
Global Mobile Trends 2021

Navigating Covid-19 and beyond

December 2020

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The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with nearly 400 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

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GLOBAL MOBILE TRENDS

Growth beyond connectivity

5G outlook

Network transformation

IoT and enterprise verticals

The digital consumer

The next billion

Regional outlook

Telecoms in the global macro context

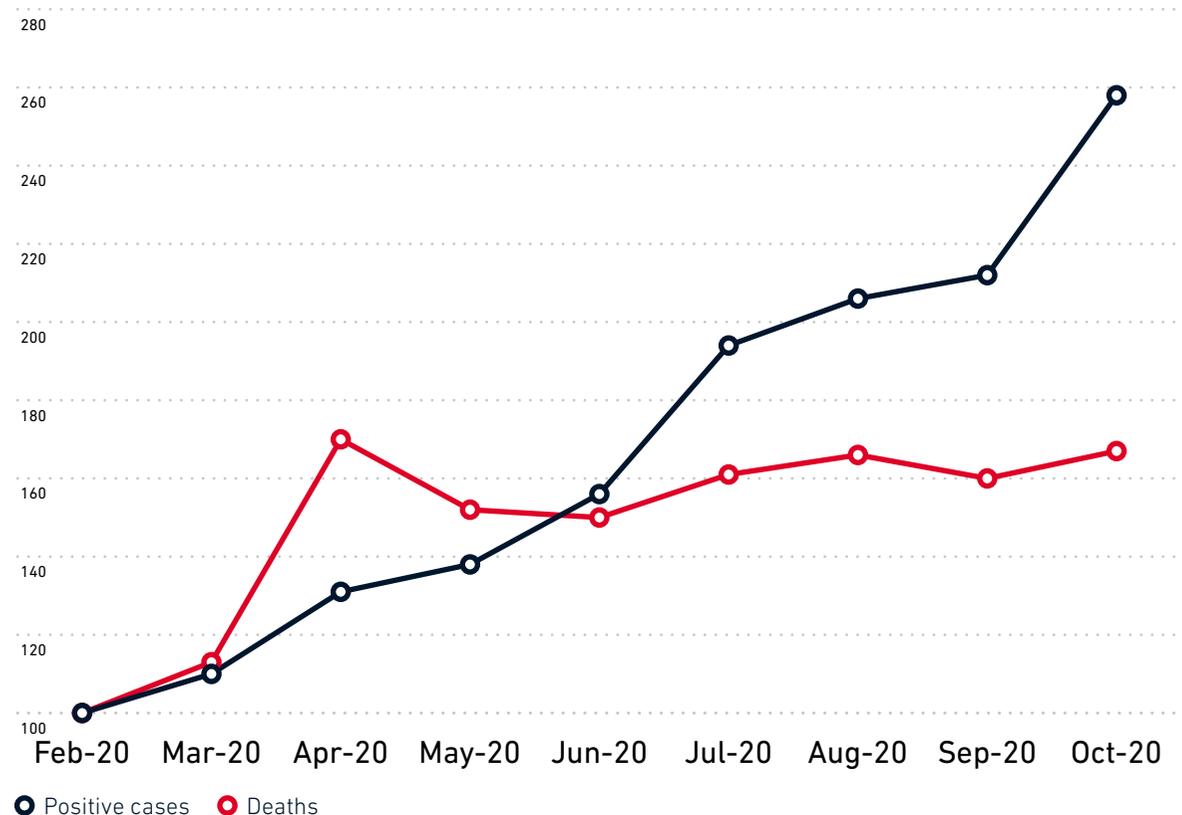
Covid-19 emerges
into an already
uncertain world

A shock to the world at large

- The arrival of a global pandemic could hardly have been a more inauspicious welcome to the new decade.
- Since the original outbreak and early infection figures from Wuhan in January, the outbreak has shifted west and then south to register a total of 63 million infections (as of the end of November), equivalent to 1 in every 100 people worldwide, and nearly 1.5 million deaths.
- Aside from the obvious public health crisis, Covid-19 has induced drastic economic restrictions across the world. The IMF forecasts global GDP will drop 4.4% in real terms in 2020, although the rate will be worse in many countries, with far-reaching consequences for unemployment.
- There is, at last, some light at the end of the tunnel following read-outs from multiple vaccine trials. Pending distribution (itself a monumental challenge, particularly in developing countries with less mature health systems), a slow recovery should begin to take hold in mid-2021, though with still unknown and potentially long-lasting impacts on how people socialise and work.

Second spikes in the US and Europe have driven Covid-19 to a case count that is 160× the February toll

Counts indexed to values in February 2020



Figures for cases and deaths are per month worldwide and expressed relative to their respective values for February 2020.

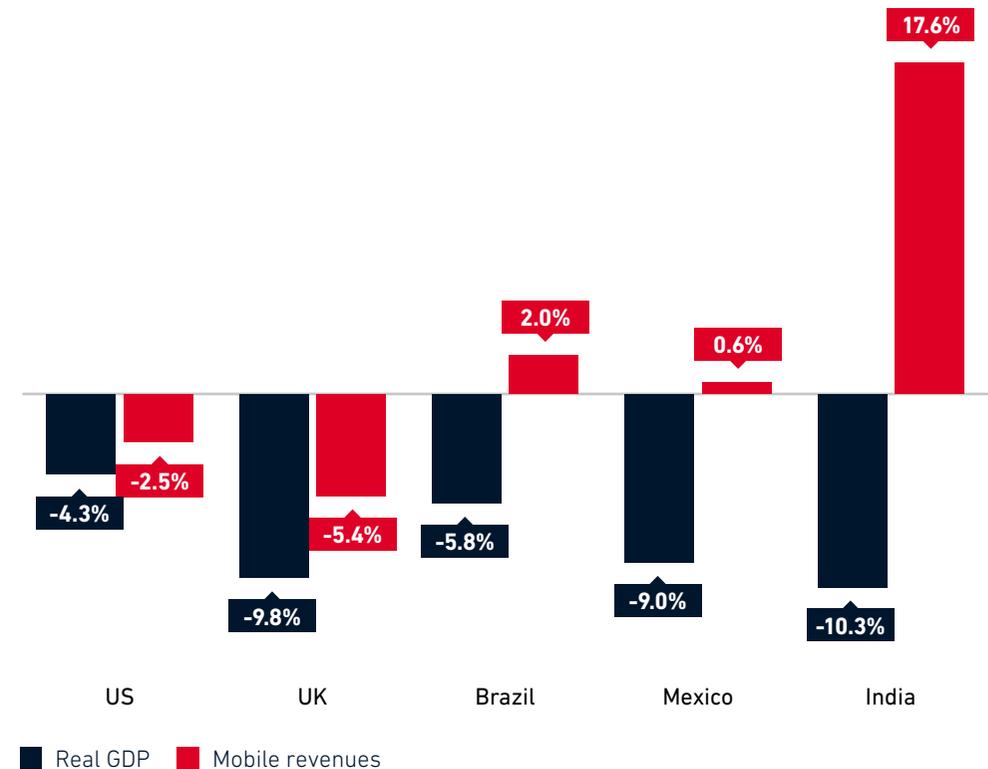
Source GSMA Intelligence, ourworldindata.org

Telecoms takes a hit but the impact is less severe than on the broader economy

- Because of its consumer-facing nature, the telecoms sector behaves cyclically relative to the economy. Precedents – most recently the 2008 financial crash – suggest that the impact compared to that on GDP in a recession is less severe and lags by 3–6 months.
- A lot, however, has changed since 2008, when the iPhone had barely arrived and 4G did not exist. Smartphones are now ubiquitous, LTE is widespread (or on the rise in emerging markets) and businesses are undertaking digital transformation, powered by cloud capacity and low-latency networking (including 5G). In short, mobile and fixed networks are more in demand than they used to be.
- Among the five most affected countries (in terms of deaths), the hit on mobile revenue has been about half that on GDP in high-income countries (the US and UK are shown in the chart). This is worse than tech and internet groups such as Google and Facebook but far better than retail, travel and hospitality.
- The same relationship is not true in many developing countries, where the absence of fixed line infrastructure makes mobile the default – often only – means of accessing the internet. Combined with ongoing 4G adoption, this means mobile revenue growth has outperformed the economy by a much wider margin.

Aggregate change in 2020 versus pre-pandemic levels in 2019

Five worst-hit countries*



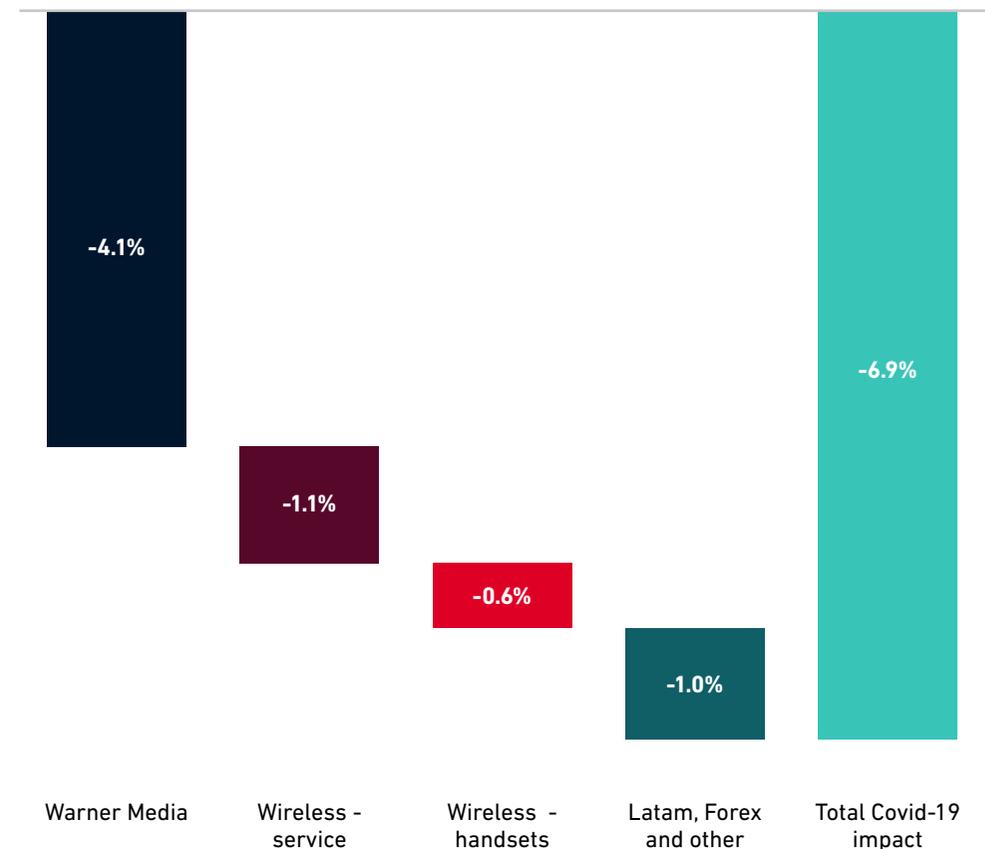
*Ranked by deaths from Covid-19 as of 30 September. Revenues = 9 months to September versus same period of 2019. GDP = forecasts for 2020 versus 2019.

The Covid-19 impact has focussed on roaming, handsets and enterprise

- While Covid-19 has impacted revenues for many sectors, for telcos – which have multi-faceted business models – it is important to understand which parts of the business have been most exposed.
- Based on reporting from AT&T, Telefónica, Telecom Italia and a handful of others, we are able to discern the negative financial impact directly associated with Covid-19, which has averaged 4–8% of overall revenues. Put differently, this means Covid-19 has shrunk the operator business by 4–8% than would otherwise have been the case.
- There is also general uniformity in the impact being concentrated in a loss of roaming business (reduced travel), lower handset upgrades (retail store closures), and discounts and payment holidays afforded to business customers facing lost revenue or even bankruptcy as a result of social distancing. By contrast, actual service revenues have held up fairly well.
- AT&T is perhaps the largest converged telco in the world. Its reporting indicates the vulnerability of media licensing, where cinema closures have exacerbated the direct-to-consumer distribution shift being executed by Netflix, Amazon and Disney.

Breakdown of Covid-19 impact on revenue for AT&T

Q2 2020. Figures are expressed as a share of overall revenue for the same period of the prior year (Q2 2019).



Network resilience has been an out and out positive

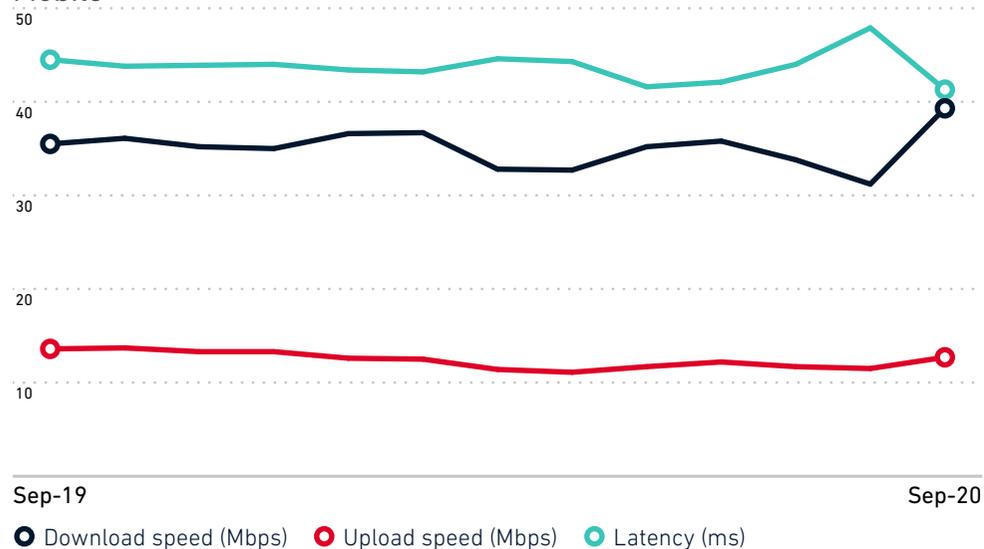
- The working-from-home phenomenon combined with in-home entertainment as a result of social distancing has led to a huge, sustained rise in data traffic, mostly over fibre but also mobile.
- Zoom has become a household name but this, of course, would not be the case without robust networks.

- Network performance has held up across the board for consumers and in aid of hospitals and medical professionals.
- The pandemic has therefore brought the systemic importance of scaled network infrastructure into sharp relief.

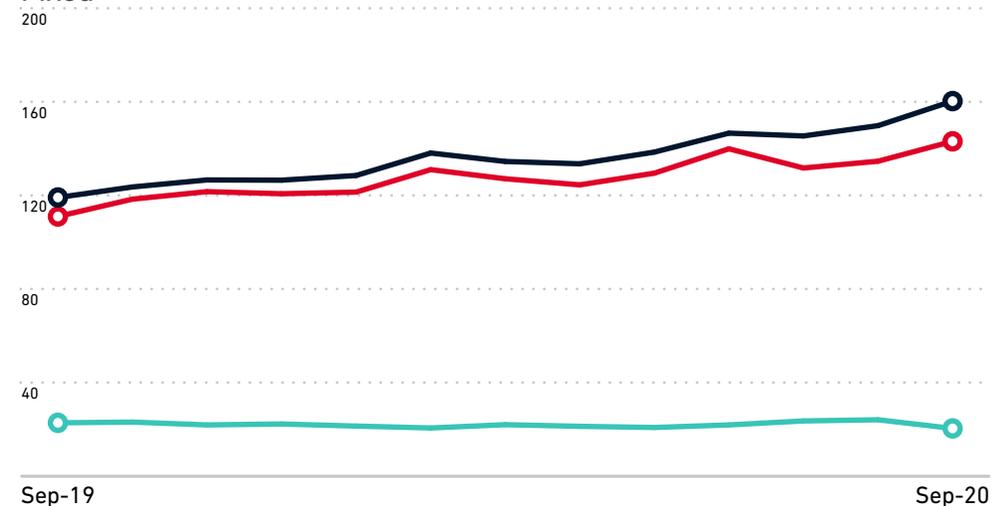
Prevailing network performance has more than held up

Spain data

Mobile



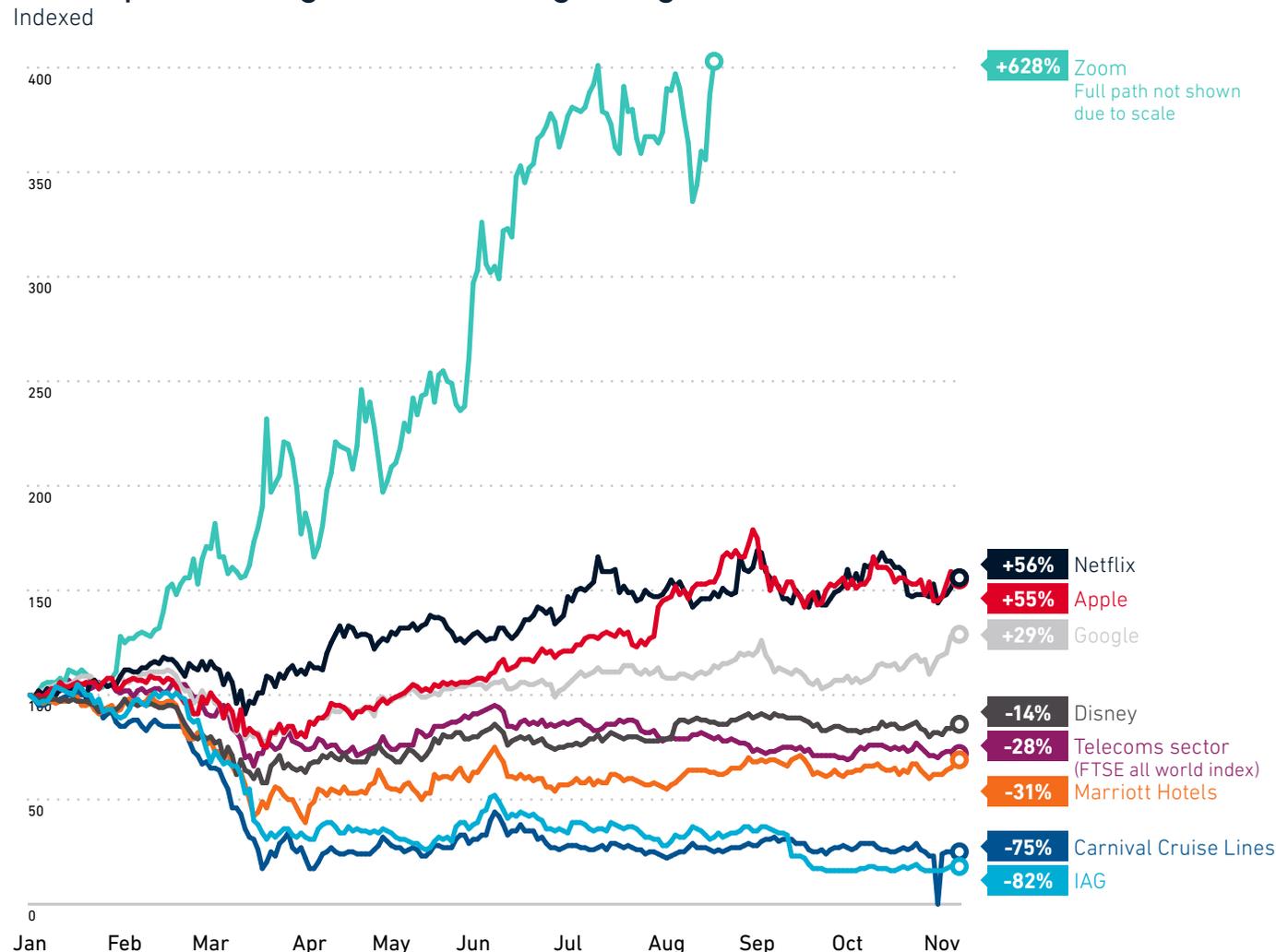
Fixed



Market valuations shift: the short versus long term

- While it is simplistic to label different sectors or companies as winners or losers of the pandemic, shifts in stock market valuations are a proxy of the relative Covid-19 financial impact and potential longer term implications for different sectors.
- Zoom has become the poster child of 2020 as the go-to platform for people and businesses seeking to maintain contact. By contrast, retail, tourism and airlines have been devastated; Marriot and IAG (owner of British Airways) have lost around 80% of their value.
- Telecoms is down by a quarter but is relatively resilient, underscoring the value of reliable connectivity. As a cyclical sector, it will recover in line with the wider economy in 2021. Longer term prospects depend on a renewed growth story from 5G, particularly in enterprise, which will take time to judge.

Share price change since the beginning of 2020



Figures are expressed relative to share price on 2 January 2020.

Source Yahoo Finance, GSMA Intelligence

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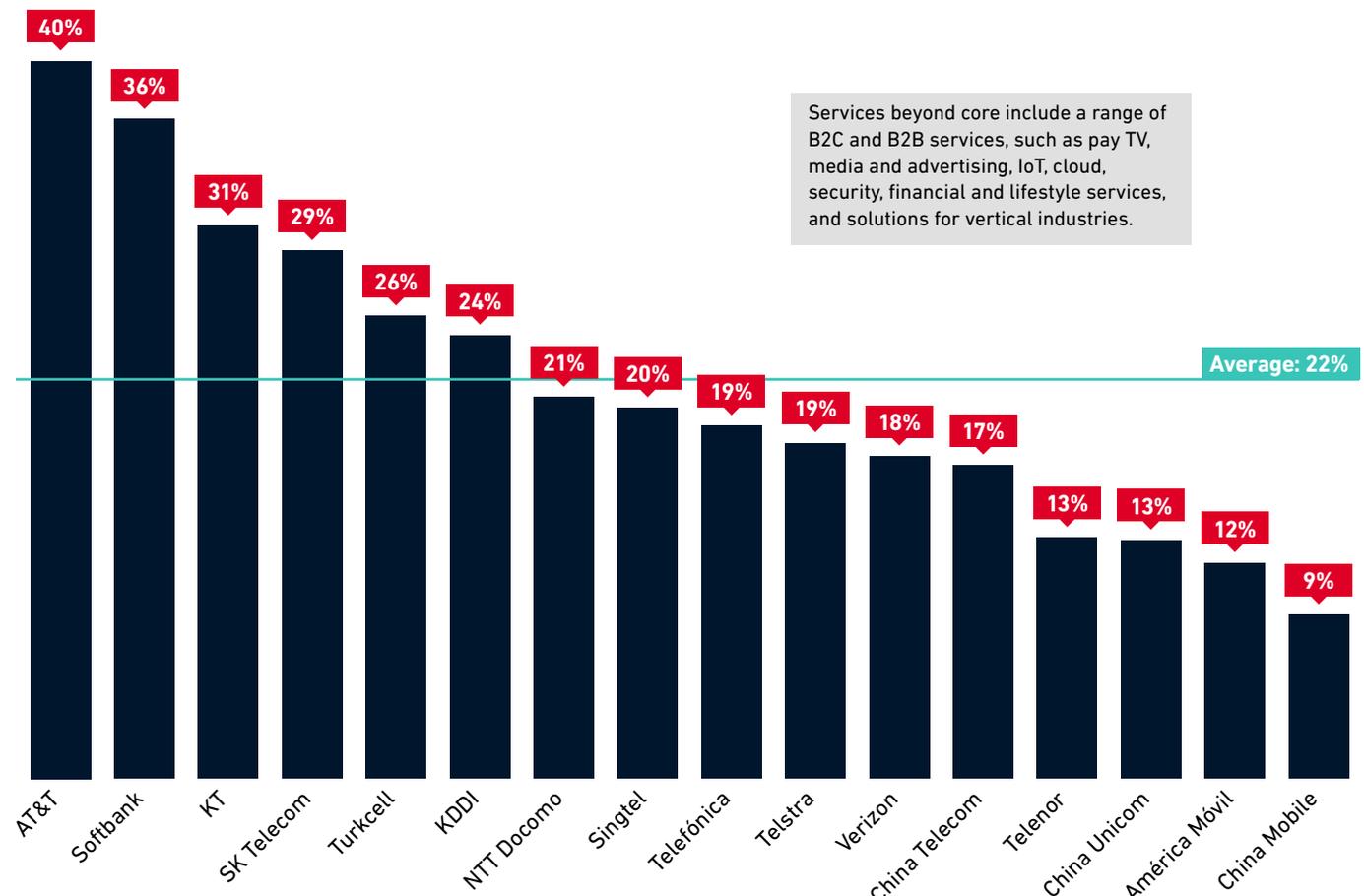
Growth beyond connectivity

Progress so far
for operators

Services beyond core have reached an average of 20% of total revenues for major operators

- Developing new revenue streams beyond the sale of fixed and mobile connectivity has for several years been a focus for many groups in an effort to restart growth and counter the effects of commoditisation.
- Our latest analysis suggests services beyond core account for between 10% and 40% of total revenues, and just over 20% on average for the largest groups – a rise from 17% in 2017.
- Growth is organic for most, but large-scale M&A has provided a significant boost to AT&T (TimeWarner) and Softbank (Yahoo Japan), as evidenced by their higher shares.

