

Point of View | **Digital Telco 2030**



Glass half-full or half-empty
Why positioning depends on the perspective

Editorial

Dear Reader,

How simple our world would be if we could at least make the majority of decisions with clear statements such as yes or no, up or down, black or white. However, the complexity that determines our actions only allows this in very few cases. What becomes relevant instead is the focus on the key driving factors for future market constellations, and the derivation of individual conclusions. The blueprint has had its day.

The objective of this publication is to identify the key driving factors and to show the perspectives as well as the possible business model options for telcos. Some drivers seem to look very promising whereas other ones might represent a huge hurdle. Depending on the assets and ambitions of a telco, the future is gloomy, it depends, or the future is bright.

So what is your view on the current market situation? Do you see the glass as half full or half empty? This perspective ultimately determines the choice of your business model and all measures derived from it. And for this reason we work with the glass-half-full-glass-half-empty metaphor.

„Telcos! Choose your battleground!“ is our call. We hope that reading our point of view will provide you with a good basis for this.

Wishing you an ever optimistic outlook!

Ralf Pichler

CEO Detecon International GmbH



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Content

Management Summary	4
Chapter 1	
Geopolitical Context and European Industrial Policy	8
Chapter 2	
The Need for Digital Regulation 2030 – Prospects for the Telco Sector	14
Chapter 3	
The Telco Factory: Key to Success for Digital Telcos	24
Chapter 4	
Competition Landscape in 2030	40
Chapter 5	
B2B: Telco Positioning in an Embattled Market	46
Chapter 6	
Key Trends and Telcos' Strategy in B2C	58
Chapter 7	
Telcos at the Crossroads: The Future of Telecommunications Is Bright – but Will Telcos Win?	78
The Authors	96
About Us	98

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The telco added-value chain is breaking apart: every telco must position itself for a new business model.

Dr. Peter Krüssel, Managing Partner, Detecon

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Management Summary

The business models traditionally pursued by telcos will change profoundly in the next few years as vertical disintegration continues. And at every stage of the traditional telco added-value chain, there will be a multitude of new players competing against – and cooperating with – one another. This fragmentation will be countered by a trend to sharper focus and consolidation among telcos. Most will scale their contact to end customers back to a bare minimum and concentrate on network expansion and operation and/or on the marketing of network resources in a wholesale business model. The telcos that are able and willing to defend end-customer contact in certain market segments will be few and far between. The prerequisites for a successful business with end customers are certain assets such as size, financial strength, brand traction, integrated infrastructures, software- and cloud-based production, strong presence in the business and consumer segments likewise, industry-related expertise, and project-specific solution competencies. The telcos that currently possess these assets to a sufficient degree are few in number – and for many of the others, the creation of these prerequisites exceeds their performance capabilities.

These factors will lead to the emergence of three types of business models for telcos respectively network operators in the future:

1. The IP (Infrastructure Provider) builds primarily passive network elements (cell towers, fiber optic networks, ductwork, etc.) and typically markets them to other telcos, large business customers, and hyperscalers. Occasionally, active components and network operation are also offered (e.g., shared RAN).

2. The DSE (Digital Service Enabler) expands the scope of the IP's business activities, i.e., builds passive network elements, supplements them with active components, operates the networks that have been created, and markets more highly aggregated upstream connectivity services to other telcos, MVNOs, resellers, hyperscalers, or even to individual business customers. Typical

offerings include IaaS, NaaS, network slices, PaaS, direct connectivity lines, managed bandwidth, and similar products. This type is essentially a wholesale business model; end-customer relationships in the business customer segment exist only in isolated cases, and the private customer segment is occupied solely as a niche, if at all (certain areas in the private customer segment or an extremely limited connectivity-related portfolio).

3. The DSO (Digital Service Orchestrator) covers the business area of both the IP and the DSE. Added to this is a strong presence in end-customer business including private and business customers with the aim of going beyond connectivity alone to offer a broad spectrum of proprietary and partnered services in the sense of an ecosystem. Typically, only one, or at most two, players will be able to position themselves as DSOs on any given national market, and they will be competing for end customers against internet-based players in particular. Most traditional telcos will opt for the DSE role. There will be a cross-border consolidation process among telcos, particularly in regions with a highly fragmented telco landscape such as in Europe, with the consequence that a handful of pan-European or globally active groups will determine what happens here.

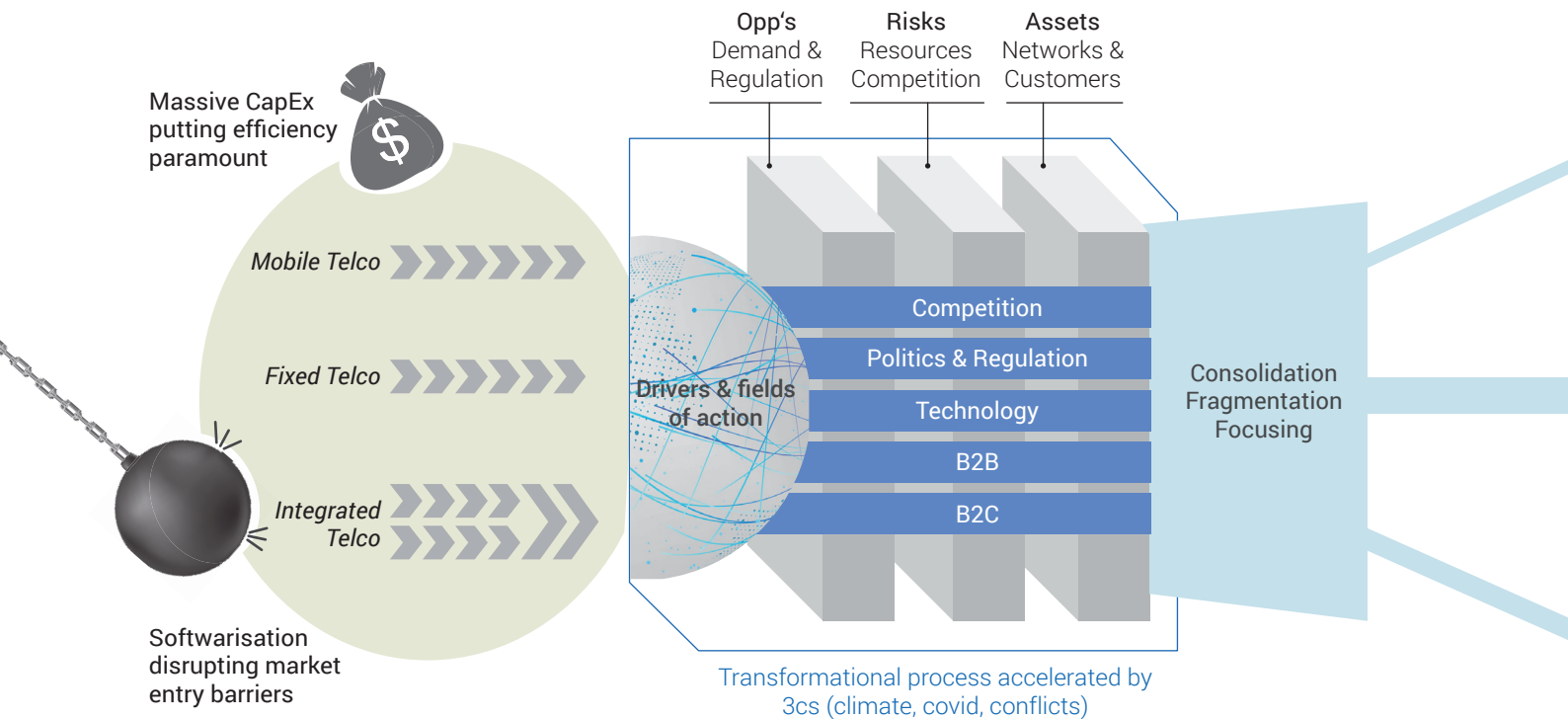
These developments can be attributed to five key drivers. The renaissance of **industrial policy** and the emergence of **new regulatory frameworks** for the digital economy are the first two of these factors. The numerous initiatives in many countries to protect domestic economies and critical infrastructures, to deglobalize, and to push for “digital sovereignty” tend to play into the hands of the telcos or national players. Much the same can be said for the comprehensive efforts to set profound regulatory limits for the digital economy, to put a stop to the negative phenomena of globally scaling business models, and to generate opportunities for local or national innovations apart from the large online platform operators. These developments will also prove to be advantageous for telcos on both the marketing and production side.

