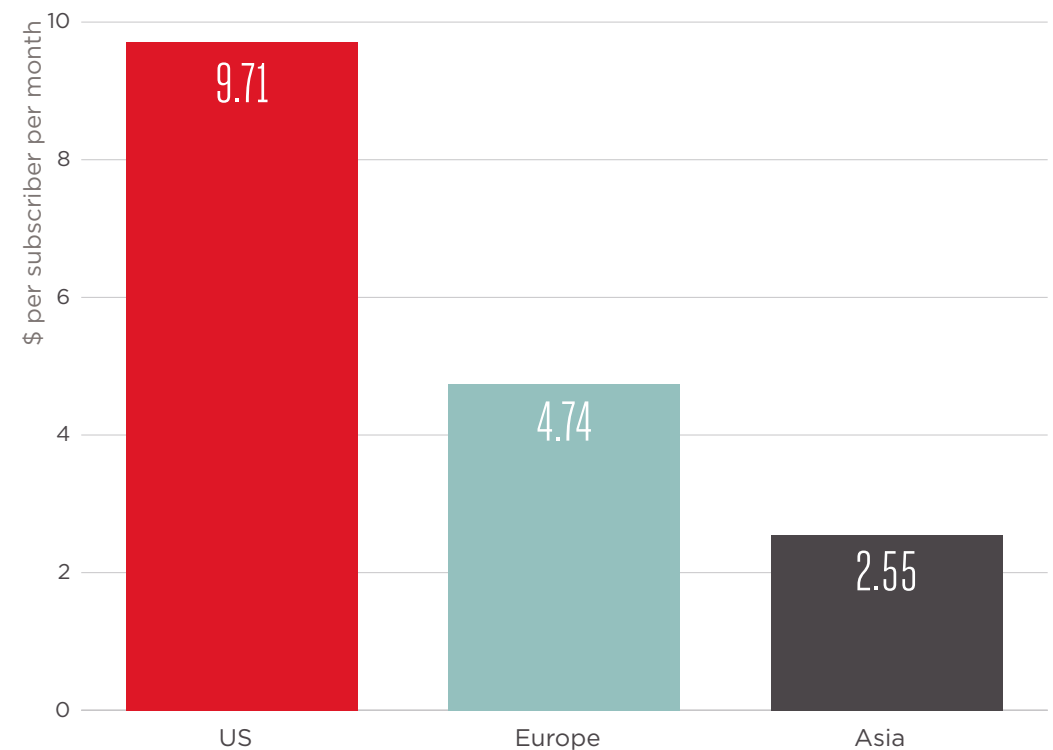
Even at 16% of revenue, that equates to an expected €133 billion over the five-year period to 2020.

In Europe, mobile capex spend is \$4.7 per subscriber per month. This is almost double that of Asia but half of the US, which is reflected in its expansive 4G footprint.