Revenue beyond core as a percentage of total revenues, 2019



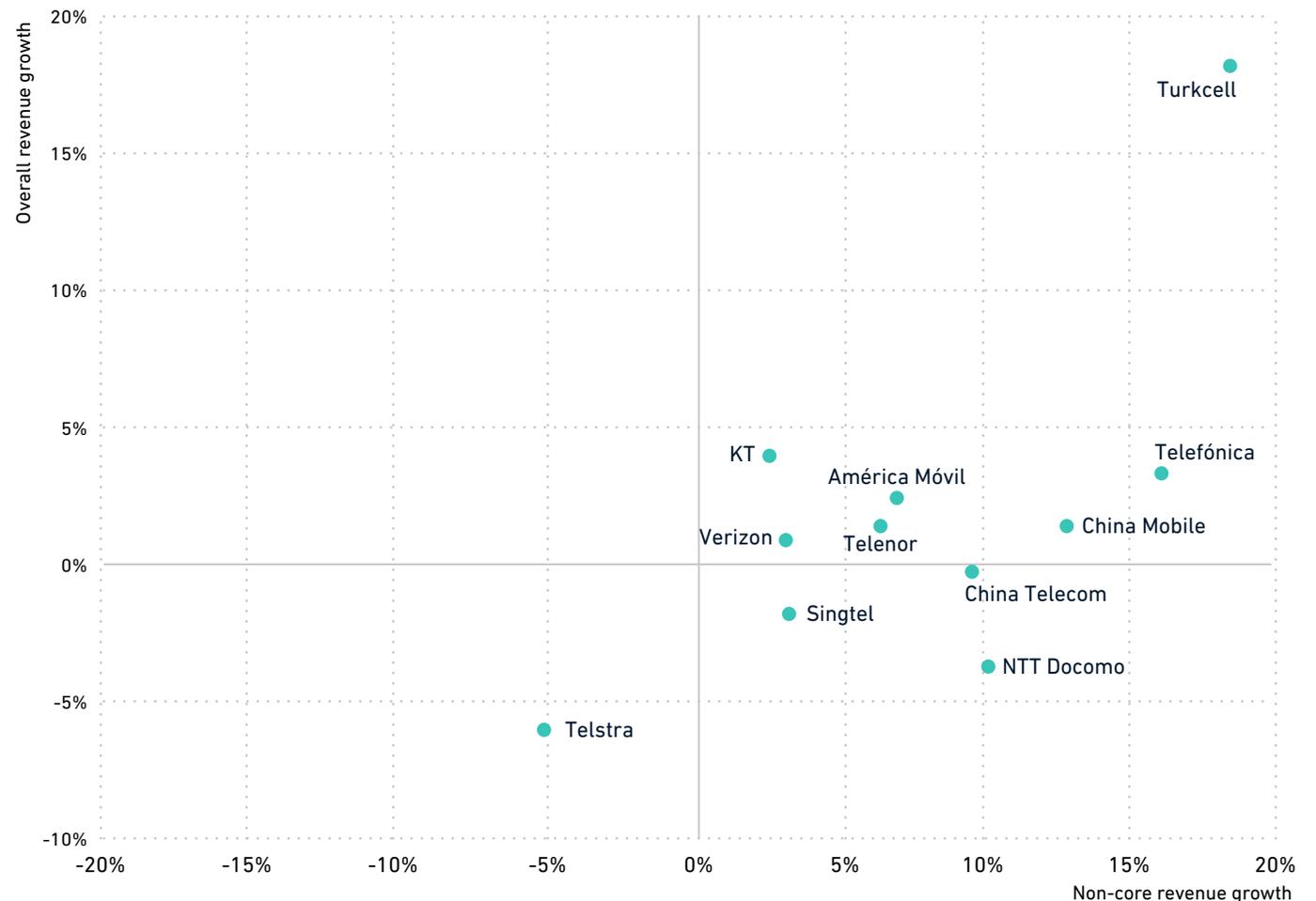
Selected operator groups (consolidated figures).

Source company figures and GSMA Intelligence

Scale remains the challenge to moving the needle on overall growth

- Mobile/broadband revenue growth is heavily constrained by competition and the economic environment. As a result, it remains in low single digits or negative territory for much of the sector.
- Services beyond mobile and fixed connectivity are growing much more quickly but from a smaller base, making it harder to effect overall growth.
- Turkcell is a standout exception; it has re-engineered itself into a digital telco. Its overall performance now almost directly tracks its success in digital services.

Trying to shift the growth drivers



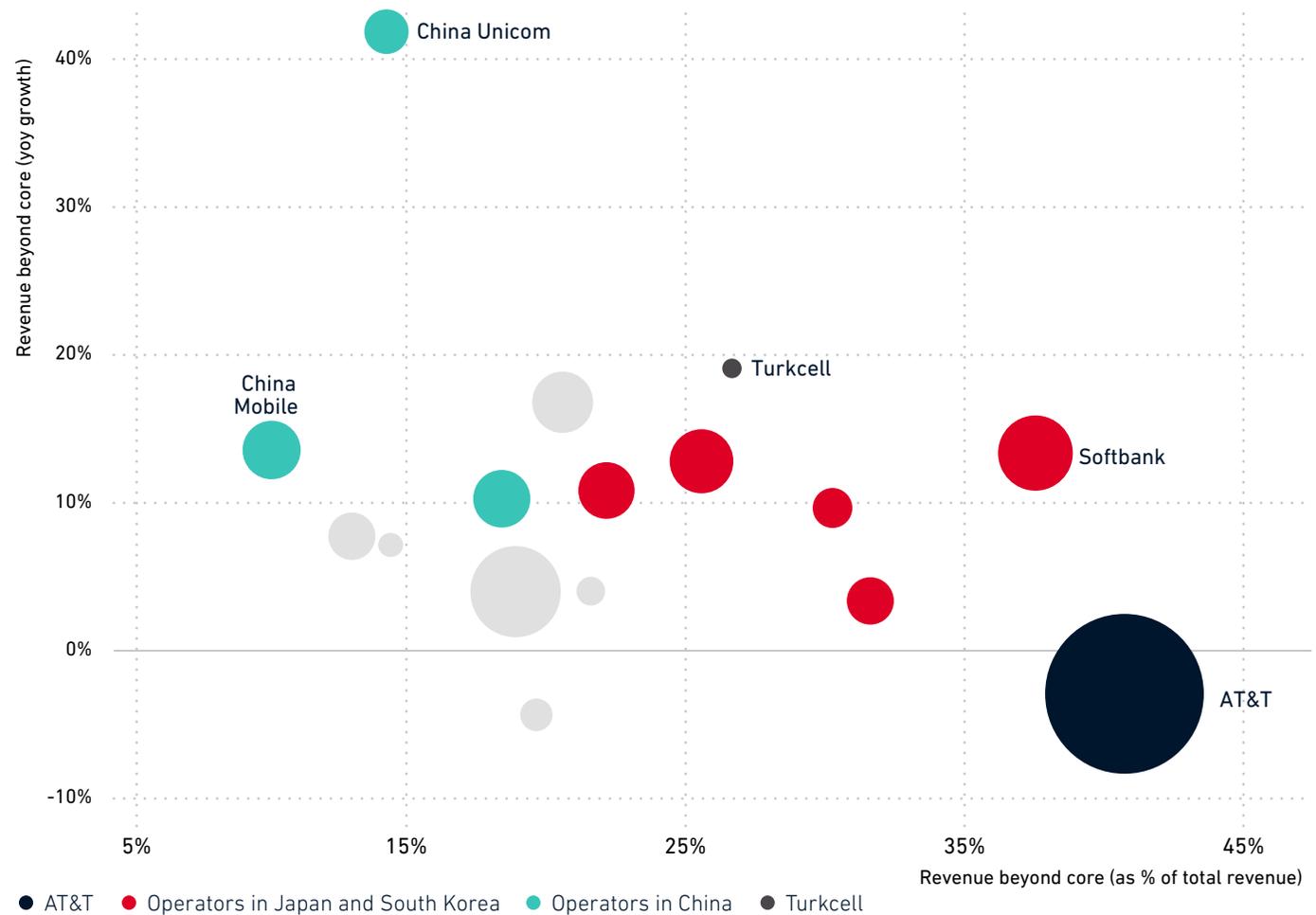
Data is for 2019

Source GSMA Intelligence

There's no 'one size fits all' approach to growing revenue beyond core services

- AT&T is the largest outlier; it spent \$150 billion acquiring DirecTV (2015) and Time Warner (2018).
- Operators in Japan and South Korea lead on diversification, targeting the digital consumer through a range of lifestyle and financial services.
- China leads on growth, driven by IoT and B2B solutions, and backed by the government's ambition to make China a leading country in high-tech industries.
- Turkcell is a benchmark (with strong diversification and high growth). It provides one of the broadest portfolios of digital services.

Scale versus growth



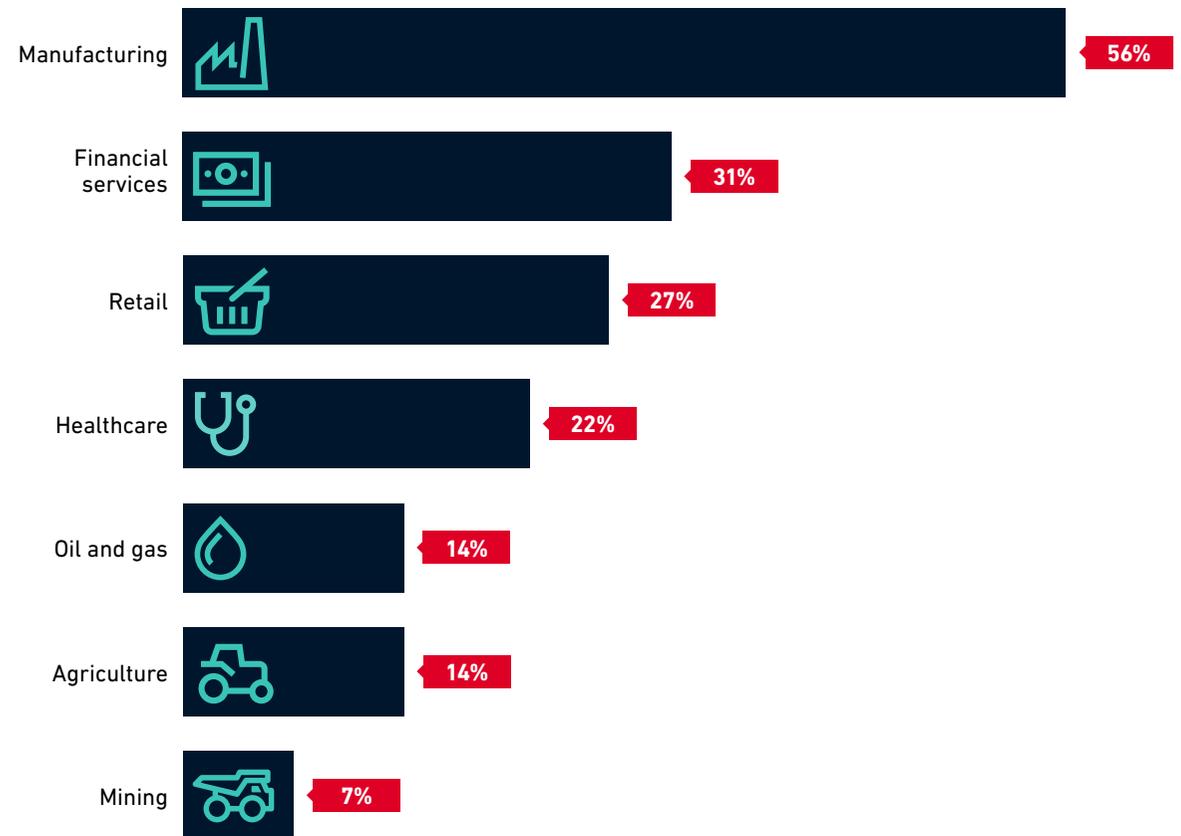
2019 data. Bubble size reflects 2019 revenue beyond core.

Source company figures and GSMA Intelligence

There is a consensus that 5G must monetise enterprise verticals

- B2B is the incremental opportunity in the 5G era considering the raft of digital transformation projects under way in a number of industries. However, this is a highly competitive arena, with cloud majors (AWS, Microsoft and Google), SaaS providers and IT consultancies such as Accenture all in the game.
- IoT was the first attempt to drive vertical-focused strategies. 5G will likely lead to a step-change in how operators approach verticals. The almost \$1 trillion in 5G network investment expected globally to 2025 adds further pressure to find new B2B revenue opportunities.
- Operators around the world see manufacturing as the largest B2B revenue opportunity going forward. While manufacturing is widespread, for other industries, variations exist; these reflect differing levels of importance to local economies (e.g. agriculture and mining in Latin America, oil & gas in the Middle East and Africa).

Which sectors do telecoms operators see as the largest revenue drivers for services beyond connectivity over the next five years?



Scores reflect where a given sector was ranked 1st or 2nd in revenue potential by operators (n=100).

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5G outlook

Pushing ahead

Network transformation

IoT and enterprise verticals

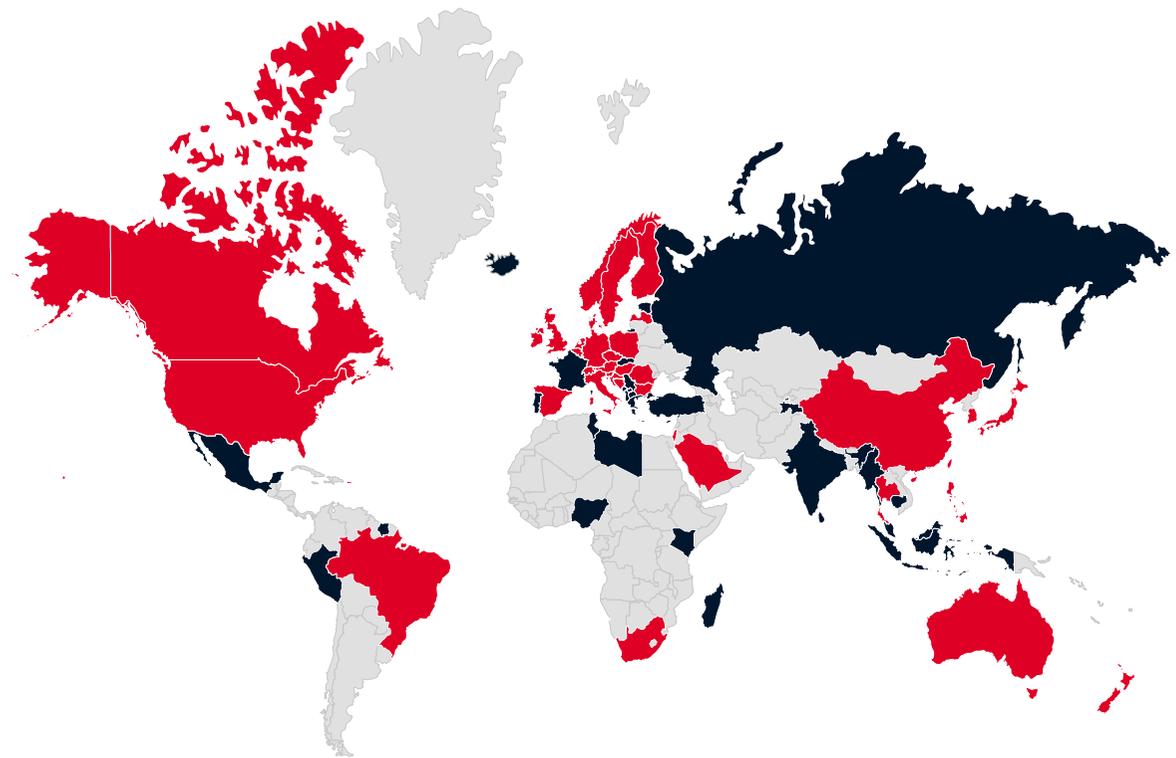
The digital consumer

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Regional outlook

5G network rollouts continue unabated

- Despite the global pandemic and associated economic constraints, new 5G networks continue to be launched.
- Following a slowdown in January and February, the pace from March 2020 has held steady at eight new 5G networks per month. This is up from fewer than six per month for the same period in 2019.
- As a result, there are now 113 operators with a 5G network across 48 countries. These operators collectively account for 40% of the global mobile subscriber base, presenting a large addressable audience.
- India has notably delayed its spectrum auction to 2021. In several other countries, however, the opposite has happened, with regulators freeing up spectrum to ensure people have connectivity at a time of heightened demand.
- Launches so far have been concentrated in more mature markets, led by China, South Korea and the US. However, developing markets are now entering the 5G era – even if scale is minimal. Prominent examples include South Africa (MTN and Vodacom) and Brazil (Claro).



■ Live commercial 5G network ■ Planned commercial 5G network

Data as of 30 September 2020

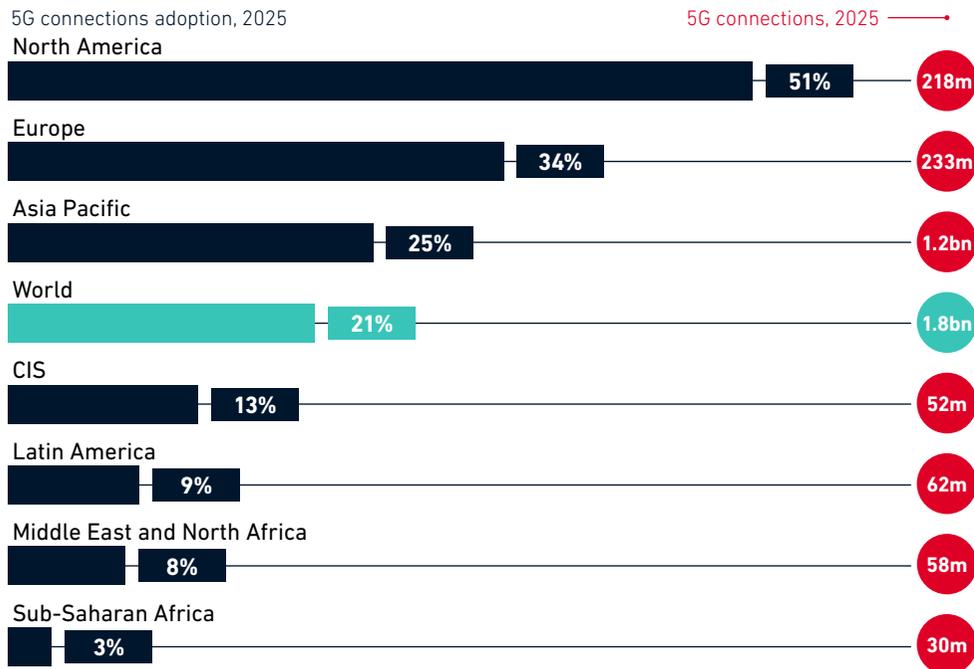
Source GSMA Intelligence

5G investment and the link to RoI

- While we are yet to see 5G become mainstream, new networks and declining handset prices will drive adoption over the next year and beyond. The new 5G iPhone 12 will play a major part.
- Globally, we forecast operators will spend 80% of sector capex (\$890 billion) on 5G networks over the next five years, reaching 45% population coverage.

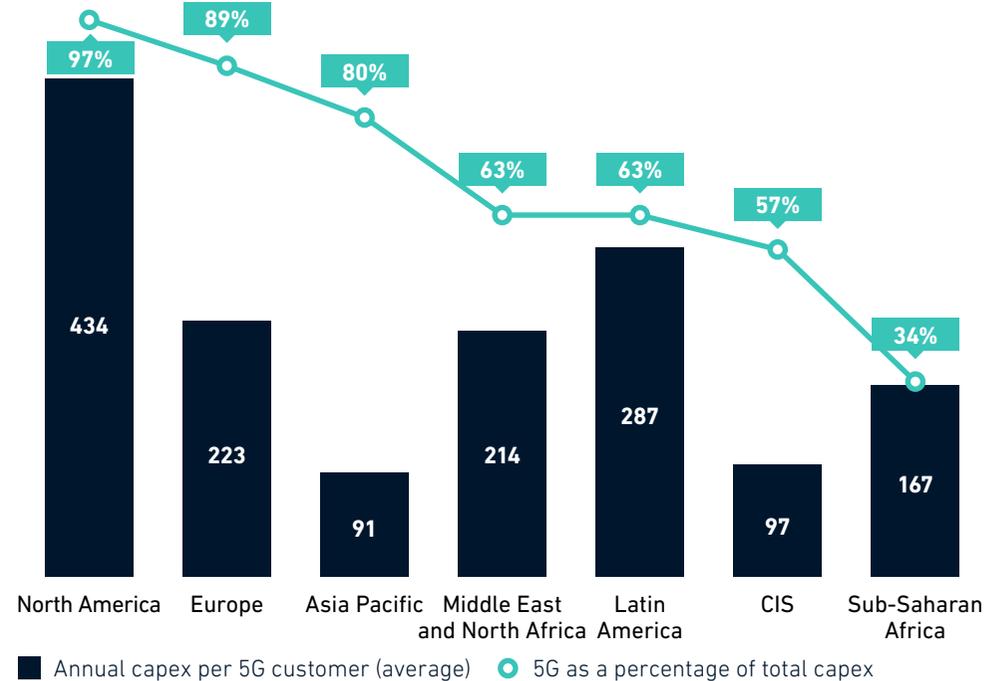
- There is an uneven regional skew to this distribution. One way of measuring this is to express capex relative to the anticipated customer base size. On this measure, the US is by far ahead of everyone else; this bodes well for quality and coverage but sets a high bar for the pricing premiums needed to recoup the investment. By contrast, Asia (mostly China) is much lower.