In third place is the significant role that will be played by **technological developments**. The separation of line and service, the decoupling of hardware and software, the softwarization and cloudification of production, ubiquitous ultrabroadband connectivity, the automation or autonomy of networks (zero touch as the target picture), the open architectures and API-based ecosystems, alternative connectivity solutions, and similar factors have the potential to change permanently and fundamentally the established industry structures and to disaggregate the classic telco added-value chain. Many telcos will not have the human and capital resources, skills, and other prerequisites essential for seizing the associated opportunities.

The **changing customer needs** of private and business customers constitute the fourth driver. Besides important motives such as individualization, contextuality, seamlessness (ideally in the form of genuine convergence across both network domains and services provided), and con-

venience, the urgent need for high-performance, ubiquitous connectivity solutions is coming to the fore, massively accelerated by the COVID-19 crisis. As the digitalization of personal lives and the economy spreads in a parallel movement to advancing interconnectivity, the actual and perceived vulnerability of people, companies, and systems in the event of system failures, criminal attacks, or misuse of data will rise to the same degree. Privacy, data protection, security, dependency reduction, and resilience are becoming more important. Another increasingly significant motive for purchasing decisions is the issue of ecological and social responsibility. Companies will have to accept the assessment of their production and marketing activities on the basis of new standards. Telcos can benefit from this development as many customers perceive them as prioritizing these aspects even now and, because they are typically national players, as being committed to compliance with the regulations of their own countries – often in contrast to many globally active competitors.

Figure 1: The new business models



Source: Detecon

Management Summary

The fifth driver is the rapidly **changing competitive environment for telcos**. This factor is both a consequence of the drivers described above as well as an original driver in its own right. New competitors are successfully occupying specific areas of the telcos' added-value generation, forcing the fragmentation of the added-value chain, and demanding a repositioning of the telcos in interaction with these new players.

The **COVID-19 crisis** and the current conflicts, both political and military, act as additional catalysts for the drivers sketched out here. The described effects will have faster and more forceful impacts than ever before.

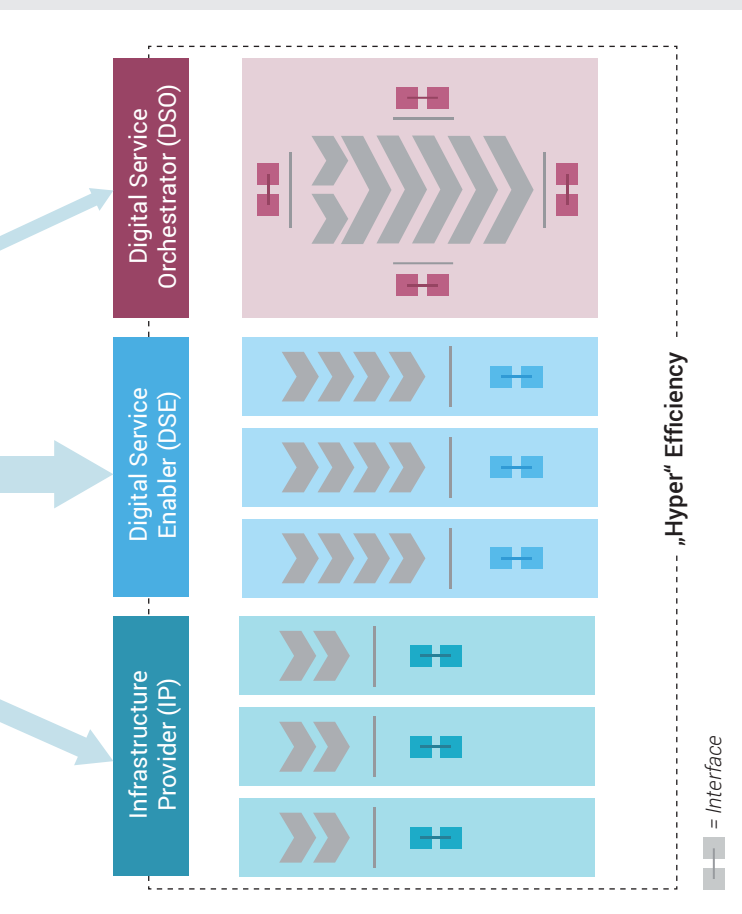
The first step for all telcos is a process requiring an unsparing stocktaking of their own assets, an assessment of their realistic ambitions against the backdrop of the above-mentioned drivers, and determination of the concrete relevance and significance of these drivers in their footprint. The future positioning alternatives must be weighed

against one another in light of the conclusions derived during this process. Every telco must decide for itself which of the three models holds promise for the long term. Once the decision has been made, they must initiate the appropriate preparations to move in the defined direction. Regardless of the choice of positioning type, telcos must first do their homework with respect to production and networks, i.e., they must not hesitate to exploit the technological opportunities in cloudification, softwarization, and automation of the networks.

Compared to DSOs, IPs and DSEs have much greater maneuvering room for cooperation with hyperscalers or other partners. At its very core, it is an efficiency game. The traditional conflicts between retail and wholesale business are becoming irrelevant.

The key element for the DSOs is striking a precise balance in production between in-house performance and the areas and scope of cooperative actions with potential partners that will enable the company to maintain its own identity and independence while simultaneously achieving the highest possible level of efficiency. An additional consideration for the DSOs is their operation within ecosystems with an eye on the end customer. They are challenged to create compelling worlds of offerings that are both their own and organized in partnerships. Promising fields of action can be determined in particular by precisely assessing the above-mentioned transformation of customer needs, the initiatives in industrial policy, and the planned regulatory interventions.

Our point of view is intended as an aid for orientation and decision-making as telcos begin the imperative evaluation of their current position and make decisions about their future orientation. Our experts will discuss in detail the major observations, hypotheses, and recommendations in the chapters that follow.



Geopolitical Context and European Industrial Policy



After three decades of being seen as the disreputable side of economic policy, industrial policy is experiencing a comeback. There are several global trends behind this change. Increasing nationalism and protectionism (and not just in the USA) have weakened the rule-based international trade system and the World Trade Organization (WTO).

Mirroring this development, the growing support for populist parties within the EU has fueled demand for protectionist policies and was a driving force for Brexit. Meanwhile, China's rise as an economic and political power is to a certain extent driven by industrial policies targeting research and innovation to create technological advantages.

While China is pursuing a number of major large-scale industrial policy technological initiatives, the Biden Administration has earmarked substantial funds for the promotion of technologies such as artificial intelligence (AI), 5G, 6G, and others. In response, industrial policy discussions in the EU have gained momentum in recent years and become a focal point of discussion. The international interdependence of critical added-value chains and a lack of resilience that have become obvious during the COVID-19 pandemic have added further fuel to this development.

It is fair to say that the European Union (EU) has a major disadvantage when launching policy initiatives targeting industrial investment policies for growth and support of technologies or industries. The Commission has neither the financial means nor the discretionary power to allocate funds among member states. Moreover, the European Commission (EC) is mainly concerned with creating a single market, which implies that its function is to supervise member states' competition and industrial policies and prevent them from subsidizing their national industries. The result has been to drive down significantly government aid in EU member states over the last 40 years, and its level is rather low in an international comparison.

In response to the COVID-19 pandemic, however, the EC did become active and launched the Recovery and Resilience Facility. This could provide a push to deepen digitalization – especially when targeted at public sector transformation. Other instruments such as the “Important Project of Common European Interest (IPCEI)” introduced by DG Grow target industrial co-operation and might be further expanded in the future.

For the time being, industrial policy in the EU will continue to focus on creating a single market and on realizing regulatory frameworks to promote

Chapter 1

innovation in what is seen as digital competence in key industrial sectors and core added-value chains. The Commission has bundled these topics in the development of the "Europe Fit for the Digital Age" strategy for the next five years, which is intended to strengthen and expand the EU's digital sovereignty. Its objective is to create a single European digital economic realm that will secure the EU's competitiveness in the face of the current dominance of the USA and China.