**Mobile capex intensity (percentage of mobile revenues)**



**Mobile capex per subscriber per month (2016 forecast)**



Source: company reports, GSMA Intelligence

# Regional views

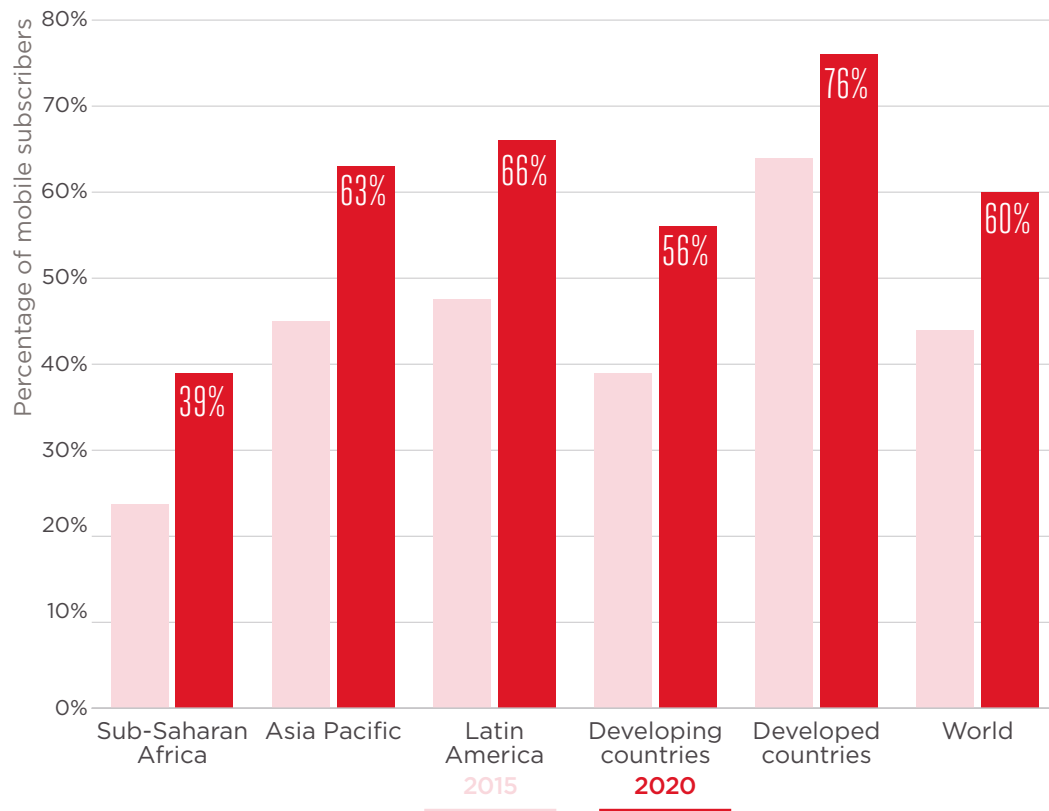
↳ Latin America



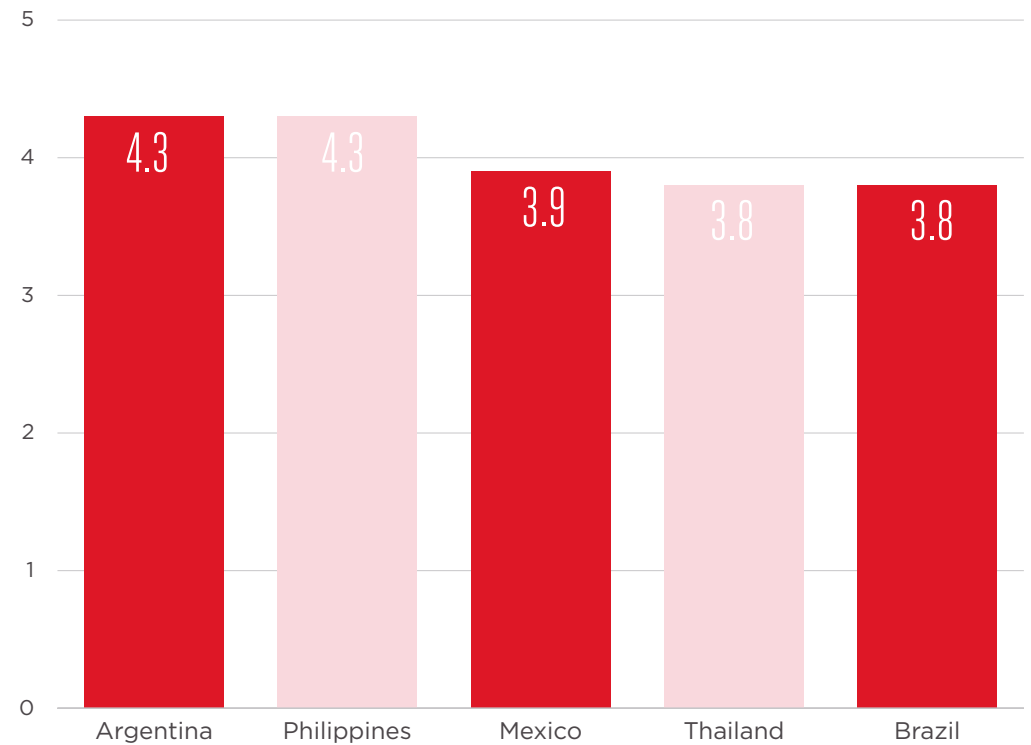
Internet penetration continues to rise in Latin America, with around 50% of mobile subscribers using the internet. We expect this to rise to 66% by 2020, driven by increased smartphone penetration.

This region is also among the most social-media charged in the world: three of the top five markets in terms of time spent are in South America, with Argentines spending more than four hours per day.

