



## Executive Briefing

# TELECOMS 2023: MEANINGFUL GROWTH IN CHALLENGING TIMES

How telecoms can adapt and offer customers and other stakeholders an attractive way forward in markets facing inflation, and geopolitical and environmental challenges.



# Executive Summary

The telecoms industry is facing its biggest decade of upheaval since its inception. Internally, operators are going through fundamental changes in the way they run their networks and operations as these become more software- and data-driven. Externally, they are facing rapidly evolving customer demands as their businesses and lives also adapt to a more software-centric world. This in turn is driving seismic change through disaggregation of the telecoms value chain, as blurring lines between networks, cloud and IT opens new opportunities for specialised players in networking technology and services – i.e. both on the supply side for traditional operators, and in how enterprises and consumers buy connectivity services. All of this is compounded by a challenging macro-economic landscape with rising inflation and geopolitical tensions and the rapidly escalating impact of climate change.

This presents a daunting future for the telecoms industry, which historically has been slow to adapt to new market structures and customer needs. But operators and network technology companies should see these changes as an opportunity: lots of difficult change means lots of problems to be solved, and therefore new sources of revenue growth for companies that can bring the best solutions to their customers. Reliable, secure and flexible connectivity is a crucial enabler to most of these solutions. On a unit level connectivity will continue to be commoditised, but how it is delivered – i.e. how easy it is to integrate and adapt to existing processes and systems – will remain a point of differentiation. This is where traditional operators must focus in order to capture a share of the growth.

Although the technologies and applications running over this connectivity will often be developed at global scale, how they are implemented within local and national markets is likely to vary from one country to the next, owing to regulatory constraints and how these have shaped the structure and priorities of the market. This also presents an opportunity for telcos to help customers in their local markets implement new technologies.

The key to success amidst the shifting tectonic plates of the telecoms industry will be companies' ability to adapt to change, openness to trying new business models and approaches to product development, and clarity on the overarching goals of the organisation. Telecoms companies must remember that their needs are not that different from those of their customers, so wherever possible, they should use themselves as a test case for innovation and deliver services to their customers with the same level of flexibility, quality and value they expect from their partners.

Across our areas of research, STL Partners has distilled our key views on how telcos can address immediate challenges and opportunities, while setting themselves up for long term growth. They are:

- **Organisational practices** need to change to go along with network and operational technology changes. It's not about doing the same things differently (e.g. better or more efficiently), it's about being adaptive enough to keep up with what customers need and **do different things**.
- **In their consumer businesses**, operators have the experience and tools to meet the economic challenges ahead and are already showing initiative through the provision of social tariffs and collection flexibility. Moving forward, operators must remain relevant by delivering smarter

connectivity and peace of mind solutions, starting in the home and expanding beyond connectivity into solutions that help consumers manage their digital lifestyle needs.

- **For enterprises'** even more complex than finding the right connectivity is figuring out how to make all the available connected technologies fit together in a way that delivers measurable business value. Operators should take stock of their unique skills and assets within the organisation and explore how they could be relevant for solving customer challenges in a specific vertical or as a horizontal solution. Every operator has a different set of skills, so the hard work lies in identifying the problems they are best suited to solve, rather than imitating others.
  - **Private networks** is one of the hottest emerging opportunities in the enterprise space that is close to the core for operators. However, customer needs will vary widely depending on their level of maturity in using new technologies, size and how mission-critical their connected operations are. Operators may struggle to compete on cost and flexibility with global players addressing the market for standardised “out-of-the-box” dedicated networks, but can play to their strengths where they have a degree of vertical expertise and/or for customers with specific and complex needs requiring ultra-reliable connectivity.
- **Edge computing** is a key component in enabling decentralised and disaggregated networks to cope with increasing traffic and customer demands for customisation. To successfully collaborate and compete with the cloud players also targeting the edge opportunity, telcos should leverage their core strength in connectivity and distributed infrastructure to establish their presence and build credibility in key verticals of interest through strong co-creation partnerships.
- **In Networks**, traditional telcos must shift from the perspective that they are the main control point for connectivity, which pits them against newly emerging players. The mindset of “them and us” hinders potential partnerships and could result in telcos ignoring or missing out on new opportunities that require a mix of technology capabilities and vertical expertise. Instead, telcos must work with newcomers as equals and work together with them to combine skills and assets to collectively solve key market and technology challenges with “the best tool for the job”.
- **Telco cloud** is what enables agility and programmability of the network, as the network becomes ‘cloud-native’ and software-based; modular, open and interoperable; intent- and service-based; instructible and programmable; self-optimising and -healing; energy-efficient, elastic and scalable; and automatable. In other words, it is the foundation to enabling operators to adapt their core asset to rapidly changing and diverse customer needs.
- As climate change becomes an increasingly apparent and immediate issue, **operators must ensure they do all of the above while lowering their carbon footprint**. Doing this well requires systematic, transparent reporting on their emissions and broader sustainability activities, as well as much greater cross-industry collaboration to agree on standards and KPIs for measuring the impact of business activities on the environment.

In this report we detail how our forthcoming research will provide ideas and practical examples from the telecoms industry on how to live up to these ambitions.

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# The key pillars to change and growth

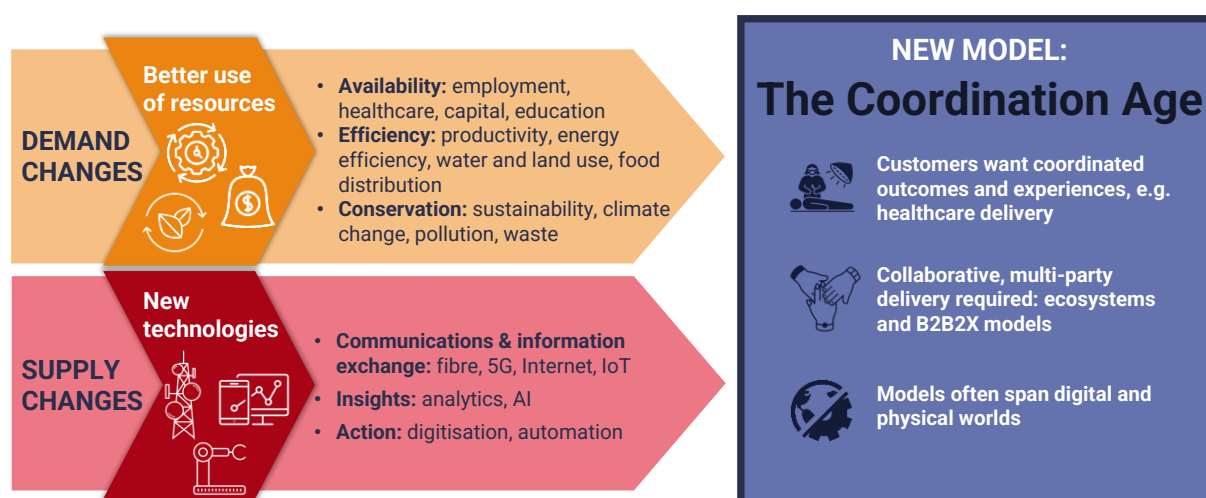
Ten years from today, telcos could find themselves growing into national or regional champions of connected technologies, working with enterprises and governments to help the world run better. Or, they may find themselves becoming marginalised, with shrinking relationships with their customers, consigned to corners of the IT market specialising in low-cost connectivity. To establish a clear path to the more desirable option one, telcos need to commit to a long-term strategy that will require fundamental changes to their business. A long-term strategy that:

- Prioritises service innovation through strong investment in research and development
- Funds ongoing innovation by shifting away from the established capex heavy financial model
- Re-orientates company systems and culture to become an effective ecosystem player, adaptable and open to multiple ecosystem roles and business models.

Commitment to this kind of strategy should happen now if it hasn't already. But current macro-economic and societal challenges may make this focus difficult to achieve. Telcos need to find a way to deal with more immediate turmoil and challenges, and be ready to seize any opportunities they present, while also progressing towards their long-term goals.

STL believes that the Coordination Age offers telcos a new context for growth. It is built upon demand for more flexible availability and more efficient use of all types of resources (energy, labour, time, etc), combined with multiple new technologies and capabilities (5G, fibre, AI, automation, virtualisation) approaching maturity. The resulting paradigm sees customers demanding coordinated outcomes and experiences, enabled through collaborative ecosystems, with business models spanning the digital and physical world. It is the context within which telcos can hope to become the champions of connected technologies helping the world run better mentioned earlier.

**Figure 1: The Coordination Age thrives on innovation**



Source: STL Partners



More immediate concerns – the energy crisis, high inflation, possible recession, the still lurking threat of new covid strains, war, climate change – demand immediate attention<sup>1</sup>. For all that these can crowd out focus on a more long-term strategy and a drive to change the role and meaning of telecoms in society, these factors are accelerating changes and mean that a Coordination Age approach is needed more urgently.

**Figure 2: Accelerating changes means the Coordination is now a “must have”**



Source: STL Partners

Telcos' national scope and assets mean that they are well placed to take advantage of some of the new opportunities. But they are large and complex businesses with many departments and initiatives to co-ordinate, and broad organisational strategy must be applied in different areas with a variety of specific goals and capabilities. In this report, STL addresses seven key strategic areas: transformation; consumer; enterprise; edge computing; networks; telco cloud; and sustainability. In each, we present our detailed assessment of how telcos can and should address current challenges and seize new opportunities, while building towards long term success in the Coordination Age, and how current and ongoing STL research can provide support and guidance.

<sup>1</sup> See previous report [Beating the crash: What's coming](#)

# Transformation: How to adapt faster and better, collectively

## Why does transformation matter?

Telecommunications as an industry is characterised by constant change: changes in network technologies, changes in the device ecosystem, changes in customer connectivity demands, changes in the competitive set. External factors outlined in our [Beating the crash: What's coming](#) report will compound these change forces, e.g.:

- Economic factors will introduce new customer conditions and increase the need for efficiency
- Environmental consequences will play a bigger role in telco operational decision making
- Political strife will have implications for network strategies and security measures
- Social factors impact employees and customers and are considerations for wider stakeholder engagement.

STL Partners defines transformation initiatives as those which aim to make organisations more adaptable and able to find growth in the midst of contextual change. These can include the adoption of specific organisational practices (e.g. continuous learning/skill development at Elisa<sup>2</sup>) or the incorporation of new technologies to improve operational responsiveness and efficiency (e.g. the use of automation and AI at Telefónica<sup>3</sup>). Of course, transformation initiatives – especially those termed digital transformation initiatives – are often a combination of both: new organisational practices plus new technologies, as in the case of Spark New Zealand which overhauled the entire organisation to support its strategic choice to expand into digital services and compete with digital natives<sup>4</sup>.

STL Partners aims to seek out the work practices that enable telcos to work better through change: those that improve the organisation's ability to quickly re-configure and coordinate resources around the challenges and opportunities that change brings. This must become a widespread capability, and not the domain of a centralised function or role.