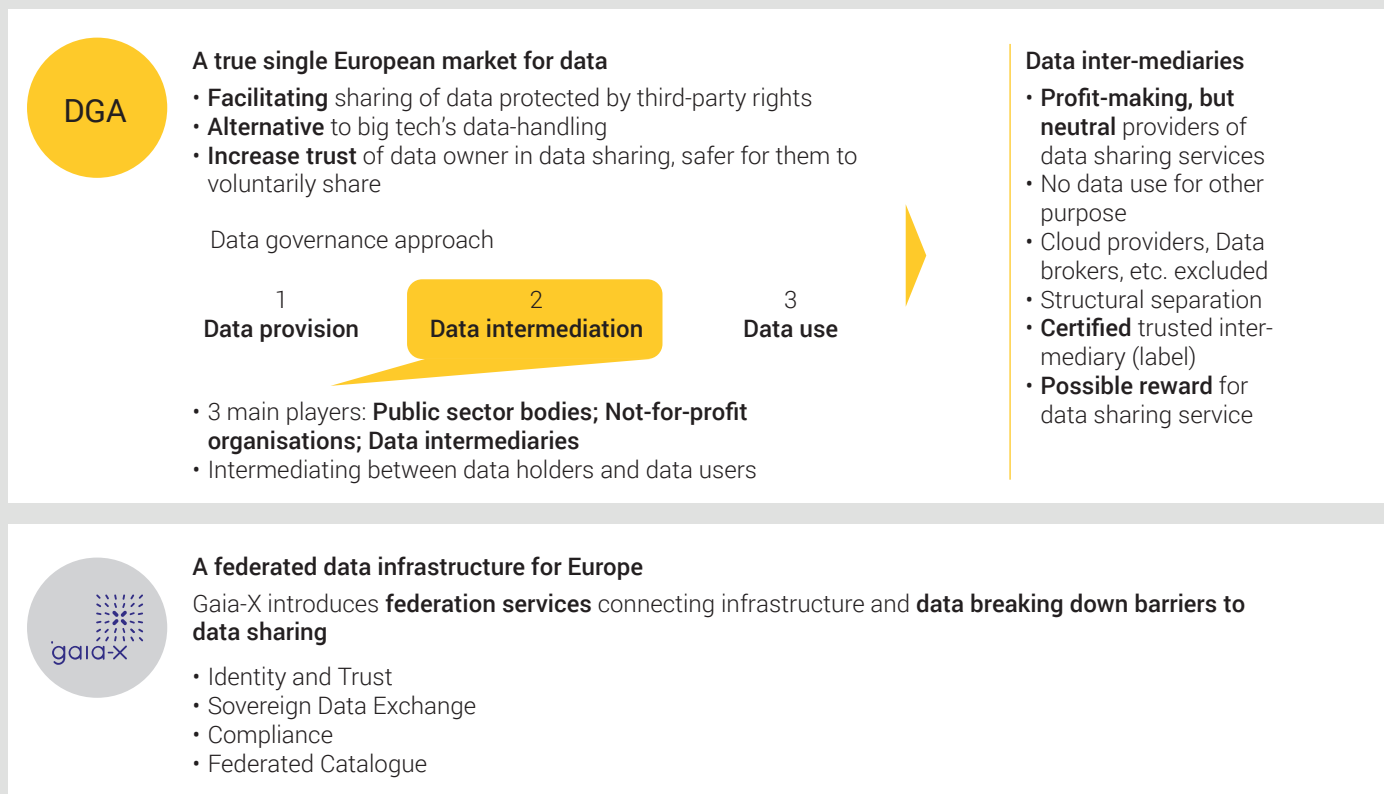
Related regulatory initiatives to strengthen the EU's digital sovereignty have demonstrated the potential for success in this approach. The framework of the General Data Protection Regulation (GDPR), for example, has developed into a worldwide standard. This power of the EU to set

worldwide regulatory standards has been displayed historically in the establishment of regulatory frameworks for telecommunications and other sectors.

Recent EU regulatory initiatives have targeted two issues in particular:

1. Setting standards for decentralized data analytics leading to the development of data-centric industrial ecosystems; and
2. Addressing systematically the Internet of Things (IoT) and 5G security risks.

Figure 2: DGA and GAIA-X



Source: Detecon

Chapter 1

The most promising regulatory initiative in the first of the aforementioned areas is the Data Governance Act (DGA). This regulation's provisions will increase data supply dramatically and create opportunities for new business models. The aim is to create a true single European market for data by facilitating the sharing of data protected by third-party rights and offering an alternative to the handling of data by the big tech companies. The Data Governance regulatory framework will increase trust of data owners and ease data sharing as it will safeguard the voluntary sharing of data. The act creates the role of data intermediaries who act as certified and trusted data brokers and clarifies the legal scope of their activity and drastically reduces uncertainties.

At the same time, the GAIA-X initiative is expected to develop and set European operational standards for data economy (identity management, data exchange, and compliance). GAIA-X essentially aims at using regulatory and data protection as means of empowering weak EU cloud players. The two initiatives DGA and GAIA-X acting in tandem have the potential to boost European data supply.

Details of the DGA are still under discussion. It is likely that industry-led data marketplaces such as the Data Intelligence Hub of Deutsche Telekom or the Data Service Hub of KPN could assume the roles of intermediaries and become drivers for voluntary data sharing a step that would open new business models for European telcos.

Public sector bodies

- Reuse of data protected by third-party rights
- **Possible fees** for allowing data re-use
- Fee shall not restrict competition
- Transparent and non-discriminatory conditions of use
- E.g. Infrastructure and Health sector

Not-for-profit entities

- Registration requirement
- Only objectives of general interest
- Freely collected data
- **Not-for-profit** basis (**no reward**)
- independence from profit-making entities
- Structural separation
- E.g. data to RKI

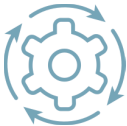
Data Users

- Businesses
- Scientific research
- Public services



Significant increase in data availability, reduced data costs, reduced time-to-market

Gaia-X sets the **operational standards** for the new data economy



1. Acting as data intermediary: In view of the neutrality obligation, joint-venture partnerships must be considered. They would create possible new revenue streams and generate spill-over effects supportive of business that can be realized from the certification as a trusted data intermediary.

2. Improving and expanding own business models: The dramatically increased data supply can be harnessed for the improvement of an operation's own business models. There is an opportunity to leverage and push proprietary data analytics services to new levels.

3. Public sector data readiness: Providing support to public bodies in adapting data for better usability, e.g., offering services using and driving Gaia-X operational standards, would establish a favorable position for driving public sector digitalization.

4. Interface platform between intermediaries and private sector: Creating an interface that links innovators and startups with data interme-

diaries provides a clear overview of available data and ready-for-use access.

If these initiatives are to be a success, it is essential to minimize their complexity and bureaucratic hurdles.

Another important regulatory measure that is part of European digital industrial policy future is cybersecurity. In 2019, the EU Cybersecurity Act extended the role of the European Union Agency for Cybersecurity (ENISA) and among other features introduced the European cybersecurity certification schemes for ICT services or products. It is still too early to assess the impact as the relevant schemes are still under development and are focusing on IoT products for the consumer market. One of the next steps will be the integration of these schemes and standards into the above-mentioned initiatives for data exchange. Realistic timeframes for developing the required harmonized standards would solidify the link between legislation and standards.

Key takeaway

A light-handed regulatory framework for data exchange combined with GAIA-X standards defining these exchange processes can jump-start European digital competitiveness and create new business models for European telcos. This becomes even more likely when funds such as the Recovery and Resilience Facility are used to push public sector digitalization. New cybersecurity certification regimes designed by the European Union Agency for Cybersecurity (ENISA) for the EU will further strengthen EU digital sovereignty by delineating and protecting European markets for digital products and services.

Given the size of the European market, the certification schemes will most likely become relevant on a global scale. In the same vein, the 5G cybersecurity toolbox developed by the Commission should also be seen as a milestone. The Telecommunications Regulatory Framework, which includes spectrum regulation, and most recently the GDPR are examples of regulatory policies that have had positive impacts on European industry and have been used as a blueprint for global regulatory standards.