### Mobile internet penetration by region



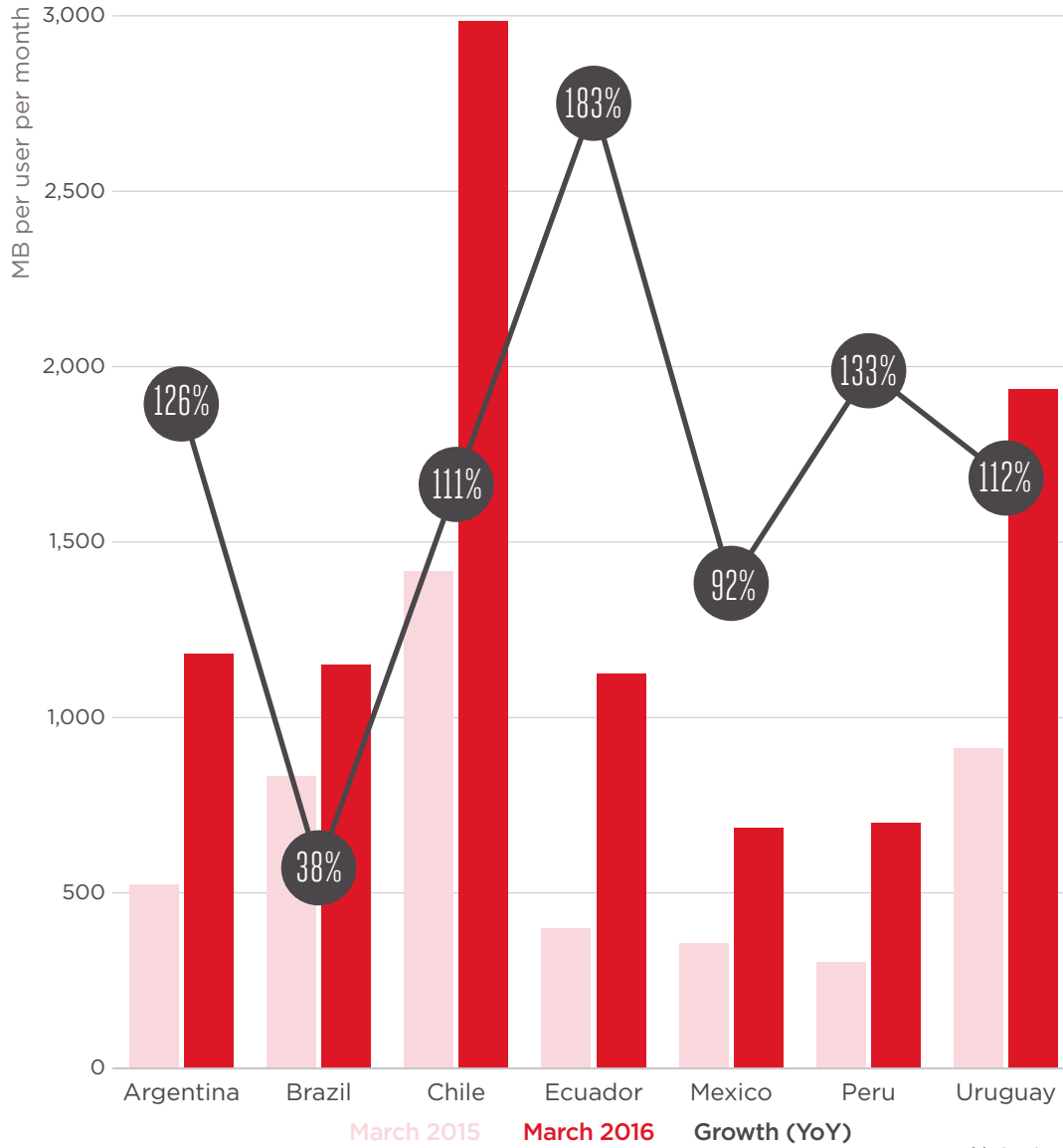
### Time spent on social media (hours per day)