5G connections and adoption



5G capex efficiency

\$ per year, 2020-2025

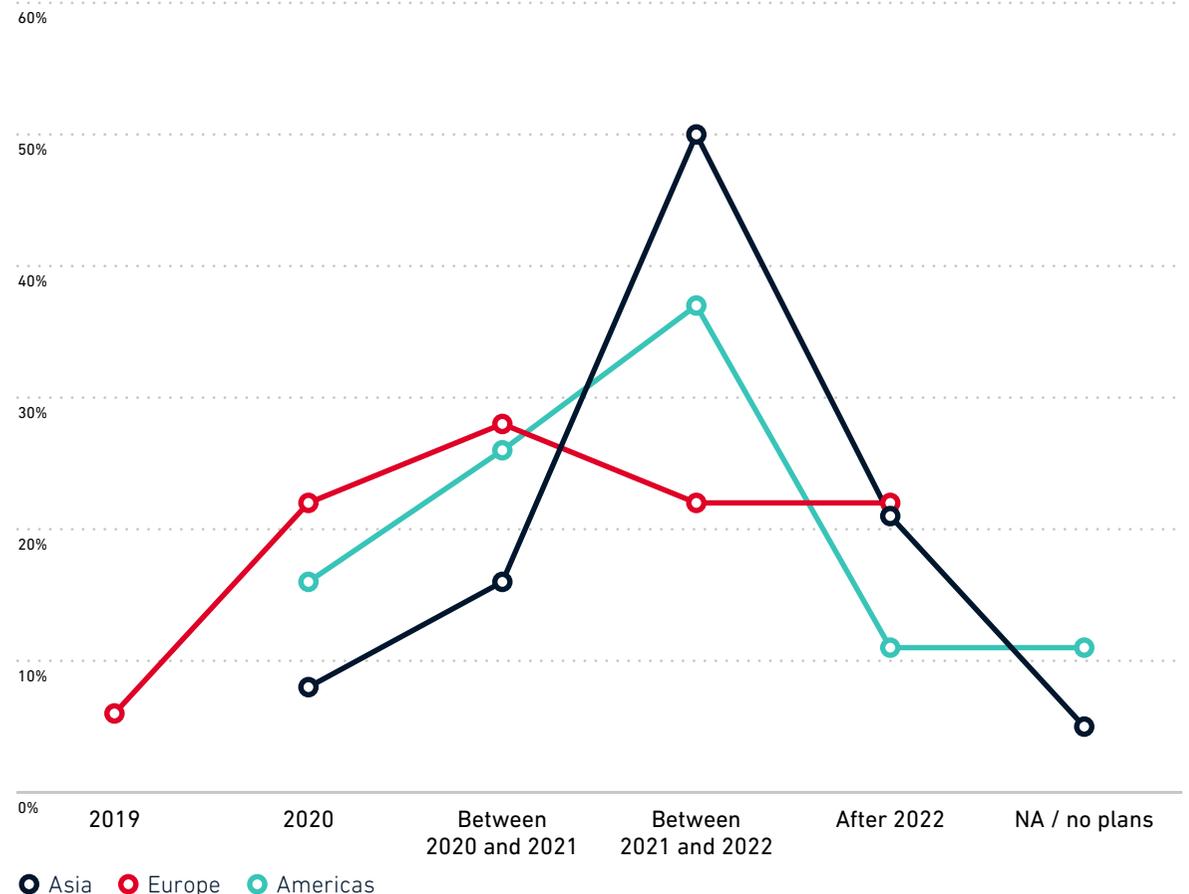


The timetable for standalone networks has been brought forward

- Much of the enterprise opportunity for 5G will rely on standalone networks being installed for low-latency capabilities.
- Our survey of mobile operators points to 2021 as the tipping point year for launching live standalone networks. This has moved forward, reflecting the urgency of having infrastructure in place to service enterprise clients being wooed by vendors and cloud companies.
- As with non-standalone builds tethered to LTE masts so far, China and the US will be the global leaders in standalone networks (China already is, as it has used the architecture from the start).
- European operators are also in the game, particularly in the Nordic region, which is seeing a mini industrial revitalisation take place with operators, vendors and enterprise conglomerates from manufacturing acting as an ecosystem to roadtest and launch 5G industrial applications.

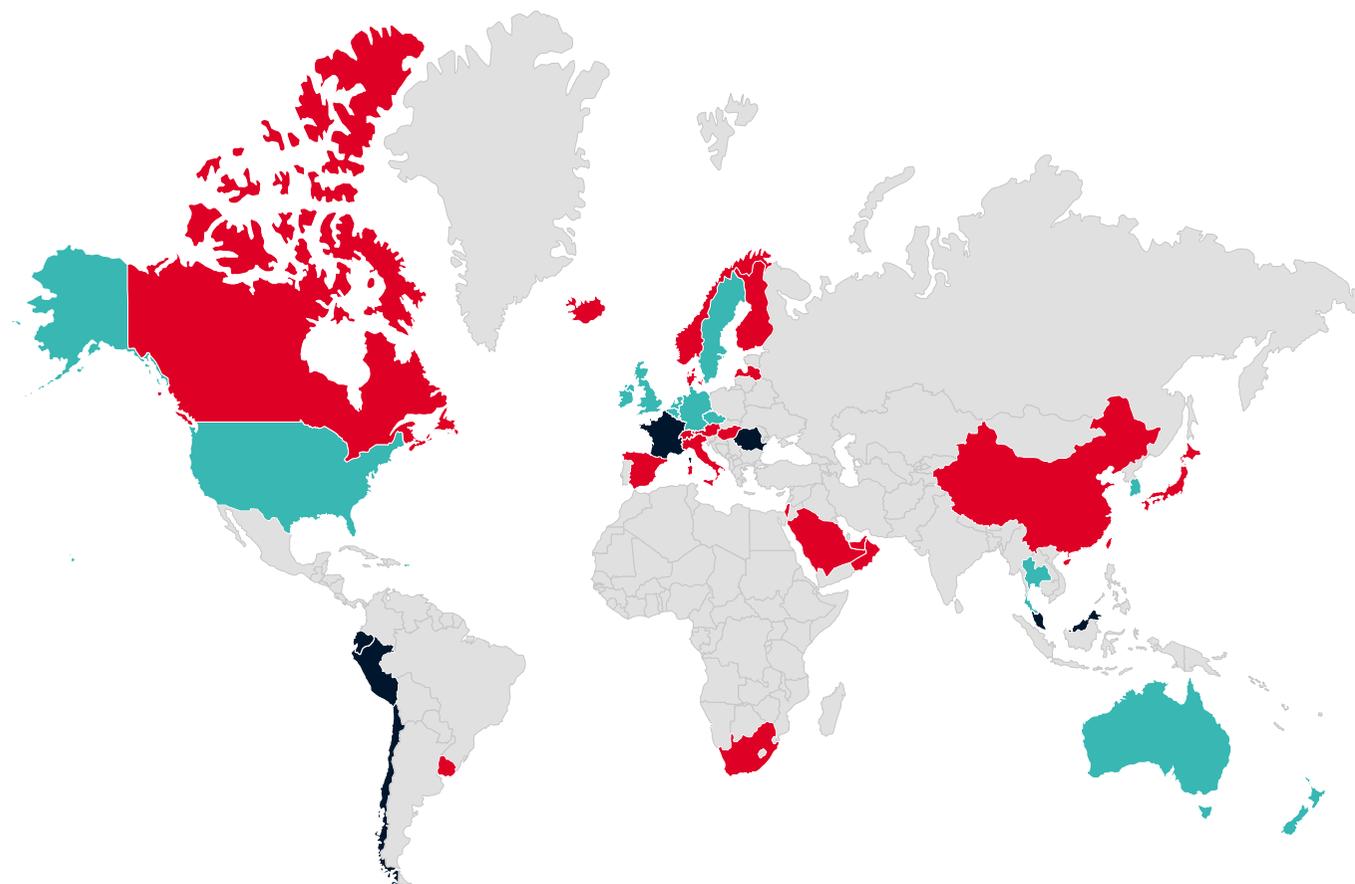
Considering your 5G network assets and strategy, when do you plan standalone 5G?

Percentage of operators



Source GSMA Intelligence Network Transformation Survey 2020

The state of play for 5G spectrum is mixed



- As of Q3 2020, 'new' spectrum specifically earmarked for 5G had been assigned in 35 countries. The remaining countries are either waiting on auctions or redeploying existing bands for 5G use.
- While the mid-band of 1-6 GHz has been most popular (50% of operators that have been assigned spectrum), sub-1 GHz and above 6 GHz have accounted for 20-30% each, underscoring a broad distribution.
- This portends a more heterogeneous era of deploying 5G networks. It could even apply to a single operator, which may deploy 5G in cities on mmWave while the suburban/rural footprint relies on coverage spectrum below 1 GHz.

■ Assignments planned ■ Assignments completed and planned ■ Assignments completed

Data as of 30 September 2020

Source GSMA Intelligence

Pursuing new spectrum frontiers and technologies

mmWave (27 GHz +)

- Where capacity requirements are high, such as in city centres in Europe, North America and China, mmWave will be used to provide a cost-effective solution for high-speed, low-latency 5G.
- Despite the advantages, there are limitations including signal loss, the high number of cell sites required to provide coverage comparable to lower band frequencies, and difficulties with indoor penetration.
- Consequently, low and mid-band frequencies will remain first choice for most consumer use cases in the early phases of 5G rollouts.

700 MHz

- This band helps reach wider geographic areas once city and suburban areas are covered.
- It is currently used for TV transmission, especially in Europe. Many countries are now working to free the spectrum to allow a transition to 5G mobile services.
- Spectrum auctions for 700 MHz are targeted to take place late in 2020 or early 2021.

Dynamic spectrum sharing

- Dynamic spectrum sharing (DSS) allows mobile operators to use the same spectrum band for different radio access technologies such as 4G and 5G.
- Sixteen mobile operators in 10 countries have launched 5G using DSS.
- These can be classified into two groups:
 - Operators that want to deploy 5G but do not have access to 'new' 5G spectrum.
 - Operators with access to 5G spectrum but want to achieve greater coverage (by deploying DSS in low or mid bands).

Examples

Verizon	US
T-Mobile	US
AT&T	US
NTT	Japan

Examples

AT&T	US
T-Mobile	US
Vodafone	Germany
KPN	Netherlands

Examples

Claro	Brazil
China Unicom	China
China Telecom	China
Verizon	US

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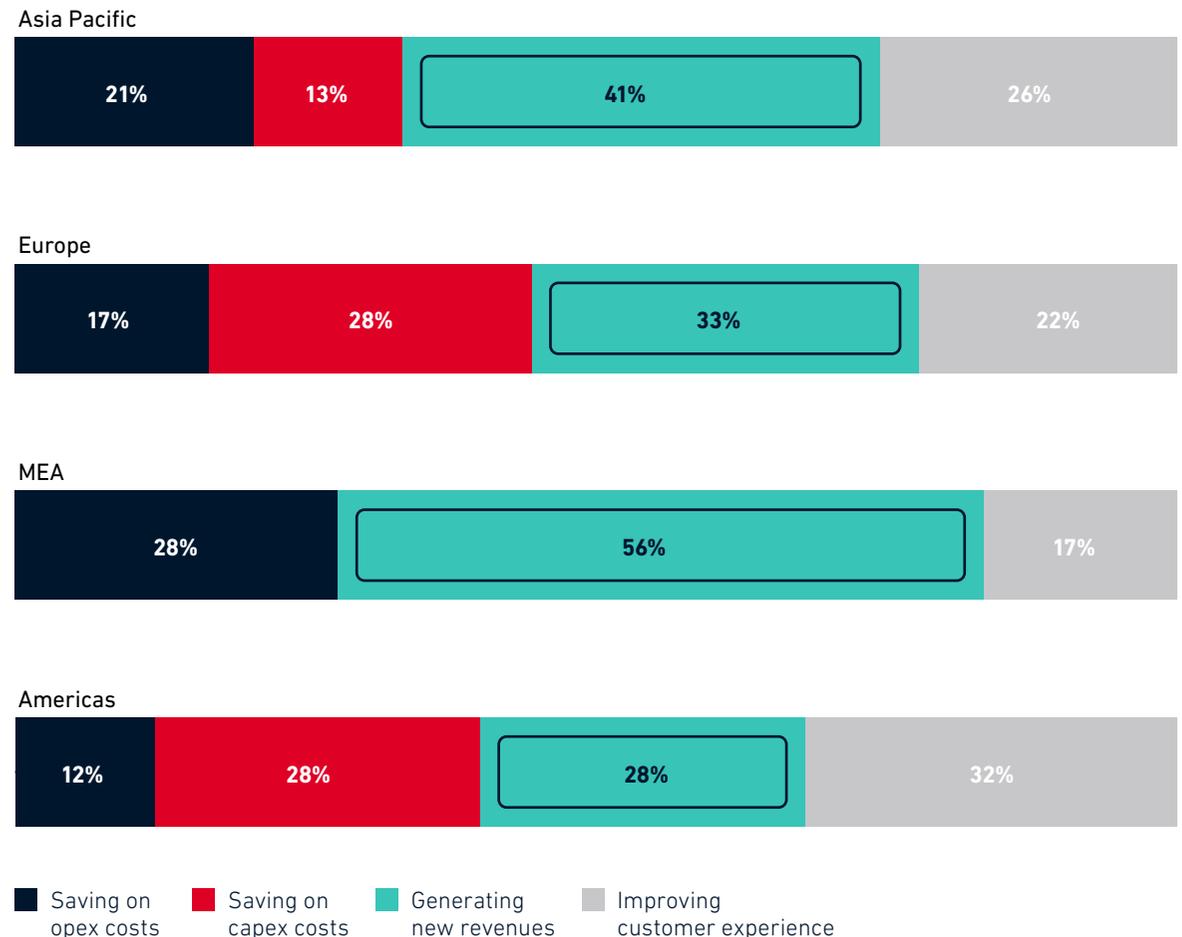
Network transformation

Open RAN, private
networks and rural
broadband

Revenue generation is driving network transformation strategies

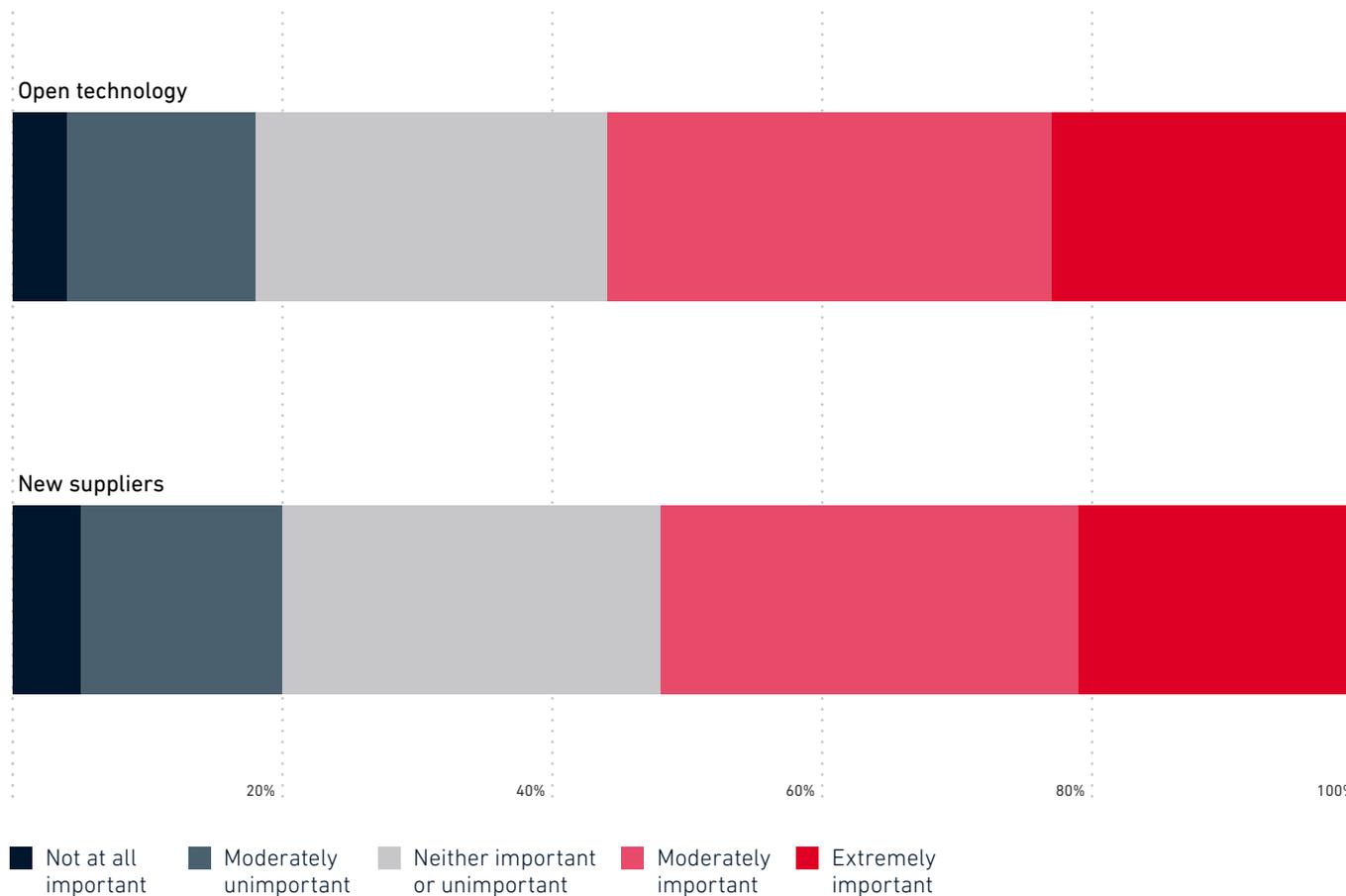
- As operators plan their network investments, they must prioritise (potentially) competing objectives: keeping capex and opex costs in check, improving the experience delivered to customers and generating new revenues. Other priorities that play a role in decision making (such as social welfare and regulation) can be considered within the same framework.
- These can also be grouped into two broader categories: making money and saving money. This helps frame the way operators are thinking about their networks and decisions.
- Across most regions, the making money component is the more important priority.
- These are, of course, not mutually exclusive objectives and both are important. The revenue priority reflects the new-found ways of monetising network assets in B2B settings (such as slicing and low-latency IoT) and, more broadly, the need for renewed growth to pay back 5G investments.

Primary goal of network overhaul (operator survey)



New suppliers and open technologies are critical to operator network plans

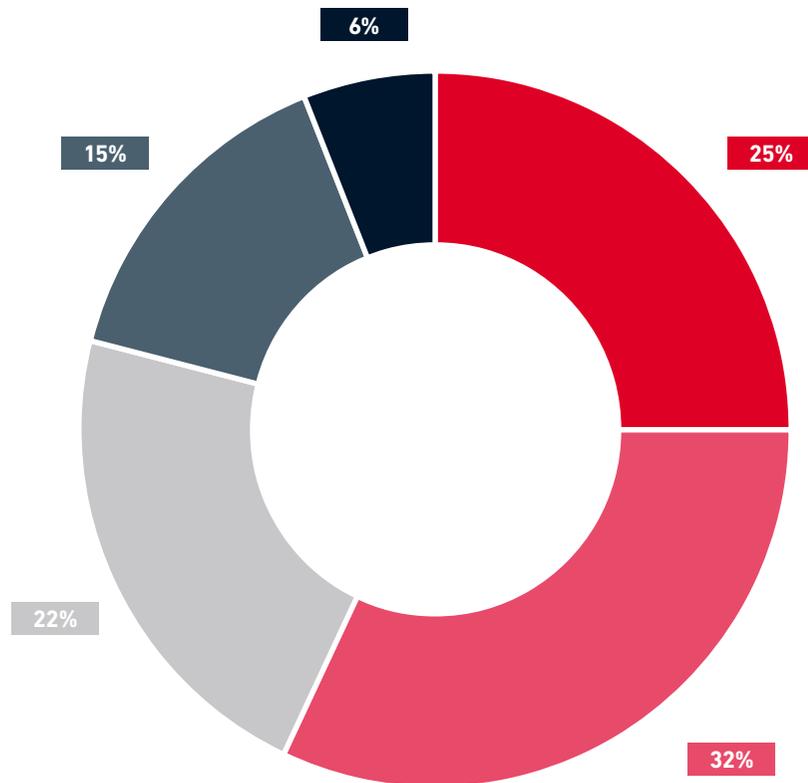
How important is it to introduce open technologies and new suppliers into your network? (Operator survey)



- While making money may be the primary goal of network transformation efforts, it is not immediately evident in how telcos view the introduction of new suppliers and open network technologies; both rank as important, with less than 20% indicating the opposite. Engaging new network suppliers is often positioned as a means to drive competition and supply-chain diversity, which will (in turn) keep overall network deployment and operations costs in check.
- The same is often said of open network technologies - including open RAN; solutions based on these technologies promise lower operations and (eventually) lower acquisition costs.

5G acts as a catalyst for bringing new suppliers and technologies into the network

How likely are you to use 5G to introduce new vendors into your network? (Operator survey)



■ Very likely
 ■ Somewhat likely
 ■ Neither likely nor unlikely
 ■ Somewhat unlikely
 ■ Very unlikely

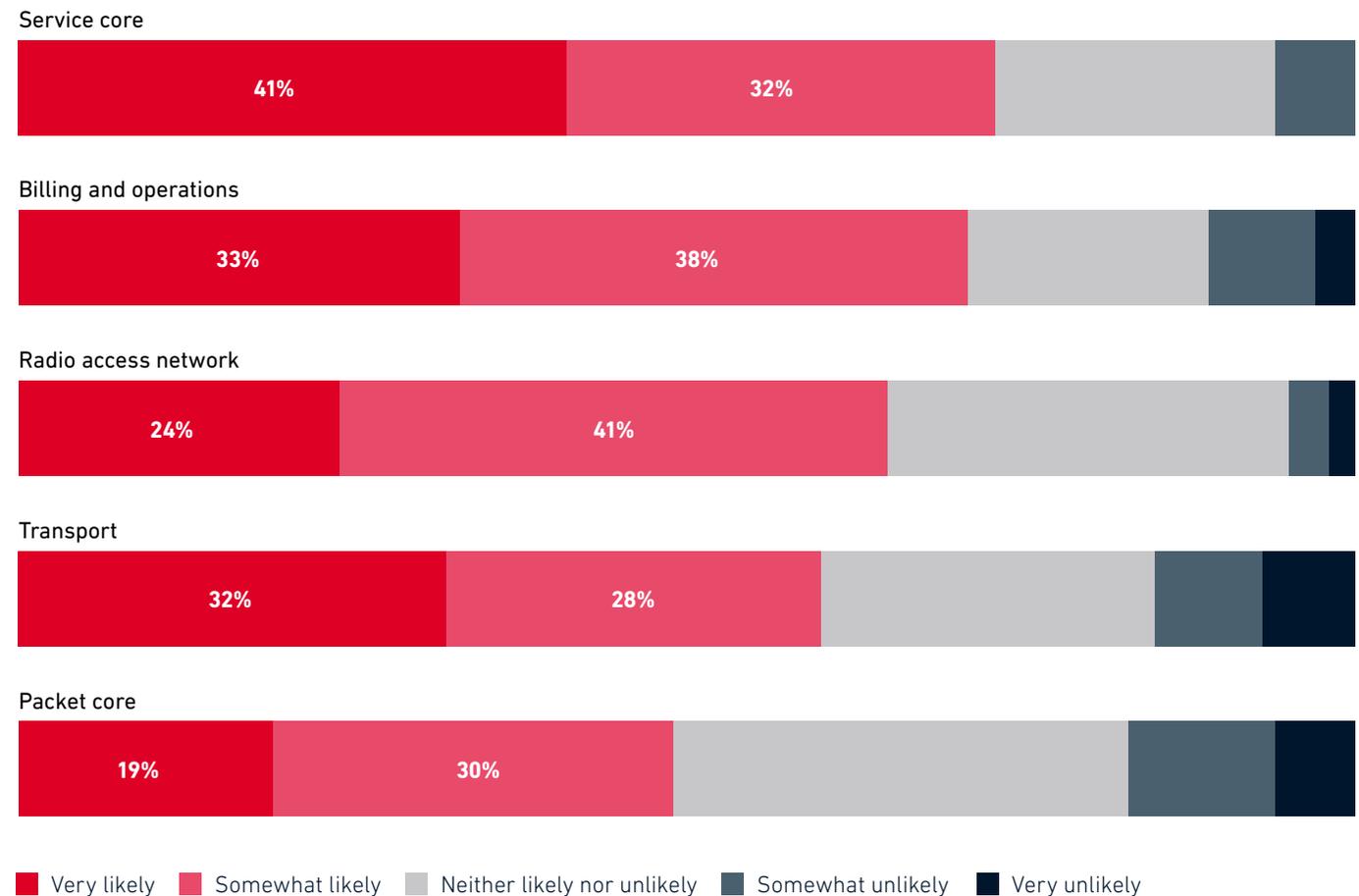
Source GSMA Intelligence Network Transformation Survey 2020

- One way to explain the importance of engaging new vendors and leveraging open network technologies, despite the strategic focus on making money, is to frame it within the context of 5G launches.
- As a new technology generation, 5G provides operators with an opportunity to evolve or even dramatically transform the way they build networks. The timing of 5G also aligns with the availability and commercialisation of open network technologies. Open RAN provides an example of a technology potentially helped by 5G timing but with massive application to previous generations of mobile tech too.
- Although 5G represents a break from previous technology generations, it also provides impetus to source network technologies and services from a broader set of suppliers. From a timing perspective, many of these will be linked to a concomitant focus on open network technologies as well as politically driven supply-chain considerations.

