

CCS
Insight

2024 & BEYOND
PREDICTIONS



SAMSUNG

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Welcome



Geoff Blaber

CEO
CCS Insight

Reflecting on the trends that grabbed our attention over the past year, artificial intelligence has, unsurprisingly, been at the forefront. As breakthroughs in AI captured the world's imagination, CCS Insight has sought to paint a truer picture of the realities and challenges ahead. The coming years will continue to see the industry's extremely high expectations challenged by society aiming to align AI to human values. Given the opportunities, risks, pace of change and complex geopolitical agendas, this won't be simple.

Despite this note of caution, we remain optimistic about what AI can deliver when it meets technologies like private 5G networks, virtualization, cloud and edge computing — it's this combination that will create more-intelligent and sustainable futures. The impact will be significant across industries, if not uniform in timing and the rate of investment. Elsewhere, the consumer landscape promises to shift to one in which we increasingly favour recycled devices and benefit from more connectivity options to support new digital experiences.

This booklet contains 85 predictions for 2024 and beyond; watch our analysts unpack them with industry executives from our sponsors EE, Qualcomm and Samsung at ccsinsight.com/predictions. We hope our 18th set of predictions provokes debate about our increasingly intelligent and connected world. Given the scale and complexity of change, the value of our research has never been clearer.



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Need to balance short-term success against long-term goals? Our tailored deliverables provide you with concise solutions to complex requirements.

Research Areas

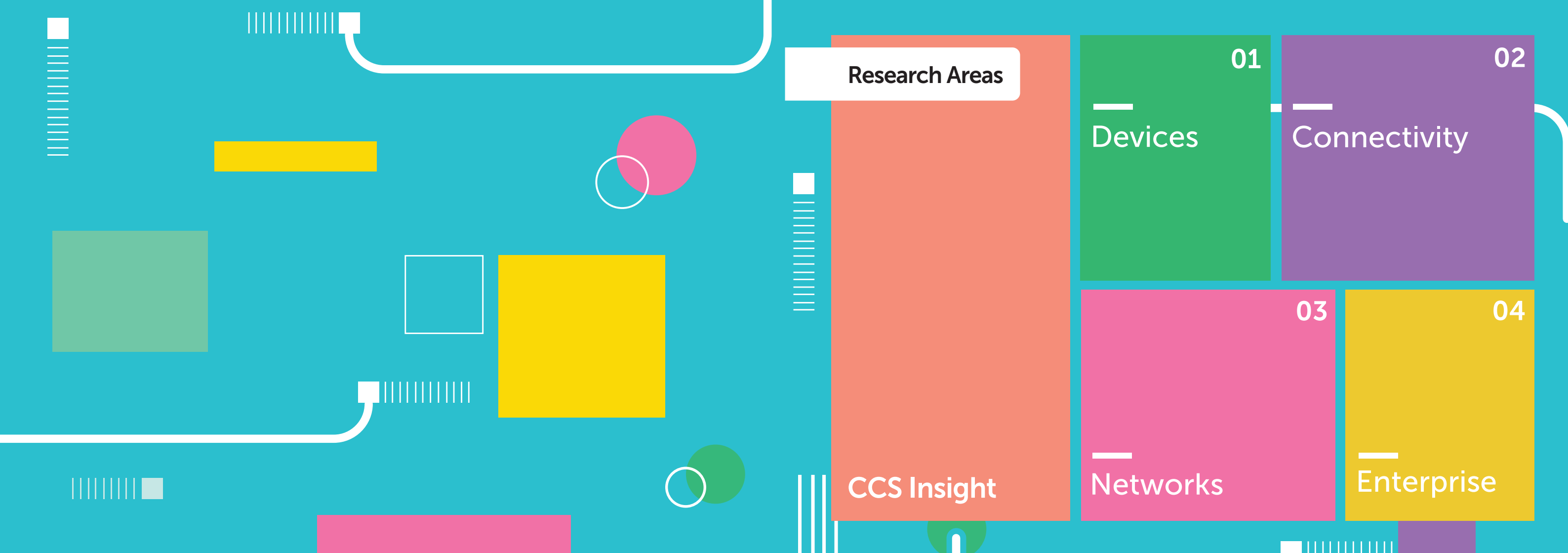
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Devices

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CCS Insight



Devices

01

Connected Consumer Radar

Regular reporting into regional attitudes and buying behaviours across a spectrum of devices before they show in the sales data.

Mobile Phones

We supply forecasts, regular reporting of market trends and timely insights into financial results and news.

Second-Hand Devices

Granular insights into the booming circular economy for devices. Featuring Pulse, our powerful new market-tracking tool.

Virtual and Augmented Reality

We deliver a leading survey of virtual reality users, providing invaluable insight for those who don't want to get left behind.

Wearables

We zero in on shipment volumes and values, clarifying the impact on your business through expert commentary and analysis.

Connectivity

02

Direct Satellite-to-Device Services

A pioneering report that defines the development of satellite-mobile services, with industry figures and holistic insight.

Fixed Wireless Access

Upcoming research that uncovers the market potential of 5G fixed wireless access, including forecasts, a global outlook and case studies.

Telecom Operators

We identify drivers of change before technologies are proven and offer insights from our survey into buying behaviour.

Networks

03

Mobile Infrastructure

A range of deliverables that provide an enlightened perspective on everything from the mobile core to the network edge.

Private Mobile Networks

Granular insights into the lucrative private mobile network landscape. Featuring Pulse, our powerful new market-tracking tool.

Enterprise

04

Cloud and Infrastructure

Examining sector trends and strategies, with insight gathered from influential industry roles.

Developer Trends

We track the sector's evolution, scan the supplier landscape and survey stakeholders to give you decision-ready insight.

Workplace Transformation

Our service helps suppliers of workplace technology tell their story and be heard above the noise.

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Achieving Differentiation through Innovation

CCS Insight is delighted to once again welcome Samsung as a lead sponsor for our annual Predictions event. This year, I had the opportunity to sit down with Annika Bizon, Marketing and Omnichannel Director for Samsung UK and Ireland, and talk to her about a wide range of topics as part of our online event — check out the interview at ccsinsight.com/predictions.

The Market-Maker for Foldables

It seems hard to believe that Samsung's first folding smartphone was only introduced four years ago when you look at the proliferation of similar devices in the market today. Samsung had been working with flexible display technology for more than a decade before it launched its Galaxy Fold in 2019, and the long development cycle underlines how challenging it was to create this new product category.

It hasn't always been a smooth journey, but the launch of the Galaxy Z Flip5 and Galaxy Z Fold5 at the recent Galaxy Unpacked event hosted in Samsung's home market, South Korea, saw the company consolidate its position as the market-maker for a category that's still in its infancy. Its duo of foldable devices have evolved and become even more attractive.

In the most recent generation, the clearest step forward was the introduction of a large external screen on the Galaxy Z Flip5, offering even more utility for the fledgling segment. Other important improvements included better performance and a more durable design thanks to water resistance and increased longevity in the folding mechanism.

As a result, the Galaxy Z product range is now central to Samsung's efforts as a leader in the top end of the market with a differentiated

product offering. But technology alone isn't always enough to grab people's attention.

Getting Consumers to Engage with Innovative Products

A major strand of Samsung's approach to foldables has been bold marketing. It has created edgy and humorous ads for its folding devices, pitching them as an alternative to more traditional smartphones; as a result, consumer awareness and consideration has grown.

However, as Annika noted in our conversation, you can't deny the power of touch when it comes to marketing Samsung's foldable devices, particularly in a retail environment. There's often a fear of interacting with unfamiliar technology, combined with people's concern that the devices are very different to the smartphones they currently use.

Annika and I discussed how Samsung has worked with retailers and mobile operators to create engaging experiences as part of its recent launch, encouraging consumers to not just look at the Galaxy Z Flip and Z Fold devices, but also physically interact with them.

Samsung found that this has made it easier for customers to understand the benefits of a folding design, and reassured future owners that the learning curve for these devices is nowhere near as steep as they may have feared. This initiative is already bearing fruit with device engagement in retail stores continuing to increase.

The best example of this is Samsung's "£500k selfie" initiative, where customers were encouraged to get hands-on with the device in participating retailers and take a selfie to be in with

the chance of winning £500,000. According to Samsung, the campaign drove further footfall and increased engagement with its foldable range, with the company completing its most successful pre-order for the range to date.

A More Sustainable Future

Throughout Predictions, CCS Insight has regularly discussed the critical importance of sustainability in consumer electronics. We consistently find this is influencing decisions across the technology market, ranging from device designs to purchasing journeys.