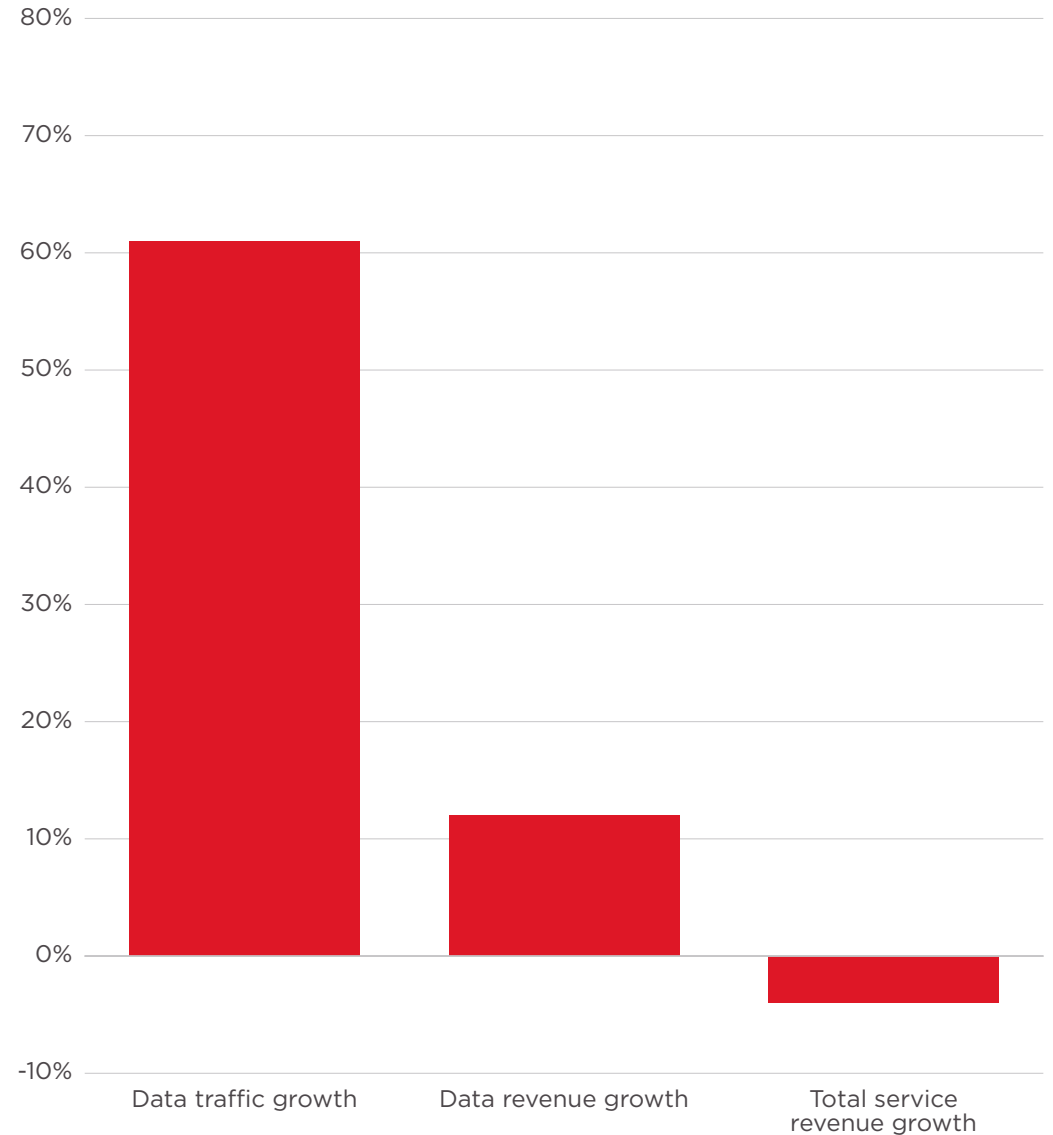
Source: GSMA Intelligence, We Are Social