Moving from monolith to modular

- Another way to consider the prioritisation of network vendor diversity and open network technologies is through a direct link to revenue generation and customer experience.
- When suppliers are added to networks, the products mostly likely to be procured include the service core (service-enabling infrastructure) and billing/operations. Beyond competition that keeps costs down, new vendors are seen as important to drive the making-money part of operator strategies.
- The link between making money and open networking technologies is less direct, but still real. If virtualisation and cloud are considered as part of the move towards ‘open’ (since platforms and functions can be disaggregated), operators see open as a way to accelerate service introductions and potentially drive new service combinations. Open RAN could in turn unlock new business opportunities by enabling new ways of building networks.

In engaging new network vendors, which types of products are you most likely to procure? (Operator survey)



Private networks sit on a scale of customisation, control and cost

Public network	Public network with SLAs	Public network with slicing	Public network with local infrastructure	Private network (operator spectrum)	Private network (non-operator spectrum)
<ul style="list-style-type: none"> • Efficient use of infrastructure and spectrum • Mobile edge computing within public network 	<ul style="list-style-type: none"> • Operator expertise and spectrum portfolio • Superior customer support and SLAs 	<ul style="list-style-type: none"> • Network resources dedicated and customised • Higher data isolation, security and privacy 	<ul style="list-style-type: none"> • Dedicated network equipment • Choices regarding localisation of data/control • On-site mobile edge computing 	<ul style="list-style-type: none"> • Isolated network • Managed service or leasing of spectrum • Customised design, operations and deployment 	<ul style="list-style-type: none"> • Direct responsibility for spectrum access and usage • Independent design, operation, procurement and radio plan

Less customisation
Less control
Lower cost
More customisation
More control
Higher cost

Source GSMA Intelligence and GSMA IoT programme

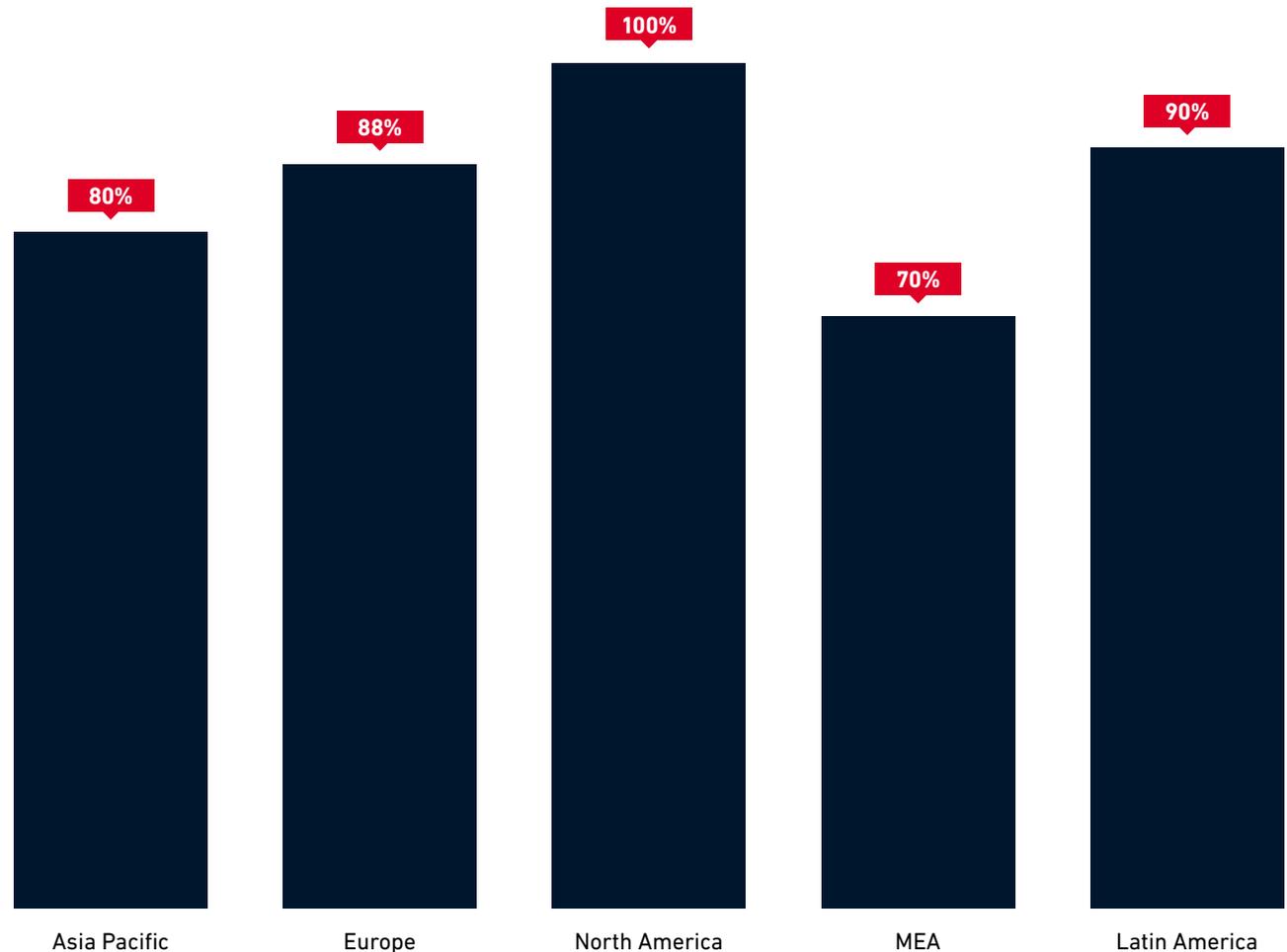
- Private wireless networks are delivered in diverse forms – with varying levels of infrastructure managed by the operator or enterprise. This disaggregation of control further feeds into the opportunity to leverage open network technologies and new vendors supporting different functions.
- For prospective enterprise customers, these options entail trade-offs centred on cost versus the level of service customisation. Use of an operator’s main public network, for example, generally offers a cheaper means of connectivity and some advanced features such as edge computing capacity. However, this network access competes with everyone else also using it, so service reliability may not be guaranteed such that it would be in a private deployment, for which a premium is paid.

Using LTE as a springboard to 5G

- As operators search for new revenue sources, private networks have become a near-universal offering across all regions.
- Around 20% of enterprises believe they need location-specific coverage (private networks). While this is a marginal share of the market, it represents a large number of individual enterprises and a major revenue opportunity – especially since more than 80% of those that need this coverage indicate a willingness to pay.
- However, as much as private wireless networks could drive new operator revenues, the opposite could also come to fruition should enterprises wish to build and/or operate their own networks in, for example, industrial campus or factory settings.
- It will be incumbent on operators to augment their offers with service as well as network capabilities to work in partnership with business clients rather than merely as connectivity suppliers.

Share of mobile operators offering private wireless networks

By region



Rural broadband is a further area of growing competition

- Open RAN's coming of age has dominated much of the network agenda in 2020. However, one should not lose sight of parallel developments in rural broadband.
- Despite fixed broadband coverage being prevalent in high-income countries, availability in the final 10% of rural households remains stubbornly low.
- This is an economics issue. Passing fibre, for example, in urban or suburban areas costs roughly £500–700 per premises but this can be 5–10× higher for the final 10% of households, deterring most companies from doing so (leaving consumers to pay exorbitant satellite prices).
- A range of new entrants using different technologies and business models have come in to alleviate this problem, including fibre wholesalers, new satellite operators and the potential use of 5G fixed wireless access.
- Each approach has trade-offs, and we expect all to be used to a greater or lesser extent. Serving rural populations will require partnership approaches, with few going it alone.

Broadband technology	Max download speed	Speed	Latency	Reliability	Economics	Coverage	Notes	Examples
FTTH	40 Gbps	Mostly suitable	Mostly suitable	Mostly suitable	Least suitable	Least suitable	Benefits: future proof, business grade Drawbacks: capital and labour intensive	CityFibre (UK), Fastfiber (Portugal)
GEO satellite	30–50 Mbps	Least suitable	Least suitable	Fairly suitable	Least suitable	Mostly suitable	Benefits: ubiquity, end-user cost Drawbacks: low throughput, climate interference, high setup capex	Hughes, Iridium
LEO satellite	>400 Mbps	Fairly suitable	Fairly suitable	Fairly suitable	Least suitable	Mostly suitable	Benefits: ubiquity, high throughput Drawbacks: high setup capex, unproven technology and business model	Space X, OneWeb, Telesat, Amazon
5G FWA	100–900 Mbps	Fairly suitable	Benefits: ubiquity, low cost Drawbacks: line of sight, climate interference, spectrum-dependent	Operators				

● Least suitable ● Fairly suitable ● Mostly suitable for rural broadband connectivity

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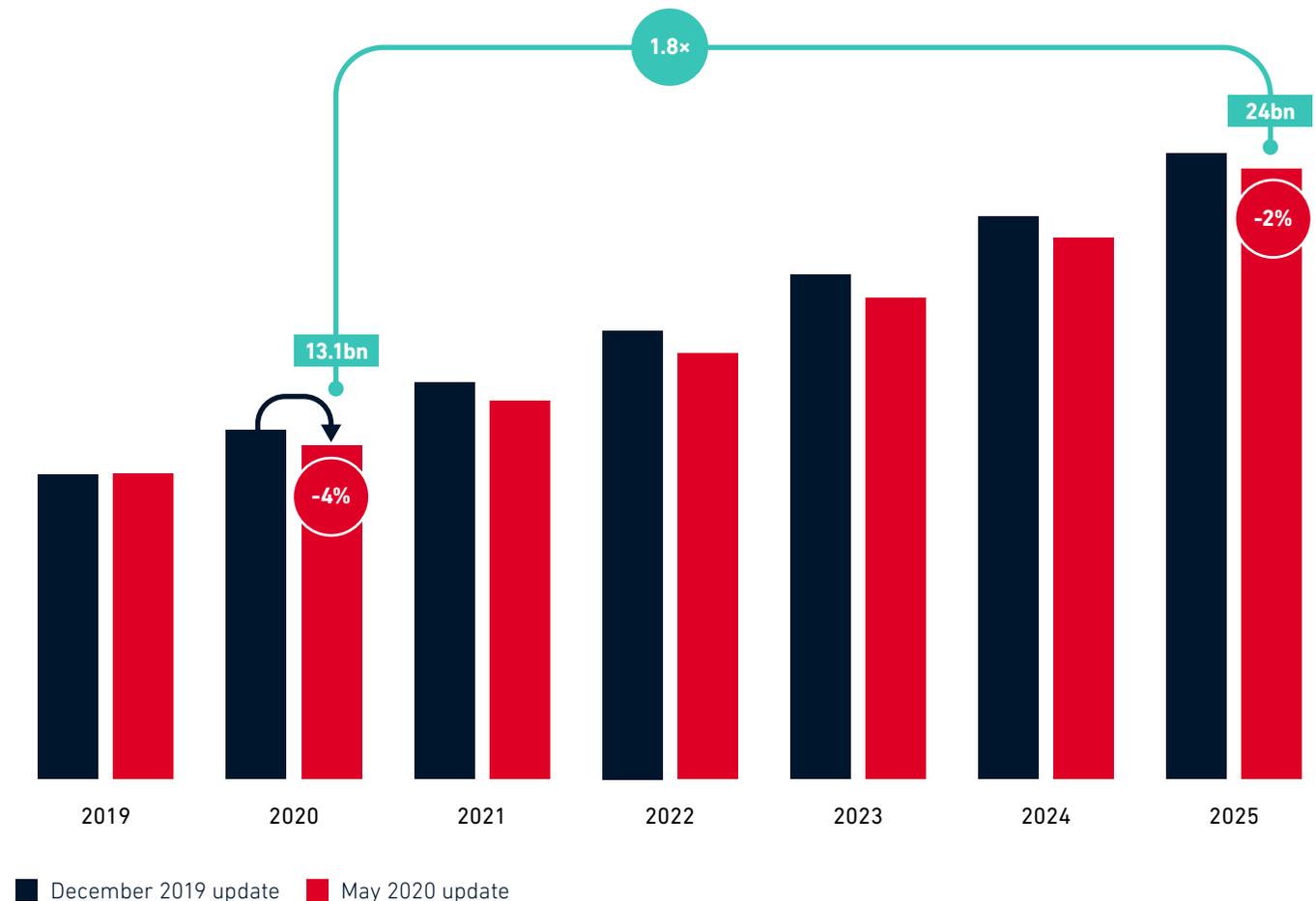
Regional outlook

Working with, not for,
customers

Short-term disruption from Covid-19; long-term upside potential

- Total IoT connections will double between 2019 and 2025, reaching 24 billion. However, we have cut our forecast for 2020 as a result of the pandemic and cost pressures in the SME and corporate markets.
- The consumer IoT market looks relatively resilient in the long term as few people give up connected devices (even if usage falls). Connected vehicles are most exposed due to slowdowns in new car sales and increasing use of ride sharing, public transportation and working from home.
- Business sector IoT volumes are more exposed as a result of the economic slowdown from the pandemic. Cities and building operators will be the most negatively affected, followed by utilities. The current crisis will also reshape retail, manufacturing and health.

Covid-19 will dent IoT connection volumes in the near term

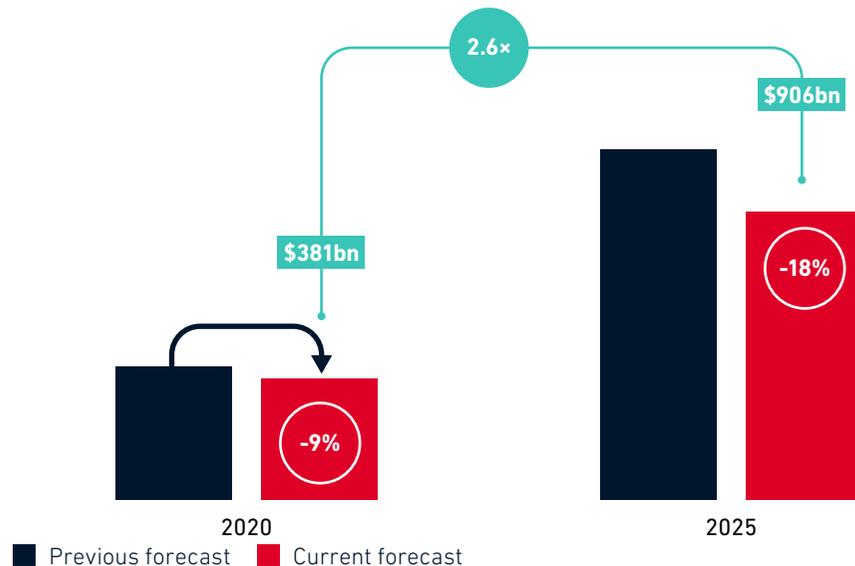


The pandemic wipes out \$200 billion of IoT revenues by 2025

- The impact of the 2020 slowdown will reverberate over the longer term more in spending than volumes. As a result, while global IoT revenues will triple by 2025, this is 20% lower (\$200 billion) than what it would have been without the pandemic.

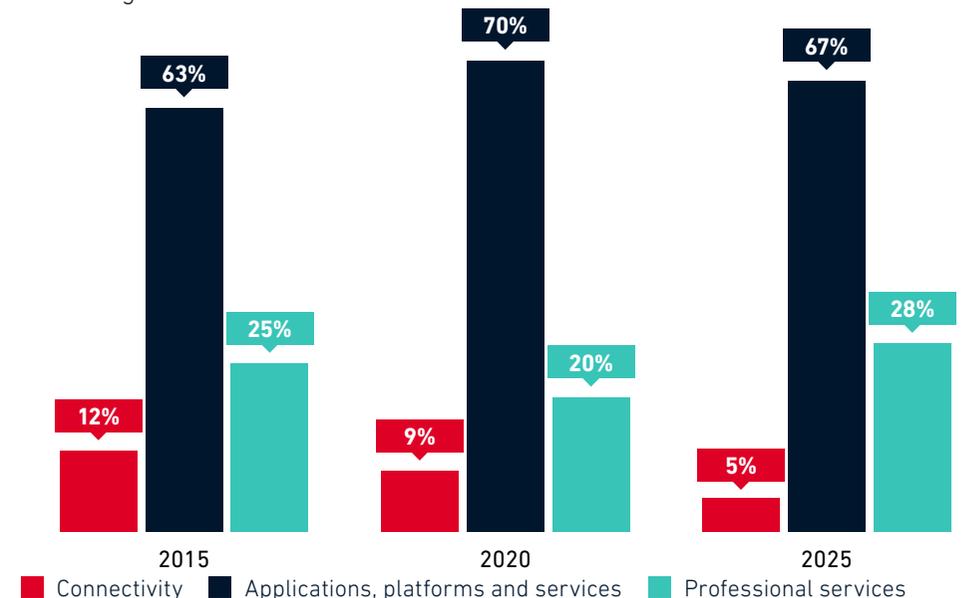
- Most of the competitive intensity is focussed at the application and analytics layer of the IoT value chain.
- Conversely, commoditisation is the reason for connectivity shrinking to just 5% of the value chain. Operators have been expanding their capabilities beyond connectivity to capture a larger proportion of the overall market.

IoT revenues will triple by 2025



Connectivity needs to be bundled with services

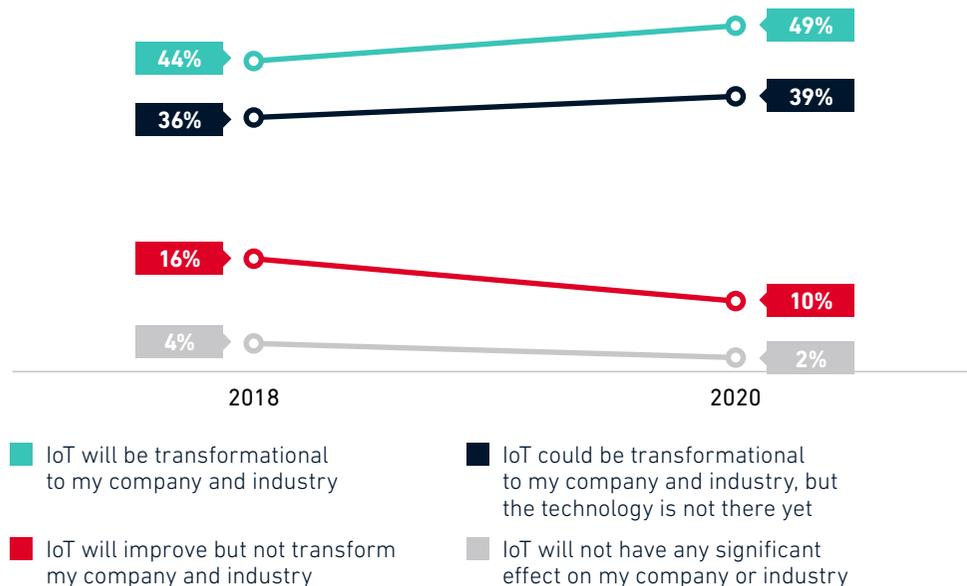
Percentage of total IoT revenues



Shifting from hype to reality

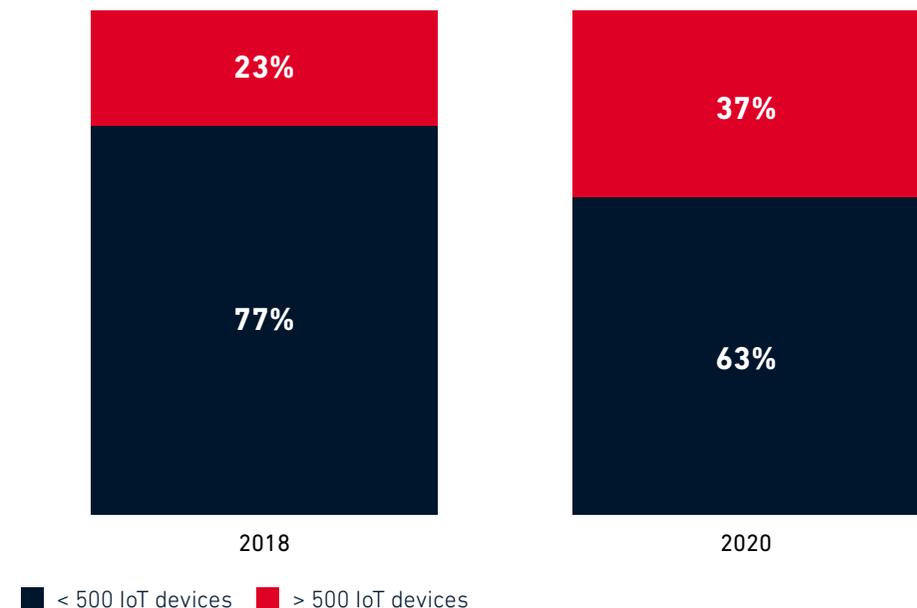
- The majority of enterprises' IoT deployments remain small, though the average deployment size has increased since 2018. The smaller scale reflects the fact that smaller enterprises tend to deploy fewer devices.
- It may also reflect technical and integration challenges associated with installing IoT services – areas not talked about in the early part of the hype cycle when the focus was on idealised prospects for transformation.
- Based on our most recent survey of IoT purchasing managers, this is most evident in public sector organisations. By contrast, transport and warehousing experienced the most positive shift in attitudes.

IoT decision makers' attitudes towards IoT are getting real...



...as deployments get larger and more complex

Percentage of enterprises with active IoT deployment

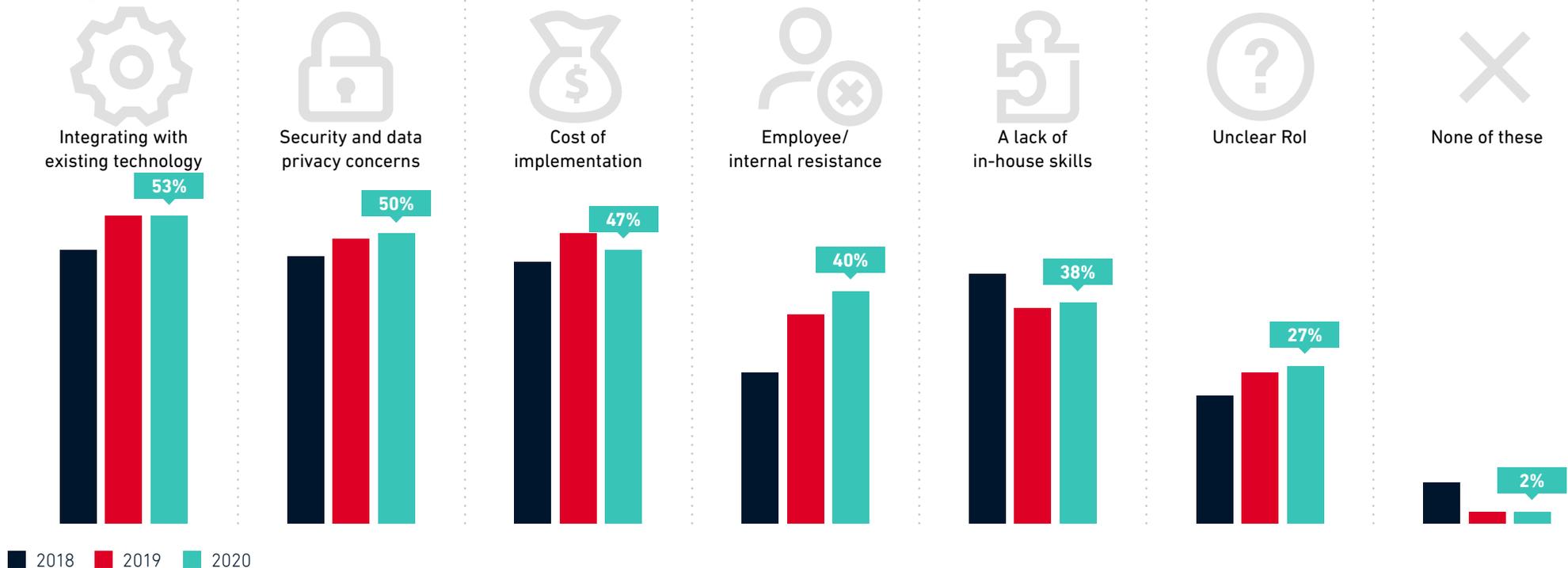


Challenges remain around integration, security and cost

- As more devices touch enterprise systems and use cases expand, deploying IoT is getting tougher. The top three challenges still centre on integration, security and data privacy, and cost
- Employee/internal resistance has grown markedly, reflecting the fact that education on the benefits of IoT has to extend beyond C-level.