2023 is a milestone year for Samsung as it seeks to reach its goal of net-zero emissions for its Device eXperience division by 2030. The efforts to reshape the company around sustainability goals are clear from the growing proportion of recycled materials used in its products. However, software support is becoming just as important as hardware investments when it comes to sustainability.

The single most positive impact the mobile phone industry can have on the environment is to get consumers to hold on to their devices for longer. Reflecting this, Samsung now commits to offering at least four generations of Android updates for all its smartphones, from its most affordable devices right through to its flagship range, as well as five years of security patches on its premium products.

A further benefit of this approach is that it enhances the second-hand value of Samsung devices. This is particularly relevant if consumers decide to trade them in as part of a future upgrade and makes these phones likelier to have a further life as a second- or even third-hand product.

An Ecosystem of Products

Beyond smartphones, we also looked at Samsung's position as a leader in consumer electronics. This affords it an enviable spot compared with some rivals as the touch point with consumers isn't merely limited to smartphones.

This is immediately relevant with related products like the Galaxy Watch, Galaxy Buds, tablets or laptops, but extends through the company's vast array of other connected devices such as smart TVs and domestic appliances including fridges, ovens and robot vacuum cleaners. Enabling customers to easily link these devices together through its SmartThings platform allows them to get even more from their experiences with Samsung products.

With all this in mind, I hope you enjoyed my conversation with Annika as much as I did. I encourage you to review the predictions on the following pages, which touch on aspects of the topics we discussed; they're designed to help us all think about what the future looks like for the connected device landscape and beyond.

I'd like to thank Samsung and our other sponsors for their support in getting our predictions to the widest audience possible.



Ben Wood
Chief Analyst
CCS Insight

SAMSUNG

Big Tech Regulation Becomes a Global Reality

After a period of relative quiet while the European Commission considered the companies and services that would fall under the reach of its Digital Markets Act (DMA), the legislation and its consequences for those deemed to be “gatekeepers” is now in full focus.

The DMA is a landmark piece of legislation that came into force in November 2022 and aims to ensure greater accountability, a level playing field for competition and a catalyst for greater consumer choice in the digital sector. The emphasis is on large digital platforms defined as “gatekeepers”: companies with revenue over €7.5 billion, market capitalization above €75 billion, more than 45 million monthly active users and 10,000 yearly business users located or established in the EU. Failure to comply with the legislation will result in steep penalties of up to 10% of global revenue.

In September 2023, the commission announced that six gatekeepers (Alphabet, Amazon, Apple, ByteDance, Meta and Microsoft) had been designated across a total of 22 “core platform services”. The companies have six months to ensure compliance with DMA obligations on each of their core platforms. Although Gmail, Outlook.com and Samsung Internet Browser met the DMA’s gatekeeper thresholds, the commission stated that Alphabet, Microsoft and Samsung had provided sufficient evidence to determine that these services wouldn’t qualify as gateways to services.

The process to this point has appeared relatively smooth, but in the coming months we’re likely to see very public opposition to the inclusion of key services under the terms of

the DMA. Notably, the commission has opened four market investigations to further assess submissions that platform services don’t qualify as gateways. This should be completed within five months.

For Microsoft, this means Bing search, the Edge browser and Microsoft advertising. Apple is claiming that iMessage doesn’t constitute a gateway. Separately, the commission is investigating whether iPadOS should be designated as a gatekeeper despite not meeting the thresholds.

Resistance to the inclusion of certain key services is likely to be substantial. Apple has stated that “we remain very concerned about the privacy and data security risks the DMA poses for our users”. It went on to say that “our focus will be on how we mitigate these impacts and continue to deliver the very best products and services to our European customers”. ByteDance, TikTok’s parent, commented that it was “extremely disappointed”. By contrast, Amazon and Microsoft struck more pragmatic tones underlining the need to cooperate and work constructively.

This reaction underlines the challenge that regulators globally face in delivering legislative change. The technology industry at large and parties across the political spectrum in several jurisdictions are agreed on the need for regulation. However, there’s absolutely no agreement on how it should be implemented or what it should encompass. It’s proven to be an extraordinarily difficult task and the European Commission should be commended for the progress so far.

The inherent difficulty in delivering the first major regulation of big tech gives CCS Insight little confidence in timely and meaningful regulation of artificial intelligence.

The commission now faces the unenviable task of defending its determinations and reaching unimpeded conclusions on the areas for further investigation. This process is critical, because the strength of the legislation will hinge on the consistency in its determinations, forthright defence against opposition and effective implementation. It will be a fascinating few months ahead.

For example, many of the areas for investigation represent highly contentious components or at least, services that are of great importance to their owners. In some cases, iMessage being a good example, the requirements of designation as a gateway would force substantial change to the very essence of the service. iMessage would be forced to open up and interoperate with other messaging platforms, notably Android, requiring Apple to provide the same APIs to third-party developers that it uses internally.

CCS Insight will look at some of these issues separately as developments unfold, given that the DMA is poised to wreak unprecedented change on the technology industry. Although the DMA is specific to Europe, it will have global implications that dictate how large platform companies operate. It’s also likely to affect the shape of similar legislation in the US. The reaction to the European Commission’s designations in September 2023 underlines its looming significance.



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Networks Push Boundaries amid Soaring Usage

Geopolitical turbulence, rising inflation and the cost-of-living crisis have dominated headlines in 2023. But against this backdrop of uncertainty, it's been encouraging to see the telecom industry continue to push boundaries in network deployment, and CCS Insight has tracked several trends highlighting efforts to satisfy people's seemingly insatiable demand for connectivity.

In few places has this been more evident recently than India, where more than 300,000 5G base stations have already been deployed, according to the government. We expect the country to become the second-largest market for 5G in 2027, thanks to wide availability and low-cost devices. China will remain the largest, representing nearly 40% of a global total of more than 5 billion connections.

The industry migration to standalone 5G is also underway. According to data from the Global Mobile Suppliers Association released in July 2023, 115 operators in 52 countries and territories are investing in public standalone 5G networks, including trials and pre-commercial launches.

One of these is EE, which — in partnership with Ericsson — recently made a successful demonstration of 5G in a wideband frequency-division duplex (FDD) radio carrier within a sub-3 GHz spectrum band. It claims that the move is a European first, bringing more than three times the capacity of a single FDD carrier, and that achieving such network capabilities helps to pave the way for its commercial launch of standalone 5G.

Another trend CCS Insight has been tracking is the accelerating momentum in satellite broadband, with more than 70

partnerships between operators and satellite providers already announced. This reflects growing enthusiasm in the industry to find complementary and cost-effective alternatives to terrestrial networks, particularly for deployments in sparsely populated locations or where the terrain is difficult, or for specific uses.

We're already seeing tentative real-world deployments, too. Through partnerships with operators, Lynk is offering satellite-to-phone services in the Cook Islands and Palau, highlighting its ability to connect remote communities and provide backup in the event of natural disasters.

Partnering with OneWeb, BT Group — the parent company of EE — has delivered Internet connectivity for the first time to the 28 permanent residents of Lundy Island, located about 20 kilometres off the Devon coast. The partnership is enabling applications such as payment systems and powering local conservation efforts.

Another interesting tie-up in satellite is between Telefonica and Sateliot. The two companies say their partnership will enable narrowband Internet of things services "everywhere on the planet", starting as soon as the first half of 2024. It's a bold claim, and one that probably only satellite connectivity could empower, given its ability to quickly cover very wide areas.

In full-fibre networks, BT's Openreach unit continues to build at pace. During its fiscal 1Q23/24, which ended in June 2023, it passed another 718,000 premises at an average of 55,000 per week. This took its total to 11 million, representing 44% of the operator's target to reach 25 million premises by the end of 2026.

Overall in the UK, 52% of homes — equivalent to 15.4 million households — had access to full-fibre services in May 2023, according to Ofcom, an increase of four percentage points since January 2023. Northern Ireland is leading the way with 90% availability. Meanwhile, gigabit services, which also include Virgin Media O2's cable network, are now available to 75% of UK homes.

This increase in full-fibre connections is providing consumers with faster speeds and greater bandwidth to power their online experiences. It's also enabling operators to differentiate themselves by tapping into new markets such as cloud gaming.

Among operators, EE is setting an early pace in this area. Through partnerships with major players such as Microsoft and Nvidia, it has showcased how low-latency network performance can deliver immersive gaming experiences. As part of its goal to be the UK's number-one destination for gamers, it's offering its EE Game Store to customers of any network, hoping to capitalize on growing interest in virtual and augmented reality and online gaming, including e-sports.