**Smartphone data usage has doubled *in a year*** (Telefonica figures)



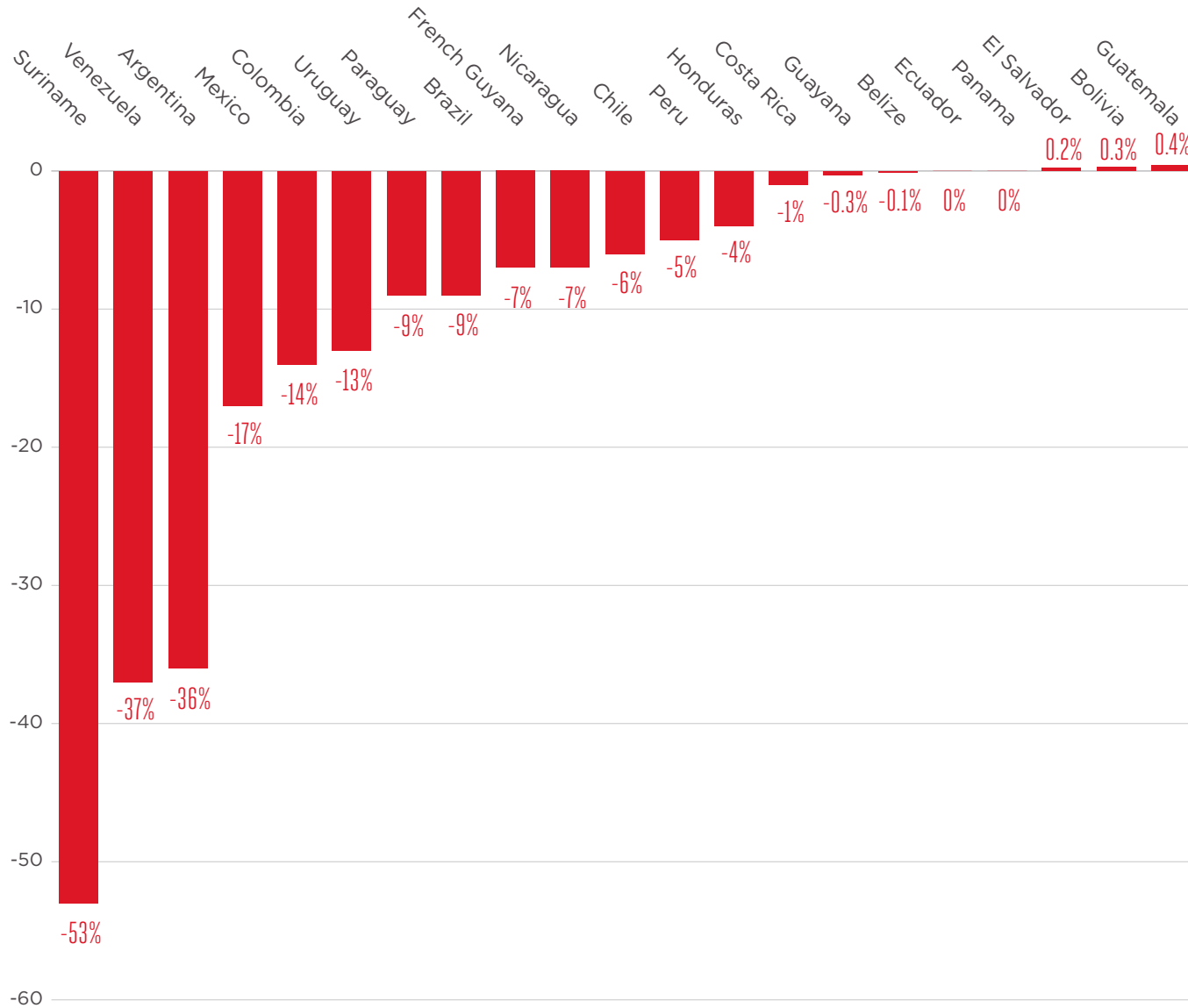
**Unfortunately much of that traffic is yet to be monetised**



Note: traffic growth is for the three months to March 2016 compared to the same period of the previous year. Source: GSMA Intelligence

## Currency devaluations hit consumer spending and investment

Change in local currency value versus US dollar (June 2015 versus June 2016)



The macro-economic environment remains challenging. The region's GDP growth was -0.9% in 2015, and is expected to remain negative in 2016, with Brazil in particular mired in recession.

This can have an impact on consumer spend, with prepay customers (78% of the base) reducing monthly spend, and contract customers delaying upgrades.

There is also an impact from high inflation, which makes imported smartphones more expensive for consumers, and network equipment denominated in foreign currency more expensive for operators.