Top three challenges among enterprises remain the same, with employee resistance on the rise

Percentage of enterprises with active IoT deployment



Compliance is moving up the agenda

- Saving money and making money are still the two main motivators for installing IoT devices.
- The revenue goal has become more pressing over the last two years as organisations seek to recoup their investments, and better analytics capabilities help with targeted sales (e.g. faster delivery times for logistics firms).
- The biggest change has been a rise in deployments to comply with regulation. This is particularly the case in sectors requiring rigorous tracking, such as with utility meters for residential and commercial premises.

Measuring success of IoT deployments: compliance on the rise

Percentage of respondents

		2018	2020
	Cost saving	85%	65%
	Revenue generation	58%	68%
	Regulatory compliance	31%	53%

GLOBAL MOBILE TRENDS

Telecoms in the global macro context

Growth beyond connectivity

5G outlook

Network transformation

IoT and enterprise verticals

The next billion

Regional outlook

The digital consumer

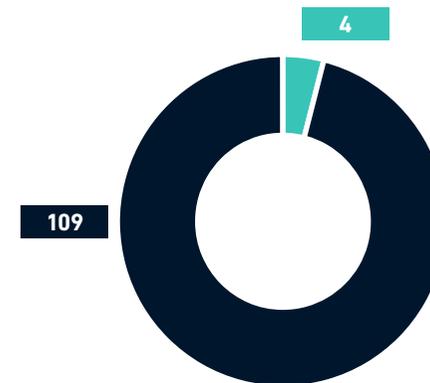
Is Covid-19 a cause or accelerator of behavioural change?

5G waits for prime time

- One year on from the first 5G launches in 2019, results and indications are mixed. Actual take-up levels are hard to ascertain because few operators (under 5% with live services) have reported 5G subscriber numbers with any level of consistency. Adoption has reached 15% of the customer base in South Korea and is growing at 2 pp per quarter. NTT Docomo in Japan is the only other comparator but its take-up is much lower at 0.5%.
- Upgrade intentions have increased, likely helped by falling handset prices and marketing efforts. Our survey data of consumers in the US, Europe, Japan and Australia suggests 32% of people intend to upgrade to 5G, compared to 24% in 2019.
- The survey was carried out before the new iPhone 12 was announced in October, which is the single biggest change factor. Can Apple generate a halo effect that extends beyond its own loyal and lucrative customer base?
- 5G still ranks low on the list of features consumers look for in a new phone, with new use cases failing to impress: only 20–30% find ultra HD video streaming, improved gaming, or sports stadia applications appealing. For the time being, the basics matter the most.

5G subscriber reporting is minimal

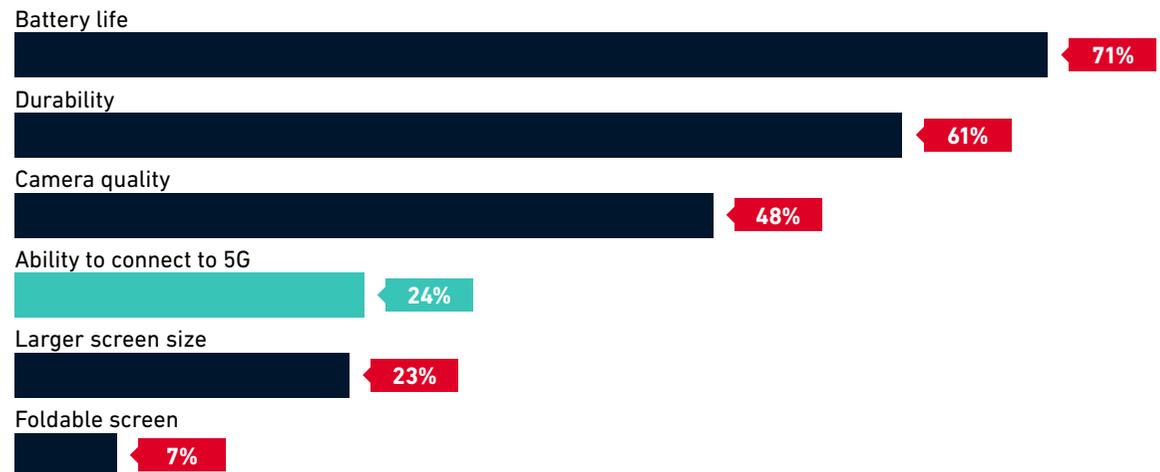
Of operators that offer 5G



■ Reported disclosure ■ No reported disclosure

Most people just want their phones to do the basics well

What features are most important to you in your next phone purchase?



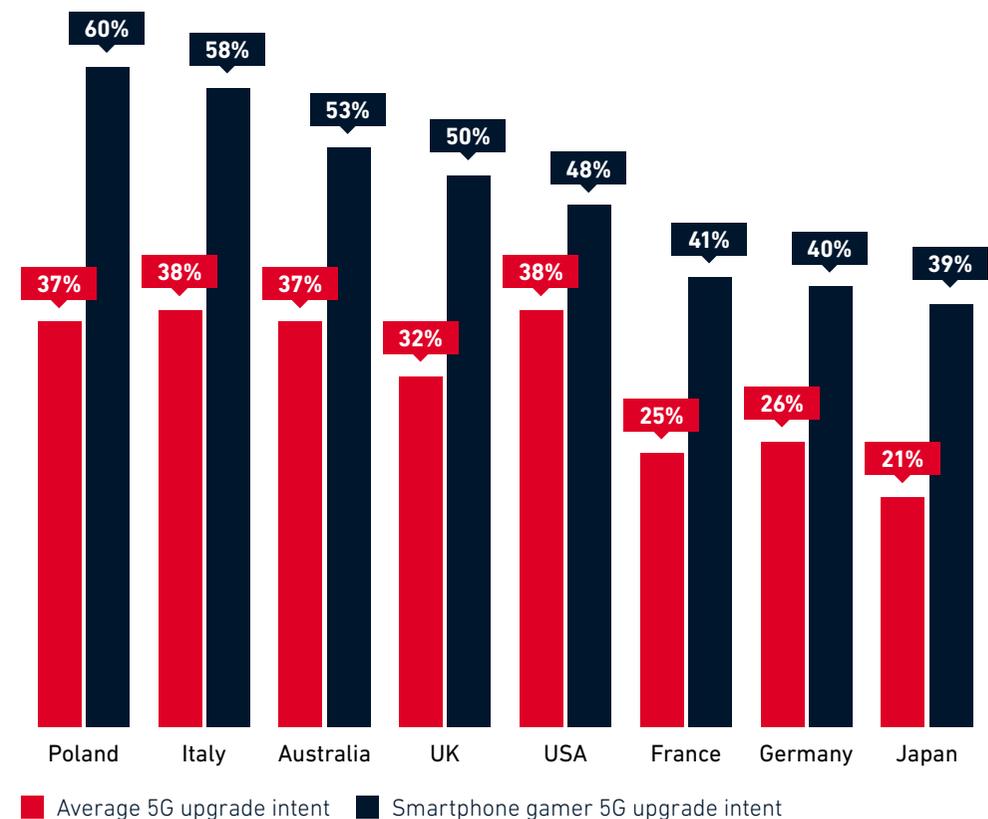
N=5,254, average of Australia, UK, France, Germany, Italy, Poland, Japan and US

Source GSMA Intelligence Consumers in Focus Survey

Watch out for gaming

- Gaming has emerged as a promising early 5G use case. This is an offshoot to the wider console offerings that have pivoted to a streaming model.
- Worldwide, 2 billion people game on a monthly basis – a huge group at face value. However, the vast majority (90%) are casual smartphone gamers and spend little or no money on it. Other media markets provide a realistic size estimate. Netflix, Spotify and Apple Music have all converted 5–7% of their addressable market into paying subscribers. If gaming were to do the same, this would imply around 150–200 million customers paying for some type of streamed or cloud gaming service.
- Microsoft, Sony, Apple, Google (via Stadia) and even Amazon and Facebook have made significant investments in mobile gaming over the past year. The 5G dimension comes in by offering low latencies that can permit multi-player modes and play in transit (such as while commuting).
- A number of mobile operators now offer gaming subscriptions as a bolt-on to 5G mobile tariffs (e.g. Vodafone UK and T-Mobile US), recognising that gamers are more technophile in nature and more likely to upgrade.
- There is also growing interest in e-sports (live gaming), for which 5G slices or private networks are well suited. The pandemic has put this on hold, but we expect interest to return in 2021.

Gamers are more likely to upgrade to 5G

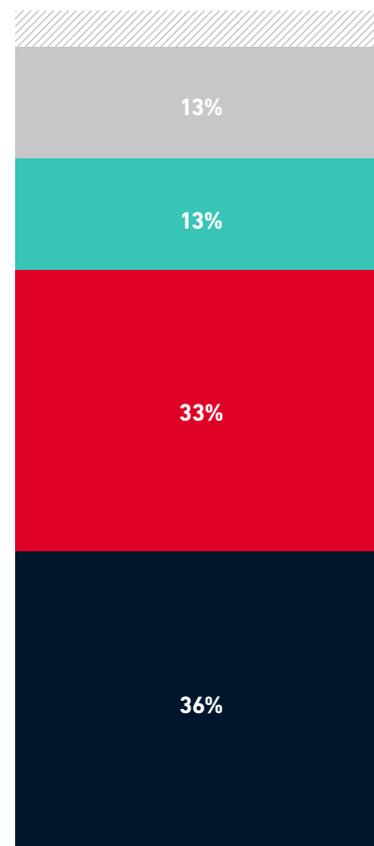


Smartphone gamers include people who pay for gaming (one-off or with a subscription) and those who play without any spend.

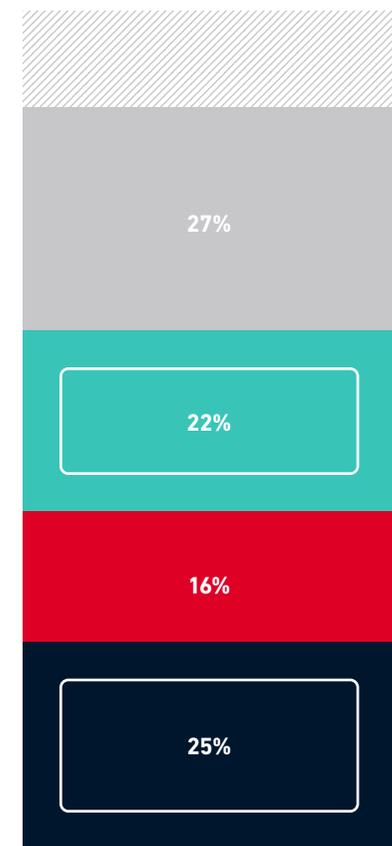
Pandemic accelerates shift away from stores, but old habits die hard

- Retail has, of course, been a casualty of Covid-19. Operators are not retailers as such but, like others, have had to temporarily close stores in line with social-distancing rules.
- With 35-40% of handset sales for operators still going through retail outlets, the restrictions have had a detrimental impact on upgrade volumes and handset revenues.
- The shift to online has long been a priority for the industry as a cost-saving measure and to counter competition from third parties (Best Buy, for example) whose commission eats into profitability. Covid-19 is likely to accelerate this change.
- However, the change may happen more slowly than one might think. Nearly 50% of consumers say they still intend to get their next handset from a store – operator or third party. This is in line with lengthening smartphone replacement cycles and suggests people may be prepared to wait to see/test out a new phone rather than price compare online.

Handset distribution and purchasing still favour stores



Distribution of operator handset sales



Where do consumers intend to get their next handset?

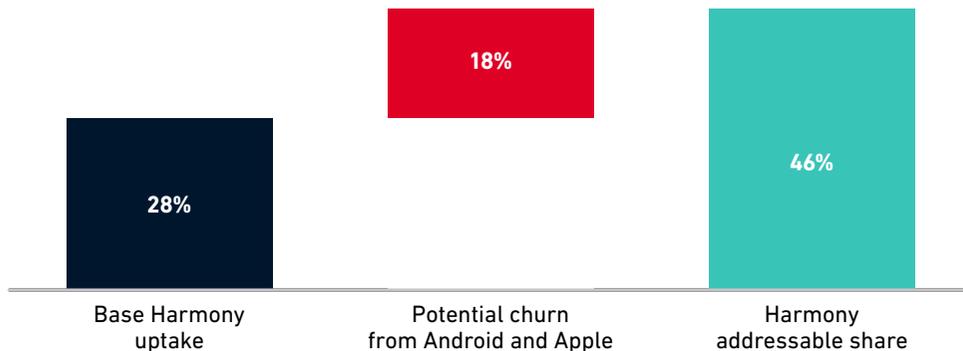
■ Operator – in store ■ Operator – online ■ Other retailer – in store ■ Other retailer – online ▨ Other

Huawei offers a third way

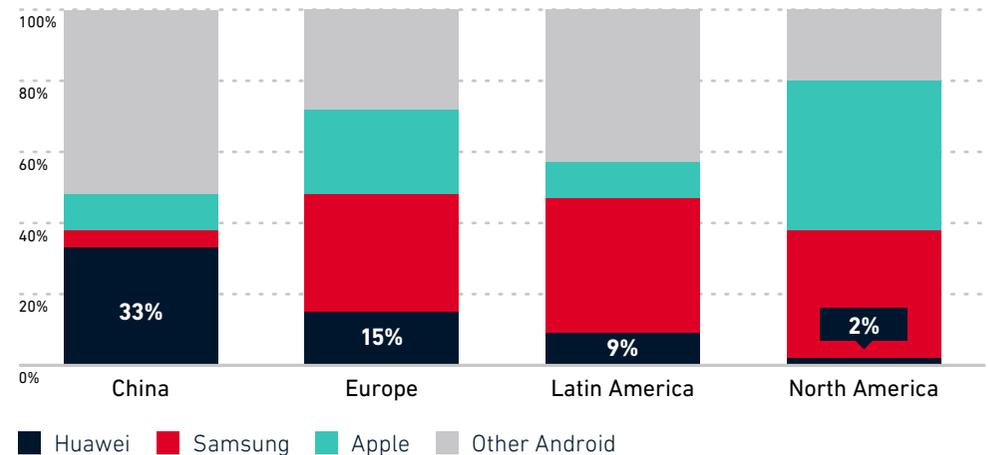
- Aside from the new 5G iPhone, an interesting dynamic in the handset market has been Huawei’s steady rise. It now accounts for 15% of the smartphone base in Europe and is similarly rising in the Middle East and South America, where it can undercut Samsung.
- Huawei’s new OS (Harmony) is a further challenge to the status quo. This is a strategic move to counter US sanctions that limit its ability to use Google services that are the mainstay of Android. In China, there is a sizeable addressable audience that could switch to Harmony provided developers flock to the platform, with the potential to reach up to 46% of new phone purchases in 2021.
- Harmony will be a harder sell outside China without a full suite of Google apps – but that’s less pressing. The company is likely to continue to be aggressive on 5G handset pricing, which would be further helped if it can successfully orchestrate domestic chip supply.

Harmony OS could take more than 45% of China smartphone sales

Share of likely smartphone buyers in 2021



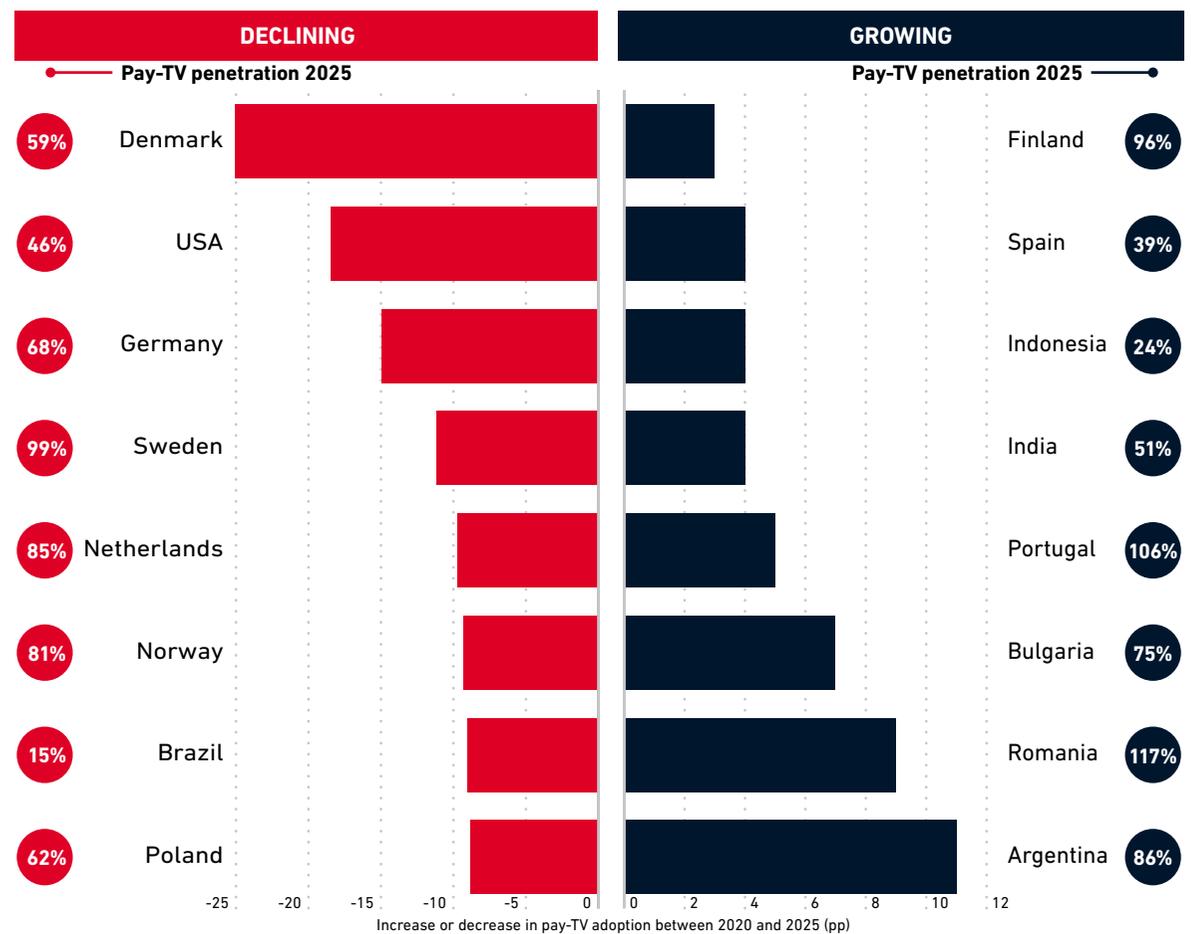
Market share by region



OTTs threaten traditional pay TV, but the impact varies by country

- The unfettered rise of Netflix, Amazon and other streaming services at the expense of pay TV and linear broadcast is well documented.
- This has particularly been the case in the US, where cord cutting continues and cord ‘nevers’ become a larger slice of the population; by 2025, less than half of households will have a pay-TV package. Of those who do, many are likely to be on lower value ‘skinny’ bundles.
- While the rise of Netflix makes it tempting to conclude cord cutting should be happening everywhere, this is not the case. In a number of countries – including high-income markets such as Finland, Spain and Portugal – pay TV is holding up or growing as a share of households, even if in the minority. This often requires discounting and investments in live sports, notably football – the last bastion of control for cable and other pay-TV operators. So far, Amazon has only dipped its toe in the water (US Open tennis, English Premier League football) but should this change, it will apply further pressure on bundle values.

Change in traditional pay-TV household penetration



Note: because of multiple subscription households and business, figures exceed 100%.

GLOBAL MOBILE TRENDS

Telecoms in the global macro context

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5G outlook

Network transformation

IoT and enterprise verticals

The digital consumer

Regional outlook

The next billion

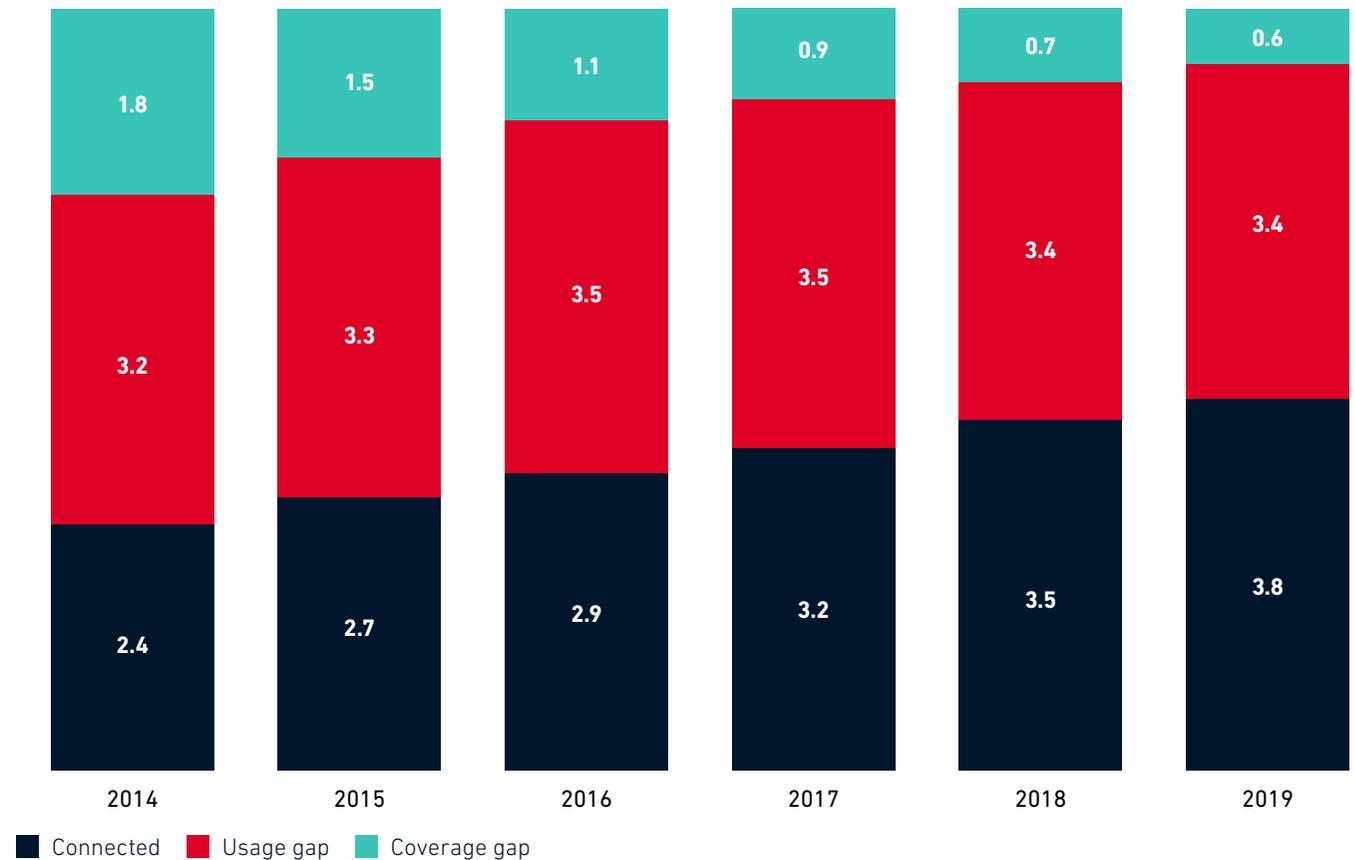
Tackling internet
affordability and
digital skills

Despite improving coverage, internet user growth is slowing

- Almost half the world's population used mobile internet in 2019, equating to 3.8 billion users - an increase of 250 million since the end of 2018.
- 3G and 4G coverage has expanded to near its terrestrial limits, so the question becomes how to bring the internet to the other 50% of the population.
- Much will come down to costs and content relevance. There are now almost six times more people in the usage gap (living within the footprint of a mobile broadband network but not using mobile internet) than in the coverage gap (no access to mobile broadband network coverage).
- There remains a significant rural and gender deficit in mobile internet use. However, progress is being made, with both the rural-urban and gender gaps narrowing by almost 10 pp since 2017, in large part due to gains in India.