A related initiative supplementing the objective of creating a common digital economic realm

that will strengthen European digital sovereignty is the Digital Services Act (DSA). It is a horizontal (cross-sectoral) initiative containing standardized rules governing the liability of providers of online intermediary services (OIS)¹ for illegal third-party content and the security of online users, or prescribing asymmetric due diligence obligations. Highlights are due diligence obligations for online intermediary services with special attention on very large online platforms (VLOP). The aim of the legislation is the establishment of a safe, predictable, and trusted online environment facilitating cross-border services, which is essential for a thriving digital economy.

¹ „Online intermediary services” (OIS) as defined by the DSA are service categories 01-02-03; references can be found in Chapter 3 “Digital Regulation 2030 – Prospects of the Telco Sector”, Subsection 3.1.2, “Understanding “Digital Services” in this document.

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The Need for Digital Regulation 2030 – Prospects for the Telco Sector



After three decades of being seen as the disreputable side of economic policy, industrial policy is experiencing a comeback. There are several global trends behind this. With each passing day, digital elements become more dominant in our everyday lives. The digital age is transforming everything. The immediate consequence is a radical upheaval in the lifestyles and communications, professional uses, and consumption habits of countries and their citizens.

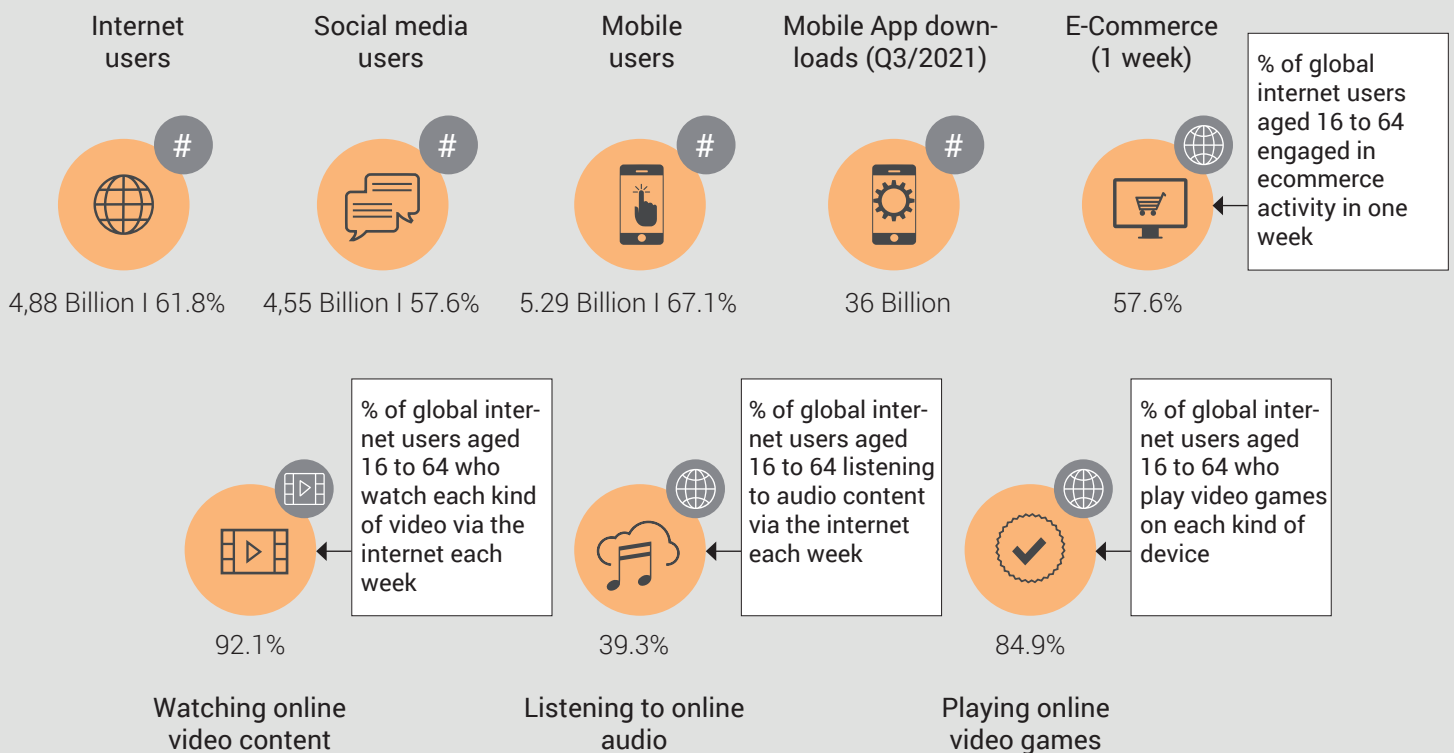
One aspect of the growing access to the internet is an explosion in the production and consumption of online products and services. The image below shows the global digital situation as of 10/2021 as determined on the basis of statistical data from DATAREPORTAL.

Drivers of this digital movement are manifold, including (among others) technological developments, competition pressures, national politics, customers' behavior, and legal and regulatory pressure. All this is currently being reinforced in the "COVID-19 era" as lockdowns and social distancing measures are forcing people to become familiar with remote and virtual interactions.

2.1 Understanding "digital services"

The race toward digitalization people experience today fundamentally revolves around the provision and the use of so-called "digital services". Simply put, one of the essential characteristics of "digital services" is that they are provided by electronic means and without the physical presence of the provider and recipient at the site of production of the service.