Source: Oanda

# Regional views

└ Middle East



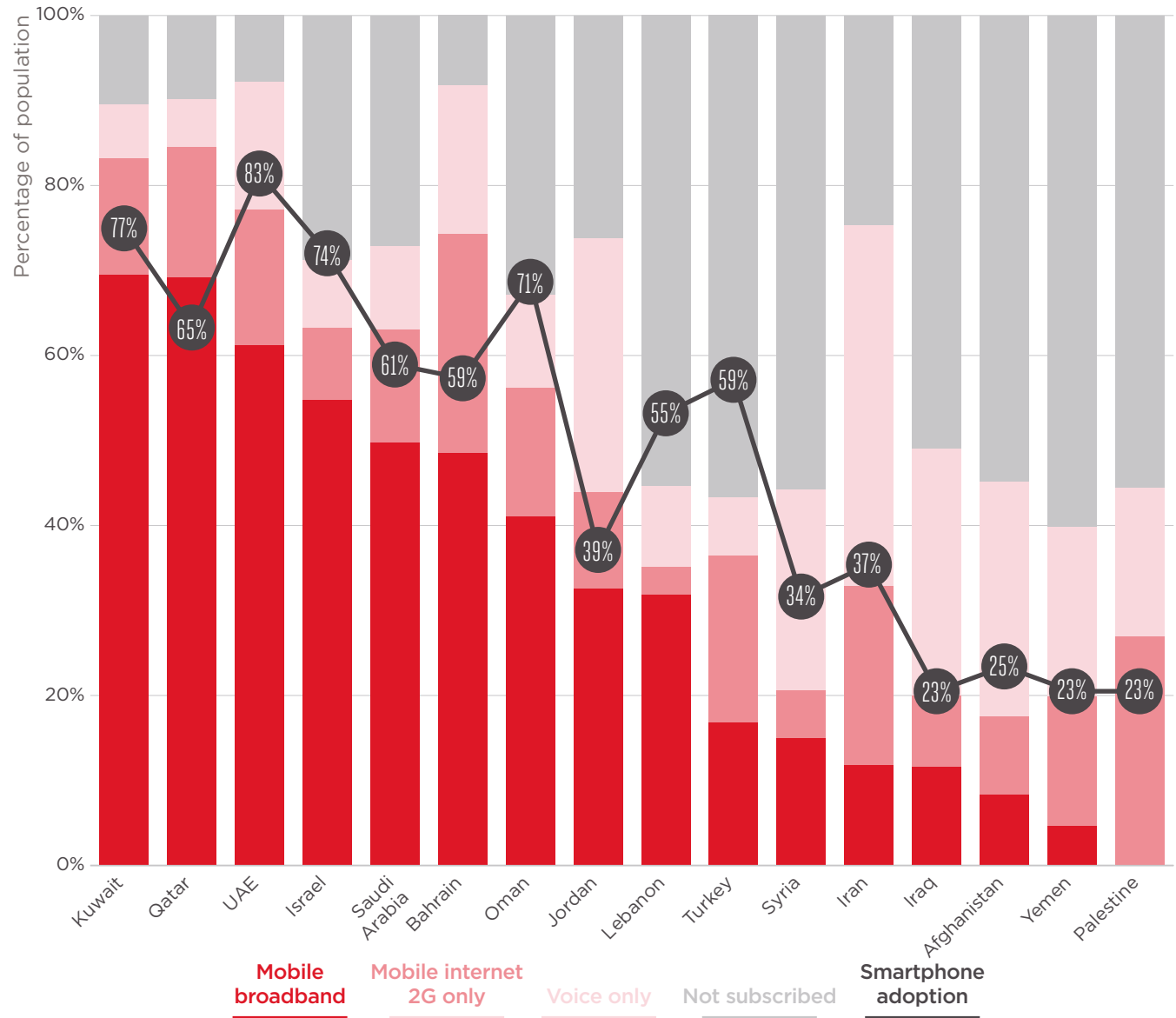
The region varies hugely in terms of mobile market maturity:

- In some markets, particularly most of those in the GCC, mobile penetration is over 90%, and the vast majority of subscribers are mobile internet users (mostly 3G and above).
- By contrast, in countries such as Afghanistan, Yemen and Palestine, less than half of the population subscribe to mobile services. In these markets, 2G is still the dominant technology for the mobile internet, particularly in Palestine where 3G is yet to be launched.

There is similar diversity in smartphone adoption:

- The UAE, at 83%, boasts the highest smartphone adoption rate in the world.
- Meanwhile, in Yemen and Palestine, smartphones account for less than a quarter of connections.