As the deployment of new networks continues, operators are also in the process of shutting down older services, such as 3G. The motivation is clear: usage has rapidly diminished as many customers upgrade phones with newer technologies.

The latest 4G and 5G networks are far more capable of supporting the giant leap in data traffic that new services will undoubtedly demand. Already, a flurry of operators in Europe have closed their 3G networks; Dutch operator

VodafoneZiggo, T-Mobile in Germany and Telia Norway were among the first.

New networks are also more efficient than their older counterparts and can therefore help operators reach their ambitious environmental targets. According to Vodafone UK, for example, for every terabyte of network data, 4G consumes only 35% as much energy as 3G; in 5G, this falls to as little as 7%.

Sustainability has shot up the agenda among telecom operators this year, and beyond cutting their own carbon footprint, some are helping other companies reduce theirs. At its recent Sustainability Festival at its Adastral Park innovation campus, BT showed off two new digital tools to help large companies measure and optimize the carbon impact of running applications and cloud workloads across their network. The Carbon Network Dashboard gives customers a real-time view of power consumption and the Digital Carbon Calculator helps customers estimate their network's carbon footprint.

As consumers and businesses show no let-up in their hunger to stay connected, telecom networks are set to continue to evolve rapidly. The emergence of faster, more reliable, more secure and greener services could prove crucial to growth and prosperity.



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Our device ownership model shows that exceptional customer satisfaction, industry profits, and sustainability can all be achieved without trade-offs.



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INFRASTRUCTURE ADVANCES



1 Recession fears push workloads from the cloud to on-premises through 2024

Enterprise applications with predictable capacity requirements are good candidates for repatriating from cloud platforms to traditional infrastructure in search of cost savings. In addition, the flexible consumption of hardware available through initiatives such as HPE GreenLake and Dell Apex provide the operational expense and infrastructure scaling promised by cloud platforms. Organizations with hybrid cloud deployments are more likely than those that have gone all-in on one or more hyperscale cloud platforms to claw back some workloads, perhaps as part of a hardware cycle refresh.

2 By 2026, Cellnex adds its own network equipment to at least 1,000 of its European towers

Having accumulated a huge portfolio of mobile towers in Europe, the ambitious Spanish company starts adding 5G infrastructure through a partnership with Nokia or Ericsson. This enables it to offer a far broader set of telecom services as a neutral provider. The move is cautiously welcomed by telecom operators as they would be able to save on the costs of network roll-out by partnering with Cellnex. But there is also an undertone of fear that Cellnex could one day become a rival network operator itself, should it secure spectrum in any of the markets in which it has a presence.

3 Hybrid public and private 5G through network slicing emerges as the dominant option by 2030

By 2027, there are more than 45,000 private 5G networks with dedicated on-premises core and radio access networks. However, over the next few years, the roll-out of standalone 5G technology enables public network slicing, and mobile network operators use it to offer a hybrid connectivity solution to a wider variety of enterprises, with shared private and public 5G elements. By 2030, network slice connections outgrow dedicated private networks. The hybrid model combines the significant cost and flexibility advantages of shared network infrastructure with the quality and reliability of private connections.

4 Arm and RISC-V together serve a fifth of enterprise workloads by 2028

The combination of cost optimization, energy efficiency and increased demand for data processing at the edge means alternatives to traditional x86-64 CPUs from Intel and AMD increase market share. AWS Graviton and Ampere Altra are enterprise-grade CPUs using the familiar Arm instruction set found more commonly in lower-power smartphones and tablets. Start-ups such as Ventana and SiFive are designing increasingly high-power designs for the royalty-free RISC-V instruction set, and Alibaba Cloud is pursuing the adoption of RISC-V with its XuanTie CPUs.

5 AI enables 5G networks to move beyond “five nines” availability

More mobile network operators deploy AI in their 5G networks and train AI models to analyse network data and traffic patterns. These algorithms can drastically improve the capacity planning and optimization of the network. In operations, AI can more accurately pinpoint the root cause of problems, reducing the time to resolution, as well as predict and prevent degradation or outages, reducing or avoiding costly downtime. AI can even enable self-healing networks, reducing and eventually removing the need for human intervention.

6 Precision agriculture is bolstered by hybrid private 5G solutions by 2030

The increased adoption of precision agriculture technologies such as self-steering machinery, hyperlocal monitoring and agricultural drones is dependent on a variety of connectivity options to provide the needed coverage and data speeds in rural areas. A 2022 survey by the National Farmers Union in the UK highlighted that 96% of farmers consider a reliable mobile signal important for their business, but only 21% said they had reliable outdoor signal in all locations and 31% said speeds were not sufficient for their business. The agricultural sector emerges as a strong adopter of hybrid public and private 5G solutions, which provide the benefits of private networks at a more accessible cost, and usher in a new era of productivity and innovation in agricultural practices.



7 “Cloud as a percentage of total network” becomes a key performance indicator for network operators

Benchmarking the transition to cloud-native networking, operators start to use the percentage of their network that is cloud-based as an indicator of success in their quarterly financial reporting. They report progress in migrating an increasing proportion of their network infrastructure and operations into the cloud as a measure of performance efficiency and strategic execution.

9 Government-backed investment funds become a blueprint for licensing radio spectrum

The Phaistos Investment Fund is an early example of this model. Backed by the Greek state and using 25% of the proceeds from national 5G spectrum auctions, it is focused on investing in specialized 5G-related products and services. The fund works with incubators, venture capital funds and academic institutions with a view to accelerating technology and business-centred experiences applicable to the Greek market and globally. With some governments under pressure to use the income from spectrum licensing to seed mobile markets, Phaistos-type funds become the blueprint for structured reinvestment of a proportion of 6G licence fees back into technology sectors.

8 By 2025, AI becomes a driver of Open RAN adoption

In the next few years, mobile network operators use AI to help them mix and match products from different suppliers of Open RAN equipment. Open RAN supports new platforms that enable AI and automation to optimize the performance of the radio access network, enabling operations with multiple suppliers while supporting all the capabilities possible with traditional set-ups. If an operator needs extra capacity in a locality, it can bring in a new Open RAN supplier without swapping out equipment in every site in a whole city or state.

10 Communications-platform-as-a-service is a strong driver of growth for 5G network slicing by 2026

Communications-platform-as-a-service is a cloud-based offering that provides all the back-end infrastructure and interfaces needed to enable companies to add real-time communication features to their existing applications or business solutions. As greater scalability and security are required, and functionality such as data analytics is incorporated into these environments, quality of experience becomes more prevalent. Using network slicing to support the quality of experience enhances delivery of this type of platform and differentiates platform providers' portfolios.

11 By 2025, a digital marketplace for app-based network functionality offers more than 100 versions of network capabilities as APIs

Based on cloud-native orchestrated networking and “network as code” programming interfaces, a centralized platform of network capabilities is made available for third-party automated interaction. Capabilities can be plugged into applications that require specific network functionality. Marketplace sellers generate revenue in a variety of ways: per transaction, per type, by time or through subscription or sponsorship models, with the ecosystem based on as-a-service consumption mechanisms.

12 Power-as-a-service is an integral part of tower infrastructure services by 2025

Getting power to tower sites is often the most time-consuming hurdle of mobile network builds because different regions, states and municipalities often have different permit processes, making it a difficult activity to streamline. But power-as-a-service, in which an organization such as a tower company manages all the power to a tower site for its tenants, can deliver cost savings and better power efficiency. By getting power to each tower much faster and allowing tenants to share resources, it expedites network deployment and proves a valuable service. Tower companies make it a cornerstone of their offerings by 2025.



SUSTAINABILITY

13 By 2025, a combination of intelligent radio access network technology, automation and AI-driven power-down techniques enables at least three leading operators to bring forward their carbon-neutral targets by several years

As energy costs and capacity demands on networks rise, the implementation of net-zero targets has become of crucial importance in sustainable operations. AI can help maximize network usage without affecting the performance of energy-saving features. It can also act autonomously on real-time or predicted traffic, helping service providers reduce their energy consumption and lower their carbon footprint, contributing to sustainability goals and lowering operating costs.

14 Greater use of solar and wind power necessitates smart grid technology to become widely adopted in advanced economies from 2028

Smart grids improve the viability of more environmentally friendly, weather-dependent technology. They also reduce the likelihood of power outages as electricity can be dynamically re-routed if a failure occurs in one part of the transmission network. It starts at a national level, but international grids emerge in the next decade.