State of mobile internet connectivity globally

Billions

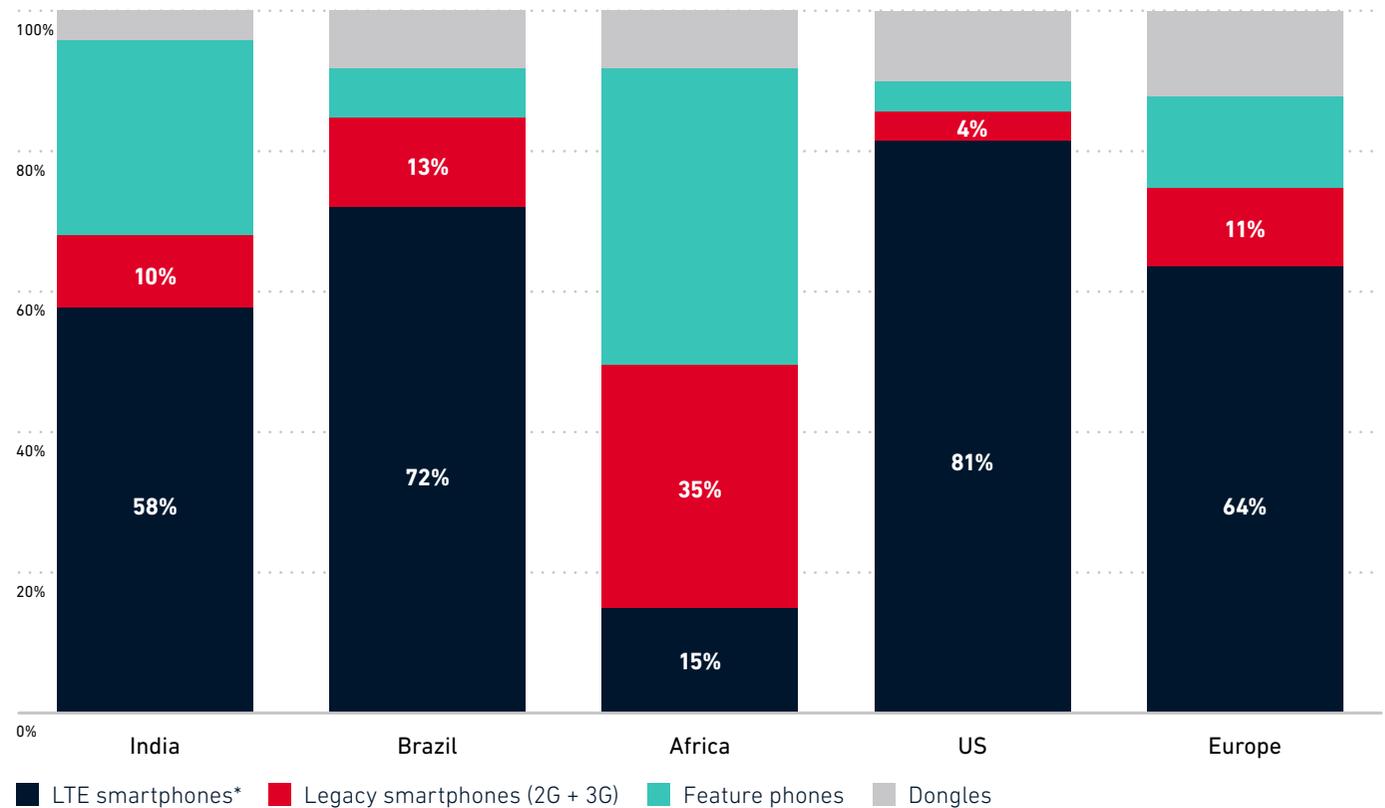


See www.mobileconnectivityindex.com and [The State of Mobile Internet Connectivity 2020](#) report for further detail.

Smartphone adoption matters, but the impact is far greater with LTE

- If consumers are to experience the full benefits of internet connectivity, it effectively requires LTE rather than GSM or even 3G speeds, which do not allow video streaming or anything beyond basic web browsing. In this sense, India and Africa offer a contrast.
- India has engineered a 4G revolution since Jio entered in 2016 and now has more than 50% of its base on that tier, leading to huge gains in the size of its internet population.
- Meanwhile, countries in Sub-Saharan Africa have lower LTE footprints and adoption. While smartphone penetration has reached 50% on the continent, this overplays its significance as most are running on legacy 2G and 3G speeds.

Even in emerging markets, most smartphones are now running LTE (with Africa the exception)



Figures as of September 2020.

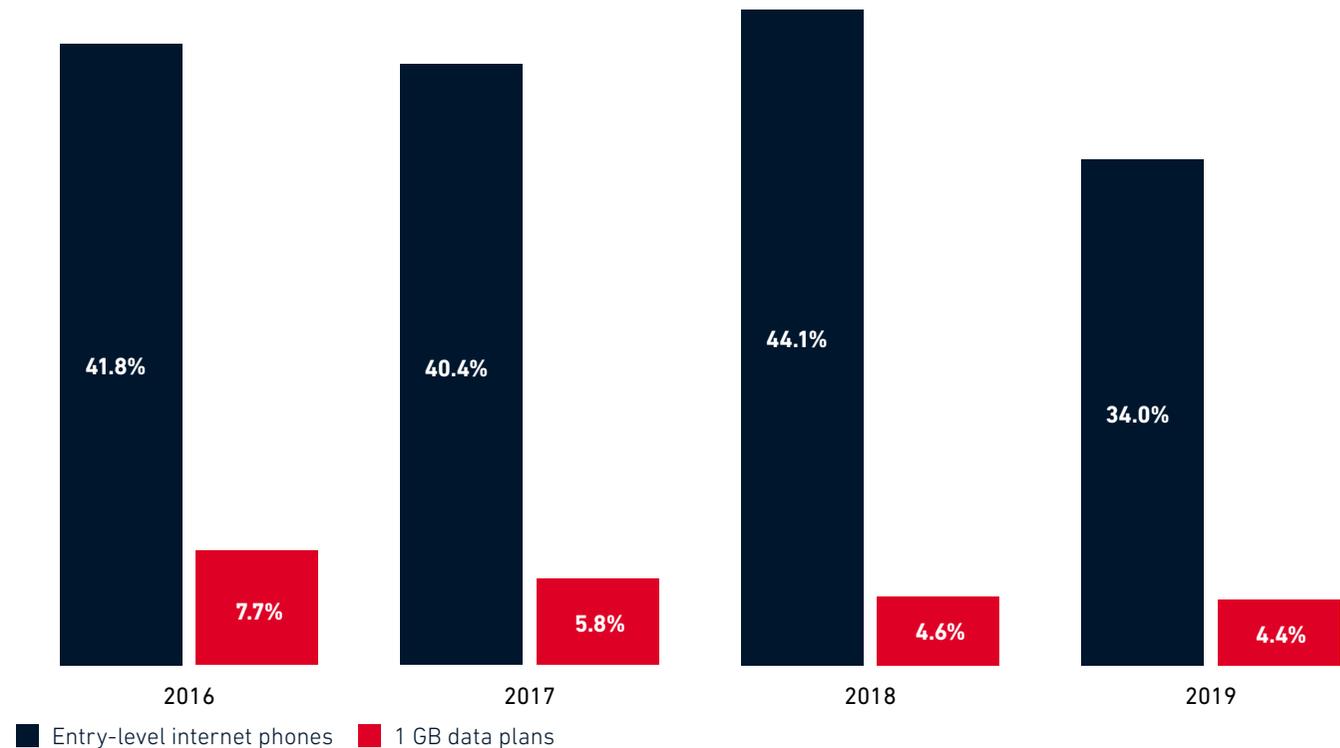
*Also includes 5G smartphones, though these are negligible in relation to the overall base, even in high-income countries.

Even if costs have come down, affordability remains a problem

- In low- and middle-income countries (LMICs), 2019 saw a significant improvement in handset affordability driven by increased availability of lower cost smartphones and smart feature phones.
- It also helps that the cost of cellular data (measured for a 1 GB basket) also fell by 40% between 2016 and 2019.
- Nevertheless, more than half of LMICs fall short of international affordability targets and it remains a significant barrier for the poorest in society.
- Other barriers are improving; awareness of mobile internet in LMICs increased from 63% in 2017 to more than 75% in 2019. More consumers are also seeing the relevance of internet access.
- Lack of literacy and digital skills remains the biggest perceived barrier to mobile internet adoption, while safety and security is also an increasing concern.

Affordability of entry-level phones and 1 GB of monthly data

As a percentage of monthly GDP per capita



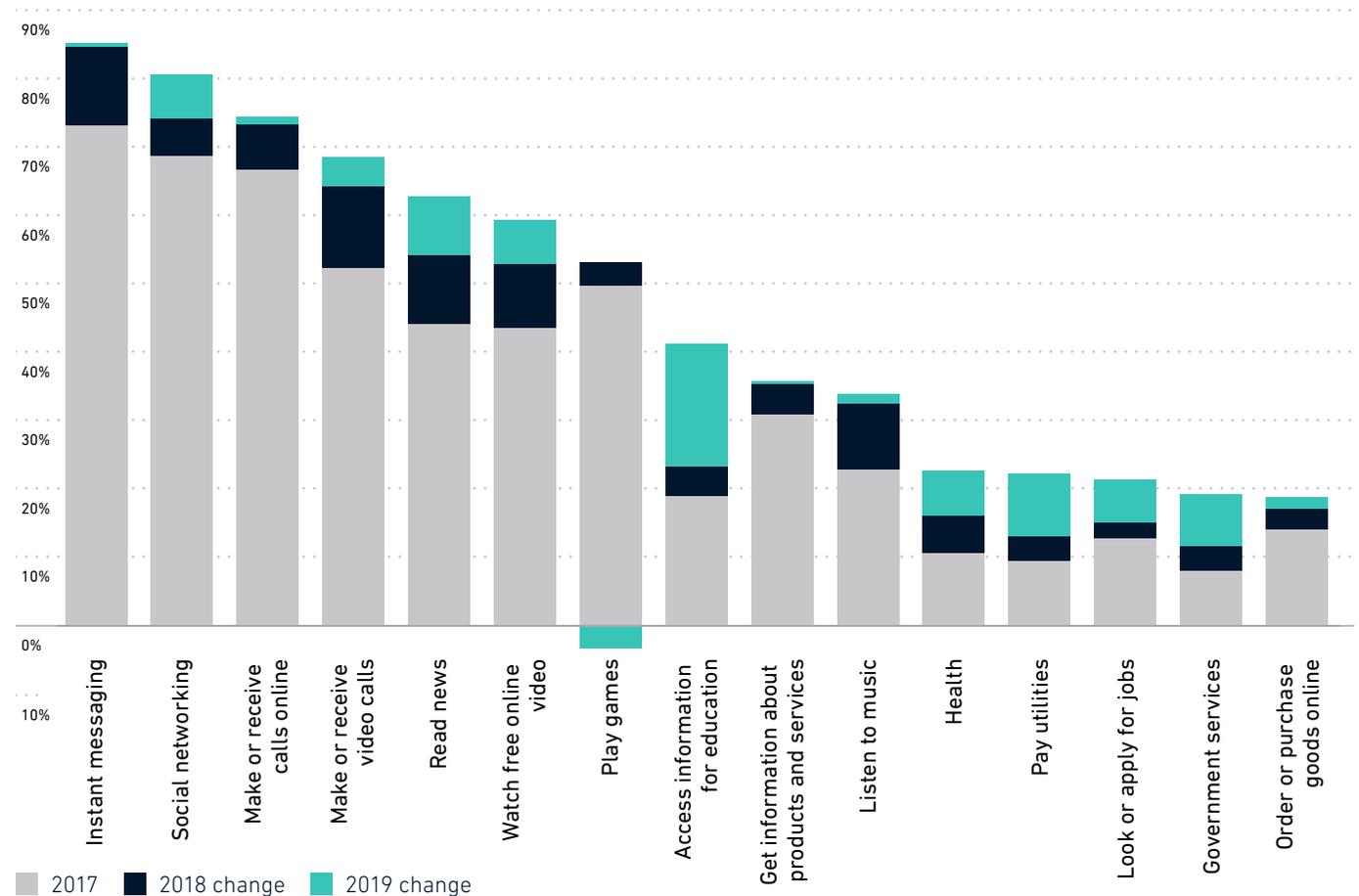
Analysis based on low- and middle-income countries (as classified by the World Bank).

People are now doing much more online

- Since 2017, there has been a notable increase in the range of online services people use in developing countries, including education, healthcare and e-government.
- This suggests usage is becoming more diverse and beneficial, which is consistent with consumers reporting substantial benefits from mobile internet use beyond core communications and social networking (mostly Facebook and some others).
- The breadth of mobile internet usage is likely to increase further as a result of Covid-19, considering the need for social distancing.

What consumers are doing on the mobile internet in emerging markets, and how it is changing

Percentage of mobile internet users that have engaged in an activity on their mobile phone at least once a month



See www.mobileconnectivityindex.com and [The State of Mobile Internet Connectivity 2020](#) report for further detail.

On the development front, mobile is helping the SDGs, but the world is set to fall short

- Since 2015, the mobile industry has increased its contribution to fulfilment of the Sustainable Development Goals (SDGs) every year. 2019 was the most impactful year so far, driven by the acceleration in phone usage across the board.
- The benefits are felt directly by people. In countries surveyed by GSMA Intelligence, more than 75% of people said their device helped them in day-to-day work and studying, and made them feel safer.
- Despite the progress, the world is not on track to achieve the SDGs by 2030. The reasons for the lag are complex. However, industry and government action will need to ramp up significantly – as it has on climate change – to get back on track and avoid a repeat of the previous global action plan on poverty (Millennium Development Goals).

SDG mobile impact scores



■ 2015 ■ 2016 improvement ■ 2017 improvement ■ 2018 improvement ■ 2019 improvement

For each SDG, an 'impact score' is calculated out of 100. A score of 0 means the mobile industry is having no impact at all, while a score of 100 means the industry is doing everything possible to contribute to that SDG. See www.gsma.com/betterfuture/2020sdgimpactreport

GLOBAL MOBILE TRENDS
REGIONAL OUTLOOK



North America

Network innovation
on the rise

Latin America

Europe and CIS

Middle East and North Africa

Sub-Saharan Africa

Greater China

India

Operators assess strategies in light of the pandemic

Covid-19 impact

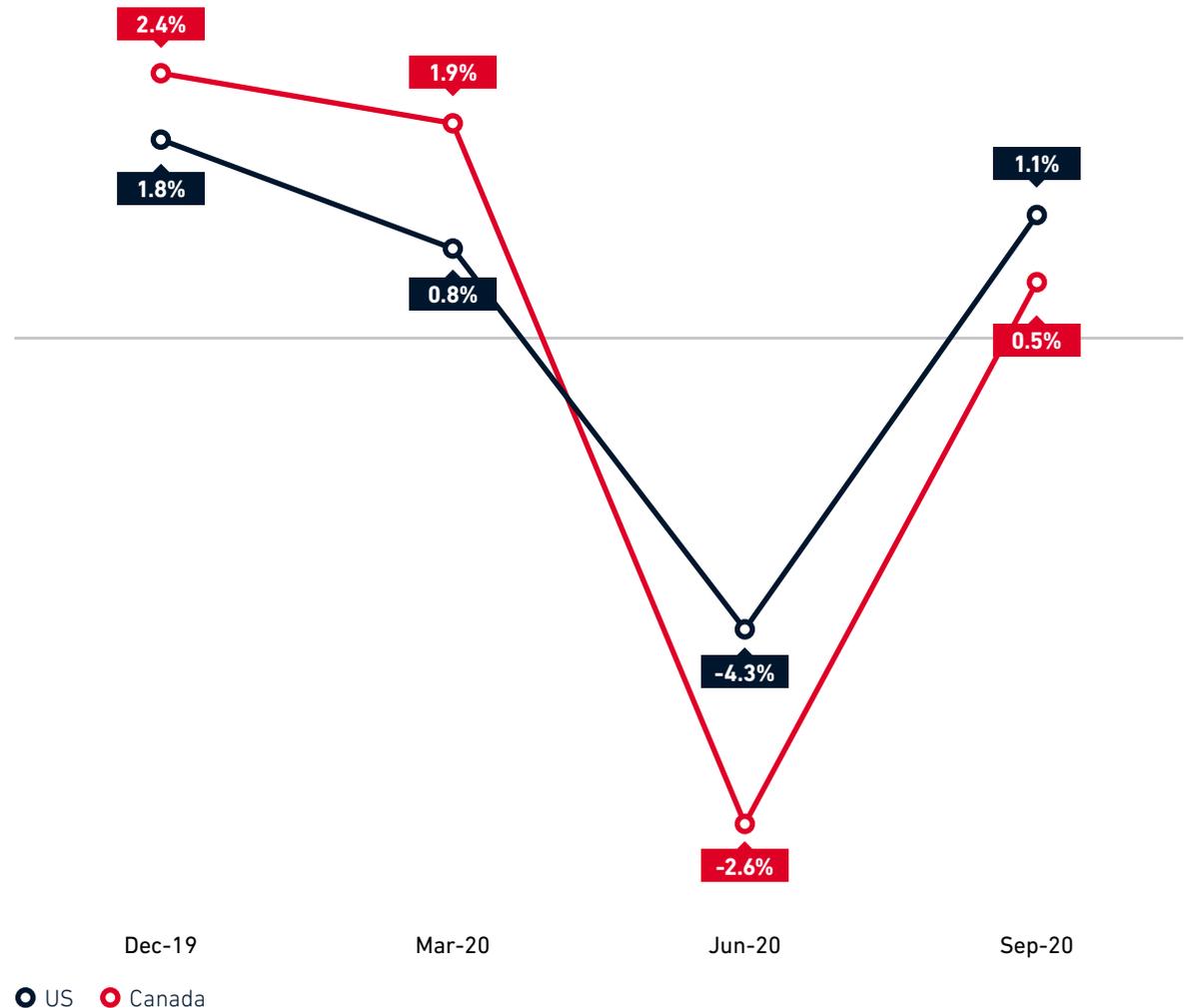
- The decline in mobile revenue growth in H1 2020 was largely due to commitments by operators to waive data overage and late payment fees because of the pandemic.
- Operators also took a hit as lockdown-related store closures constrained handset upgrade volumes. Some stores in the US have shut permanently as operators anticipate that the pandemic will accelerate the shift to digital channels.
- There were signs of a recovery in Q3 2020, as network performance remained resilient amid rising bandwidth pressure.

Outlook

- The prepaid segment will become more of a focus in the short term, as it can be vulnerable in downturns. Verizon has acquired prepaid MVNO Tracfone to serve this segment, while AT&T and T-Mobile already have well-established prepaid brands.
- If behaviours such as working from home persist, operators may have to adjust their 5G network deployment, phasing away from city centres (even if temporarily) to suburban areas.

Operators bounce back from Q2

Mobile revenue growth (year-on-year)



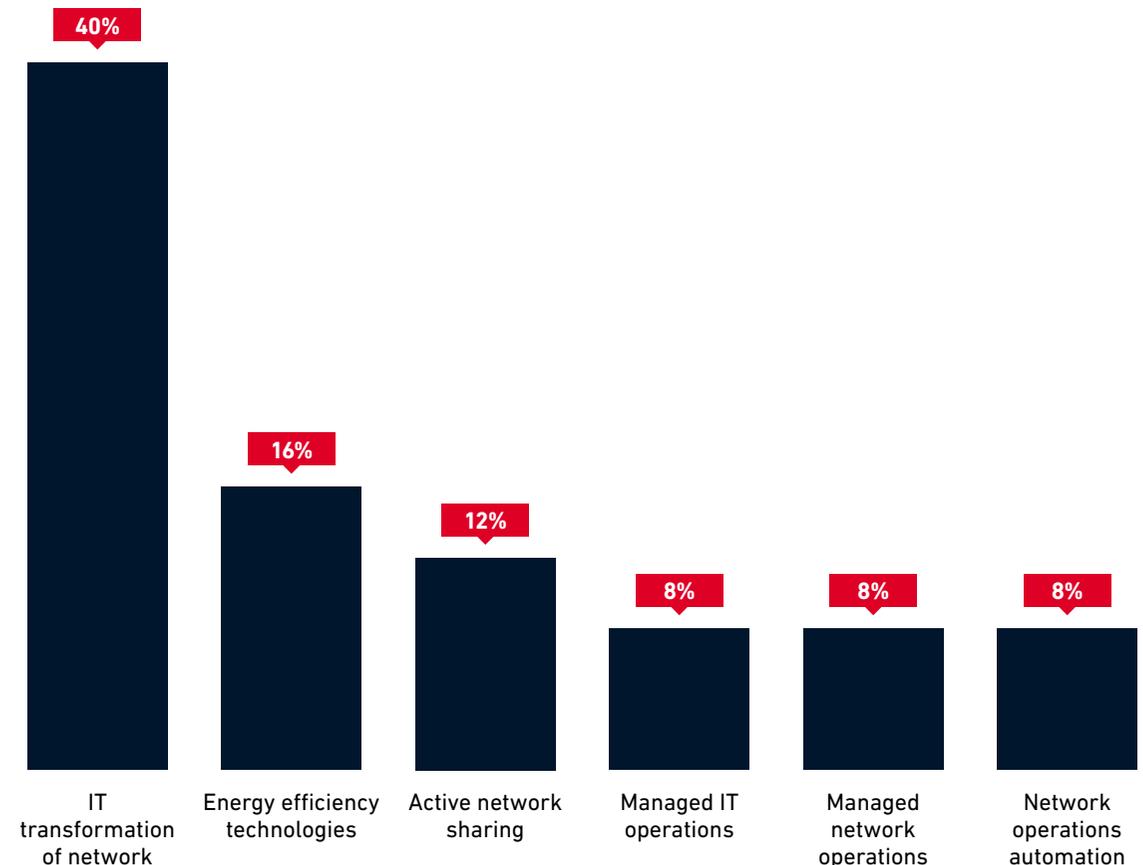
Data as reported in local currency.

Source GSMA Intelligence

Running a network cheaper without compromising standards

- The IT transformation of the network underscores the intention of operators to scale networks up and down to match demand more easily, reduce costs and accelerate service innovation.
- While progress varies across North America, AT&T aims to virtualise 75% of core network functions by the end of 2020. The challenge for incumbent operators is how to fit new technologies around their existing IT platforms and back-office systems.
- In this respect, greenfield operators have an advantage in starting their network builds from scratch. In the US, Dish Network plans to embrace open and virtualised technologies in its greenfield deployment, taking inspiration from the Rakuten model.
- This new way of running networks also reduces vendor lock-in, which could help US-based challenger vendors (such as Altiostar, Mavenir and Parallel Wireless) gain a foothold in the market.

Which technologies hold the most promise of driving opex savings in network and service operations?