### Mobile and internet access across Middle East



Note: smartphone adoption measured as percentage of connections. Source: GSMA Intelligence

GCC states are increasingly seen as pioneers in mobile technology innovation.

- Some of the main areas of focus have been smart cities, automotive, smart metering and security.

There is also a vibrant innovation ecosystem emerging in Israel.

- Tel Aviv is ranked one of the world's most innovative cities.
- It is home to a booming startup scene, supported by growing venture capital, seed funds, accelerators, co-working spaces, free Wi-Fi and frequent startup competitions.
- Many international venture-capital firms, scientific research institutes and high-tech companies are headquartered there.

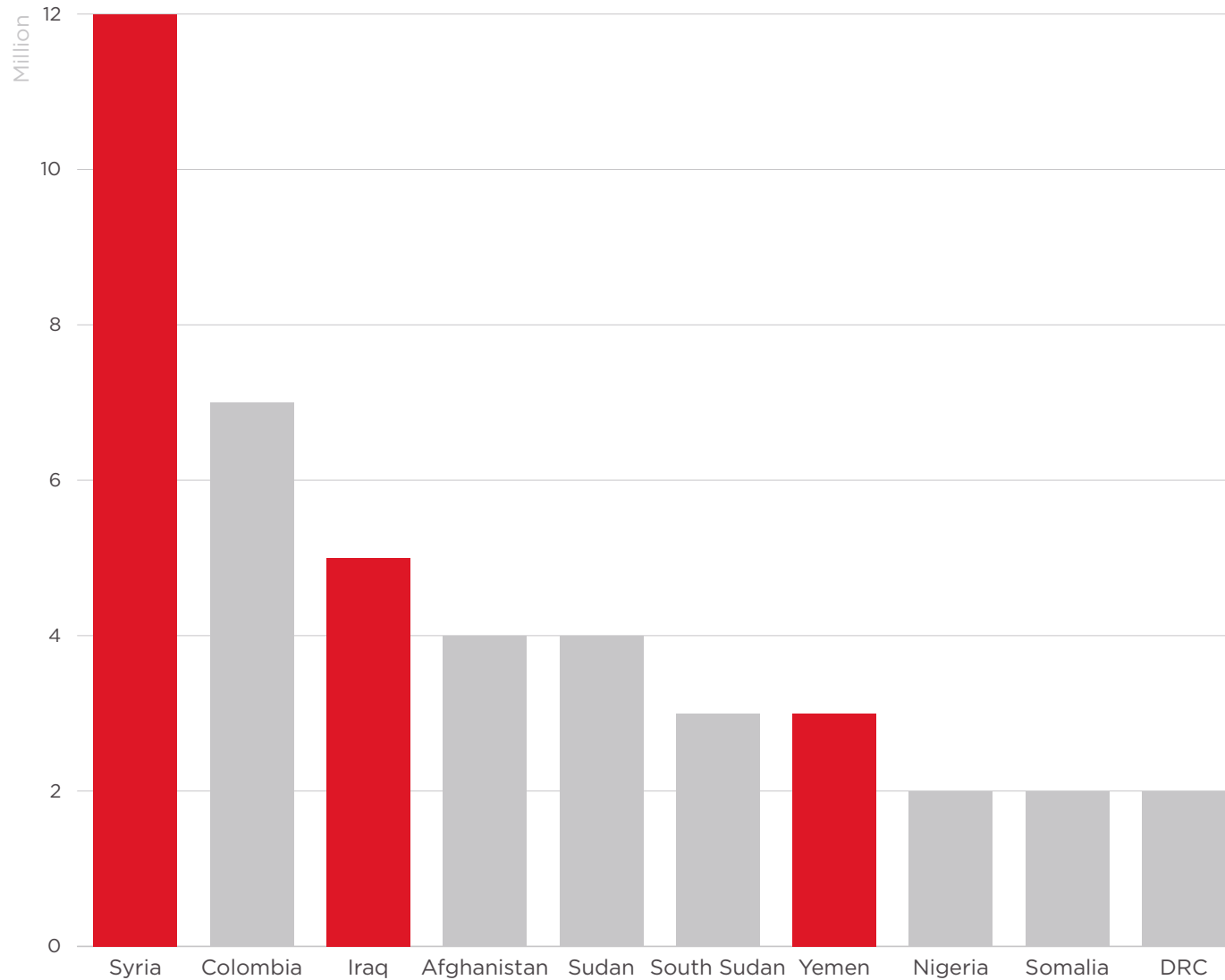
There are currently just under 10 million cellular M2M connections in the region, accounting for just over 2% of total connections.