15 The first smartphones with biodegradable batteries are introduced by 2030

As the imperative for more-sustainable consumer electronics accelerates, batteries using materials such as chitosan, a natural polymer derived from the exoskeletons of crustaceans, and electrodes made of zinc and manganese dioxide are offered in commercially available smartphones. These batteries can be broken down by living organisms, making them more environmentally friendly and easier to recycle and dispose of.

16 By the end of 2023, more than half of iPhones in use are second-hand devices

In a sign of the growing importance of secondary markets, pre-owned devices as well as hand-me-downs make up more than 50% of the 1.3 billion iPhones in use by the end of 2023. The second-hand market continues to take a larger share of sales as the appetite for used devices grows and the circular economy extends the life of devices. From 2024, the average life of an iPhone is eight years. In contrast, used Android smartphones represent less than 25% of Android's installed base.

17 By the end of 2024, Apple implements software to show consumers that an iPhone has been repaired and that genuine replacement parts have been used

Given the vibrant market for refurbished iPhones, in addition to existing measures like Battery Health, new diagnostics let owners check whether an iPhone has been repaired and whether genuine replacement components have been used. It starts with key areas including the screen and battery, before extending to other components.

18 By 2024, some consumer electronics come with a "date of birth" indicator

Although it is already possible for specialists to identify when a device was manufactured, companies making consumer electronics devices start to implement a clearer way for consumers to easily tell when a product was made or first switched on. This gives a clearer indication of how much a device has been used and influences its trade-in and second-hand value. In a similar manner to cars, the indicator is particularly important for products that have been available as new devices for several years.

19 By the end of 2024, at least five mobile network operators in Europe offer a smartphone-as-a-service solution for consumers

The approach lets people buy a smartphone with the benefits of being able to upgrade their device at any time in any condition, having it repaired with ease and receiving a guaranteed trade-in price when they upgrade. This service drives sustainable outcomes, extending the lifetime of devices while surplus phones are repaired, refurbished and sold as pre-owned products.

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— The quarterly updated market tracker —

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Ensure you and your stakeholders stay up to date, with easily digestible quarterly updates into a range of industry KPIs, including:



Number of
deployments



Capex/opex
revenues



LTE, 5G,
network slicing



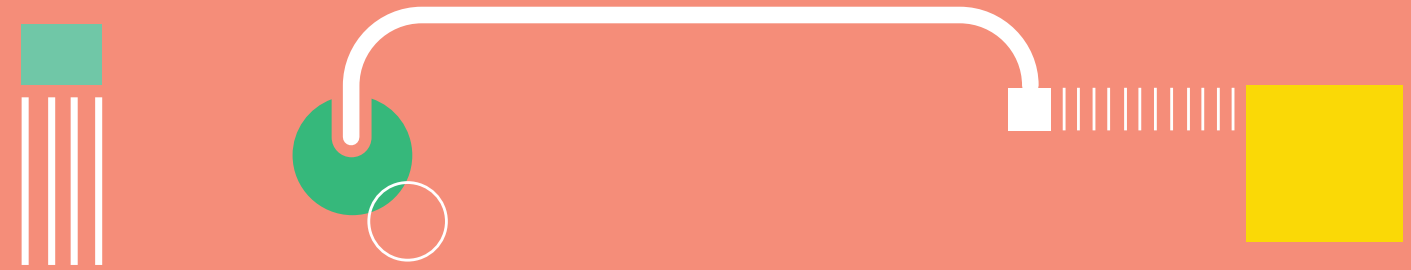
Industry
sectors



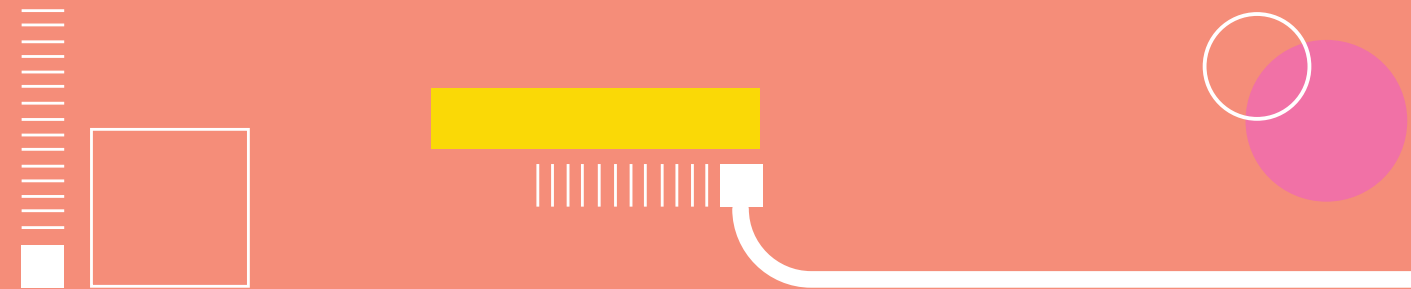
Supplier
landscape



Geography



DIGITAL LIVES





20 An early wave of interest in social media standard ActivityPub in 2023 fails to lead to truly interoperable social networking

ActivityPub has been promoted as a standard to allow social networks to speak to each other openly, and users to publish content through any platform and have their followers be able to access it anywhere. Although Meta appears to be expressing early support for this vision — often referred to as the “fediverse” — it slowly backtracks as it aims to tie users more closely to Instagram and Threads as its core social platform.

21 From 2025, smart home and wearable technology work in sync to optimize the home environment and aid well-being

Adjusting lighting and heating can increase total sleep time and quality as well as alertness during the working day. Household light and temperature settings are adjusted based on smartwatch data to improve natural circadian rhythms; smart thermostats optimize the temperature in each room for individuals’ sleep patterns, and smart bulbs adjust the amount of blue light to help people wake up in the morning and to increase natural melatonin levels at night, aiding sleep.

23 50% of Western European homes have a smart home device by 2026

By mid-2023, almost 40% of households in Western Europe owned a smart home device. Our research reveals significant intention to own more devices in the future, by current owners of smart home devices and those yet to make their first purchase. The next wave of adoption is fuelled by smart domestic appliances as households replace ageing washing machines, fridges and ovens and more of the upgraded products are connected by default. This trend leads to the average number of smart home device types increasing to four per household by 2027.

24 Over the next three years, the introduction of Auracast into true wireless headphones sparks a surge in people sharing audio streams

Auracast is a new Bluetooth capability designed for wireless audio broadcasting and sharing rather than one-to-one audio connectivity. Greater adoption prompts new consumer behaviours as people share music streams and watch videos with friends in close proximity on their smartphone or tablet. It is also an attractive application marketed for use on foldable smartphones, which are well-suited to sharing content thanks to their large screens.

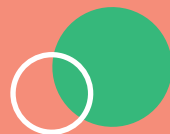
25 Someone is arrested for using AI for identity theft by 2024

The ability to use AI to create convincing fake voice recordings and photographs provides new opportunities for identity theft, potentially fooling even the most cautious people. Image generation and voice synthesis foundation models can be customized to impersonate a target using data posted publicly on social media, enabling the creation of cost-effective and realistic deepfakes. Potential impacts are wide-ranging, including damage to personal and professional relationships, and fraud in banking, insurance and benefits.



22 Amid the rise of AI, social dynamics shift toward in-person interactions by 2030

The availability and adoption of the Internet has enabled social interaction, work and administrative tasks such as renewing driving licences to be conducted digitally over the past several decades. As many companies are already applying pressure to return to the office, negative reception of AI leads to an increase in analogue or in-person activities, to avoid the risk of academic dishonesty, fraud and identity theft. A preference emerges for communal social events, from live music, theatre performances and spectator sports to participatory events such as recreation league sports and tabletop gaming.



26 By 2025, a quarter of households in the UK own a smart tag

Our Connected Consumer Radar research indicates that 6% of households in the UK currently own a smart tag, and an even smaller proportion intend to own one in the future. This subdued interest can be attributed to low levels of awareness, perceived high cost and concerns about privacy. However, as smart tag technology steadily advances, accompanied by expanded applications and continuous innovations that enhance battery life, size and connectivity options, as well as integration into existing technologies, adoption rises rapidly to reach 25% of UK households.

27 In 2024, screen-time reports on smartphones add data from wearables to give a more rounded picture of users' health

Screen-time notifications have been providing smartphone users with a snapshot of one aspect of their digital health since 2018. Integration with devices like the Apple Watch and applications like Apple's Health take the concept one stage further, allowing the phone to give periodic snapshots of people's overall activity levels and health.

28 By 2025, a major wearables company releases an early Alzheimer's detection feature for a smartwatch

Recent medical research has shown that the early signs of Alzheimer's can be detected by analysis of a person's gait. Combined with recent discoveries of medications that can slow the progress of the disease, it opens the door for wearables companies increasingly focused on detecting severe medical conditions to provide an opt-in service that warns users they may be suffering from the early stages of a severe medical condition.