## Why is transformation difficult for telcos?

The **confusing history of “transformation”** in organisations makes it difficult to conceptualise. Change is inherent to the telecommunications industry (3G to 4G to 5G, new devices, etc.) and telcos have always been expected to accommodate it. People are used to this type of change, and the type of change that usually comes with new leaders (e.g. changes to reporting lines or strategic priorities), or cost-cutting. But these changes, by themselves, are not transformational: transformational change

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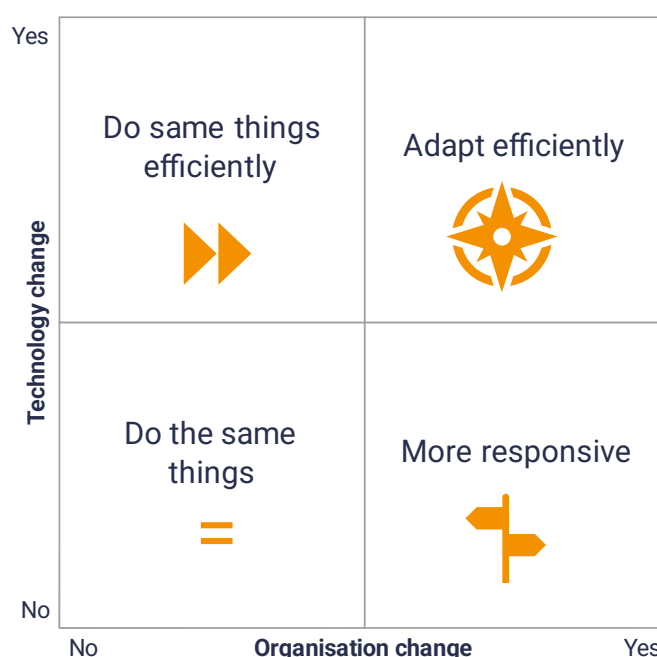
<sup>2</sup> <https://stlpartners.com/research/building-the-learning-telco/>

<sup>3</sup> <https://stlpartners.com/research/ai-is-starting-to-pay-time-to-scale-adoption/>

<sup>4</sup> <https://stlpartners.com/research/vision-stories-getting-the-most-for-transformation/>

is not about doing the same thing differently. It's about setting the telco up to be different and do different things which is necessary due to the **climate of perpetual change**. It is not about achieving a virtualised network, for example, but recognising and being ready for how that network can benefit the telco as the environment changes. Transformation initiatives should have a deliberate intention to increase the organisation's ability to respond to change and to innovate in the face of it and enable growth.

**Figure 3: Technology change + organisational change = Adaptability for growth**



Source: STL Partners

We saw this in our report on [Building the learning telco](#) (February, 2022), where implementing a learning management system was insufficient to change the learning behaviour in an organisation. New management styles and processes that encouraged experimentation with new knowledge were required to establish an effective learning culture.

**Ownership of transformation** initiatives can also be an issue which complicates the realisation of output improvements. Transformation efforts may be broken down into individual projects, with individual owners responsible for each piece. In these situations, it is easy for the bigger picture to be lost – and little attention given as to how initiatives interface with other parts of the business (other parts of the business may be focused on their own priorities). As an example, an exploration of B2B2C business models may be considered the domain of the consumer business, but should be done in conjunction with the enterprise teams, who may have a conflict of interest for doing so. Ways to

increase exposure to the “big picture” and encourage end-to-end thinking is an area of exploration for STL Partners.

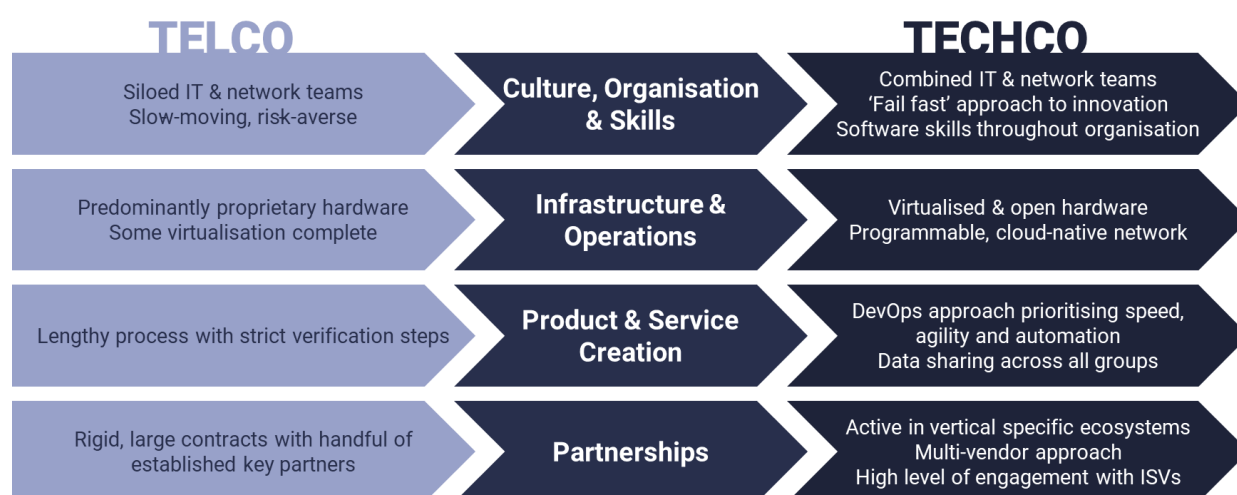
Telco leaders need to **take stakeholders with them** through transformation initiatives. Whether introducing new processes, practices or technologies, stakeholder – particularly employee – cooperation will be required to enact change and make it successful. Yet change can be uncomfortable for them. Leaders need to motivate employees, respond to their needs and manage their resistance. **Spark New Zealand’s** “no plan B” approach to transformation and comprehensive communication plan around its vision helped Spark to secure employee buy-in to its change.

Legacy practices such as siloed structures, multi-tiered management hierarchies and long-range financial planning need to be exchanged for those that are more adaptable and responsive to external conditions. Telcos must reconsider how they execute their business functions, i.e. they must **innovate operationally**, to facilitate organisational flexibility.

## How telcos can operationalise adaptability

The growth and innovation at technology companies is often attributed to their responsive and adaptable operational models, as highlighted in the report **Transitioning to techco in APAC: Priorities for success**. Telcos have started to adopt some of the practices with regard to their infrastructure (partly due to the upgrade to 5G), but this should go hand in hand with developments in culture, organisation and skill, and product and service creation, for example (Figure 4).

**Figure 4: Towards a “techco” operating model**



Source: STL Partners

It is these practices that will enable the telco to quickly **identify new customer needs and re-orientate resources** to meet them more closely. Responsiveness and innovation can unlock growth potential and are especially important in uncertain times.

There is an opportunity to **augment human potential with technical tools**, especially automation, AI and analytics. These tools are known for delivering greater efficiency, but they should also be an opportunity to help employees to balance workloads and spend more time on human-centric tasks that benefit from their creativity, adaptability and experience in the workplace (as explored in our report [The Future of work: How AI can help telcos keep up](#)).

Additionally, these practices enable telcos to **experiment with new ideas and business models** which can help them to find new roles for themselves, not only as direct service providers to their own customers, but as part of new and different value chains. These opportunities can offer alternative commercial prospects that operators would be able to explore.

## What must telcos do to capitalise on the adaptive opportunity?

Aside from the infrastructure change covered more thoroughly in other STL research areas, our transformation research explores the practices that help telcos to work better through change and capitalise it. Areas of focus include:

- Leadership initiatives to foster a **culture and values that are compatible with change**<sup>5</sup>: Leaders must encourage collaboration and devolve decision making responsibility to accelerate organisational responsiveness and develop it as an organisational capability.
- Establishing a **clear and stable vision**, or picture of the future, to keep stakeholders on course through change. A vision, tied to a meaningful telco purpose, can help to coordinate individual actions, and overcome barriers to change<sup>6</sup>. It can also be an important consideration for employee prospects and digital talent looking to work there.
- **Improving operations**: Removing practices that constrain telco responsiveness and ability to innovate and **implementing better processes**, as well as **technical** (e.g. a unified data platform) and **human enablers** (e.g. learning and development) to improve customer outcomes.
- Telcos need to keep a close eye on demographic trends (migration, urbanisation, ageing, etc.) that will have consequences for themselves (e.g. the shift to hybrid working), as well as influence the needs for telecom networks and services. Telcos should **look for areas of trend-induced opportunity** and be quick to respond<sup>7</sup>.
- As employers, telcos should **design work so that employees can focus on what humans do best**, while **technology does the rest**. Employees should not see technical tools such as AI and automation as a fad, or worse still, a threat. Employees must be trained to leverage technology constructively and in combination with their human capabilities to deliver employee satisfaction.

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<sup>5</sup> <https://stlpartners.com/research/elisa-telco-leadership-excellence-and-how-to-do-it/>

<sup>6</sup> <https://stlpartners.com/research/vision-stories-getting-the-most-for-transformation/>

<sup>7</sup> <https://stlpartners.com/research/the-future-of-work-how-ai-can-help-telcos-keep-up/>

- Telcos must be **open to new ideas and alternative business models**. They must be bold and continue to invest in innovation even when returns are not guaranteed. Attitudes towards failure need to shift so that it is recognised as a stepping-stone to learning.

Our forthcoming report list includes topics such as:

- Transforming internally: Monetising what you learn (A telco case study of post-pandemic working practices)
- Working as part of ecosystems: Telco roles in distributed value creation
- How to make AI, automation and analytics (A3) work: Setting up A3 as organisational capabilities
- Beyond silos: Cross-boundary working
- Cloud-native telcos on the inside (Processes/ Organisational impact of tech change)
- What to do with APIs?

# Consumer: (Re)engaging through new needs

## Why does the consumer business matter?

The consumer segment represents the lifeforce for many telecoms operators accounting for the bulk of their revenues. In Deutsche Telekom's home market (of Germany), consumer accounted for 50% of its revenues in 2021. For Verizon its consumer segment represented 71% of revenues in 2021. Similarly, Vodafone Group's Europe consumer business accounted for 52% of service revenue in FY 2022.

The importance of network connectivity to consumers, governments and society at large was laid bare in 2020. Telecoms operators moved at lightning speed to facilitate people working, learning and entertaining themselves at home during the pandemic. Physical elements of people's daily lives were brought online, and a wider digital lifestyle has emerged which is enabled by, and can be fulfilled by operators.

Connectivity in the home has been somewhat re-energised as customers added more electronic devices such as smart TVs, cameras, doorbells, lights and speakers (with voice assistants) to their home. Plume, the high-end smart home Wi-Fi optimising service, recently highlighted that the average number of connected devices across its customer base (of 41 million homes) has grown to an average of 17.1 per home in the first half of 2022, up from an average of 15.5 the year before.

Additionally, consumers increasingly rely on a number of connected services or subscriptions that support their everyday lifestyle needs. Streaming video and music content (Netflix, Prime, Spotify) and specialist content such as sports (Dazn, The Athletic) are the most obvious examples of such services, but physical services such as food, cosmetics and wider e-commerce facilitation, including home delivery fulfilment, would also be included.

The consumer business is important to the case for government to grant the telecoms industry a better investment environment for fibre and 5G deployment. Before the pandemic, the industry was looking to reset its relationship with government and regulators by establishing the concept of a 'social contract'. The aim of this contract is to forge a partnership between governments and telcos, with telcos helping governments to achieve their national digital agenda goals of improving the economy and society.

## What challenges are telcos facing in the consumer market?

### Some consumers may need to tighten their belt

War in Europe is impacting energy and food prices around the world with regions also experiencing devastating climate change events. The current inflationary environment has dented consumer confidence as essentials such as food, electricity, heat and higher mortgage repayments (via interest rate rises) take an increasing proportion of the consumer wallet. Recession is on everyone's lips.

Operators have seen recession before – but not with all of the above factors combined at once:

- In the previous 2008 recession, operators adjusted their propositions as customers ‘optimised’ their spend by switching from postpaid (handset) tariffs to monthly SIM-only deals, opting for prepay tariffs and downgrading to slimmer pay-TV subscriptions on their converged packages.
- The pandemic (2020 and 2021) saw operators provide more flexibility and longer payment collection terms to financially stressed consumers and businesses while government provided record stimulus to meet their ongoing commitments.