Figure 3: The global digital situation as of 10/2021

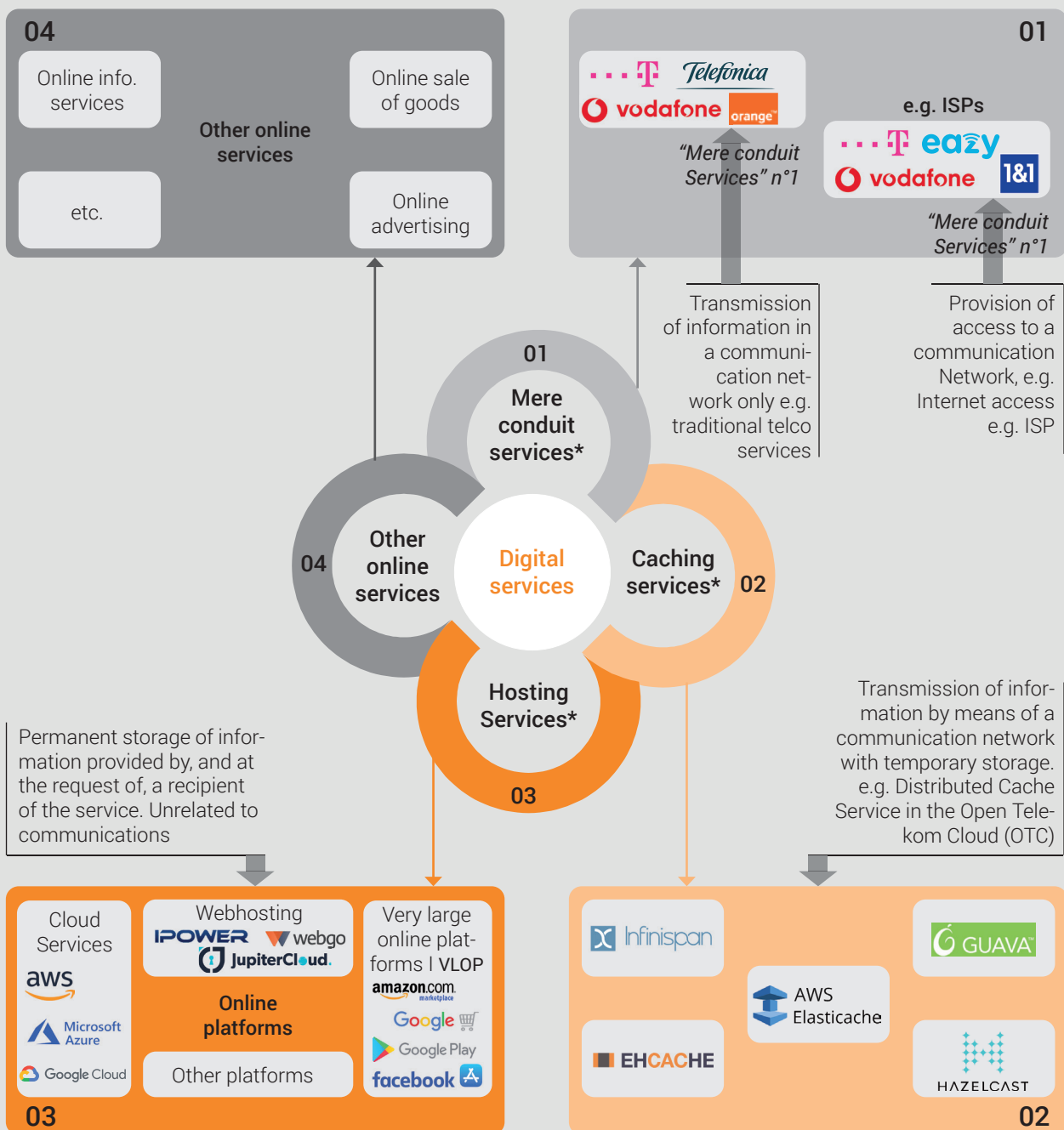


Source: Datareportal, "DIGITAL 2021: OCTOBER GLOBALSTATSHOT REPORT"

The classification of digital services in two groups called “online intermediary services” (01-02-03) and “other online services” (04) is useful for illustration.

In other words, “digital services” encompasses a wide range of economic activities that take place online. Some of these activities such as hosting services (Category 03) and “other online services”

Figure 4: Digital services can be classified in two groups: online intermediary services and other online services



* = Categories 01-02-03 are referred to as “online intermediary services”

Source: Detecon

Chapter 2

(Category 04) are completely unrelated to communications while others have ties to communications. The latter group includes Category 01 (transmission of signals or information over a communications network, e.g., data-based interpersonal communications services; transmission services used for the provision of machine-to-machine services; or provision of access to a communications network, e.g., internet access service) and Category 02 (transmission of information over a communications network with temporary storage).

2.2 What about “digital regulation” and why it matters

It is important for countries to work towards a coherent pro-competition landscape supporting digital businesses and innovation while also protecting users from potential harm and defining a common set of rules that defines the mutually accepted platform on which companies and customers/users can interact. The regulatory framework that results is known in this paper as “digital regulation”.

Digital regulation is expected to be a catalyst for business in a digital era. It is all about addressing the challenges brought about by digital transfor-

mation with the view of creating a legal and regulatory environment that will enable a thriving digital sector.

2.3 Ongoing regulatory initiatives

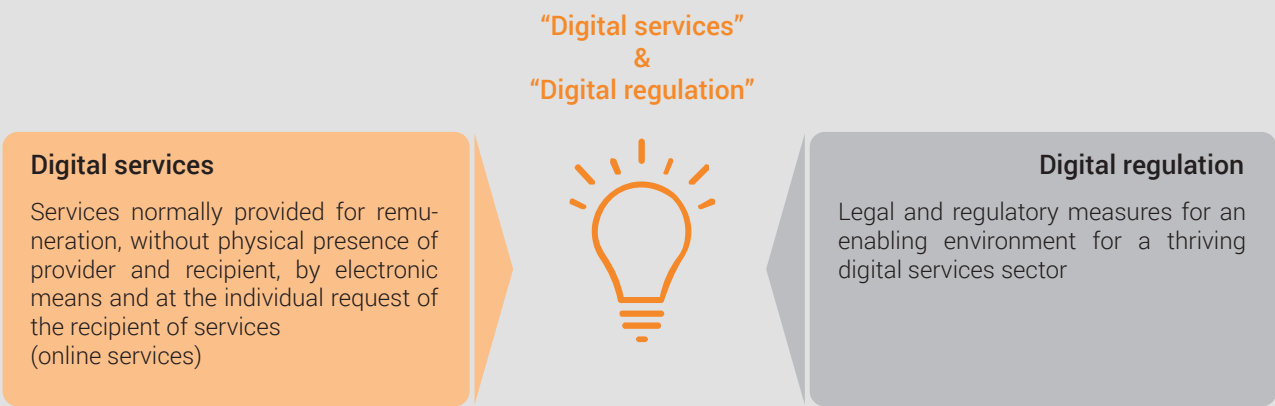
Regulatory approaches in selected countries

Regulators and lawmakers around the world are adopting models to face the challenges posed by the 4th Industrial Revolution. The EU, UK, Australia, the USA, and Germany are just some examples that can be mentioned (see Figure 5).

From the perspective of competition, the subject of greatest interest in this paper, the main focus of many initiatives is on “big tech” or “hyperscalers”.

- **EU’s Digital Market Act (DMA).** Far-reaching ex-ante prohibitions and obligations aimed at restricting the power of so-called “gatekeepers”, the providers of “core platform” services with significant intermediation power (SIP). They are similar to the operators with significant market power (SMP) familiar from the electronic communications sector.

Figure 5: Digital services and digital regulations



Source: Detecon

■ **Germany's revised antitrust law (GWB).** Extensive authorization for action by the Federal Cartel Office (BKartA) against digital services providers with "paramount cross-market significance for competition" for the mitigation of certain anti-competitive tendencies of those players holding SIP at a stage early enough to be effective. Germany is anticipating some of the measures still under discussion within the framework of the EU's DMA and DSA.














BKartA has in the meantime taken advantage of the new antitrust digital regulation framework² to initiate proceedings against four of the well-known big tech companies (GAFA). According to the latest online news, Microsoft's practice of bundling its cloud solutions such as OneDrive and Microsoft Teams with its operating system Windows is reported to be the subject of the BKartA's scrutiny in response to a complaint from Germany's cloud provider Nextcloud GmbH.

Nextcloud claims that the bundling of these services is tantamount to Microsoft's abuse of its Windows monopoly with the objective of tying customers to its own cloud services.³

■ **UK's Strategic Market Status (SMS) regime.** The proposed new framework would proactively

- 2 In January 2021, the 10th amendment to the German Competition Act (GWB Digitalization Act) entered into force. A key new provision (Section 19a GWB) enables the authority to intervene earlier and more effectively, in particular against the practices of large digital companies. In a two-step procedure, the Bundeskartellamt can prohibit companies which are of paramount significance for competition across markets from engaging in anti-competitive practices. Source: BKartA Press Release 04.06.2021: "Bundeskartellamt examines Google News Showcase"
- 3 At the time of the finalization of this paper, however, no mention of any actions regarding the reported complaint could be found on the BKartA's website.

Figure 6: Current international initiatives for digital regulation

	DSA Digital Services Act	DMA Digital Markets Act	DGA Digital Governance Act	DA Data Act
	Trustworthy, transparent digital environment; due diligence obligations; special attention on VLOPs (illegal content, liabilities) 	Fair and competitive digital environment; restricting power of gatekeepers (providers with significant intermediation power) 	Single market for data; fostering data availability for use; data-sharing services (intermediaries); increasing trust in the use of data 	Addressing difficulties of access to and use of data in specific situations, incl. in B2B and B2G context; complementing the DGA 
	 UK Online harms legislation and Digital Market Unit (DMU)	 Digital Platforms Mandatory Bargaining Code	 Anti-Monopoly Agenda for "A Stronger Online Economy"	 Renewal of the German Competition Law
	Harmful online content; Liability of online companies (DSA-like); regime for the most powerful digital firms (DMA-like) 	Level playing field between news media and digital platforms; addressing bargaining power imbalances; non-discrimination 	Measures against Google, Apple, FB; anti-competitive behavior in digital markets; risk of structural measures; 5 bipartisan draft bills in process* 	Increasing competition in digital environment; adapting existing tools; ex-ante action against gatekeepers; intermediary power 

* = USA: (Congress initiatives): 5 bills tabled on Friday 11.06.2021 aimed at limiting the power of companies like Google, Facebook, Amazon and Apple. Could lead to break up of corporations, ban on them to sell certain products, new hurdles for the acquisition of competitors ("killer acquisitions"). Germany (§ 19a Abs. 1 GWB): BKartA opened 4 files in 6 months against Google, Apple, Amazon, Facebook

Source: Detecon

Legislation in progress =  Public consultation in progress =  Legislation adopted = 

structure the market behavior of digital services providers with SMS (i.e., those with “substantial entrenched market power”) and set clear rules of the games tailored to each individual SMS provider.