29 Netflix sees at least 5% of its viewing take place on extended reality devices by 2027

As more and more people own virtual and augmented reality devices, streaming platforms such as Netflix see a surge in demand from people watching in "big screen" experiences on headsets. We forecast the installed base of virtual and augmented reality devices to hit 209 million units in 2027; at this point, the popularity of watching Netflix on virtual big screens means it accounts for at least 5% of Netflix's total viewing time.

30 A wave of AI-generated web articles with minimal scrutiny prompts a search engine to add content health warnings to its results

One of the downsides of the proliferation of generative AI has been the flood of AI-written spam articles that have lowered the quality of search engine results. In a similar way to how, in the wake of Covid-19, Google warned users that its results may be unreliable when a search topic was new and rapidly developing, a major search engine is forced to start offering content warnings on individual search results that it believes may have been AI-generated.

31 In 2024, a major gaming franchise integrates AI natural language processing into the dialogue of non-player characters

Many popular video game franchises today populate their worlds with hundreds of non-player characters with daily routines and lives of their own. Pioneering work by developers like Replica Studios combines natural language processing with text-to-voice technology to allow these characters to react dynamically to events in an individual and realistic way on a scale far beyond what would be viable through scripting.



32 By 2026, one in three households in the UK has a smart doorbell

As smart home technology advances and consumer awareness grows, the popularity of smart doorbells is on the rise. Our research shows that 16% of households in the UK have already embraced smart doorbells and we expect this number to rise to 30% by 2026 as more people recognize the security benefits and convenience they offer.



33 By 2028, a major healthcare provider offers its customers a digital twin service that proactively monitors their health

The service combines data from in-person visits to the doctor and hospital with data from the growing number of biosensors in wearables devices to assess all aspects of personal well-being and medical conditions. It enables healthcare providers to identify potential health problems more quickly, reducing healthcare costs.

34 Instagram adds an “unfiltered” feed by 2024

Among concerns about the ability of AI to create believable images, Instagram aims to offer a space for unedited photographs. Images are taken and uploaded without any chance for user editing, and watermarked as #unfiltered, apeing the experience on picture-sharing app BeReal. The move finds favour among those increasingly disillusioned by non-authentic imagery.



GOVERNANCE AND REGULATION





35 In 2024, the rise of anticipatory computing triggers widespread privacy concerns and the introduction of regulation to manage its development

The volume of data collected by anticipatory computing systems, including behavioural tracking, search results and location data, combined with concerns about its accuracy prompts legislators to set limits on how the technology can be used. However, the speed at which the technology develops means regulations consistently lag the advances being made.

36 AI oversight committees become commonplace in large organizations by 2024

Companies establish diverse oversight committees composed of AI ethics experts, legal advisors, data scientists and representatives from different business functions to review applications of AI in the business, set guidelines, conduct audits and address ethical and legal concerns. These committees bridge the gap between technical teams and the organization, ensuring alignment with values, mitigating biases, respecting privacy and adhering to regulations.

38 EU legislation is delayed and redrawn multiple times owing to the speed of AI advancement

The EU is in the process of regulating AI with the AI Act. This is a risk-based framework that would apply to all AI systems created or deployed in the EU. The legislation has a global impact in the same way as GDPR and the Digital Markets Act. However, the speed at which AI is advancing makes the construction of a robust and workable regulatory framework extremely difficult. There are also likely to be significant differences of opinion between the US, EU and market participants, with Europe taking a far more structured and robust approach to regulation. Legislation is not finalized until late 2024, leaving industry to take the initial steps at self-regulation.



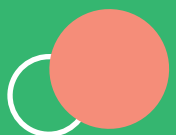
39 US regulation of big tech fails to progress in the next two years

Despite repeated promises of regulation of the US technology industry, little progress is made. Although in part because of timing ahead of a presidential election in 2024, a further factor is growing complaints that the EU's legislation is discriminatory against the mostly US companies caught by rulings. The lack of progress means the EU's Digital Markets Act becomes de facto global legislation. It highlights the enormity of the challenge facing the US in reaching consensus on the regulation of AI. In this area, the EU again reaches agreement on regulation first and in the process defines the global framework for governing AI.



37 Calls for a hiatus in AI development fall on deaf ears in 2024 as AI investment accelerates

Elon Musk and a series of industry protagonists have called for a six-month pause in AI development of systems more powerful than ChatGPT 4, citing a lack of planning and management as systems become competitive with humans at general tasks. This does nothing to slow advancement in 2023 and 2024 as fears of falling behind competitors and a more general fear of China overtaking the West propels efforts forward. Although the debate shines a light on the need for effective regulation, little progress is made in this area over the next two years.



40 Blockchain establishes a central role in addressing the challenge of explainable AI

As AI momentum grows, pressure is increasing on companies using large language models to identify the provenance of the data used for training and the basis for the outputs provided. The need for an irrefutable record of the basis for large generative models provides an opportunity for blockchain to demonstrate its value beyond cryptocurrency. In time, regulatory requirements state the need for such records. Blockchain ledgers also address the copyright problems associated with AI. Despite slow regulatory progress and the need for extensive resources to operate ledgers for large language models, major players police themselves in a display of trust and transparency. The Content Authenticity Initiative is an early example of industry-led responsibility.

41 To take advantage of post-Brexit regulatory decoupling from Europe, the UK holds off from enacting legislation slowing AI development

Brexit has created a challenging environment for UK business in the short term, and there is a growing feeling that regardless of political stance, opportunities to make the best of the situation must be found. One area of opportunity is the flourishing field of AI. London has been one of the hotbeds of the recent explosion in development, with major research entities like DeepMind headquartered in the city and Open AI opening its first international office there. As regulation in Europe stumbles, the UK seizes the opportunity to establish itself as the principal location for further development.

42 By 2025, a connectivity performance rating is mandated as part of the sale of any property in a major European market

The legislation mirrors the UK's Energy Performance Certificate, which rates the energy efficiency of buildings. The connectivity performance rating includes an assessment of indoor and outdoor mobile coverage by each network operator and the current and expected status of full-fibre broadband. Its introduction comes in the wake of reports that access to high-quality connectivity has a growing impact on property prices.

TECHNOLOGY INNOVATION



43 Self-healing displays appear on smartphones and other consumer electronics by 2028

Although currently in the early stages of development, the first self-healing displays emerge that are capable of repairing minor scratches and dents on their own. This is enabled by using a special material in the display, which when exposed to air reacts and forms a new layer of material to fill an imperfection.

44 There are over 10,000 Matter-compatible smart home devices by the end of 2025

In April 2022, the Connectivity Standards Alliance officially announced the Matter smart home standard. By May 2023, there were over 1,125 Matter-certified products. Momentum for the standard pushes the total over the 10,000 mark by 2025. A major beneficiary is Apple, whose fortunes in the smart home market are dramatically improved as a result of Matter certification increasing the number of compatible devices with the Apple Home platform.

45 In 2025, Samsung sells more foldable phones than high-end monoblocs

As monobloc smartphones become more commodity-like, with fewer distinguishing features, Samsung looks to foldable designs to maintain its market share. It gradually introduces phones with folding screens to mid-tier price ranges. This serves the company in two ways: it reaps the rewards of being the market-maker, and pushes rivals including Apple to create foldable devices, thus supporting its screen business.

46 Google's next voice assistant speaker incorporates Bard functionality, sparking a public backlash

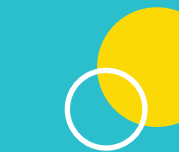
By using the capabilities of generative AI, the speaker can produce dynamic and creative responses to questions, transcending the traditional, limited preprogrammed responses of voice assistants. Concerns about the accuracy and potential for harm of generative AI responses prompt calls for tighter regulation. The concept joins the long list of Google's abandoned projects.

47 By 2030, carbon nanotube technology enables thinner, lighter smartphones with longer battery life

The technology, which employs a cylindrical structure made up of rolled-up graphene sheets, enables transistors that are smaller and more efficient than their silicon rivals. It also affects other areas of smartphone technology, such as creating smaller, more-efficient antennas with better reception and faster data speeds.

48 Generative AI has a cold shower in 2024 as the reality of cost, risk and complexity replaces the hype of 2023

There is little doubt that AI will have a significant impact on the global economy, productivity and society at large. However, the hype of 2023 has ignored several obstacles that will slow progress in the short term. Intense computing requirements mean the cost of deployment is a prohibitive factor for many organizations and developers. On-device and hybrid approaches address this over time, but do not solve the problem in 2024. Similarly, the social and commercial risks of deploying generative AI in certain scenarios result in a period of evaluation prior to roll-out. Hurdles are exacerbated by ongoing uncertainty about future regulation.