This time, while MNOs will most likely plan to provide this flexibility again, government stimulus will be constrained to essentials like energy and consumers will feel the impact of the recession a bit harder.

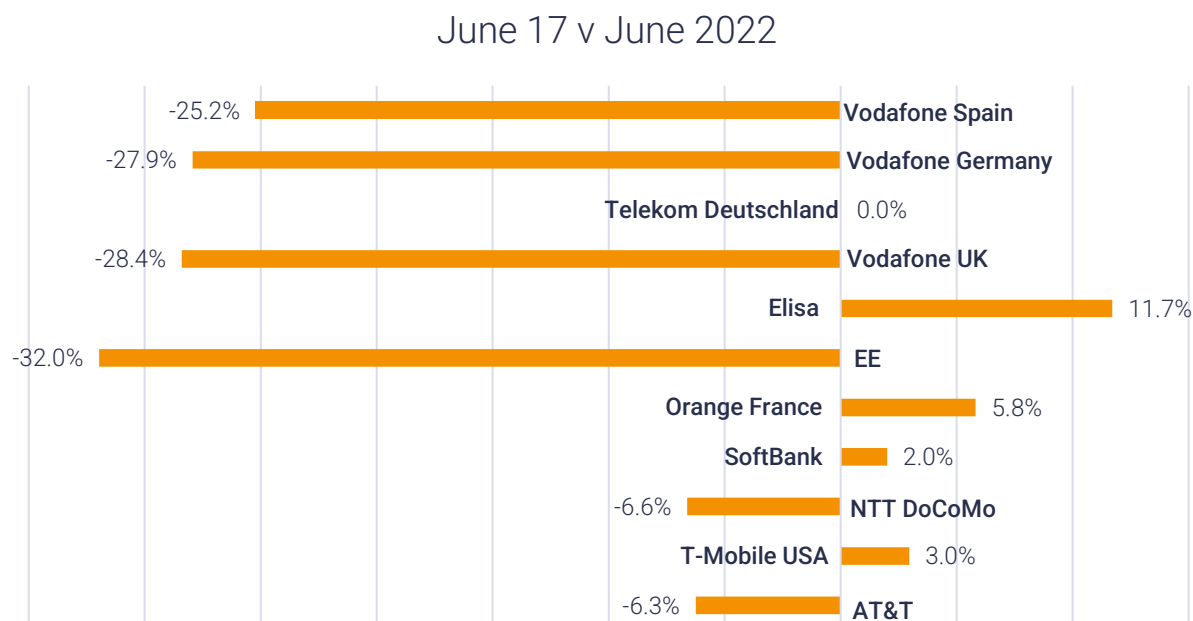
Today some operators have already noted a slight uptick in bad debt from pre-pandemic levels but not yet at a concerning level. AT&T CEO John Stankey recently remarked that it is consumers in the low end of the market that are “definitely stressed in making choices” and collection levels were impacted. Vodafone had not yet seen signs of people struggling to make payments in July 2022, but the company was anticipating a possible issue come winter. The operator, like others including AT&T, has preparations in place to help customers with advice on rescheduling payments while maintaining service and connectivity. In recent years, telcos have also taken measures to counter inflation (as well as the on-going cost of network investment) by linking their tariffs to annual price inflation. Telefónica recently remarked that as much as 80% of its revenue base has tariff mechanisms that protect against inflation, including inflation-linked tariffs in most of its Latin American markets. Some of the group’s opcos (such as Argentina) have been operating in inflation hit markets over the last decade. In the UK, Vodafone’s tariff plans are linked to annual price increases based on the consumer price index (CPI) plus 3.9%. The 3.9% component reflects network investment, equipment and supplier costs.

Despite arguments such as those from Vodafone’s CEO Nick Read that price rises ensure continued investment in the network which in turn ensures that the (government’s) national economy remains globally competitive, above inflation price rises could impact attitudes towards operators should struggling customers perceive an unfairness in these tough times.

## 5G on its own cannot mitigate commoditisation

On-going pricing competition for 5G mobile customers has made it difficult to build and sustain higher ARPU performance, and a killer, growth-stimulating 5G app has not yet been forthcoming. Most of the operators shown in Figure 5 below reported a lower postpaid ARPU in June 2022 compared to five years ago in June 2017, before the advent of commercial 5G. Indeed, operator revenue growth this year will be partially attributed to operator price increases as BT highlighted in its Q1 results in June 2022. During the pandemic, consumer priorities shifted and quality of service became paramount (a hint at de-commoditisation). As a result, consumers are less likely to downgrade broadband plans, but they are likely to shop around for better deals from other providers. Operators that can’t offer differentiated quality of service will be challenged to offer more favourable retention discounts. Customers may also hold on to their handsets rather than upgrade and switch to more lower cost SIM-only deals which will also impact ARPU.



**Figure 5: Postpaid ARPU growth/decline June 2017 compared to June 2022**

Source: TeleGeography, STL Partners

This is significant because while customers recognise importance of connectivity, they may not care which telco brand they use. Consumers may also be more inclined to switch to a lower cost sub-brand, digital brand or MVNO that ultimately uses the same network as the one they are on. This is a point often highlighted by leading consumer champions and consumer advocates when communicating money saving tips, and reinforces the idea of connectivity as a commodity.

Operators' digital and secondary brands can provide a buffer as belt tightening customers seek to optimise their spend. But they may yet have to increase prices as, like the rest of the industry, they are also going to feel the impact of energy costs on their already thin margins. This is especially the case where operators have not hedged their energy requirements in advance into 2023 or can't rely on growing their renewable sources.

## A three-pronged approach to winning with consumers

So how can telcos manage and thrive in the uncertain environment in which they find themselves? With consumer confidence low and the likelihood of constrained consumer spending as we head into winter (2022) and next year, customers' loyalty will be tested when it comes to value for money. So far there have been no must-have 5G services that have moved the needle for operators. Video continues to be a driver for data consumption.

Operators need to **stay relevant** in an era where new technology advancements and innovation is changing consumer lifestyles and ways of getting things done. Ideally, operators should ensure they are playing a central or ideally some role in consumers everyday lives. They need to build and look for

**new consumer revenue opportunities** in areas surrounding the core connectivity business. Understanding the customer's needs and identifying and resolving issues to improve customer journeys will boost **customer engagement** aiding both acquisition and retention.

**Figure 6: Consumer pillars of growth**



Source: STL Partners

## Staying relevant

The search for commercial opportunities that catch emerging technological and lifestyle trends is a high risk - high reward area for telcos. The opportunities available are not only direct to consumer (B2C), but also require partnerships with other enablers (such as hyperscalers) or other customer facing brands. Government can also play a partnering role in meeting consumer needs in for example, transport, public health, energy and entertainment/live events.

Recent STL research highlighting operator roles in enabling real-time interactive content and advanced connectivity at live venues explored one potential avenue for operators to find new roles in consumers lives and thus stay relevant<sup>8</sup>. We have also shown the role some telcos are playing in improving mass public transport as well as air quality. Similarly, our web 3.0 research<sup>9</sup> explores the potential roles of telcos in this emerging ecosystem: compute capacity; authentication support; breaking down complexities. Forthcoming report topics that will support operators in their efforts to stay relevant and support their customers' digital lives include:

- **Smart Wi-Fi:** The roll out of fibre passing millions of homes represents an opportunity to upsell advanced connectivity. This upsell opportunity is not just about offering faster connectivity, but also smarter connectivity with new services built on top, enabled by smart Wi-Fi. Not only offering better (mesh) coverage, but delivering features such as security and motion detection through Wi-Fi devices deployed around the home.
- **Lifestyle platform and subscription aggregation:** This has the potential to boost revenue as operators look to platform partnerships, direct carrier billing and e-commerce). Lifestyle platforms can also build reach and increase the level of daily interactions across the operator's app or other focal channel such as a financial services/payment app. It's interesting to note, Amazon Prime members spend \$3,000 a year on Amazon which is more than twice the spend of

<sup>8</sup> <https://stlpartners.com/research/telco-plays-in-live-entertainment/>

<sup>9</sup> <https://stlpartners.com/research/will-web-3-0-change-the-role-of-telcos/>

non-Prime customers according to Morgan Stanley<sup>10</sup>. Some operators are even partnering with Amazon with the aim of achieving similar results<sup>11</sup>.

As a cautionary note, personal subscription creep and management has become somewhat cumbersome for some consumers, and we may see elements of the subscription economy facing challenges.

## New consumer revenues

As economic pressures and lack of differentiation on basic connectivity services pose risks to consumer revenues, operators are re-focusing their effort on **the core business** by investing in fibre and 5G to address the core connectivity needs in the home and enterprise. At the same time they are looking for new revenue **surrounding the core** in areas such as subscription aggregation, content such as video, gaming and esport, e-commerce, security, and financial services. Our previous research has looked at opportunities beyond connectivity where operators such as Reliance Jio and Rakuten<sup>12</sup> aim to combine their commerce and retail capabilities with connectivity and communication. Similarly we have outlined the role telcos can play in the delivery of financial services, specifically the capabilities they can provide and where partnerships can fill gaps such as machine learning and data analytics. Upcoming research topics that will help telcos evaluate potential routes to new consumer revenues include:

- **Cybersecurity:** As customer's daily lives are increasingly connected and the number and range of connected devices continues to expand, particularly in the home, the vulnerability of consumer devices to malware, ransomware and financial losses has increased dramatically. Operators are the well placed to protect consumers' devices and their identity when on the move and in the home, where there is multiple connected devices and a wider family of individuals, in particular kids who are vulnerable to illicit content and internet device over use.
- **Bundling in energy:** Both consumers and telecom operators (and all businesses) will grapple with rising energy (and potentially labour) costs in the coming months. Some operators such as Plus Poland continue bundling energy supply such as electricity and have extended the initiative to the installation of solar panels with bi-directional meters which send (sell) excess energy back into the grid to reduce the customers energy bill<sup>13</sup>. Others such as Proximus in Belgium are working with partners to refurbish their street cabinet infrastructure as electronic vehicle charging points. In Australia, Telstra Energy customers receive electricity through a mix of fossil and renewable energy sources including energy generated by the operator's solar generation assets.

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<sup>10</sup> <https://www.nytimes.com/2021/04/29/technology/amazons-profits-triple.html>

<sup>11</sup> <https://sktuniverse.world.co.kr/main/tuniverse>

<sup>12</sup> <https://stlpartners.com/research/commerce-and-connectivity-a-match-made-in-heaven/>

<sup>13</sup> <https://www.plus.pl/fotowoltaika>

- **Consumer 5G:** Operators continue to search for ways to leverage 5G drive new revenues, whether through AR / VR, cloud gaming and eSports, video and other entertainment and digital services.