■ **USA anti-monopoly agenda for “A Stronger Online Economy”.** Five bipartisan bills addressing anti-competitive conduct of providers of so-called “covered platforms”, which can be understood as platforms with significant intermediation power (SIP) similar to the DMA concept, are under consideration.

Some of the measures currently found in the draft of the EU’s DMA

Below are six DMA rules governing the provision of “core platforms” that act as bottlenecks between businesses and consumers and where the provider is a so-called “gatekeeper”.

■ **No combining of personal data.** A gatekeeper should refrain from mixing data collected from data brokers or their business customers with the data they collect from their non-business customers. This is meant to stop the practice of “hyper-scalers” like Facebook and Google so widespread today of linking commercially available data with the data they extract from their own users. This rule also bans gatekeepers from automatically signing users onto additional services; logging onto Gmail, for instance, wouldn’t automatically log you onto YouTube.

■ **No bundling or cross-tying:** A gatekeeper should refrain from forcing business customers and consumers to sign up for “ancillary services” (that have not been requested) as a condition for using a gatekeeper’s core platform service (that has been requested). This is meant to stop the practice of forcing you to create a Gmail account if you want to use Android or to use Apple’s high-priced payment processor if you want to sell products on Apple’s App Store.

■ **No self-preferencing.** A gatekeeper should refrain from treating competitors’ services from adjacent markets less favorably than their own services. This is meant to stop practices such as diverting traffic away from competing com-

parison shopping services to a gatekeeper’s own comparison shopping service (Google Shopping) or reserving privileged interoperability with its own PC operating system (e.g., Microsoft Windows) to its own media player (Windows Media Player).

■ **“FRAND” access obligation to app store. Specific for app stores.** A gatekeeper with app stores should be required to accept business apps on a fair, reasonable, and non-discriminatory (FRAND) basis.

These rules are relevant for gatekeepers who provide access to software application stores since these outlets generally serve as important gateways for app developers seeking to reach consumers. Fairness refers to pricing or other general access conditions. The FRAND obligation is meant to stop the practice of mandating use of the gatekeeper’s in-app purchase mechanism (IAP) for developers wishing to distribute their apps via the gatekeeper’s app store and charging a commission (e.g., 30% for Apple and Google) on all fees collected through the IAP.

The FRAND provision would have an impact on two aspects: discrimination (there is no percentage commission for the gatekeeper’s own apps) and unfair pricing (30% or 15% could be too high compared to the price charged by other providers of app stores).

■ **No “spying” on business customers (loyalty obligation):** A gatekeeper should refrain from using the data of its business users gathered on its platform to enter into competition with the same business users on adjacent markets. This is meant to stop today’s practice of platforms (e.g., Amazon) gathering data on their business customers’ activities to figure out how to compete with them, e.g., how to reproduce their products.

■ **Vertical interoperability obligation.** A gatekeeper should be required to enable interworking of ancillary services (e.g., payment processing, advertising) provided by third parties with the same operating system and hardware or software features that it uses in the provision of own ancillary services. This is meant to force a gatekeeper to enable interoperability of its operating system

Chapter 2

(e.g., Windows) with rival media players (e.g., other than with Windows Media Player) or web browsers (e.g., other than with Internet Explorer). It is worth noting that there is no explicit mention of so-called “horizontal interoperability”, which is interoperability between “core services”. This means, for example, that Facebook might have to permit a competitor to offer its own payment processing for Oculus apps, but not to offer a competing social media network that interoperates with Facebook.

2.4 What is of significance for the electronic communications sector

Digital regulation and electronic communications services

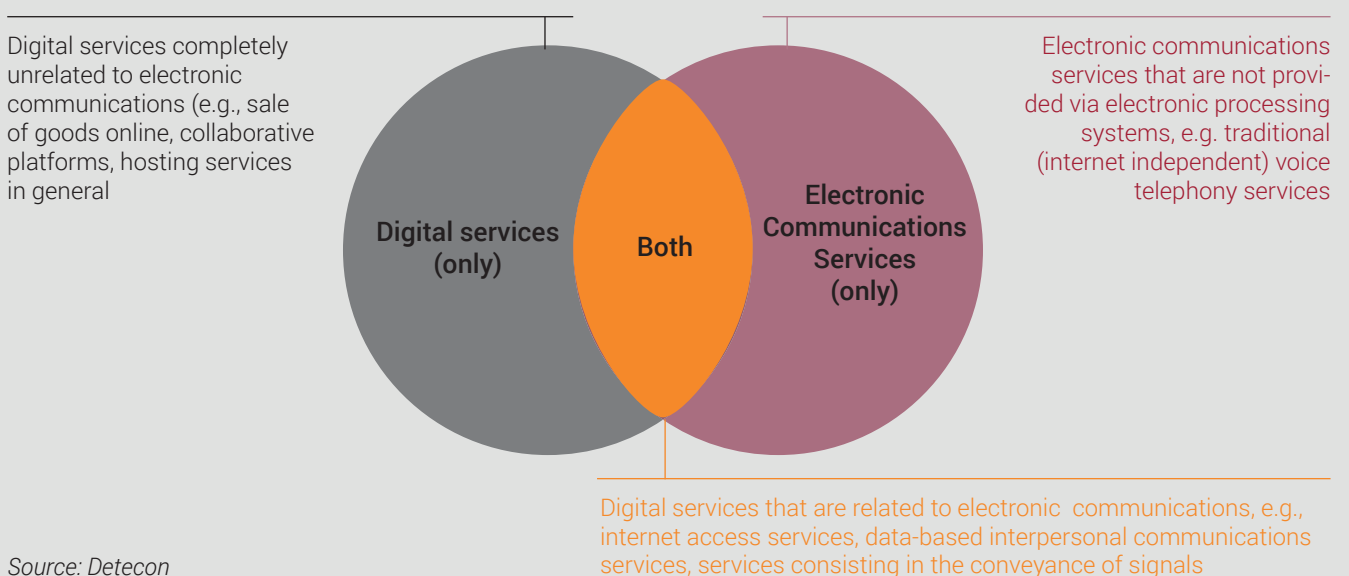
The rise of digital regulation does not affect the scope of existing sector-specific regulation in the electronic communications sector (hereafter referred to as “telcos regulation”). Telcos remain subject to telcos regulation. Digital services – as defined above – are subject to telcos regulation solely to the extent that the services involve communications.

In fact, some “digital services” are completely unrelated to communications and would be outside the scope of telcos regulation. This is true for hosting services (Category 03), for instance. In contrast, digital services that are related to communications comprise especially those of Category 01, including data-based interpersonal communications services such as OTT services (excluding traditional voice telephony services), services for the transmission of signals or information over a communications network (e.g., transmission services used for the provision of machine-to-machine services), or in providing access to a communications network (e.g., internet access service).

As the figures below shows, digital services and electronic communications services are two overlapping circles, with the intersection representing digital services that are related to communications.

It should be noted that regulatory initiatives aiming at promoting a fair and competitive digital environment (hereinafter referred to as “digital competition regulation”) are generally not meant to apply to the telco sector. However, even if telcos are not the target of digital competition regu-

Figure 7: Communications digital services as an overlap between digital services and electronic communications services



lation, they would benefit considerably from many of the provisions meant to restrict the market influence of online providers with SIP (“gatekeepers”), in particular of big tech.

Prospects for telcos from digital competition regulation

Certain digital competition regulation measures could benefit telcos considerably in terms of more business flexibility and independence from dominant online players. They could also offer telcos better prospects for many products and production.