Source GSMA Intelligence Network Transformation Survey 2020 (Americas operators only)

GLOBAL MOBILE TRENDS
REGIONAL OUTLOOK



North America

Latin America

The need for cost reduction
in uncertain times

Europe and CIS

Middle East and North Africa

Sub-Saharan Africa

Greater China

India

Covid-19 and currency fluctuations create tough macroeconomic environment

Covid-19 impact

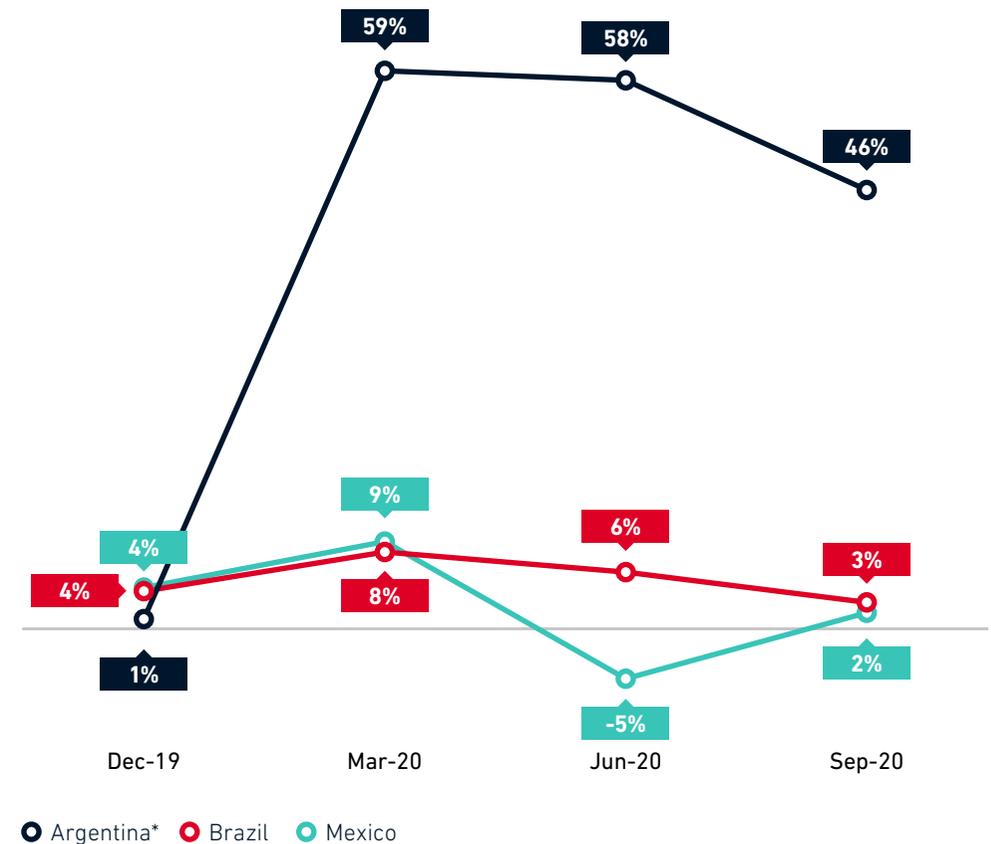
- Currency fluctuations have affected operator revenues for some time, which now must be managed alongside the pandemic.
- The fall in handset upgrades and prepaid top-ups as a result of store closures stunted revenue growth across the region in Q2 2020. However, there were encouraging signs in Q3 2020 as the easing of lockdown measures led to revenue growth returning in Mexico.
- Digital channels have become increasingly important for prepaid top-ups, reaching around 30% for some operators in Brazil. This could provide a route to improved customer retention and higher prepaid margins for operators.

Outlook

- Migrating customers from prepaid to contracts will be a key focus going forward as operators look to secure a more stable revenue base. This will be particularly important in Mexico where only 11% of connections are contract (versus 40% in Argentina and Brazil).
- In 2020, Brazil and Uruguay became the first countries in Latin America to introduce 5G services. Chile, Colombia and Dominican Republic could shortly follow, with spectrum auctions set for 2021. Nevertheless, with significant headroom for 4G growth remaining, 5G is likely to be a longer term play.

Prepaid-dominant countries in South America under pressure

Mobile revenue growth (year-on-year)



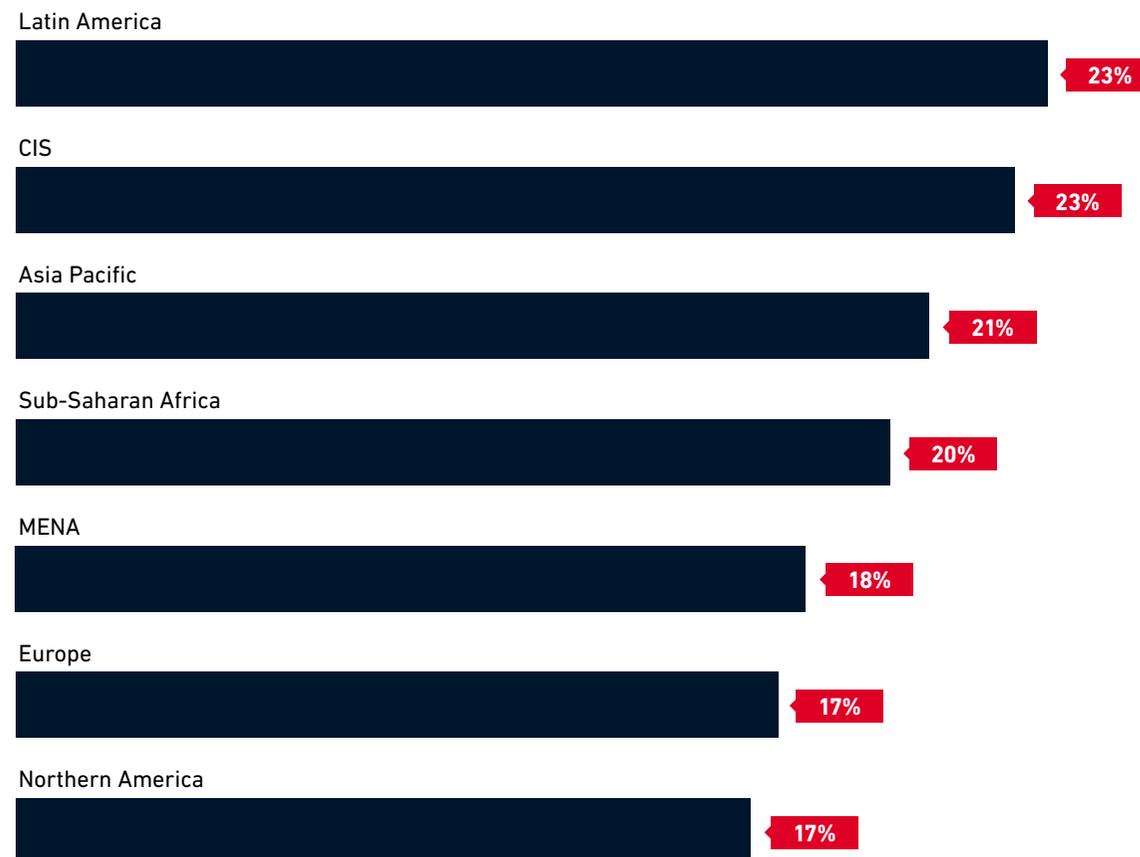
*Subject to hyper-inflation. As reported in local currency.

Source GSMA Intelligence

Operators embark on infrastructure reshuffling; open RAN remains a longer term bet

Cost reduction is the priority in Latin America where capital investment is inefficient relative to other regions

Capex/revenue ratio (2019)



Source GSMA Intelligence

- Capex cuts are under way in the region, with América Móvil reducing its 2020 budget by more than a quarter. Other operators are taking a more moderate approach, balancing the need to cut costs with early 5G rollouts.
- Top of the agenda is the move to infrastructure sharing. Telefónica has struck deals in Brazil, Mexico and Peru, while CNT and Claro have signed an agreement in Ecuador. Infrastructure sharing helps to reduce unnecessary duplication of network infrastructure, saving costs and speeding up network rollout.
- Tower sales provide another way to reduce costs. Telefónica has agreed a sale and leaseback arrangement for its network towers in Colombia, providing a quick way to reduce debt levels.
- Early open RAN trials are under way in Latin America, predominantly in rural areas. The hope is that, by using standardised interfaces and interchangeable networking components, operators will be able to extend coverage to new areas in a more affordable way.

GLOBAL MOBILE TRENDS
REGIONAL OUTLOOK



North America

Latin America

Europe and CIS

Weathering the storm

Middle East and North Africa

Sub-Saharan Africa

Greater China

India

Operational resilience in the wake of Covid-19

Covid-19 impact

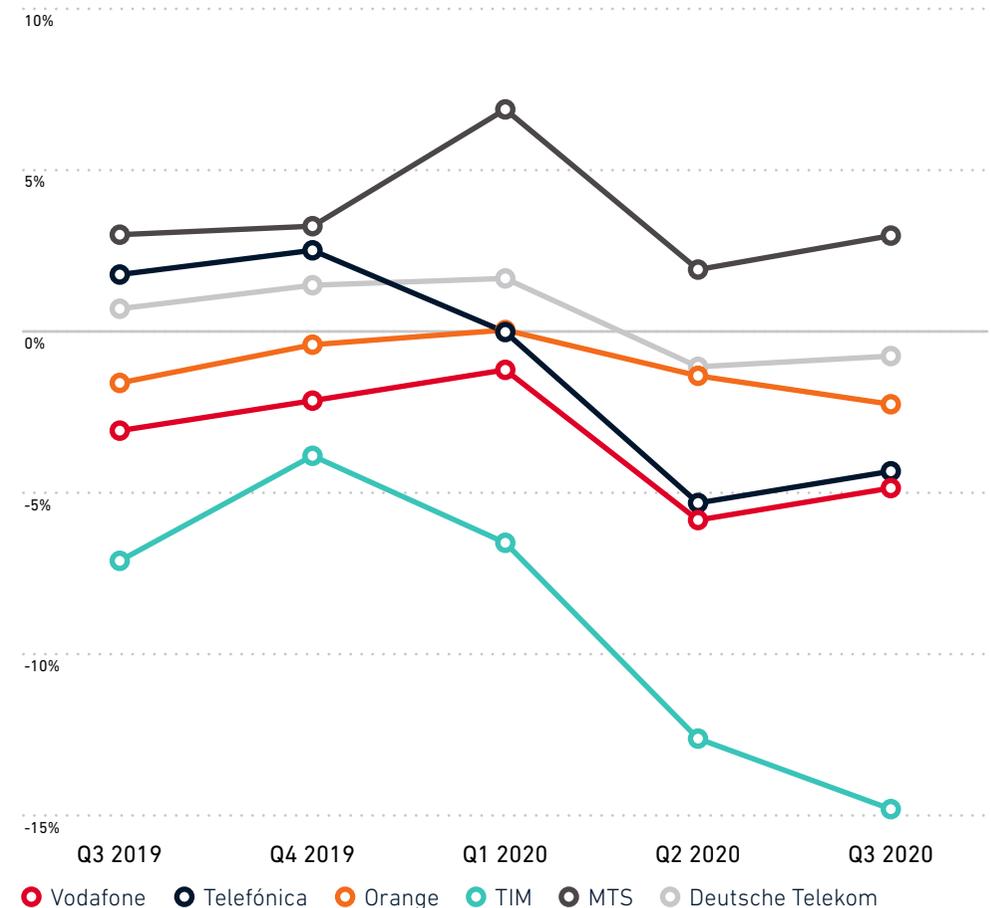
- Telecoms networks have continued to perform well during testing times, despite changing consumption levels and peak hours. Residential broadband usage and video calling are up, and voice call volumes temporarily reversed a downward trend.
- Most of the major European telco groups have followed a similar path through the pandemic. However, there still exists a sizeable gap between them, with Germany (Deutsche Telekom) and France (Orange) enduring less of a hit compared to southern countries, especially Italy.

Outlook

- The financial outlook is uncertain: limited subscriber growth and price competition in the most developed markets could be compounded by lower consumer spending and the reintroduction of restrictions on movement and trading. Still, operators are looking to how they cultivate opportunities in connectivity, digital transformation and adjacent services, while helping their customers navigate a challenging macroeconomic climate.
- Europe is now getting back on track with 5G progress. Spectrum assignments in the region recovered somewhat in Q3 following earlier postponements, which will support operator deployment plans.

Most European operators have rebounded from the Q2 nadir, though Q4 will likely see renewed pressure

Mobile revenue growth (year-on-year)



Source GSMA Intelligence

Operators look to monetise extensive tower assets

- European telecoms remains highly competitive. An increasing number of operators have recognised the need for strategic action, including the monetisation of underutilised assets. Whereas towers themselves give operators little operational leverage over their rivals, sale and leaseback deals can free up financial resources for more productive use, with positive implications for costs and capital intensity.
- Independent tower companies have been the main acquirers of operator sites, utilising multi-tenancy as the driver of profitability. During 2020, Cellnex strengthened its position in Ireland, Portugal and the UK, and has agreed with Iliad to buy a 60% stake in a network of around 7,000 sites belonging to Play in Poland. It has also acquired Hutchison's European site portfolio in a deal valued at €10 billion.
- Others have spun off infrastructure in partnerships with private equity groups. Altice has hived off towers in a joint venture with KKR in France (SFR) and Portugal (PT), citing the opportunity to wholesale capacity to other operators as its rationale.
- 5G brings further complexity and new ways of operating a network with or without licensed spectrum. The future will see network ownership continue to shift away from traditional vertical integration towards shared and/or leased access, resulting in a more diverse telecoms landscape.

The growing trend of operators offloading or restructuring tower assets

Orange

Announced plans in 2019 to carve out European towers into an independent business, starting with France and Spain.

Telefónica

Created a global infrastructure unit called Telxius in 2016, later merging it into a new division, Telefónica Infra.

TIM

Established INWIT in 2015, and has since sold stakes in the group to investment firms.

Vodafone

Created Vantage Towers in 2020, a 79,000-strong European tower company, which is preparing for an IPO in 2021.

GLOBAL MOBILE TRENDS
REGIONAL OUTLOOK



North America

Latin America

Europe and CIS

Middle East & North Africa

A region of contrasts

Sub-Saharan Africa

Greater China

India

Operators shift focus to online distribution and cost optimisation

Covid-19 impact

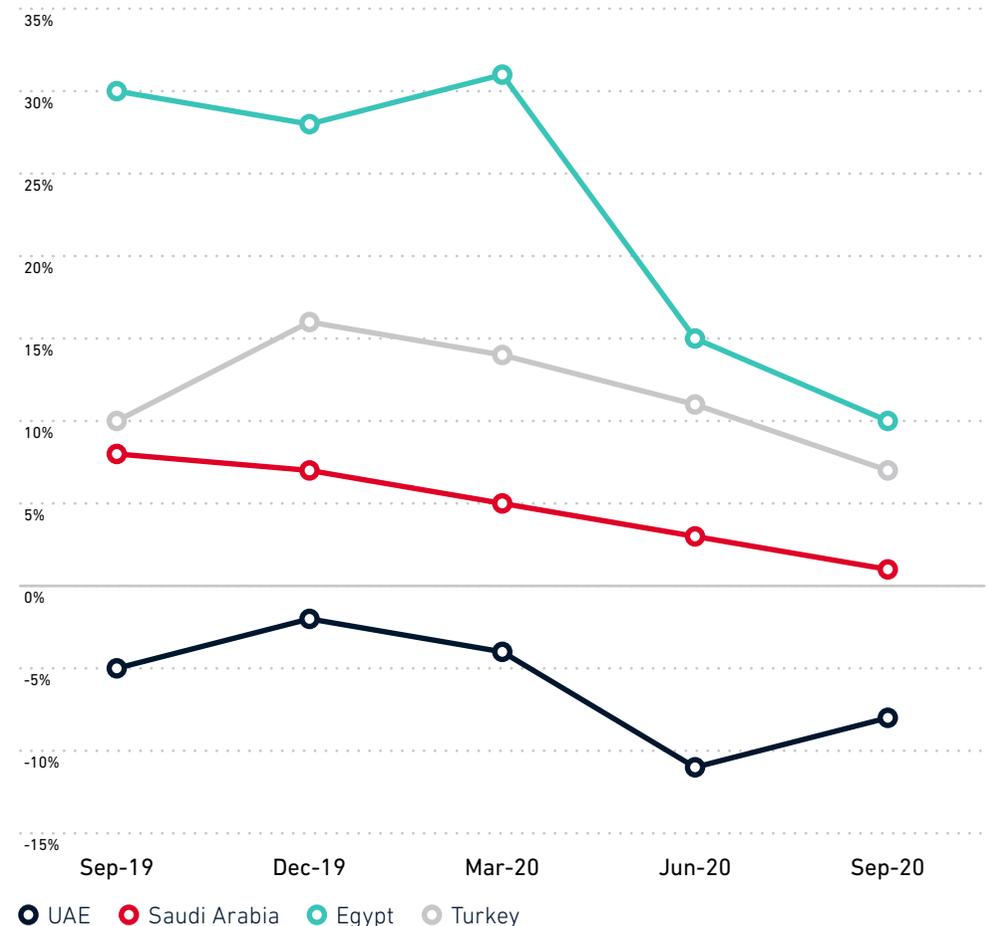
- There has been a sharp decline in mobile revenues as economic weakness and changes in user habits (e.g Wi-Fi offloading and VoIP calling) reduced mobile usage.
- Roaming revenues have plummeted as tourist numbers fell due to border closures. Store closures during lockdown also affected handset sales and airtime top-up revenues, especially in Egypt where the shock was most acute.
- The steady revenue growth from fixed broadband and home entertainment services has partially offset the decline in mobile revenues for converged operators.

Outlook

- Signs of recovery emerged in the latter part of 2020 with the easing of lockdown. Du reported 8.7% year-on-year growth in mobile ARPU for Q3, as the increase in mobility reduced the incidence of Wi-Fi offloading.
- Operators will look to boost contract subscriptions as well as online distribution channels for airtime and handsets to counter the impact of potential future lockdowns on in-store sales.
- Sluggish economic output and low tourism numbers will likely weigh on mobile revenue growth in the short term, leading operators to focus on cost optimisation to boost margins.

Mixed performance for mobile revenue growth

Quarterly revenue growth (year-on-year)

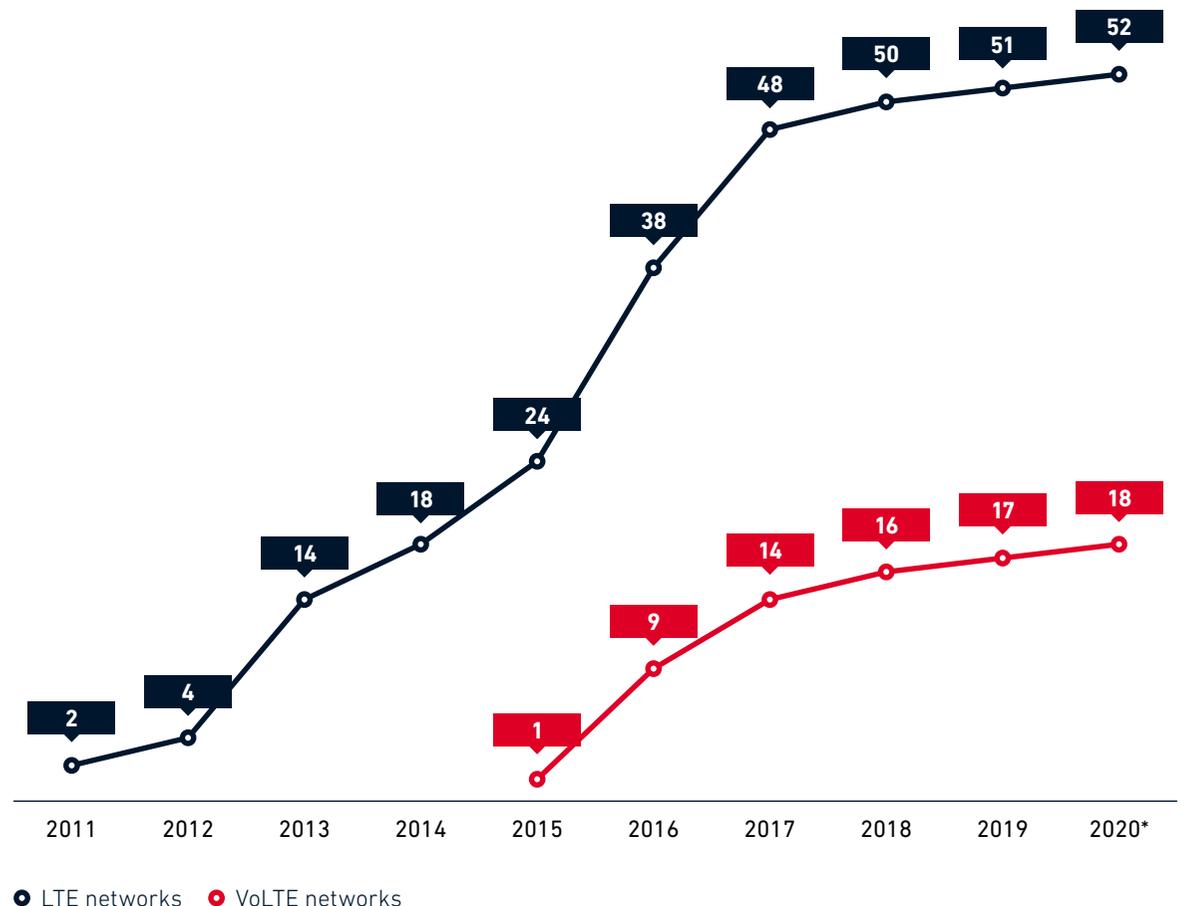


Source GSMA Intelligence, company results

Legacy network shutdowns hinge on VoLTE deployment

- The rollout of 5G networks has led operators and regulators, particularly in the GCC countries, to step up plans to close legacy networks and reform 2G/3G spectrum for 4G and 5G services.
- To date, only one 2G network has been closed in the region, compared to 35 2G and four 3G networks globally. Recently, the UAE telecoms regulator and STC in Saudi Arabia announced plans to close 2G and 3G networks, respectively, by 2022, following similar moves by Batelco in Bahrain.
- VoLTE will play a crucial role in network closure plans, as it enables voice calls over LTE networks without the need for GSM or 3G. However, only 18 VoLTE networks are now live – a third of the total number of LTE networks in the region.
- With around two thirds of mobile connections still based on legacy 2G and 3G technologies, the challenge for operators will be to accelerate 4G adoption, which currently sits at 35% compared to the global average of 55%. This will in turn strengthen the case to deploy VoLTE and facilitate legacy network closures in the coming years.

VoLTE deployment trails LTE rollout in MENA



*Data is cumulative to September 2020.