## Customer engagement

While there are some good opportunities for telcos to expand their services incrementally with consumers as outlined above, they will have little success if they are not delivering an excellent customer experience. Operators have made significant strides in the last several years by bringing customer data together into a single 360 view that customer support, marketing and sales teams can use to help solve problems faster (next best action) and identify relevant services (next best offer). However, they remain far from being "loved" brands. The holy grail of truly "personalised" customer experience is still far from the norm in the industry. Our recent research has recommended that to overcome current barriers in customer experience, telcos must focus on shared customer data platforms (CDPs) and repositories of insight from the network<sup>14</sup>. Upcoming research topics that will support telcos' efforts to engagement better with consumers include:

- **CX masters:** Customers are pay telcos for connectivity, so operators must ensure that their customer engagement teams have visibility into customers' experience of the network, and not just the history of their interactions with the operator. How a customer is using the network – when/where they experience slow connectivity, where they are using, what device / features, how many devices they have in the home, where they are positioned, quality of connectivity on each – are the types of insights that will give telcos a good understanding of a customer's priorities, and what they might value as additional services.
- **Brands and customer segments:** There is an opportunity to learn from the points of differentiation adopted by various sub- and digital brands. Operators' rationale for multi-brand mainly revolves around the low-cost secondary brands and addressing different consumer segments, but can also be used to address different business lines and experiment with different approaches. At the same time, telcos must look to retention efforts on main brands, e.g.:
  - The promotion of existing features and network benefits as reminders of why it's better to remain and not switch network. "WHY"<sup>15</sup> benefits can include bundled and exclusive content, data rollover, better roaming benefits, "stay connected" features when inclusive data is exhausted, access to nationwide and international public Wi-Fi access, Wi-Fi calling and other tariff benefits not available on secondary and challenger brands.
  - Social and low-cost tariffs will prove hugely valuable to customers. We are already seeing operators provide such initiatives such as **BT Home Essentials** in the UK **MEO Portugal Social Internet Tariff**.

Our consumer insights service will continue to explore these themes going forward.

<sup>14</sup> <https://stlpartners.com/research/a3-in-customer-experience-possibilities-for-personalisation/>

<sup>15</sup> Why EE? <https://ee.co.uk/why-ee> Why O2 Germany? <https://www.o2online.de/warumo2/#/> Why AT&T? <https://www.att.com/why-att/>

# Enterprise: Becoming a transformative partner

## Why does enterprise matter?

In the 4G era, consumer services exploded into the online world and although operators benefitted from strong demand for mobile data, they largely lost out to more innovative players at the applications layer. Now, operators are trying to adapt their enterprise businesses so that the same pattern doesn't repeat itself with enterprises in the 5G era. Enterprises will be just as demanding as consumers have been for services that make it easier to achieve their business priorities, whether that is to lower costs, lower their environmental impact, upskill their employees, or leverage connected technologies to innovate new propositions themselves. If telecoms operators do not provide their services – both connectivity and anything higher up the stack – in a way that is adaptable to each customer's needs and can feed into tangible business outcomes, then they will face ongoing commoditisation.

## What challenges is the industry facing in enterprise?

- **Monetising 5G, edge computing, private networks, and other new services:** While telcos have invested significantly in rolling out 5G networks, most have yet to demonstrate a return on their investment. At STL Partners, we believe the growth telcos are seeking from these investments will only materialise from new capabilities – enhanced mobile broadband will continue to be commoditised. Doing this will require focus on a specific area (whether a vertical or type of horizontal solutions) and a coherent play across the value chain, from networking, to enabling platforms and applications and solutions themselves.
  - The best examples we have seen in the industry so far include [Elisa's International Digital Business](#), [TELUS Health](#), Telia Division X's customer insights business, [Telefónica Tech AI of Things](#), and PCCW Global's Console Connect<sup>16</sup>. All of these have been concerted, ongoing efforts over a period 5-10 years, or more. While in some cases they have not yet achieved the level of revenue growth they aspire to, all are attempting to break out of the traditional telco mould and address real customer problems. In our enterprise research we will continue to profile examples of telcos building on their existing assets and capabilities in innovative ways to provide applications and enabling platforms.
- **Identifying your USP as a telco:** The examples above demonstrate that there is no one right strategy for telcos – every operator will need a unique strategy that builds on the capabilities it has already built within and beyond connectivity. Operators must become less reliant on examples of success among their peers for inspiration of how to generate growth. If it was as simple as replicating what another operator has done elsewhere in the world, then it would be easy, and others would already be replicating it. To generate new value, operators must do the hard work to figure out which persistent enterprise challenges they have some of the

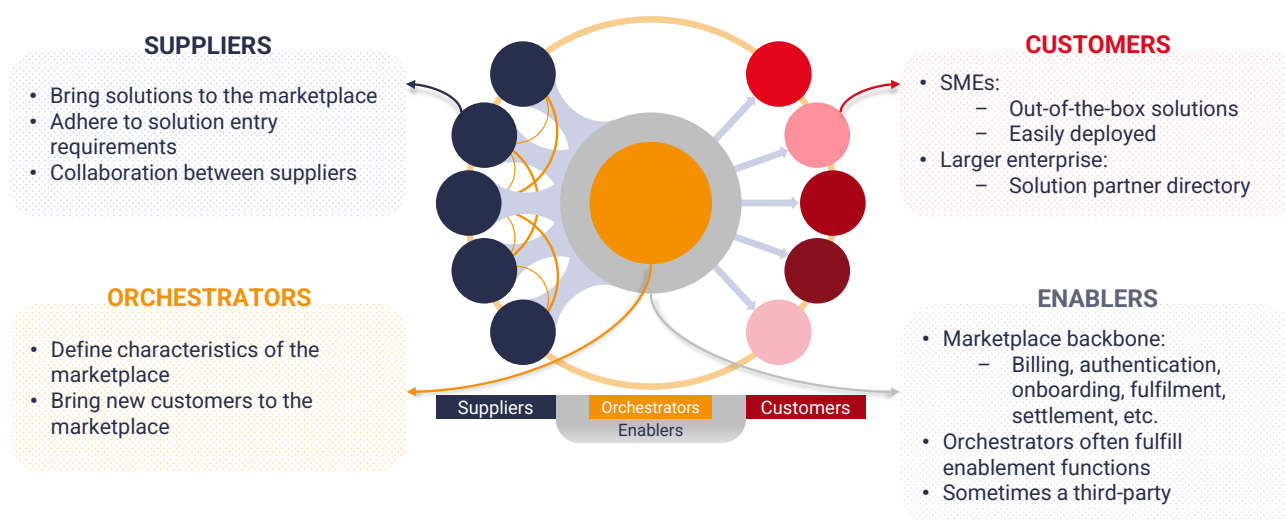
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<sup>16</sup> See [Why CFOs must drive telecoms business model change](#), pages 25-26.

fundamental skills to solve, and the appetite to invest in building a solution for over a sustained period.

- **Changing business models in the enterprise market:** enterprises and telcos alike are operating in an increasingly marketplace or ecosystem-oriented business environment. This brings benefits in terms of the ability to partner more easily with a wide range of suppliers using standardised frameworks and systems, but also creates complexity. For telecoms operators, this raises many difficult questions about what role they should play in different ecosystems (supplier, enabler, orchestrator, customer, or a mix), and how this fits with their traditional business models. More broadly, there is a question about how many business models a telco can have simultaneously, and how to effectively measure (and communicate to shareholders) the progress or success of innovative activities experimenting with new business models.

**Figure 7: Operators should aim to play a mix of roles across multiple ecosystems**



Source: *Why B2B marketplace sits at the heart of a thriving ecosystem*

- Historically, telcos have often sought to be marketplace orchestrators rather than suppliers or enablers. Because in the past connectivity was a key control point<sup>17</sup>, they are accustomed to owning the customer relationship and requiring partners to adapt to their processes and systems to gain access to those customers. However, with applications now decoupled from connectivity, telcos' control point is less powerful. As connectivity becomes more cloud-based, and new players enter the market to serve diverse enterprise and government connectivity needs, the control point will continue to shift towards platforms that help enterprises overcome the limitations of a single connectivity provider (coverage, range of services, etc.). This will happen whether traditional operators like it or not, so rather than withhold their services from these platforms, they should explore how they can be favoured suppliers within them. We are currently conducting primary research with telcos, developers

<sup>17</sup> See previous reports exploring how disaggregated networks and maturing digital services are shifting historical market control points in *Why and how to go telco cloud native: AT&T, DISH and Rakuten* and *New age, new control points?*

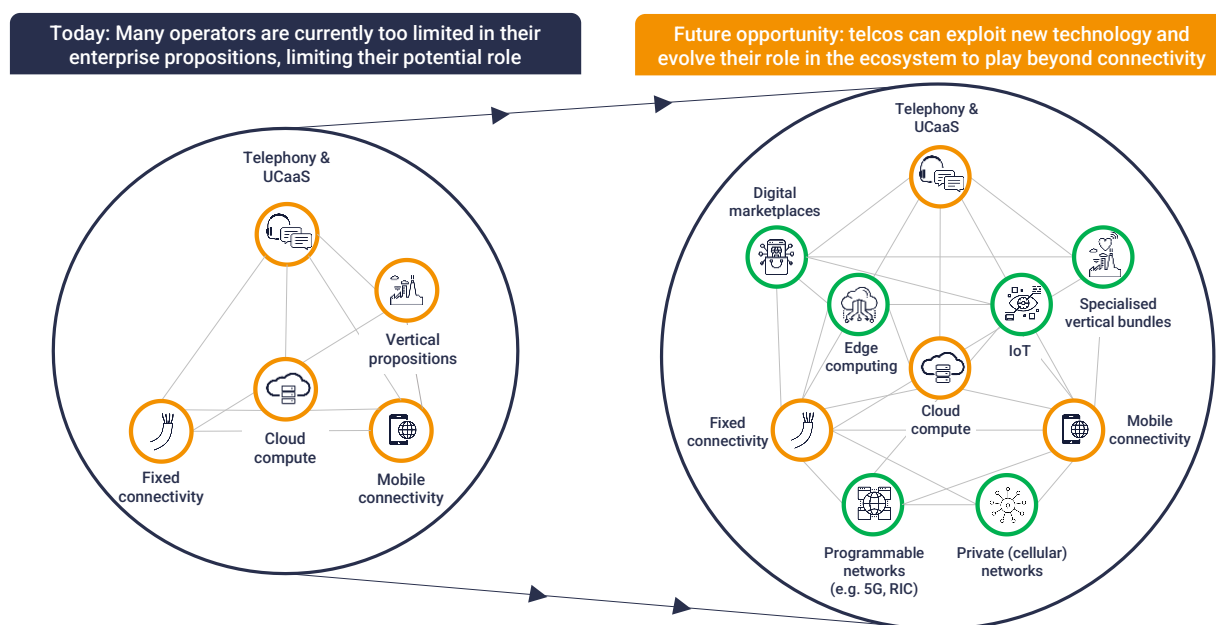
and other players on network APIs, which will feed into future publications addressing this topic in more detail.

- This doesn't mean telcos shouldn't seek to become ecosystem orchestrators, too, but rather to focus their orchestration efforts in areas where they are most likely to have success – i.e. ones that can deliver value at a national or regional level. In our view, however, connectivity alone no longer gives telcos the right to orchestrate marketplaces – if they wish to play this role, they must leverage, develop or acquire new capabilities that will attract customers (and in turn partners/suppliers)<sup>18</sup>.

## What are the potential opportunities?

While our discussion so far paints a challenging picture for telcos, we believe that with the right mindset and commitment there are significant emerging opportunities for operators. The first phase of digitalisation, where enterprises have shifted IT systems into the cloud, is maturing, and we are now entering a second phase where operations – sometimes mission critical ones – are beginning to leverage connected technologies (AI/ML, automation, digital twins, AR/VR/XR, etc.). For this to succeed, connectivity will have to shift from being a best-efforts service, to delivering the guaranteed reliability and security enterprises will demand to feel comfortable relying on connected technologies. In other words, connectivity will become more critical and more in demand, but also much less one-size-fits all. Figuring out how to deliver this at scale is a significant challenge that today's traditional telcos are well positioned to solve.