■ **Mandatory interoperability.** Mandatory interoperability that enables both the interworking of ancillary services with core functions of the gatekeeper platform and the interworking among core platforms that are substitutes for one another could facilitate direct access of telcos to the software developer community. This would be critical for those telcos that, owing to lock-in effects, work only vis-à-vis hyperscalers, especially where these telcos have no footprint. For instance, they could provide to such developers 5G-based cloud services so that the developer community would bypass hyperscalers. In terms of service delivery, telcos could harness more effectively the interworking between cloud services of hyperscalers (e.g., AWS, Google, etc.) and other cloud services as they would be independent of one single cloud service provider, strengthening their negotiating position.

■ **Ban on bundling or cross-tying.** As telcos would no longer be obliged to use Apple’s or Google’s expensive in-app purchase (IAP) system, telcos could stop worrying about being closed out of the aftermarket and could route their aftermarket payments through alternative (e.g., their own) platforms. Moreover, this would pave the way for telcos willing to bring a new app store onto the market since hyperscalers’ operating systems (e.g., IOS and Android) could no longer automatically install the hyperscalers’ app stores (e.g., Apple’s App Store or Google’s Google Play).

■ **Ban on self-preferencing.** Telcos would enjoy a more level playing field in competition with ver-

tically integrated business units of hyperscalers (e.g., Apple, Google Search) and could expect benefits such as a better ranking of their own products on hyperscaler platforms.

■ **Mandatory business users’ multi-homing (ban on anti-steering).** With the obligation for hyperscalers to allow their business users to promote offers outside the hyperscalers’ core platform services (multi-homing), it would be easier for telcos to attract smaller business users who are currently on a competing online marketplace of hyperscalers (e.g., Amazon) to their platform. Hyperscalers could no longer prevent these telcos from acquiring consumers on the former’s marketplace and concluding contracts with them instead on the latter’s own marketplace.

■ **Mandatory acceptance of third-party app stores.** The mandate for hyperscalers to permit installation of third-party apps and app stores using the hyperscalers’ operating systems opens up opportunities for price and quality competition among app stores. Telcos would enjoy greater independence as app developers and be in a better position to operate their own app stores. If Deutsche Telekom AG (DTAG) were to open app stores with lower entry and aftermarket prices, it might be able to attract more app developers and apps, eroding the currently dominant position of Google Play and the Apple App Store.

■ **Mandatory “FRAND” access to app stores.** As business users of app stores, telcos would enjoy better access prices and other access conditions to app stores. Effectively reducing price competition distortion would require some form of accounting separation between the app store and internal app developers as app store owners would now have to apply the same conditions (prices) to their own apps. Experience from telco regulation could be indeed useful in this respect.

■ **Ban on “spying” on business customers.** When using a hyperscaler’s platform for their business, telcos would have more incentives to introduce new products. In fact, information flows from the hyperscaler’s platform to its vertically integrated parts that compete with telcos on the platform would not be allowed.

Key takeaway

One of the essential characteristics of “digital services” is that they are provided by electronic means without the physical presence of provider and recipient at the location where the service is produced.

In this document, the terms “digital services”, “information society services”, “online services”, and “Internet services” are used interchangeably.

“Digital regulation” in this document refers to the set of legal and regulatory measures for addressing the challenges brought about by digital transformation with the objective of creating an enabling environment for a thriving business of digital services and products. While there is no one recipe for digital regulation, it has a decisive impact on the fate of the digital sector. If properly structured, digital regulation could be a key enabler for a dynamic, inclusive, and secure digital sector.

Although it is a huge step in the right direction, the DMA draft contains some shortcomings that require lobbying for further clarification and/or extension and for avoidance of delays and dilution. The missing explicit mandatory interoperability for core platform services would maintain the “closed” nature of gatekeepers’ platform.

Enforcing more effective interplatform compatibility and interoperability is key to promoting contestability and really unleashing the potential for competition in the provision of core platform services.

Despite the rise of digital regulation, telcos remain subject to telcos regulation. Digital services are covered by telcos regulation only to the extent that they are related to communications, i.e., electronic communications services.

Even if telcos are not at the focus of digital competition regulation, they would benefit considerably from many of the provisions meant to restrict the market influence of online providers with significant intermediation power (SIP players).

For telcos, digital competition regulation promises greater business flexibility and independence from hyperscalers’ lock-in as well as better prospects for many of their own products and production.

If properly designed, regulatory measures meant to restrict market power of online providers with significant intermediation power (SIP player) could be a game changer in the interaction between telcos and hyperscalers at the levels of both service delivery and services marketing. Strict interoperability obligations and FRAND access to app stores would be essential.

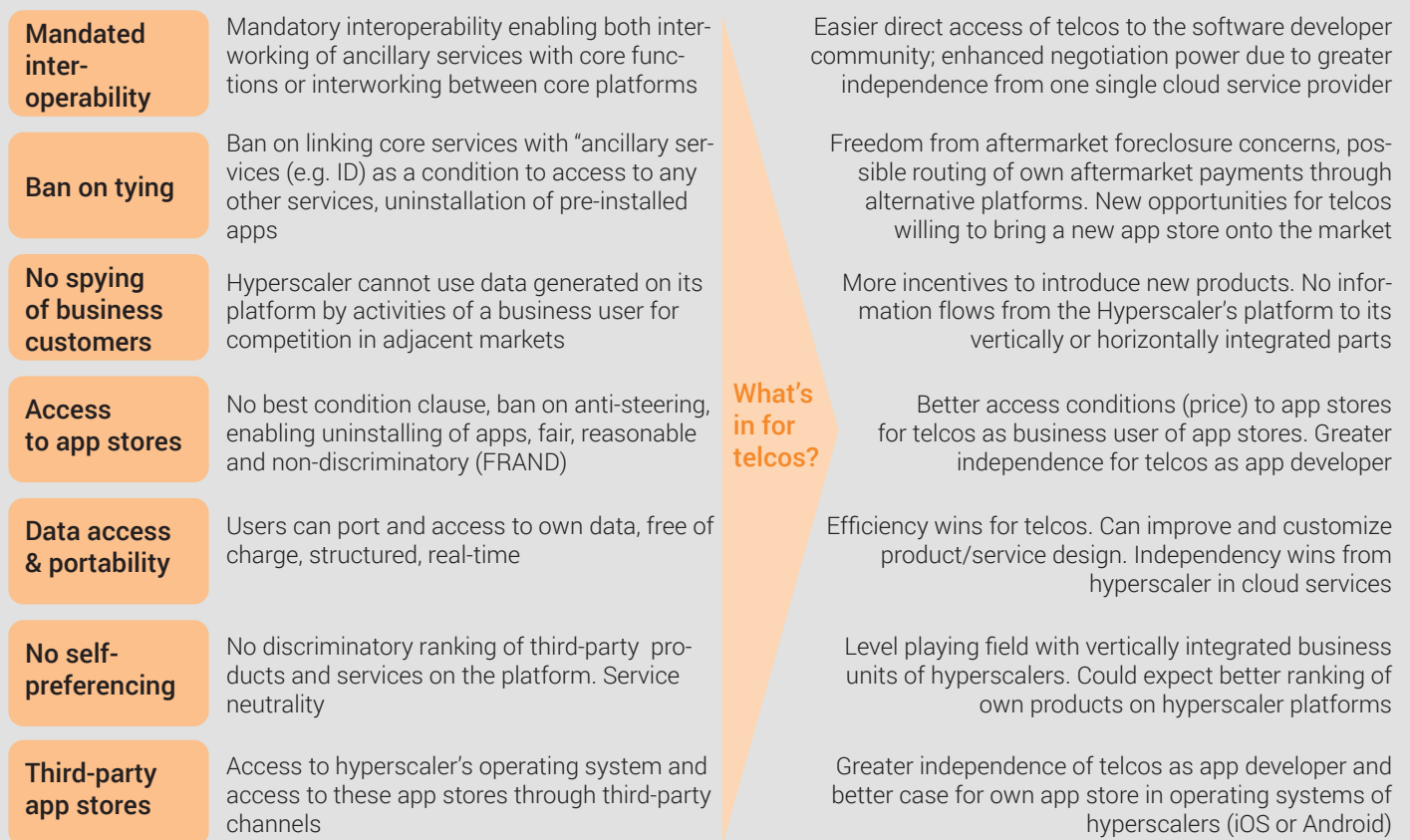
■ **Ban on “best condition clause”.** When using a hyperscaler’s platform for their business, telcos would be able to offer to consumers the same products or services that they make available on the hyperscaler’s platform on other platforms as well and even subject to different conditions.