49 By 2030, the first 6G-powered massive-twinning city is announced

Massive twinning extends the digital twin concept beyond production and manufacturing applications to a wider world, leading to a full digital representation of whole environments. By capturing and modelling the physical world with sufficient fidelity — potentially including humans, physical objects and processes — massive twinning could support the management of transportation, logistics, entertainment, social interactions, digital health and public safety, offering unprecedented experiences and control. Enabled by 6G, almost every aspect of the trailblazing city is digitally represented, allowing precise modelling, monitoring and management. The concept is especially suited to countries that are building entire cities from scratch, such as Arab Gulf states.

50 By 2028, cognitive robotics accelerates to deliver more human-like experiences with robots that have multiple senses

Increasingly powerful software, fast, edge-based processing and advanced sensors allow robots to interact with the world in more natural ways than ever before. They can see, feel, hear, smell and behave in a more human-like manner while learning from the humans they interact with. Their reasoning skills aid problem-solving and decision-making, giving them a more active role in our daily lives as they become better able to move around, manipulate objects and interact. Initial growth areas include retail, healthcare, senior care and operations in remote and dangerous environments.

51 Haptic feedback accessories fail to reach consumer mass-market volumes

Haptic accessories such as gloves and vests, which aim to replicate the sense of touch for wearers in virtual worlds, have been in development for some time but remain niche. In our view, they remain underwhelming in their performance, with prohibitively high costs. The technology fails to mature and develop meaningfully for the consumer market, meaning it never achieves mass-market volumes, and it largely remains a tool for specific business scenarios.

52 A new quantum computer, not using superconductors or ion traps, establishes quantum advantage by 2030

Multiple approaches to building a quantum computer are valid. To date, commercialized quantum computers typically use superconductors or ion traps, but new approaches such as cold atom, photonic and electron-on-helium designs are being pursued by start-ups; Microsoft is exploring Majorana fermions, and Intel is leaning on its manufacturing knowledge to develop silicon quantum dots. One of these alternative approaches establishes quantum advantage — a point at which a quantum computer definitively outperforms a classical computer — by 2030.

53 AirPods gain a local “conversation zone” feature by 2025

True wireless earbuds are increasingly able to offer conversational enhancement features, helping users to dim background noise in busy environments and focus on people around them. Apple goes one step further and adds a feature that lets several proximal AirPods users create a “bubble” for group conversations, which automatically and intelligently creates spaces for their discussions, dimming background noise and making it easier to hear each other.

54 Large language models encounter an upper growth limit, and are not the pathway to artificial general intelligence

The fervour surrounding AI has centred on large language models. Some level of improvement can be found in making them larger: OpenAI's GPT-3 has 175 billion parameters, Meta's Llama-2 has 70 billion and Google LaMDA has 137 billion parameters. It is possible to improve models by improving the training data, using fine-tuning for specific applications, and simply making them larger, although diminishing returns result after a certain level of growth, perhaps at 300 billion to 350 billion parameters. The impressive results of large language models have led to prognostication about the development of artificial general intelligence, a type of AI that can accomplish any intellectual task that humans can perform, through reasoning and inference. Large language models are not capable of reason, so a different or complementary approach is needed to achieve artificial general intelligence.

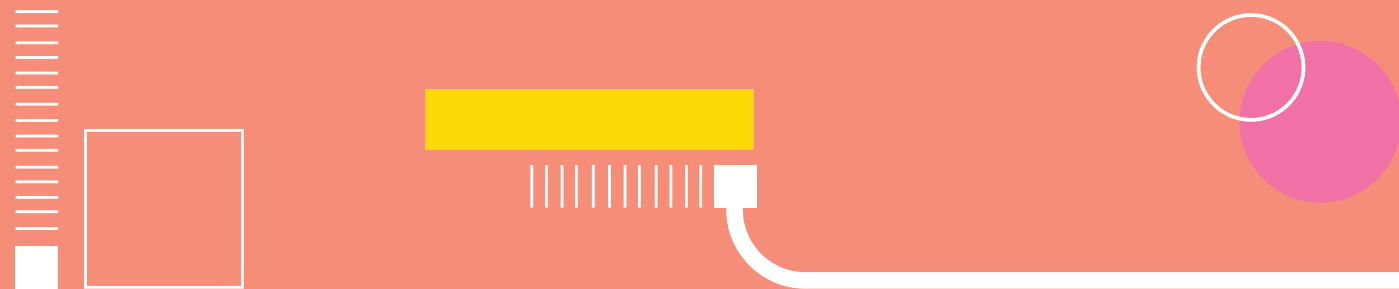
55 Apple adds support for third-party controllers to its spatial computing devices by 2026

Apple's approach to spatial computing has seen it ditch controllers in favour of a hand- and eye-tracking control mechanism. Although this works well for many apps, it does not work for games already built for other headsets. As a result, Apple announces support for third-party controllers by 2026, possibly coinciding with a more mass-market, non-Pro edition of its headset.

56 AI-powered repair diagnostics become a standard feature on some consumer devices by 2027

Device manufacturers incorporate AI into their designs, enabling consumer devices to self-diagnose problems, offer recommendations for necessary repairs, suggest suitable replacement parts and provide guidance to the nearest repair centre. This integration of AI empowers devices to analyse and interpret data, accurately identifying problems and delivering personalized solutions, enhancing user convenience and optimizing the repair process.

FUTURE OF WORK





57 By 2026, there is a revival of demand for hand-coded assembly programmers as they use their expertise to extract greater performance and plug vulnerabilities

The move aims to provide differentiation from the army of AI-generated standardized solutions. Code that is augmented or created by AI undoubtedly helps in the development of innovative solutions. It also has value in the identification and mitigation of software vulnerabilities. However, the human spark of innovation and ingenuity, especially for non-linear approaches, becomes a speciality of skilled and experienced programmers, not least for the lower energy requirements for them to undertake their work.



58 By 2026, an international consortium of technology companies collaborates with a UK academy school on a unified learning credit or certification platform

Many technology providers already have learning frameworks and certification programmes, such as IBM's SkillsBuild and P-Tech and Salesforce's Trailhead. However, subscribing to individual frameworks can be time- and resource-intensive; educational institutes are not financially equipped and lack the expertise to support the many different programmes available. An open framework approach unifies and provides standardization across training platforms. The bid is encouraged by the UK government through tax incentives; it helps the government's push to raise the digital literacy and capabilities of students, and builds the foundations needed to keep the UK relevant and competitive in the global tech economy. The move also paves the way for other business groups to make similar educational investments, as well as the potential for a backlash as concerns about corporate involvement in education grow.

59 By 2030, AI enables 50% of companies in a European country to trial a four-day working week

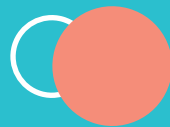
In the UK, a trial in 2022 of a four-day working week involving 2,900 employees in 61 companies saw 92% of participating companies opt to continue with the working pattern. Trialists reported increased revenue, lower employee turnover and higher productivity. As workplace tools are enhanced by generative AI in a bid to boost productivity, firms harness the power of this technology in a more considered and responsible way to offer new opportunities for many staff to spend their time more effectively. The widespread adoption of AI leads to employers in one nation championing a shorter working week.

60 Proficiency in generative AI is a common feature of job adverts for knowledge workers by 2025

The swathe of recent announcements of generative AI being embedded into workplace tools such as Microsoft Office and Google Workspace prompts a dramatic increase in demand for employees who can understand and work with AI tools. Knowing how to frame requests is essential to getting better results from such tools, and as generative AI becomes entrenched over the next few years, these skills become a requirement for employees using everyday workplace collaboration and communication tools in their roles.

61 By 2026, an application written entirely by AI exceeds \$10 million in revenue

The intensity of AI-augmented support and the repeatable nature of service functions pave the way for software products developed only by AI. This spearheads a burst of productivity and innovation that allows a broader range of developers to compose custom applications for internal and external users. It leads to a marketplace for low-level common functional services created entirely by AI, followed by a more sophisticated set of AI-written applications that generate considerable revenue. However, the move causes lasting changes in the demographics and skills of developers, sparking a backlash that sees strikes like those held by writers and actors in the Hollywood film industry.