**Figure 8: There are many emerging opportunities for telcos in enterprise**



Source: STL Partners

<sup>18</sup> <https://stlpartners.com/research/why-b2b-marketplace-sits-at-the-heart-of-a-thriving-ecosystem/>



For enterprises, even more complex than the pure connectivity will be figuring out how to make all the available connected technologies fit together in a way that delivers measurable business value. Some very large enterprises, such as Bosch, Rolls Royce and General Motors (which owns autonomous driving company Cruise) will pour significant investment into this, mirroring what AT&T has done in telecoms with its huge investment in in-house expertise in telco cloud (see our [Telco Cloud Operator Profiles](#) for more detail) in their own industries. However, most enterprises will lack the skills and resources to solve these problems themselves.

Telcos are in a good position to help others navigate the complexities of getting the best balance and optimisation across physical and digital operations; they have strong foundations in AI and ML from managing their networks, large sets of unique customer data, and strong relationships with governments, enterprises and consumers. Perhaps more importantly, telcos themselves have large physical and digital infrastructures, with real diversity in terms of functions, meaning that they can trial and test many potential enterprise solutions in their own operations to understand how they could work. This is the approach that enabled Amazon to excel at innovation in fulfilment and cloud services, which telcos have rarely emulated in the past. It was also the basis for Elisa's [network automation](#) and [smart factory](#) solutions.

## What must telcos do to capture the opportunities?

Operators should continue to improve visibility and accessibility of data and software / cloud tools across their organisations. This is essential to creating an environment where employees have both the systems and time to think of new opportunities and experiment with developing prototypes. By having these capabilities in place, telcos will also ensure they are able to attract and retain employees with the desire and ability to innovate.

They should also take stock of the unique skills and assets within the organisation and explore how they could be relevant for solving customer challenges in a specific vertical or as a horizontal solution. Based on the examples of success outlined above, the best opportunities beyond connectivity bring together a combination of A3 (automation, AI and analytics), vertical expertise and a unique asset or market position. In many cases, something that begins as solution for one vertical, with an "anchor customer" or service that delivers initial revenues and builds confidence in the new business, can then be applied in other sectors with similar challenges.

The order in which an operator integrates each of these elements is likely to vary, depending on which one is their starting point and the most immediate customer needs in their market. For example:

- Telia Division X includes the operator's IoT business, which provides a core source of revenue for the innovation unit. From there it spent significant effort aggregating and anonymising customer data, to develop unique customer insights for key customers of its IoT business – including many government bodies seeking support for better planning of resources such as public transportation. The customer insights and data analytics / AI skills it has developed are also relevant for retail, and may enable it in future to play a key role in data ecosystems in the Nordic markets where it operates.



- TELUS Health, in contrast, started with a decision to develop vertical expertise in a specific sector where it felt its position as a national operator could give it an advantage. It chose healthcare, making numerous acquisitions to become the leading health IT provider in Canada. Since then, it has built a data exchange platform, and applied its skills in application and data management to create a similar platform for the agriculture sector.

Operators should be realistic about which elements of an end-to-end solution they can deliver, who they will need to partner with and how, and how long it will take to deliver returns. This is true even for big emerging horizontal opportunities such as private networking, where operators feel they have a natural right to be the orchestrator of end-to-end solutions.

For investments into new areas that will take longer to deliver returns, operators must be able to communicate their long term vision to investors, and demonstrate that doing new things does not negatively impact the core connectivity business – or even how it benefits the core business. For example, TELUS Health has long been included in the company's wireline revenues, where its health IT solutions have helped support demand for its fixed connectivity in primary care organisations.

Make space for innovative ideas to filter up from operational teams, with mechanisms and processes in place to support their development into potential commercial solutions. However, ensure new ideas also have clear milestones for further investment – building new business should be iterative, addressing customer need at each stage of evolution.

In our enterprise research, we will explore these topics in more detail through analysis of new technologies, deep dives exploring the value of 5G, private networks and A3 for key sectors, and of emerging business models to meet shifting enterprise demands on how they adopt connected technologies.

Our forthcoming report list includes topics such as:

- Data monetisation update: New use cases and data sources
- Hybrid working: How telcos can help enterprises empower their workforces
- Transport & logistics: The role of 5G and private networks
- SMBs: What's the telco strategy
- Network APIs: Where and how can they add value to applications?
- The private networks ecosystem: Who to partner with
- A3 for private networks
- Digital services in enterprise: Moving to an aaS model

# Edge computing: Getting compute to where the customer needs it

## Why does edge computing matter?

The edge computing market has steadily grown over the last few years. Enterprises continue to deploy edge solutions and explore the advantages it adds to their operations. Different types of edge vendors and solutions providers are leveraging the opportunity to strengthen their propositions in the enterprise sector. Whether it is to enable building resilient and efficient networks with more distributed and virtualised infrastructure or to accommodate enterprise use cases with special latency, bandwidth and security requirements, edge computing has become an important element of next generation connectivity.

Telcos cannot afford to miss on the edge opportunity, both commercially and operationally, as use cases and customers' requirements develop beyond what legacy centralised network infrastructure can support. This is also important as other large competitors such as cloud hyperscalers and data centre providers are actively addressing these customer needs to expand into the enterprise market with on-premise and regional edge offerings, which could further erode telcos' presence in the market.

## The key challenges and opportunities the in edge market

The edge market is not fully mature and will likely be impacted significantly by the various major macro trends we discussed in our report [Beating the crash: What's coming?](#)

These macro trends might impact the development of the edge market in several ways including:

- **Commercially and financially** by affecting the appetite for investing and spending on edge solutions for both telcos and enterprise. They can also impact where and how stakeholders chose to spend their money, such as which verticals to focus on or which value chain layer to invest in. As mentioned above, edge computing is still developing and sectors that are the most nascent, such as the network edge, are most at risk of slowing investment and customer demand.
- **Organisationally** by changing telco and enterprise priorities and mindsets towards the edge. Telcos and enterprises might become more risk averse and therefore want to focus on their core business rather than experiment with new technologies. They might also reevaluate the main role of edge in their business.
- **Operationally** by directly or indirectly affecting the supply chain and suppliers' ability to source equipment and components. Edge computing deployments are, in many cases, enabled by combining expertise and technologies from various sources. Any macro trends that limit or enhance collaboration among stakeholders would have a serious impact on edge use case innovation. Moreover, the impact is not limited to components and technology but also human resources and the availability of a skilled workforce.

Edge computing stakeholders face both challenges and opportunities, including ones that impact the telecoms industry as a whole and others that are unique to the edge market. The table below highlights some of these challenges and opportunities and how current global affairs could affect them.

**Figure 9: Challenges and opportunities for edge computing**

	Challenges and threats	Opportunities
<b>Climate change and environmental issues</b>	<ul style="list-style-type: none"> <li>Increasing the cost of building and maintaining edge sites including physical locations and the energy required to run them means that there might be:               <ul style="list-style-type: none"> <li>Fewer suitable sites for edge data centres</li> <li>Increased requirements on site and equipment protection and energy consumption (cooling/heatings)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Harsher climate could impact management and energy consumption of hyperscale data centres, leading to higher cloud prices               <ul style="list-style-type: none"> <li>Enterprises might consider on-prem edges as a more reliable and cost-effective option</li> <li>Conversely, the cost of energy might push some companies to get rid of their underutilised traditional on-prem compute infrastructure and offload workload to a network or regional edge.</li> </ul> </li> <li>Building greenfield edge data centres that are more energy efficient.</li> <li>Reducing data flowing through the network by filtering at the edge can reduce backhaul costs and energy consumption.</li> <li>More renewable energy sites such as offshore wind farms and nuclear plants will drive the deployments of edge. Edge computing use cases that can help reduce energy consumption could become higher priorities for customers.</li> </ul>
<b>Political tension</b>	<ul style="list-style-type: none"> <li>Less stable global supply chain</li> <li>Shortage of resources and talents to drive innovation</li> <li>Less priority is given to research and experimental use cases</li> </ul>	<ul style="list-style-type: none"> <li>The increased focus on domestic supply chains means that resilience and data security/sovereignty is valued more and can accelerate deployments</li> <li>The need for a more diverse, resilient and distributed network infrastructure</li> </ul>

	Challenges and threats	Opportunities
	<ul style="list-style-type: none"> <li>International sanctions limit technology and innovation sharing</li> </ul>	can encourage the development and uptake homegrown technology.
<b>Societal issues (Covid, pandemics, etc)</b>	<ul style="list-style-type: none"> <li>Technology innovation is not a top priority when dealing with major natural disasters. Government funds are redirected to disaster relief programmes, social services, etc</li> <li>Some disruption to traditional cross-business/industry collaboration, knowledge and idea sharing</li> </ul>	<ul style="list-style-type: none"> <li>Driving new ideas out of necessity to improve the efficiency and delivery of essential public services: healthcare, transportation, education, etc</li> </ul>
<b>Economic issues and inflation</b>	<ul style="list-style-type: none"> <li>Increasing cost of equipment and raw material and disruption to deployments can translate into higher CAPEX and opex</li> <li>Limited appetite to invest from telcos and other stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>Exploring new models to fund and build edge locations</li> <li>Drive competition and create new players based on business model innovation</li> </ul>

Source: STL Partners

As a relatively nascent market, the edge is also characterised by the following challenges.

#### Use cases can get too complicated and not easy to scale

- There is no single 'killer app' for edge computing. Use cases vary across verticals and stakeholders, including both solution providers and enterprise customers, are working to identify use cases that will drive adoption and revenue.
- Use cases that enable real transformation within the enterprise, such as automating and coordinating processes in industrial settings, can be some of the most complex to implement and replicate. Such use cases require fundamental changes across the environment. This can start from redesigning the entire process and goes all the way to retraining the staff, reconfiguring devices, and reallocating resources to accommodate the new process along with scaling requirements. As a result, they are slow to implement and it will take time for the industry to build strong proof points of the value of these edge-enabled use cases, and best practice on how to implement them successfully.

#### The ecosystem is diverse and still evolving

- Building and scaling edge infrastructure, especially network edge, involves multiple stakeholders** including telcos, enterprises, hyperscalers, neutral host providers, equipment providers and application developers. They need to collaborate efficiently and have their requirements aligned to establish a sustainable framework.

- **Some players looking for opportunities across the value chain.** In some cases, they must collaborate and complement each other's offerings to deliver end-to-end solutions. In other cases, their offerings will overlap and compete. The competition between hyperscalers and telcos (where they partner with each other to establish a network edge services but will continue to compete for a larger role in the market) is an example of how such dynamics work.
- Relationships with traditional partners, suppliers and competitors are being redefined and telcos and others are assessing ways to move forward.