- This number will more than double to 25 million by 2020 (5% of connections).

## Key initiatives of new services in the Middle East

Market	Initiative
<b>Smart cities</b>	
<b>Qatar</b>	Ooredoo has a business development team focusing on mega projects – Hamad International Airport and Lusail Smart City are example bids that Ooredoo has won.
<b>Saudi Arabia</b>	STC has developed a crowd management service for monitoring consumer locations. A particular use case is during Haaj.
<b>UAE</b>	Etisalat is planning to develop a smart theme park, with a “seamless and engaging” guest experience through mobile devices, web portals, wristbands, smart kiosks and digital signage.
<b>Various</b>	Zain has acquired NexGen, a smart city advisory firm. It plans to develop smart solutions in Zain markets throughout the region (Bahrain, Iraq, Jordan, Kuwait, Lebanon and Saudi Arabia).
<b>Digital identity</b>	
<b>UAE</b>	As part of UAE EIDA's 'My number, my Identity' campaign, Du and Etisalat provide a service which allows people to renew Emirates IDs digitally without visiting service centres.
<b>Saudi Arabia</b>	The Saudi government is mandating biometric fingerprinting on all SIMs for reasons of security. Jordan and UAE are heading in the same direction.
<b>Various</b>	Operators in Jordan, Saudi Arabia and UAE are launching Mobile Connect services.

## Countries with highest displaced populations, 2015



Source: UNHCR

Aside from Iran, in all countries in the region more than half of the population is financially excluded according to the World Bank.

- There are now 20 live mobile money services in 10 markets across the region.

The total displaced populations from Syria, Iraq and Yemen account for a third of total world displacements.

- The mobile industry is improving network preparedness and restoration, and providing more effective, coordinated support to humanitarian responders and disaster-affected populations.



# About us



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## Editor in Chief

Hyunmi Yang  
Chief Strategy Officer

---

## Lead authors

David George  
Director  
[dgeorge@gsma.com](mailto:dgeorge@gsma.com)

Tim Hatt  
Director  
[thatt@gsma.com](mailto:thatt@gsma.com)

---

## Editors

Ed Barker  
Head of Industry Strategy

Aastha Gupta  
Director of Industry Radar

---

## Authors

Akanksha Sharma  
Senior Analyst

Barbara Arese Lucini  
Senior Analyst

Calum Dewar  
Director, Forecasting

David Evans  
Director, Product and Commercialisation

Francesco Rizzato  
Analyst, Forecasting

Henry James  
Mobile Ecosystem Specialist

Jan Stryjak  
Lead Analyst

Joss Gillet  
Director, Data and Partnerships

Kalvin Bahia  
Senior Economist

Kavi Bains  
Analyst, Financial Modelling

Kenechi Okeleke  
Senior Analyst

Mark Giles  
Lead Analyst, Financials

Mark Little  
Senior Manager

Matthew Iji  
Senior Analyst, Forecasting

Maximo Corral San Martin  
Analyst, Forecasting

Mike Rogers  
Senior Analyst

Mike Meloán  
Lead Analyst

Nuno Afonso  
Senior Analyst

Pablo Iacopino  
Senior Manager

Pau Castells  
Lead Economist

Robert Wyrzykowski  
Analyst, Spectrum

Sylwia Kechiche  
Lead Analyst, M2M

Xavier Pedros  
Analyst, Regulatory Economics





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GSMA Intelligence is the definitive source of mobile operator data, analysis and forecasts, delivering the most accurate and complete set of industry metrics available.

Relied on by a customer base of over 800 of the world's leading mobile operators, device vendors, equipment manufacturers and financial and consultancy firms, the data set is the most scrutinised in the industry.

With over 30 million individual data points (updated daily), the service provides coverage of the performance of all 1,400+ operators and 1,200+ MVNOs across 4,500+ networks, 77 groups and 238 countries and territories worldwide.

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GSMA Intelligence, The Walbrook Building, 25 Walbrook, London EC4N 8AF