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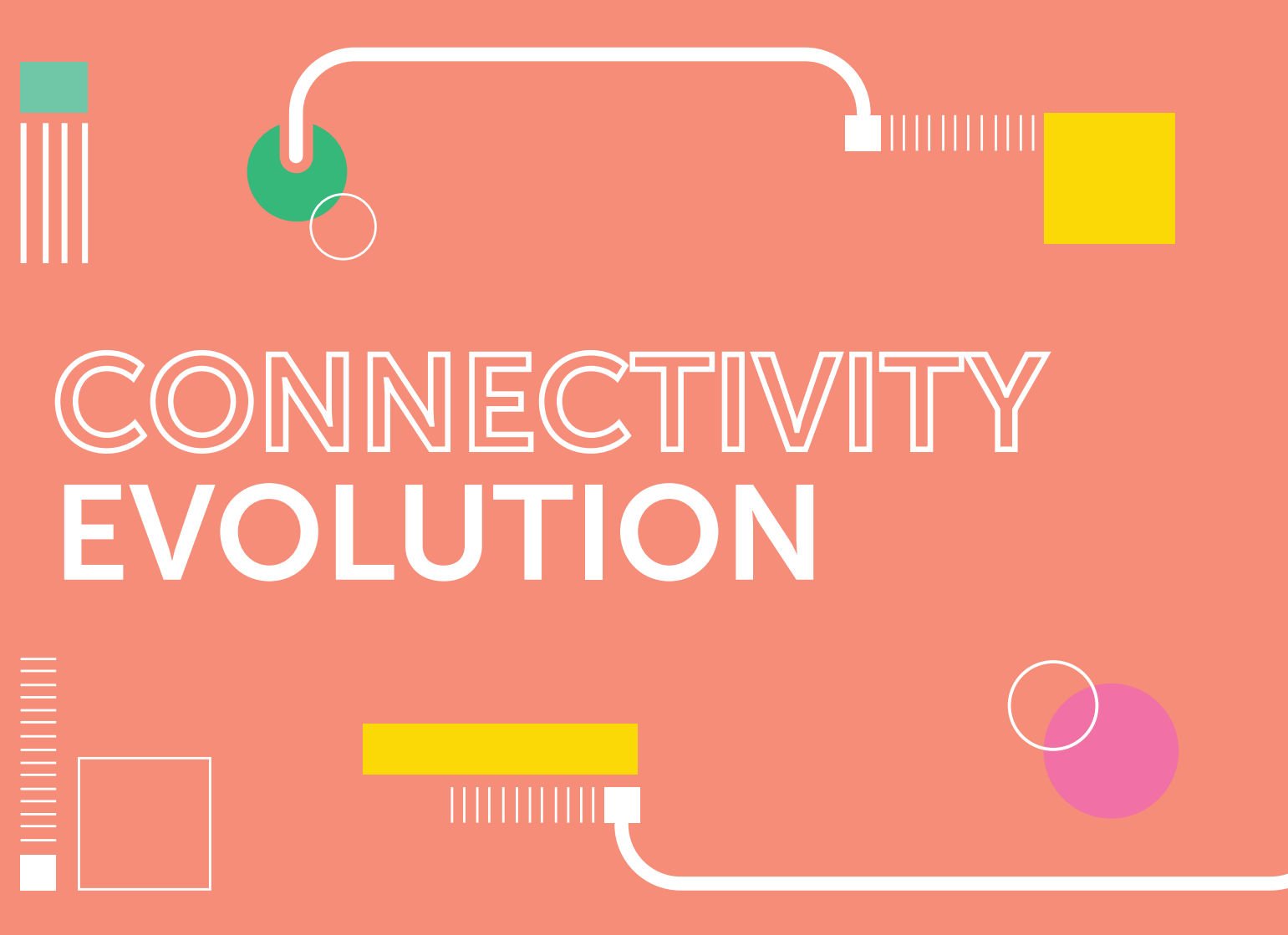
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CONNECTIVITY EVOLUTION



62 15% of smartphone users have satellite-enabled devices by 2027

As major players like Apple, Qualcomm, MediaTek and Samsung collaborate with satellite providers such as Globalstar, Iridium and Inmarsat, satellite connectivity becomes an essential feature, enabling SOS capabilities and two-way messaging, and contributing to the wider adoption of satellite-enabled smartphones.

63 Google launches a consumer broadband service in Europe by 2026

The company offers the service by agreeing wholesale terms with an existing provider, rather than building its own infrastructure, as it has done in the US. The service aims to bolster sales of its Nest smart home products and Google TV by bundling them with low-priced connectivity. Although initially small-scale and experimental, the service is closely monitored by the region's telecom operators amid concerns it could evolve into a highly disruptive offering.

64 By 2027, an in-orbit laboratory underlines the vital role of satellites in 6G networks

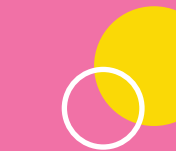
The world's first in-orbit 6G laboratory hosts an experimental environment in which institutions can develop and test technologies such as AI-assisted dynamic spectrum allocation and dynamic service-based resource management. Within two years of operation, it proves essential to satellite and mobile network operators, network solutions providers and test equipment suppliers in developing new 6G standards in space, establishing satellite-based connectivity as a fundamental element in 6G applications.

65 By 2029, all new cellular connections in at least one leading telecom market are made through e-SIM

The milestone heralds the beginning of the end for the physical SIM card. It is driven by rapid momentum of e-SIM in smartphones, kick-started by Apple's launch of an e-SIM-only iPhone for the US in 2022. This prompts Samsung to accelerate its own e-SIM strategy. Telecom operators, long fearful that e-SIM could lead to higher churn and lower prices, belatedly realize they are powerless to halt its progress. Instead of resisting the technology, they begin to embrace it, sensing opportunities to differentiate, promote network quality, save costs and lower their carbon footprint.

66 By 2026, Starlink provides data services of at least 10 Mbps directly to smartphones

We have previously predicted that by 2026 more than 25 million people will access the Internet on a satellite-connected smartphone. Starlink, with its ambitious goal of launching over 10,000 new satellites, stays on track to achieve a ground-breaking milestone in connectivity. It works with T-Mobile US to enable direct-to-smartphone services, beating AST SpaceMobile and others to revolutionize smartphone connectivity by offering data speeds of at least 10 Mbps, eclipsing alternative service offerings of lower data-rate text and emergency SOS functionality.



67 Two-way satellite communication features are added to sports smartwatches by 2025

Satellite communication has become a point of differentiation in premium smartphones. The technology becomes mature enough to be offered in other devices such as wearables. Early adopters of the technology include sports-centric brands such as Garmin and Coros, which are keen to demonstrate the ability of their devices to keep athletes and explorers protected and safe. We also expect Apple to champion the technology in its Watch Ultra range. Swiss watchmakers like Breitling, which pioneered satellite-based location beacons in watches, also embrace two-way communication.

68 The UK's first direct-to-mobile satellite service launches in 2025

By 2025, many operators around the world have rolled out direct-to-mobile satellite services through agreements with low-Earth-orbit constellation providers such as AST SpaceMobile, Lynk and SpaceX. The UK sees its first service launched in 2025, with Vodafone benefiting from its strategic investment in AST SpaceMobile to beat BT and other operators vying to be first to offer ubiquitous coverage in the UK.

69 By 2026, at least five European operators agree a partnership with a "buddy" operator from a different region

A trend of "telco twinning" emerges, leading to a new wave of alliances targeting increased scale, product co-creation, shared learning and joint procurement. It comes as the relevance of European network operators is increasingly called into question amid concerns about returns on investment and competition from major Internet players. In at least one of the "buddy" pairs, the operators make a reciprocal share purchase agreement.

70 The market for low-power wide-area networking IoT systems consolidates radically by the end of 2027

Despite being incredibly useful for many applications, low-power wide-area networking IoT systems generate such small volumes of data that network operators and cloud providers struggle to make any money with them. Their cost structures are designed for higher volumes of data and prices to match. Triggered by a wave of major players dialling down their support for the technology or exiting the market, a highly consolidated market structure takes shape with specialist providers dominating both the networking and cloud areas. This works in favour of LoRaWAN and against NB-IoT.

71 By 2026, at least five mobile virtual network operators launch in Europe with a dedicated focus on small businesses

Traditionally, small businesses have not been well served by telecom operators. Many have struggled to address the middle ground between customized solutions for large companies and mass-market offers for consumers. Spying an underserved market, virtual providers move in to target the needs of companies with fewer than 250 employees. With mostly online operations, they offer packages of affordable connectivity combined with value-added features like cybersecurity and collaboration tools.