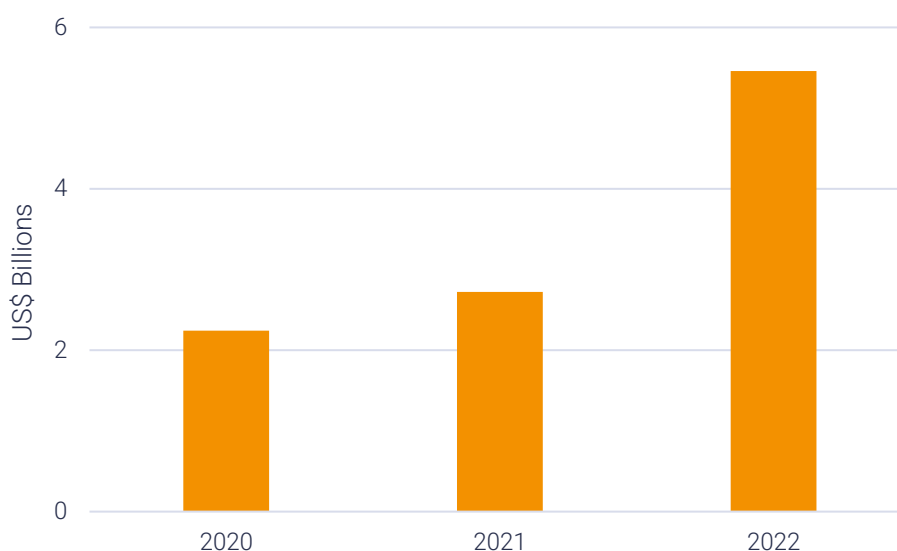
### High cost/risk but no clear ROI for some players

- In the search for killer apps and solid business cases, many players hold off big investments and long-term commitments. Although telcos and other stakeholders might be anticipating a big opportunity with an edge, they are not quick to invest in expensive and complicated deployments without proven ROI. Spending on enabling infrastructure and platforms is dependent on developing scalable revenue-generating applications and vice versa.

## So where to invest?

Despite the challenges, the data from our [Edge Investment Tracker](#) shows a steady growth of edge investments over the last two years and has been, so far, resilient to the major global changes including COVID19 and post-COVID19 economic effects.

**Figure 10: Total investment on edge computing 2020 – August 2022**



Source: STL Partners

- **Simple and greenfield use cases that are easier to deploy** and do not require the burden of reinventing processes, such as video analytics and asset tracking, can offer good monetisation and cost-saving opportunities. Video analytics is one of the main use cases driving the adoption

of edge computing across different environments including airports, stores and stadiums for commercial and public safety and security services.

- **Rising opportunities in emerging sectors.** While manufacturing has attracted much of the edge computing investment over the years, there are other sectors where adoption is starting to accelerate. For example, interest from the public sector and defence is rising and is supported by good funding levels and rapid innovation and sales cycles. Another example is the retail sector where retailers, both online and physical stores, are exploring ways to meet and improve customer experience efficiently. Use cases in these scenarios include using edge computing to virtualise traditional equipment such as the point of sale (POS) system and to enable video analytics supported advertising, service customisation and traffic control. Also, our [Edge computing market sizing forecast](#) estimates a sizable demand to come from the media and transport sectors by 2030.
- **The private networks market** is also developing in conjunction with edge computing. Many private network use cases such as automated guided vehicles and real-time monitoring rely on or can be enhanced using edge computing. Edge stakeholders have recognised these parallels between the two markets/technologies and are actively expanding their solutions and services to reflect that and push the adoption of both markets.

## What must telcos (and others) do to capture the opportunities?

To capture the opportunity, telcos need to explore different business cases and roles within the edge value chain beyond their traditional connectivity play. The platform and the application spaces are lucrative areas in the edge market and providing end-to-end solutions can help telcos to capture a larger share of the pie. However, that level of verticalisation would require telcos to invest more in understanding vertical market requirements and acquire new skills in application development and system integration to deliver these customised use cases.

The fragmented and complex market state, with many different technology vendors and service provider options, might enable different partnership opportunities. However, it can be challenging for small and new customers to navigate and explore their way into the space. Telcos and other players still need to put effort into demystifying the edge for the enterprise community and educating them through real-world use cases delivering tangible business outcomes, while also demonstrating long-term support and commitment to further encourage adoption.

Our [Edge Insights Service](#) is a highly valuable educational and strategic tool for any player in the edge market, covering extensive research into existing and emerging business models and use cases for edge computing. We are updating our edge market sizing forecast and edge capacity forecast by the end of 2022 to reflect changes in the market and in our views. Within the course of the next 12 months, we are also planning to continue covering opportunities and challenges for edge including the role of **AI and automation in edge, security for edge computing**, and the benefits of **edge for sustainability**.

# Networks: Developing and delivering the best tool for the job

Networks are evidently the core element of telecoms operators' businesses. We could even argue that networks have been too central, dominating decisions around how to invest in innovation and differentiation (i.e. a waterfall rather than agile approach, capex heavy), and instilling a mindset of exceptionalism that has created barriers in adapting to today's rapidly changing and increasingly software-centric – and silicon-centric – world.

In particular, we believe that to succeed in the 2020s, operators need to accept that 5G cellular networks are just one of many connectivity technologies that will all need to co-exist and complement each other. A recent swing of investment towards FTTX in some countries suggests this message is already apparent to some, while rocketing interest in satellite constellations has pulled a few operators into its orbit too.

## The key challenge: Moving to a world of “network diversity”

The mobile part of the telecoms industry has long revolved around a predictable network upgrade cycle, with each new “G” bringing more powerful networks enabling new applications and (generally) driving revenue growth for vendors and operators alike, albeit with a few glitches and delays.

The narrative around 5G has focused primarily on how it could underpin the transformation of many other “vertical” industries, although often with limited attention paid to the timings of 5G “phases”. Yet there is still not enough honest assessment of how 5G is helping transform the telecoms industry itself.

In fact, it is not only or specifically 5G that is transforming telecoms, but rather the confluence of a range of rapidly evolving technologies in networking, alongside parallel developments in regulation and business models. AI and automation, cloud computing / virtualisation and the evolution of other types of connectivity including Wi-Fi and satellite are all playing their part.

There is also a shift in the regulatory and policy domain, with many authorities open to new forms of infrastructure sharing, as well as mechanisms to drive better coverage of both fixed and mobile networks. The financial markets have also played a role, encouraging new infrastructure investment vehicles to emerge, spanning from multiple fibre AltNets to numerous mobile tower spinouts.

From this rich mix new types of telecoms operator are emerging. They are challenging incumbents' positions, driving innovation in technology and business models, and extending options for customers in both retail and wholesale telecoms sectors. The softwareisation of networks allows for many new layers of the network to become multi-tenant platforms – or for different technologies to be combined together.

Although in the past a few other sets of providers have co-existed with the main telcos – such as MVNOs, international wholesalers and small rural operators – they were mostly overlooked in industry-wide commentary.

But the difference between a “virtual” operator using another’s network, compared to an operator using a virtualised network is disappearing. Essentially all operators now use a mix of their own assets, plus those of towercos, cloudcos or fibre infracos.

Niche wireless providers, such as indoor coverage specialists, satellite operators and rural fixed-wireless ISPs can now buy and deploy the same types of 5G radio equipment or core networks as public MNOs. They are telcos in all but name.

Enterprises and governments are not only building networks for their own use but have started selling them to others. They may not always sell to consumers, or even a wide set of other businesses – but then few traditional telcos are completely ubiquitous either.

Numerous other niche providers are also offering telecom services – for consumers, businesses, vehicles, IoT devices and more. Many of these are linked to, or based on, cloud platforms. Indeed, the hyperscale cloud / technology giants are also offering telecom services in many ways as well.

At the same time, the pandemic – and the rise of cloud services for streaming and remote working – bolstered the importance of residential broadband, with massive acceleration of fibre investment in both established and laggard markets. Some countries such as the UK now have over 100 operators building FTTX networks, which must surely lead to imminent consolidation.

If networks really are that central to the future of business, consumer and government existence, then it should be unsurprising that there will be a wider demand for control and ownership of the assets.

Looking out to 2030, it now seems clear that the telecom landscape will look very different. This won't be just because of 5G, or fibre, or Open RAN, or private wireless deployments in enterprise. It will be because of a widespread belief that traditional telcos won't be able to meet the huge diversity of customer requirements.



**Figure 11: Summary of new telcos' threats to traditional telcos**

New telco type	Private 4G/5G network role	Wider B2B & enterprise role	Role in fixed home bband	Role in mobile for consumers	Infrastructure / Under-the-floor	Wildcards to watch
Greenfield telcos						
TowerCo+						
Neutral Host						
WISPs						
Foreign telcos						
Vertical MNOs						
Utilities						
"Heavy" MVNOs						
Satellite						
IT / cloudcos						
Govt / municipal						
Fixed <> mobile						
Telco SI units						
Industrial SI's						
Internal IT svcs						
Decentralised						
IoT players						
Community SPs						
<b>Key:</b> Risk to traditional telcos	<b>No / little threat</b>	<b>Risk of niche displacement</b>	<b>Significant challenger</b>	<b>Major issue for trad. telcos</b>		

Source: STL Partners

## It's not about 5G, but the best tool for the job

STL believes that telcos (as well as policymakers) should pursue a strategic approach of "connectivity diversity" for networks, especially in the enterprise sector where IT managers and CIOs typically have a strong idea of the solutions they prefer to buy. Hybrid networks are also important for sectors such as railways, while even gigabit home broadband is driving demand for better Wi-Fi versions 6/6E/7 and IoT-centric platforms such as Matter.

Traditional telcos must shift from the perspective that they are the main control point for connectivity, which pits them against the newcomers. The mindset of "them and us" hinders potential partnerships and could result in telcos ignoring or missing out on new opportunities that require a mix of technology capabilities and vertical expertise.

They should also ignore vendors that are selling 5G “hammers”, suggesting that all verticals are simply “nails” that can adopt cellular networks everywhere and for everything. 5G network slicing does not create a “multi-tool” for telcos to address all scenarios.

Instead, operators must work with newcomers as equals and work together with them to combine skills and assets to collectively solve key market and technology challenges with “the best tool for the job”.

Rather strangely, while mobile telcos are rethinking their roles, some parts of the fixed-operator side of the industry are now pitching the same story that 5G is just emerging from. A group of operators and vendors is pitching today’s fibre as F5G, with a vision of a similar 8–10-year loop – and a much more complex architecture for network control and even “slicing”. This looks like a potential error in the making.

## Adapting regulation and policy to the new industry landscape

In this environment of far greater diversity of providers and technologies, regulators must also ensure they do not hinder innovation and development by sticking to traditional licensing and oversight regimes that benefit incumbents over new entrants. Their counterparts in competition policy, on the other hand, might need a broader and more multi-dimensional vision of the industry beyond simply weighing up the benefits of three versus four nearly identical consumer operators.

For example, regulators should focus policymaking more on the requirements of indoor connectivity, where the bulk of wireless usage and value accrues. This has implications in terms of spectrum rules, competition considerations, wholesale models and many other regulatory levers.

More broadly, as connectivity moves from being a “best efforts” enabler for business to supporting critical, time-sensitive operations with much more stringent reliability and security requirements, regulators must re-consider what makes a “good” network. The requirements attached to spectrum licenses today around population coverage or average speeds are not fit to support mission critical applications, or aligned with government’s net-zero targets, for instance.

There are plenty of other debates in the policy sphere too – especially as 6G priorities and design goals come into view. Cybersecurity and geopolitical issues may have an outsized impact. At the same time, the 2020s edition of the perpetual Net Neutrality debate is haunting the industry once more – although this time often conflated with the power of “Big Tech” and concerns about data, privacy and platform power. It’s not obvious that Netflix and YouTube streaming are causing financial pain to operators’ broadband though – if they can’t profit while delivering 10Mbps video, why are they selling 1Gbps broadband?