GLOBAL MOBILE TRENDS
REGIONAL OUTLOOK



North America

Latin America

Europe and CIS

Middle East and North Africa

Sub-Saharan Africa

5G debuts but focus remains
on 4G

Greater China

India

Data underpins revenue resilience and future growth

Covid-19 impact

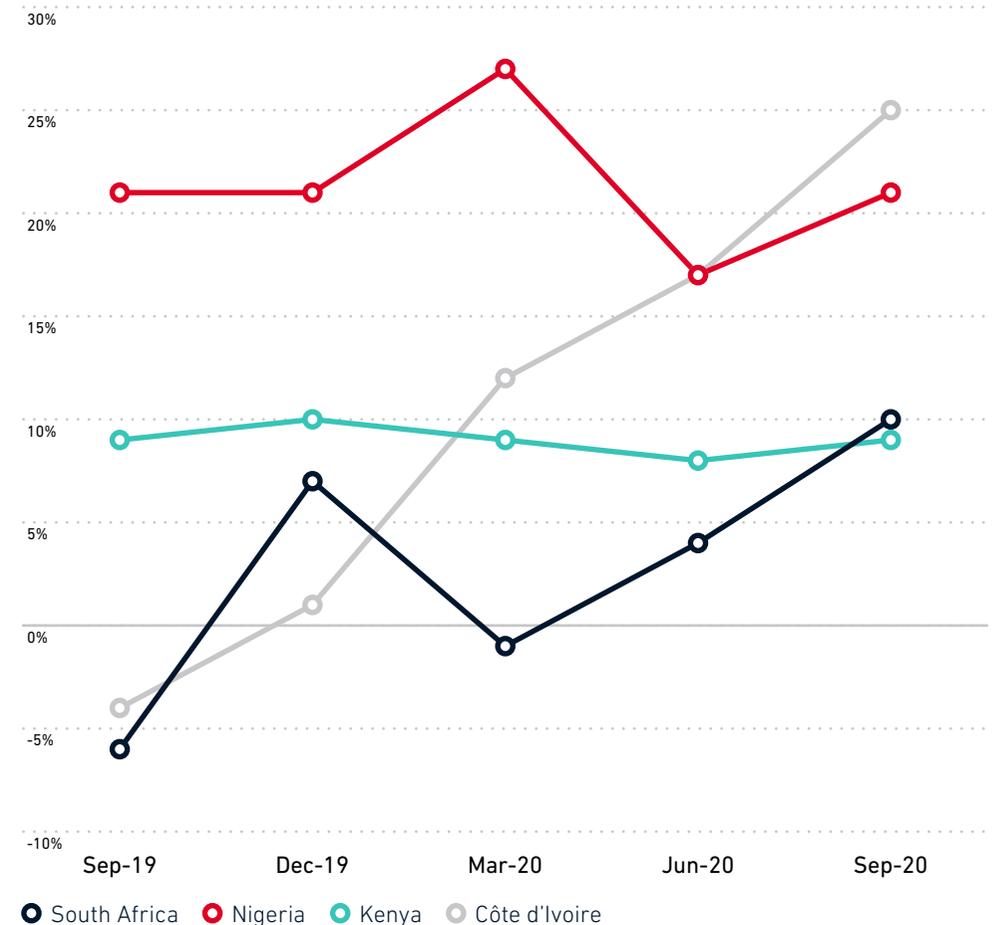
- Revenue growth remained resilient at the peak of the pandemic due to increased demand for data and connectivity services, and greater adoption and use of mobile money services during lockdown. Discounting of data tariffs and mobile money transaction fees only partially offset this.
- Strong mobile data traffic growth and a surge in new subscribers reflect the near-total reliance on mobile networks for internet access given the lack of fixed broadband infrastructure in most residential locations. This is particularly evident in Côte d'Ivoire, helped by a rapid rise in smartphone ownership.

Outlook

- The operating environment remains challenging and uncertain. The pandemic has sparked the region's first recession in 25 years, with potential to constrain consumer and enterprise spend in the short term.
- However, the pandemic has brought the value of connectivity into sharp relief, particularly in rural areas. In Ghana, the government intends to connect up to 2,000 rural communities with open RAN solutions, while Kenya fast-tracked approval for Google's Loon project in July 2020.
- Data and mobile money will remain the top growth drivers for operators, considering the significant headroom for both services.

Solid revenue growth during pandemic reflects strong demand for data

Quarterly revenue growth (year-on-year)



Data from operators with combined market shares above 70%.

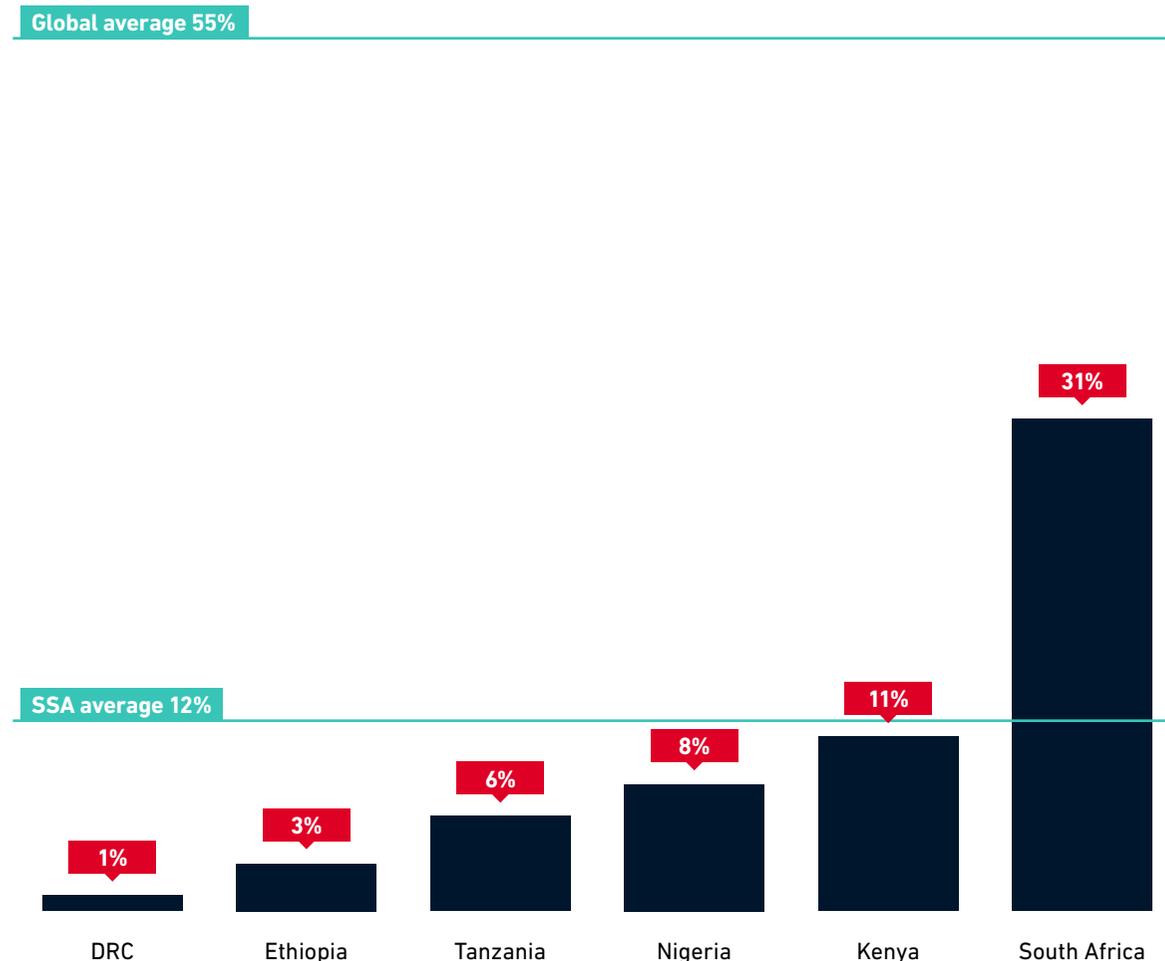
Source GSMA Intelligence, company reports

5G debuts but 4G still has room to grow

- Vodacom and MTN launched the first major 5G networks in Africa in 2020, offering mobile and FWA services in South Africa. FWA is a more obvious opportunity in Africa considering the paucity of fixed-line infrastructure.
- However, mass deployment and adoption of 5G is not imminent, as operators will likely focus on increasing 4G uptake in the near term. Adoption is just 12% and more than half of available capacity remains unused, meaning much of the LTE investment return is still to be had.
- Furthermore, 4G is sufficient to meet current levels of demand and most internet use cases in the region, while the cost of 5G devices will remain prohibitive for most consumers for the foreseeable future.
- For operators, LTE migration offers an immediate ARPU uplift; Airtel's reporting indicates that LTE ARPU is \$5.20 across its footprint, twice that of 3G and 17× that of 2G.
- Much of the upgrade barrier has come down to handset costs (themselves hit by high taxes). Airtel, Orange, Safaricom and Vodacom Tanzania have recently launched smartphone financing schemes to help.

4G has significant headroom for growth

Percentage of mobile connections



Data as of September 2020

Source GSMA Intelligence

GLOBAL MOBILE TRENDS
REGIONAL OUTLOOK



North America

Latin America

Europe and CIS

Middle East and North Africa

Sub-Saharan Africa

Greater China

Targeting global
leadership

India

First in, first out

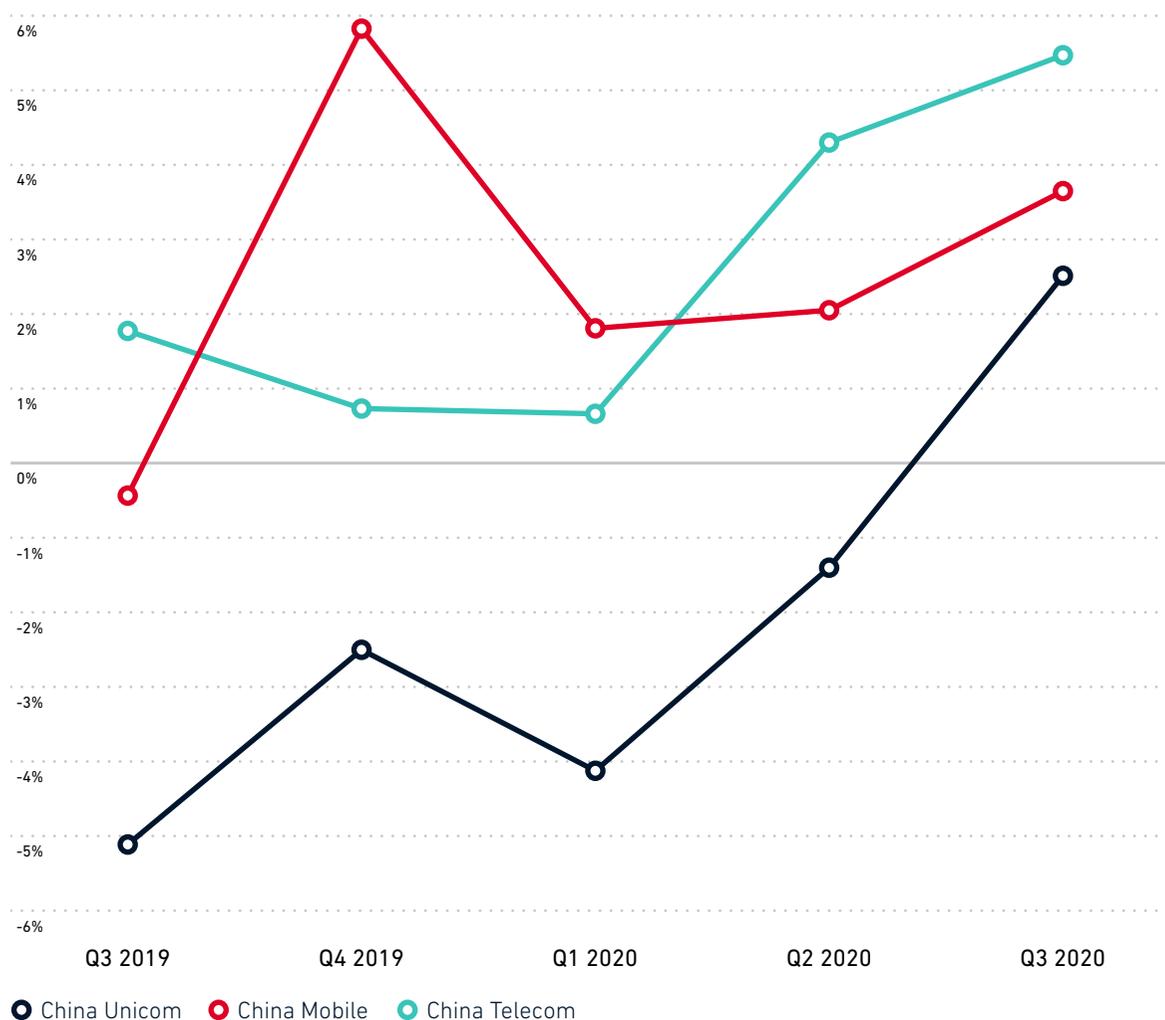
Covid-19 impact

- As the original epicentre of the Covid-19 outbreak, China's economy and mobile industry were impacted earlier than most other countries.
- While average service revenue growth turned negative in Q1, it was only just so (-0.8%) – a robust result in the circumstances, reinforced by the resilience since then.

Outlook

- The outlook for the Chinese mobile market is strong, with 5G upgrades (and the associated price premium of larger data packages) playing a key role. China Broadcasting Network is expected to fuel further growth on this front, while intensifying competition.
- The rise in SME and corporate use of digital and cloud-based services due to Covid-19 was expected but it has provided impetus for an expanded telco offering, which China Unicom (industrial internet) and China Telecom (healthcare, remote education and enterprise apps) have acted on.

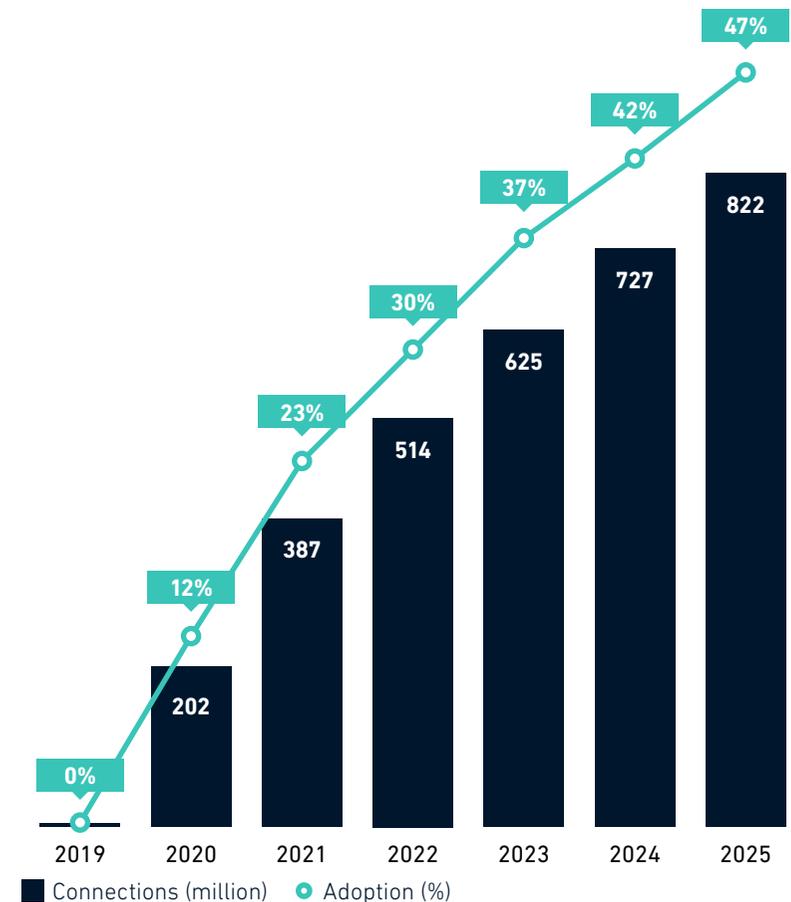
Mobile service revenue growth of Chinese operators has rebounded



In China, perhaps more than anywhere else, 5G is a national priority

- Chinese mobile operators have guided towards ambitious deployment timelines for 5G networks. By mid-November 2020, they had built nearly 700,000 5G sites, making China's 5G infrastructure presence by far the largest in the world.
- The regulator has revealed that over 180 million handset terminals are now connected to 5G networks. The country's rapid growth can be explained by a number of factors:
 - the post-Covid economic recovery and return to normality for many business activities
 - increased options for 5G handsets with a wide price range, including the iPhone 12 and some smartphones below CNY2,000 (\$300)
 - attractive 5G data tariffs where 5G is typically available at a cheaper per-GB price than 4G.
- Our estimates for 5G take-up are slightly lower than those reported by the operators, where there is some inclusion of 5G 'data package' tariffs which do not actually require a 5G handset. The difference is most pronounced now but will gradually converge in 2021 as 5G handset adoption grows.
- A major differentiator between Chinese operators and many of their counterparts is an intention to soon deploy new standalone 5G networks. These will be vital to driving a range of industrial applications demanding low latencies in key verticals such as manufacturing, transportation and healthcare.

China on its way to becoming the largest 5G market globally



GLOBAL MOBILE TRENDS
REGIONAL OUTLOOK



North America

Latin America

Europe and CIS

Middle East and North Africa

Sub-Saharan Africa

Greater China

India

The 4G revolution
continues

Covid-19 has rocked India but telecoms remains resilient

Covid-19 impact

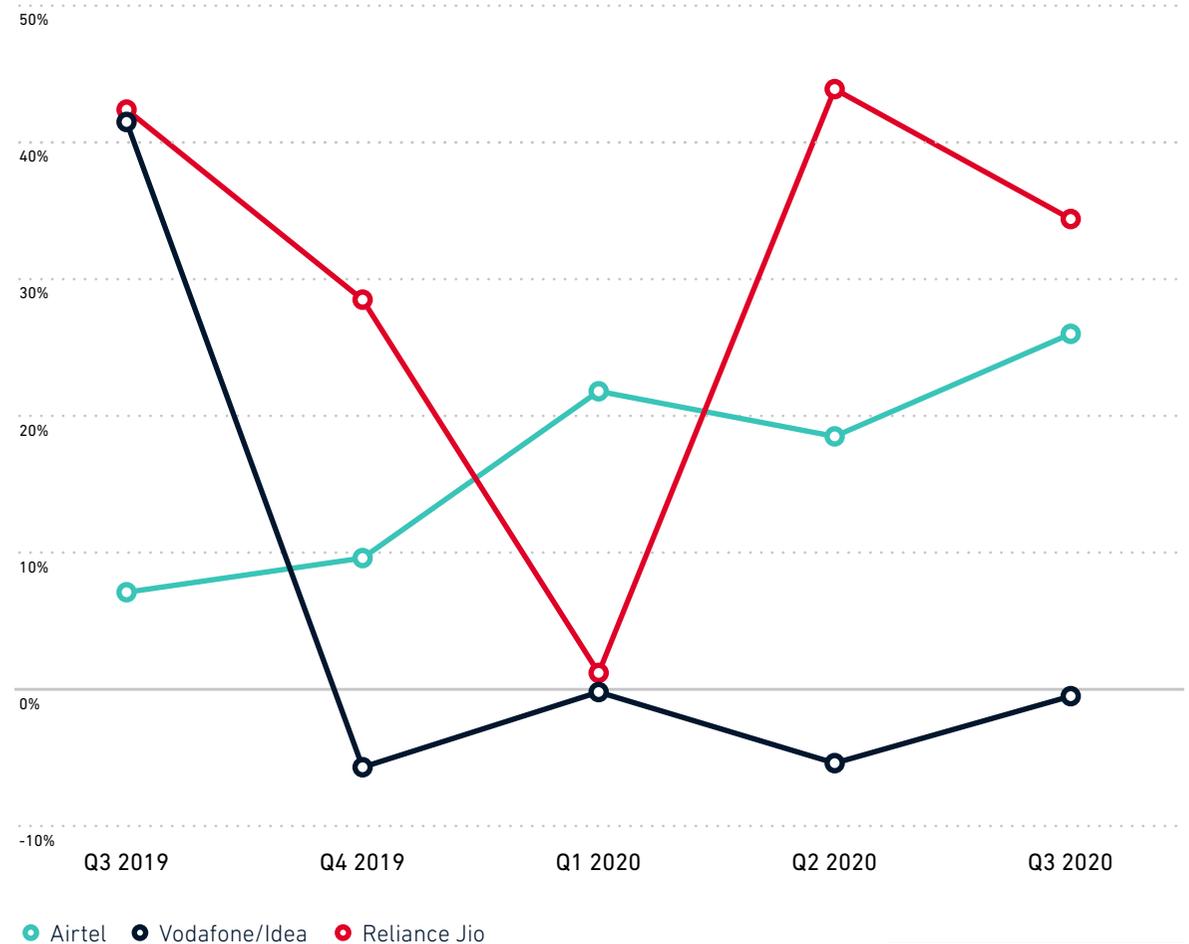
- Telecoms in India is heavily driven by 4G momentum. Before the pandemic, LTE net additions were trending at 9 million per quarter but these have since come down markedly to 5 million since Q2 2020.
- The pandemic also had a slowing effect on subscriber ARPU, but this did not stop the overall upward trend. The combination of pandemic-fuelled data traffic and a consolidating operator market structure will increase ARPU further.

Outlook

- The government's "Make In India" and "Aatmanirbhar Bharat" initiatives are laying the groundwork to develop Industry 4.0 capabilities and improve telecoms infrastructure, though this will take some years to feed through.
- Despite the uncertain economic outlook due to the pandemic, growing demand for home broadband and increasing smartphone penetration are expected to fuel growth in India over the coming years.

LTE migration continues to drive revenue growth

Mobile revenue growth (year-on-year)



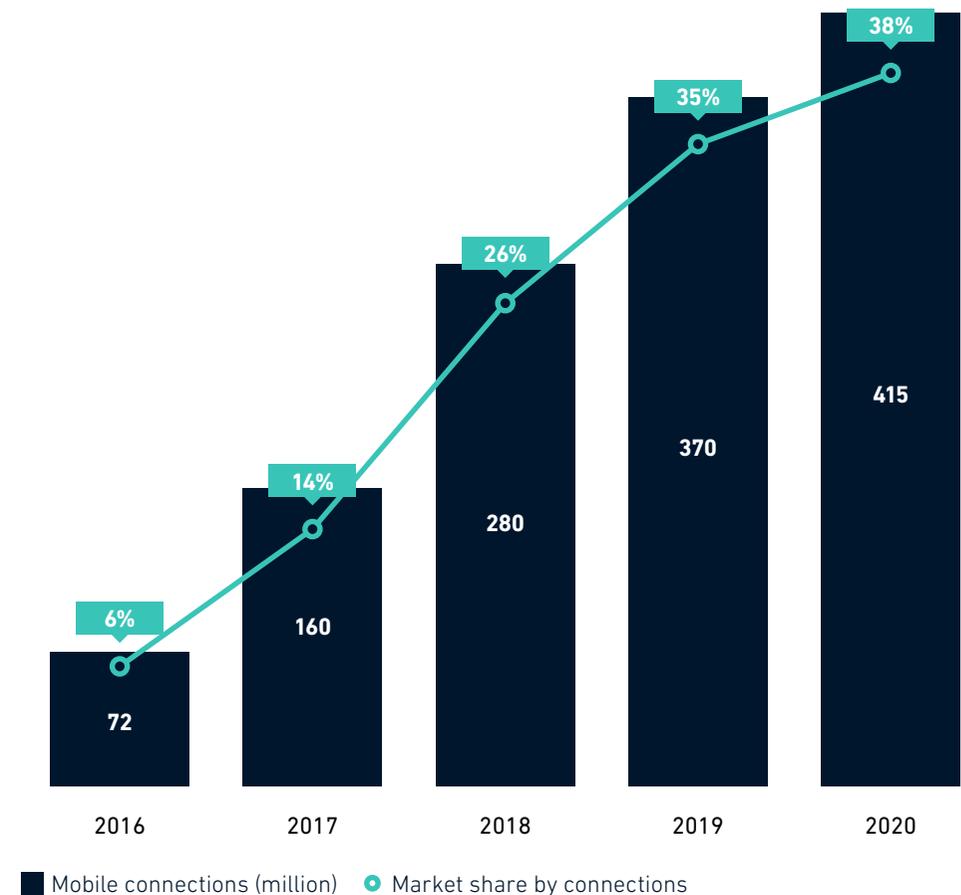
Data from operators with combined market share above 70%.

Source GSMA Intelligence

Jio continues to disrupt

- It is more than four years since Reliance Jio launched commercial services. Its impact has been indelible, with 400 million customers, a range of phones and JioMart (the online delivery platform launched in 2020).
- The company also started its fibre service in August 2019. It has a 325,000 km network and has connected almost 1 million home across India.
- Importantly, Jio’s converged all-IP network architecture can easily be upgraded to 5G. As soon as 5G spectrum is available, the company is expected to start field deployments.
- It is also in advanced stages of designing a smartphone expected to be priced around \$50. The combination of an affordable 4G smartphone and Reliance Jio’s inexpensive data plans are expected to further fuel 4G adoption and necessitate price responses from competitors given its scale and customer loyalty. Bharti has withstood much of the competitive intensity but Vodafone/Idea remains under pressure.
- Jio has raised \$20 billion from investors, many of them US tech companies including Facebook, Google and Qualcomm Ventures. The company is expected to develop a 5G-based open and virtualised architecture with Radisys and Qualcomm, underscoring its intention to continue a disruptive prowess.

Reliance Jio’s growth in India



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