72 In 2024, e& buys Vodafone's majority stake in Vodacom

The move enables e& — formerly known as Etisalat — to bolster its presence in Africa. To seal the deal, the ambitious Middle Eastern operator uses its growing influence at Vodafone, where it has built up a near-15% stake and its CEO has a seat on the board. For Vodafone, the sale enables it to reduce a large chunk of debt as it looks to slim down and refocus under new CEO Margherita Della Valle.

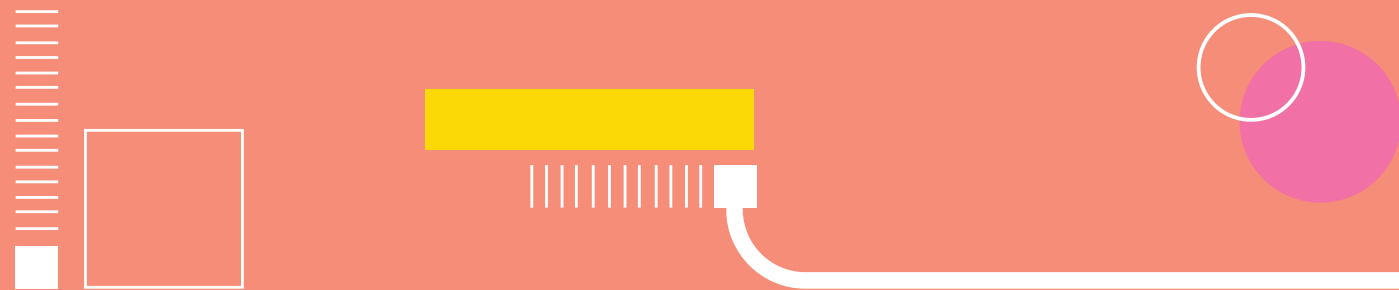
73 By 2025, Apple makes iMessage a satellite-based global service

Apple extends its investment in satellite service provider Globalstar to make iMessage universally accessible on any compatible iPhone. Satellite-based iMessage is bundled with Apple One, heightening the value of this service subscription plan and increasing the attractiveness and “stickiness” of the Apple ecosystem.

74 By 2025, AI-powered voice assistants redefine customer service in the telecom space

The move sees the largest mobile network providers in the UK using AI-based voice assistants to offer faster customer service and round-the-clock support, leading to a reduction in contact centre and support staff. Customers use voice commands to access real-time information, receive personalized recommendations about their mobile service plans and upgrades, and resolve enquiries more quickly.

STRATEGY SHIFTS



75 In 2024, Apple moves to take greater control of the second-hand iPhone market

The popularity of refurbished iPhones, which CCS Insight estimates account for 80% of the organized secondary market, starts to dent sales of new iPhone models. To address this, Apple takes more direct control of the secondary market in Europe and the US. It introduces a "Verified" grading system that aims to give consumers and distributors confidence in the devices they buy and the prices they pay. It grades devices based on technical characteristics and cosmetic appearance. In addition, Apple incentivizes network operators to return traded-in iPhones by linking them to rebates against new iPhone purchases and commitments related to the supply of the latest models.

76 Within four years of MediaTek's debut of PC processors, a major player exits this market

MediaTek joins Qualcomm as a supplier to the PC market with an Arm-based chip in 2023. It builds on MediaTek's diversification and range of products for the Chromebook segment. However, the company's entry into PCs comes at a time of considerable strain for market participants. With AMD, Apple, Intel, Qualcomm and MediaTek all targeting the opportunity, competition mounts and prices fall, leading to at least one contender quitting the market before 2027.

77 HTC exits the virtual reality market by 2026

An early pioneer in this space, HTC has struggled to compete with rivals largely because of its refusal to engage in aggressive pricing strategies. The firm has seen revenue gradually decline over the past few years and, although it is buoyed slightly by growth in the category in the coming years, by 2026 it makes the decision to shut down its work in virtual reality and sell its intellectual property to other players.

78 By 2025, an operator-led consortium tasked with developing its own generative AI emerges, and fails

Telecom operators have much to gain from generative AI, such as offering more personalized information on products and services and responding to customer enquiries more intelligently. Believing that they can go further and faster by working together, they form an alliance to pool investment and expertise. Despite initial fanfare, the effort comes too late to develop into even a complementary alternative to existing solutions from large technology firms such as Google and Microsoft. Operators disband the idea and instead focus their AI efforts on partnering with this kind of company.

79 Apple opens its first Verified Apple store in an African country by 2026

Following the opening of its first Indian store in April 2023, Apple seeks to tap into growing circular economies in developing countries. Its pioneering African outlet focuses on refurbished smartphones, tempting consumers into its lucrative services ecosystem with certified products. The move helps it counter the rising threat posed by Chinese brands such as Tecno in emerging marketplaces.


80 The metaverse becomes a brand used only for Meta experiences by 2025, with no other companies continuing to use the term

After a flurry of hype, the metaverse has become a deeply problematic term and many companies have already steered away from discussing it. New entrants into extended reality have opted for other terminology, creating a clearer divide in approach. As more participants shun the term, "metaverse" is used to refer specifically to only Meta's apps and services.






81 In 2024, Netflix wins rights to broadcast live sports

To date, Netflix has been reluctant to offer live sports because of concerns about the high price and limited opportunities to offer such programming to a large-scale audience. However, amid slowing customer growth and heightened competition from other streaming providers, it makes an initial low-profile investment, targeted at its young and tech-savvy audience. The move builds on the success of several sport documentary series and could form a beachhead to a more assertive push. Sports popular with US audiences, such as baseball, golf, ice hockey and motor sport, are a logical place to start.



82 The deteriorating health of the Android ecosystem sees Google doubling down on its own hardware

Android has suffered steady erosion of its market share over the past few years, losing out to iOS as Apple has proven increasingly adept at addressing lower price tiers thanks to more keenly priced new products, financing and a burgeoning second-hand market for iOS devices. With little evidence to suggest a slowdown in iOS growth at the expense of Android, Google responds by making bigger investments in its own hardware, software and distribution, including second-hand products. The move risks creating further fragmentation in the Android ecosystem and greater disillusionment among other Android manufacturers, but Google decides it needs to control its own destiny.





83 By 2027, a US wireless carrier buys a leading US cable company

The motivation is to make a more assertive push into the market for converged services and respond to the emerging threat posed by cable operators cross-selling mobile services through virtual network agreements. Verizon or AT&T would be the likeliest acquirers; Charter, Cox Communications or Altice USA their potential prey. Putting more emphasis on connectivity through such a deal would represent a major about-turn following several ill-fated forays by US carriers into adjacent markets, notably AT&T's disastrous \$85 billion purchase of Time Warner in 2018.


84 A major repricing of cloud providers' edge computing services takes place by the end of 2028

As edge computing grows, it becomes bigger than cloud computing over the next five years. At present, cloud providers price their edge offerings attractively in order to build higher consumption of cloud services, where they make most of their profit. As edge computing grows, they are forced to improve the margins of their edge computing services, resulting in significant price rises for many customers.



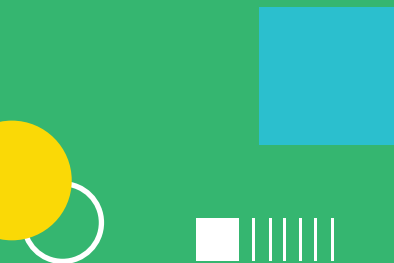
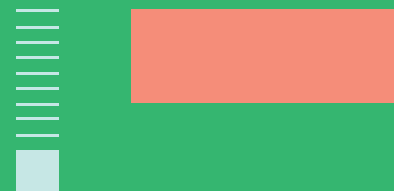
85 The "economy of things" enables 5G network operators to create a new role over the next five years as brokers in an emerging digital economy

The Internet of things enabled machine-to-machine data transfers; the economy of things takes this further, enabling devices, machines and connected vehicles to exact transactions with each other without human intervention through secure digital platforms, such as Vodafone's Digital Asset Broker. Mobile operators position themselves as brokers, providing secure 5G connectivity and digital platforms that verify "things" as devices from a trusted authority, allowing them to exchange data and money, but with the device owner retaining control.



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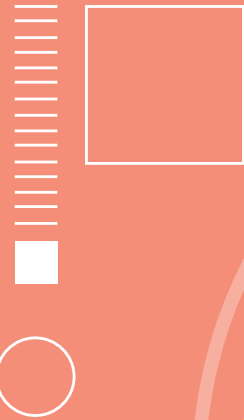
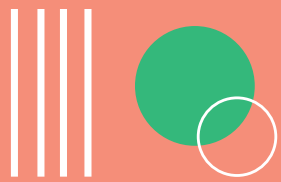
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