## What are the potential opportunities?

There are a multitude of opportunities in future networks for telecoms companies that adapt their perspective to the notion of network diversity. Key areas we will explore in our research include:

- New technologies and approaches to driving network evolution, e.g.:

- Can CSPs monetise the new generations of Wi-Fi, either in homes or business environments?
- Digital twins in telecoms: Where do they bring value?
- Network use metrics: Good vs. easy and why it matters for regulators
- 6G update: How is it evolving? What should be the goals and priorities?
- Understanding key priorities and technology considerations in different verticals:
  - The role of 5G and private networks in transport & logistics and utilities
  - 5G C-V2X and connected car connectivity
- New players and business models:
  - New satellite connectivity technologies & services: How they fit in network evolution
  - Wholesale and open access networks: What approaches are working (or failing)

# Telco cloud: Making the fabric customer-adaptable

## Why does telco cloud matter?

STL Partners defines telco cloud as the virtualisation (softwareisation) of telecoms networking functions and infrastructure, so that they ultimately become a form of cloud dedicated to running telco networks and optimised to deliver telco-grade performance and reliability. Like any other cloud, the telco cloud needs to evolve to run over any virtual or physical server infrastructure. Ultimately, it needs to have hardware-software independence so that it can be built and operated where it makes the most sense financially and technically to do so: over private telco facilities, or a hybrid of private and one or more public clouds, or entirely over non-telco-owned facilities.

Telcos that are going through this journey of network virtualisation, in the core first and increasingly in the RAN, face major challenges as it changes the technological and organisational basis for creating, managing and delivering network services. Essentially, 'telco' and 'cloud' are converging: telco is *becoming* cloud, or as US challenger Dish Networks puts it: "we're not a telco company, we are a cloud company that offers a telco service".<sup>19</sup>

## Telco cloud and network disaggregation

Telco cloud is also a foundational element in a broader process of network disaggregation, where the different elements of the network – software, hardware, and network layers, functions and domains – are broken up into standard, component parts that can be distributed, reassembled, reconfigured and programmed to support a plethora of new software- and compute-directed use cases, in addition to enabling more advanced, efficient and sustainable connectivity and communications services.

Telco cloud is what enables this agility and programmability of the network, as the network becomes a 'cloud-native', software-based and -directed artefact: modular, open and interoperable; intent- and service-based; instructible and programmable; self-optimising and -healing; energy-efficient, elastic and scalable; and automatable.

## Delivering Coordination Age goals

These characteristics make the 'cloud-network' an integral element in delivering some of the goals and needs of the Coordination Age around, for instance:

- Enabling connectivity-as-a-service delivered over any physical infrastructure, to any location
- Delivering edge compute-based services and use cases that power more resource-efficient and sustainable processes in industry, and intelligent, automated services addressing social and individual needs

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<sup>19</sup> <https://www.rcrwireless.com/20220926/5g/three-learnings-from-the-dish-cloud-native-5g-deployment>

- enabling telecoms itself as an advanced, resource-efficient utility service that can adapt to changing social needs and economic circumstances.

## What challenges is the industry facing in telco cloud?

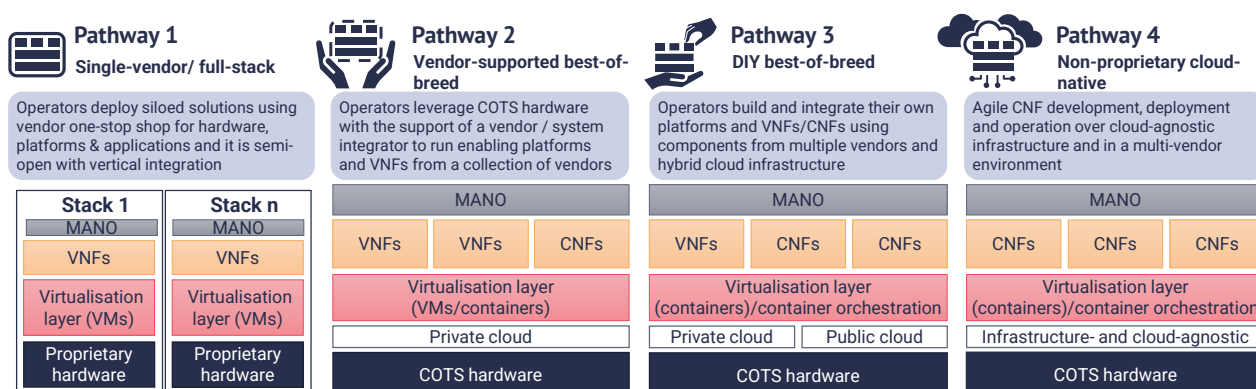
The challenges facing the industry in telco cloud are at several levels:

- **Commercial and competitive:** network disaggregation also brings disaggregation of the value chain. Many different players are able to deliver parts of the disaggregated telco technology stack. This enables them to create and offer networking and / or edge compute services over the cloud, in partnership with third parties delivering the elements of the stack that they themselves are not able to provide. For example: SD-WAN or private networking.
- **Technological:** the very basis for producing telecoms services is shifting to software and the cloud. This realignment is in itself an extremely complex and painful process, from a purely technological point of view.
- **Organisational:** fundamental organisational change is required to bring the journey to telco cloud to a successful conclusion, involving breaking down traditional departmental siloes and hierarchies, and re-engineering processes, so that they replicate those of successful software and web companies, including massive automation. A large amount of upskilling of existing staff and recruitment of new talent with the necessary skills is inevitable, along with redundancies of those whose tasks are phased out.
- **Strategic:** in this shifting and uncertain landscape, telcos need to carefully weigh up their strategy for completing the transition to telco cloud. This will take into account their size, organisational capabilities, networks, and existing markets and services, along with the new sources of value they seek to unlock through telco cloud.

## What must telcos (and others) do to capture the opportunities?

Further to the point on strategy above, we have defined four 'pathways' that map out different routes and outcomes for telcos' journey to telco cloud. These are illustrated in Figure 12.

**Figure 12: Telco cloud deployment pathways**



Source: STL Partners

Our [Telco Cloud Insights Service](#) provides reports and tools to help operators and vendors understand the current and future challenges of telco cloud and how to address them:

- We introduced the pathways mentioned above in our [Telco Cloud Manifesto](#), published in March 2021. At that time, we characterised three pathways (single-vendor, vendor-supported best of breed and DIY best of breed as shown above), which represented the most common strategies that operators could choose when migrating from appliance-based based to software-based network functions. We have since added a fourth pathway, which refers to operators that are sourcing and running their telco cloud and virtualised network functions over the public cloud. This is a topic we will discuss further in upcoming reports, including a new version of the Manifesto.
- In our recently published tool, the [Telco Cloud Operator Profiles](#), we discuss the telco cloud journeys of four operators that illustrate the four pathways above: Telenor, Axiata Group, Turkcell and AT&T respectively. This provides a detailed account of the factors influencing each operator's choice of pathway, and what the benefits and risks have been. For example, Turkcell's decision to partner with a cloud-native challenger vendor (Affirmed Networks) at the beginning of its virtualisation journey (Pathway 2 approach) paid off by enabling the operator to shape its platform according to its multi-vendor vision, and accelerated its cloud-native deployments and present Pathway 3 trajectory. This was in part shaped by Turkish national policy to avoid dependency on foreign vendors and US hyperscalers; although Turkcell may now be hindered by a relative lack of partnership opportunities. Further profiles illustrating each of the Pathways will be added in the first half of 2023.

- We also continuously monitor the progress of telco cloud deployments by leading operators worldwide. This data is included in the quarterly updates to our **Telco Cloud Deployment Tracker**, which comprises: an Excel database detailing the operator, vendor, types of network function and cloud platform, and dates for all publicly announced telco cloud deployments; an accompanying report focusing on a key technology area; and an interactive tool for generating charts and tables illustrating the trends. 5G core deployments were the focus of our latest **Telco Cloud Deployment tracker update (July 2022)**. Here, we pinpointed the 5G Standalone (SA) core as the next network function that will drive telco cloud deployments. However, in a follow-up analytical report, **5G standalone (SA) core: Why and how telcos should keep going**, we observed that SA core deployments are being deferred by several major operators, and urged operators to keep going with roll-outs – albeit cautiously – in order not to miss out on the many opportunities it presents.
- In addition, we publish regular in-depth reports examining key opportunities enabled by telco cloud, which we examine in the light of the pathways together with more specific factors relating to the topics under discussion. Additionally, upcoming research will examine key opportunities enabled by telco cloud, and key factors affecting the development of telco cloud. During the next 12 months, questions we will be reporting on include:
  - **The cloud-native telco: what does this mean, and when will it happen?** Can the ‘Pathway 4’ model – cloud-native networks over infrastructure not owned by the telco – be generalised across the industry, and what would the implications of this be?
  - **Network-as-a-Service (NaaS):** How does telco cloud enable different types of on-demand networking? What are the non-telco actors that are seeking to capitalise on these opportunities? And what opportunities are open to telcos following different telco cloud pathways?
  - **Open RAN: If not now, when – and by whom?** Open RAN appears to have stalled, but it is still viewed by many as the future of the RAN. When will this future begin to happen, and who will be driving it: telcos, hyperscalers, vendors, enterprises, or others? How is open RAN strategy restricted or enabled by different telco cloud pathways?
  - **Security at the edge and in the core:** How is security impacted by the transition to cloud-based networks? What are the threats and opportunities for telcos, including from new services such as SASE, SD-WAN and managed security services? Security is a highly relevant concern in relation to new technologies that involve disaggregation and the use of open interfaces, such as CNFs (cloud-native network functions), open RAN and 5G Standalone (SA) cores. And it is an increasingly worrying issue for telcos in a world of growing political instability, as discussed in Part 1 of our Beating the Crash report.<sup>20</sup>

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<sup>20</sup> <https://stlpartners.com/research/beating-the-crash-whats-coming/>

# Sustainability: Making it relevant for everyone

## Why does sustainability matter?

While operators' consumer, enterprise and technology teams may have limited overlap with each other, like transformation, sustainability is an area that will require an organisation-wide approach to be successfully addressed. Across different regions and types of telecoms companies, the level of maturity with regards to their sustainability journeys differs significantly, but collectively all countries and organisations will have to commit to reducing their environmental impact in order to mitigate the risks of climate change<sup>21</sup>. The collective responsibility stretches far beyond the bounds of the telecoms industry, so operators are facing increasing pressure from their customers and shareholders to demonstrate that they are playing their part in addressing a global challenge.

It's not just a risk, though. Many operators have found that making a commitment to sustainability initiatives – both environmental and social – is a key lever for improving employee engagement. Embedding sustainability more deeply into company strategy, rather than approaching it only as a compliance or business risk, can give employees a sense that their daily work has a positive impact and purpose beyond the direct benefits of connectivity or other services for customers.

## What challenges is the industry facing in sustainability?

The biggest challenge is making the business case for investing in sustainability. In some cases, the financial incentive to reduce emissions is reasonably clear, for example in optimising energy efficiency in the RAN which can reduce energy costs by more than 15%. But many other activities, such as committing to purchasing power agreements (PPAs) for renewable energy, have initially met with scepticism among operators' finance teams. This scepticism represents a big challenge because for operators to achieve net-zero targets, they will need to figure out how to eliminate their carbon footprint across all of their activities, which will require education, awareness, new processes and incentives across the whole organisation. This cannot be achieved without a mandate from the top to prioritise sustainability.

It is also an area where the industry will have to take a much more collaborative approach than elsewhere. The vast majority of any telecoms company's carbon footprint – roughly 70-80%, or more for those that have made big reductions in their scopes 1 and 2 – falls into their scope 3, which means that it is embedded in the products and services they buy from suppliers (e.g. network equipment) and in those they sell to their customers (e.g. handsets and CPE)<sup>22</sup>. No organisation can have full visibility into their carbon footprint and reduce their impact without transparency from and cooperation with their suppliers.

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<sup>21</sup> See [Beating the crash: What's coming?](#) for analysis on climate change risks in telecoms.

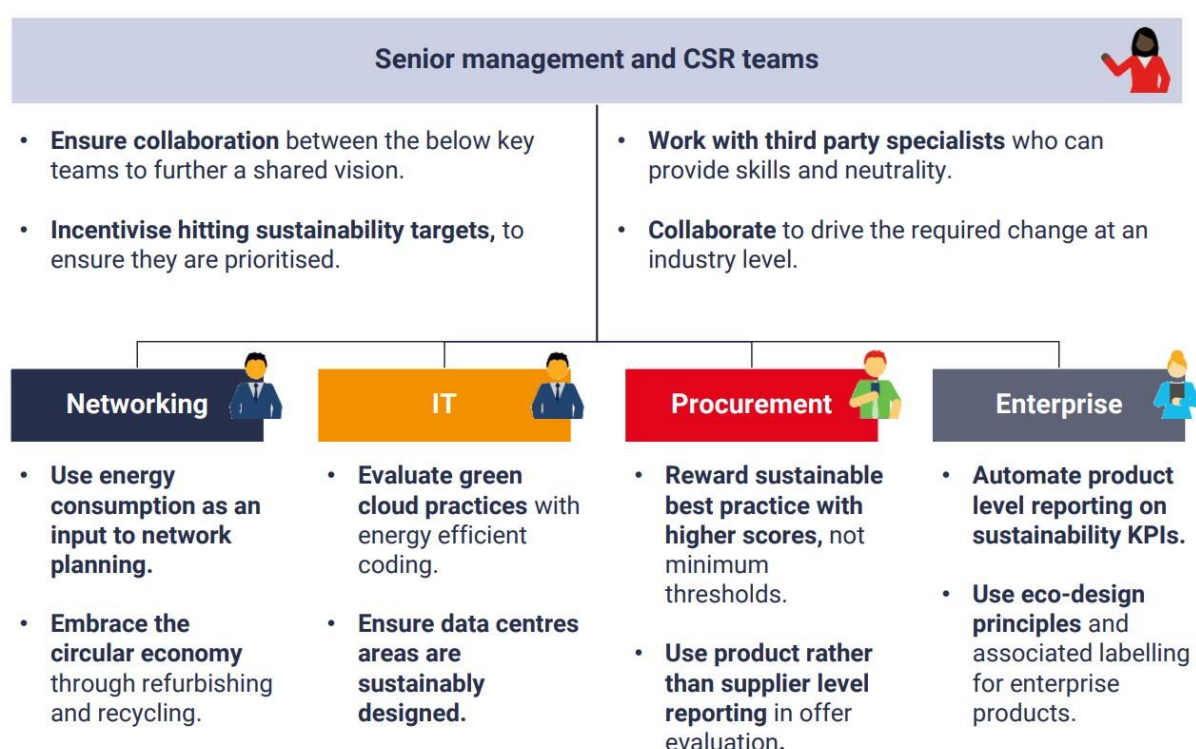
<sup>22</sup> See definitions for scope 1, 2 and 3 download our market overview here: <https://stlpartners.com/articles/sustainability/sustainability-insights-market-overview/>



Likewise, it will be difficult to agree on good cross-industry reporting standards without collaboration between all players in the value chain, governments and regulators. This is in large part why European operators are most advanced in their sustainability activities – meeting net-zero targets is a top priority for the EU and most European national governments, resulting in stricter regulations and investment into cross-industry organisations to develop best practice frameworks.

Our **Telecoms sustainability scorecard** evaluates how mature telecoms operators are in embedding sustainability as a strategic priority across their organisation. Through profiles of leading companies, we also distil learnings on best practice and identify practical actions companies can take to accelerate their progress towards net-zero operations.

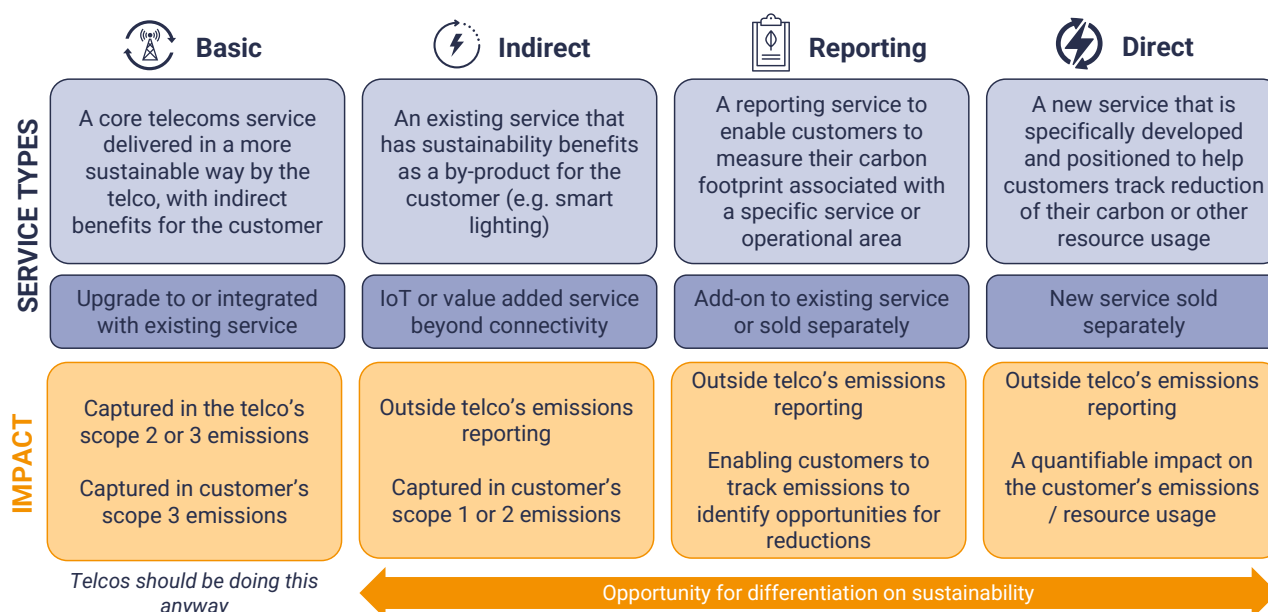
**Figure 13: How operators can integrate sustainability as a priority across the business**



Source: [Telco roadmap to net-zero carbon emissions: Why, when and how](#)

## What are the potential opportunities?

There may be opportunities for operators and vendors to differentiate their services and brands based on their sustainability activities, credentials and expertise. In our **Net-zero enablement use case directory**, we look at over 35 examples of services that telecoms operators or others are offering to help their customers reduce their environmental impact. Today these are primarily IoT solutions that optimise use of fuel, energy, water or another resource, but almost all stop short of reporting on the emissions reductions achieved to their customers. Newer solutions are providing reporting on sustainability KPIs, with the most directly impactful services combining emissions or other resource reductions with usage-based reporting on sustainability KPIs.

**Figure 14: Four tiers of sustainability enablement services**

Source: STL Partners

The size of this opportunity remains difficult to measure because there are not yet agreed standards or reporting frameworks for measuring the impact of telecoms or IoT services on customers' carbon emissions, let alone how much of premium a telco or other provider could charge for an enablement service. Alongside examples of enablement services offered by operators and potential partners, best practices on reporting / communicating the sustainability benefits of these services and exploring how to quantify their potential value are key focus areas of our sustainability research.

## How to move the industry forward on sustainability

In the big picture, the telecoms industry is still at the beginning of its sustainability journey. Key priorities for all telecoms companies should be to:

- Set as ambitious a target as possible for becoming net-zero and report transparently and in detail on scope 1, 2 and 3 emissions.
- Work closely with partners across the supply chain, government and regulators, and other operators, to develop workable ways to measure and improve on scope 3 emissions.
- Implement financial incentives for all senior management that are tied to sustainability targets. Then cascade financial incentives across the entire employee base, using targets that are relevant to reducing environmental impact or improving social outcomes within their role.
- Open dialogues and experimentation with customers to understand how existing services could be adapted or new services created to help them address their biggest challenges in progressing to net-zero.

# Conclusion

In STL's view, the key to success amidst the shifting tectonic plates of the telecoms industry will be companies' ability to adapt to change, openness to trying new business models and approaches to product development, and clarity on the overarching goals of the organisation.

Telecoms companies must remember that their needs are not that different from those of their customers, so wherever possible, they should use themselves as a test case for innovation and deliver services to their customers with the same level of flexibility, quality and value they expect from their partners.

Distilling our key views on how telcos can address immediate challenges and opportunities, while setting themselves up for long term growth, we believe that:

- **Organisational practices** need to change to go along with network and operational technology changes. It's not about doing the same things differently (e.g. better or more efficiently), it's about being adaptive enough to keep up with what customers need and **do different things**.
- **In their consumer businesses**, operators have the experience and tools to meet the economic challenges ahead and are already showing initiative through the provision of social tariffs and collection flexibility. Moving forward, operators must remain relevant by delivering smarter connectivity and peace of mind solutions, starting in the home and expanding beyond connectivity into solutions that help consumers manage their digital lifestyle needs.
- **Enterprises** are going through a similar shift to telecoms operators and need help figuring out how to make connected technologies work well together and deliver measurable benefits. Operators should leverage a combination of capabilities in A3 (automation, AI and analytics), vertical expertise and a unique asset or market position that they have built up through their own experience and adapt them to support proven customer needs. Every operator will have a different set of skills and opportunities, so the hard work will be to figure out which problems they are best suited to solve rather than merely replicating what others have done.
  - **Private networks** is one of the hottest emerging opportunities in the enterprise space that is close to the core for operators. However, customer needs will vary widely depending on their level of maturity in using new technologies, size and how mission-critical their connected operations are. Operators may struggle to compete on cost and flexibility with global players addressing the market for standardised "out-of-the-box" dedicated networks, but can play to their strengths where they have a degree of vertical expertise and/or for customers with specific and complex needs requiring ultra-reliable connectivity.
- **Edge computing** is a key component in enabling decentralised and disaggregated networks to cope with increasing traffic and customer demands for customisation. To successfully collaborate and compete with the cloud players also targeting the edge opportunity, telcos

should leverage their core strength in connectivity and distributed infrastructure to establish their presence and build credibility in key verticals of interest through strong co-creation partnerships.

- **In Networks**, traditional telcos must shift from the perspective that they are the main control point for connectivity, which pits them against newly emerging players. The mindset of “them and us” hinders potential partnerships and could result in telcos ignoring or missing out on new opportunities that require a mix of technology capabilities and vertical expertise. Instead, telcos must work with newcomers as equals and work together with them to combine skills and assets to collectively solve key market and technology challenges with “the best tool for the job”.
- **Telco cloud** is what enables agility and programmability of the network, as the network becomes ‘cloud-native’ and software-based; modular, open and interoperable; intent- and service-based; instructible and programmable; self-optimising and -healing; energy-efficient, elastic and scalable; and automatable. In other words, it is the foundation to enabling operators to adapt their core asset to rapidly changing and diverse customer needs.
- As climate change becomes an increasingly apparent and immediate issue, **operators must ensure they do all of the above while lowering their carbon footprint**. Doing this well requires systematic, transparent reporting on their emissions and broader sustainability activities, as well as much greater cross-industry collaboration to agree on standards and KPIs for measuring the impact of business activities on the environment.

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