■ **Mandatory data portability.** As business users of a hyperscaler’s platform, telcos could take all the data that the platform has collected about them to one of the hyperscaler’s rivals. This ensures a certain gain in efficiency as telcos could (for instance) transfer their consumer review scores from one hyperscaler’s platform to another.

■ **Mandatory data access.** Telcos who are business customers when using a hyperscaler’s platform would have unhindered and free access to the aggregated and non-aggregated data provided and generated in the use of the platform by the telcos themselves and their users, which would enable telcos to improve and customize product/service design (better business position). Telcos could provide more efficient services to their customers.

Below a snapshot of some highlights of what telcos could expect from digital competition regulation.

Figure 8: Some of telcos’ expectations from digital competition regulation



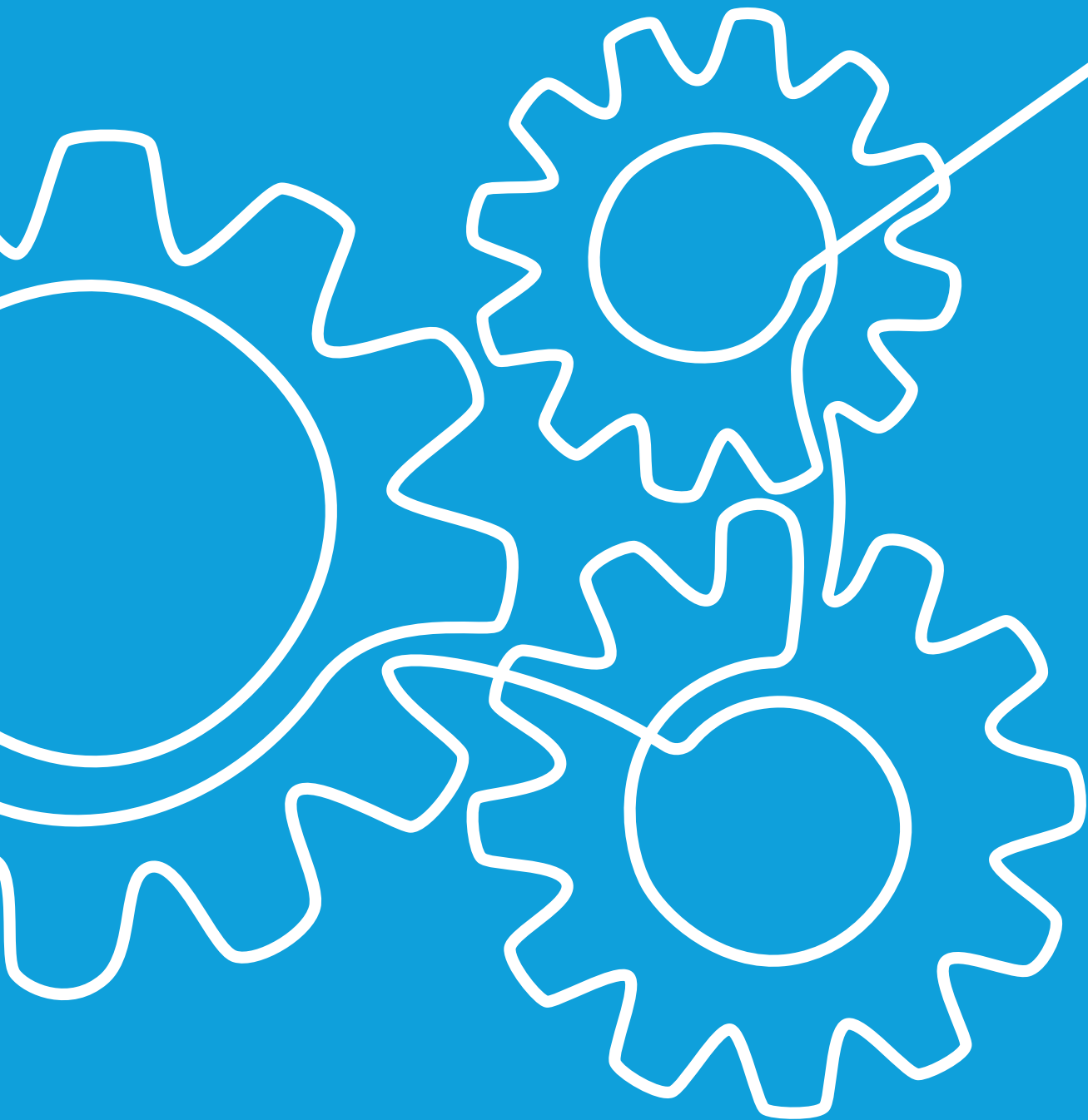
Source: Detecon

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The Telco Factory: Key to Success for Digital Telcos



An essential element for the success of telcos is the establishment of highly efficient production. Physical network infrastructures should be intelligently linked and flexibly combined into customer-specific solutions that are integrated into ecosystems featuring the division of labor. The more successfully this is realized, the more customers' enthusiasm can be generated and the more unique selling propositions can be used to establish a sustainable position in a competitive environment.

More and more IT technologies and concepts such as cloud computing and disaggregation are making their way into the NT world. New technologies (e.g., artificial intelligence and hyperautomation) create opportunities for telcos to offer tailored solutions to their customers and to work more efficiently (reduced manpower intensity) themselves. Customers expect their telecommunications operator to provide the same mechanisms that have long been common among competitors such as cloud providers with their one-click-zero touch provisioning mechanism.

Utilizing new production processes based on IT and software are possible means for overcoming the shortcomings of current legacy systems. Today, networks with their long history and the OSS and BSS systems based on them are highly complex and lack flexibility, and their operation and development cost time and money. Tomorrow, a restructuring of the systems and a replacement of the legacy world will prepare the groundwork for optimal utilization of an organization's own assets and for long-term market success.

But how must a factory be structured so that telcos can position themselves on the market as providers of digital services? The following paper will describe the capabilities that telco production should generate so that it is more than just a connectivity provider. Building on this foundation, a blueprint that describes how a successful telco enterprise manages physical infrastructures and implements intelligent, software-based steering mechanisms will be described.

3.1 Key capabilities of the production of the future

Changing customer demands will determine the capabilities that a production of net-centric, digital services should provide in the future. They can be summarized as follow:

Flexibility ensuring the provision of customized solutions: The demand for digital services is increasingly characterized by the trend to customization. Customers expect carriers to offer tailored services and to provide them as a ready-to-go, managed service. Additional services beyond the simple from the network specifically required for the use case such as security or service management are bundled into packages. Examples of such packages are solutions for networking multiple sites in companies – national and cross border - using SD-WAN services or campus networks for industrial applications.

The individualization of services will also change mobile communications and will demand new capabilities for the differentiation of quality levels. In 2022, mobile providers are still largely single-product enterprises. All connectivity services are offered via standardized SIM cards with best-effort quality levels. In the future, however, customers will want mobile communications services differentiated by quality levels aligned with the demands dictated by their use cases.

In the B2B/public segment, for example, authorities and organizations responsible for public safety and security will require tap-proof mobile communications lines with high availability for the performance of their tasks. In the B2C segment, customers for gaming applications will be interested in lines that guarantee low latency and ensure a stunning experience for the game players.

Satisfying such demands will require telcos to have the ability to offer differentiation in network properties such as bandwidth, latency, and security. The prioritization of traffic in the network and

Chapter 3

the provision of dedicated subnetworks, so-called network slices, are possible means for realizing this ability.

Innovation and time-to-market: R&D tasks on today's telco market are by and large the domain of only a few manufacturers on which carriers are dependent.⁴ The new technologies offer opportunities for the provision of network functions as software from the cloud, enabling telcos to break free of their dependence on proprietary solutions from a few providers and to make applications in the telco ecosystem accessible to all market participants. New players from startups to midsize software companies to global IT integrators can develop applications for networks and offer them to telcos. An increase in competition that leads to more innovations, shorter innovation cycles, and falling prices can be expected to result.

Simultaneously, carriers can offer upstream services from their network to third parties for subsequent incorporation of the services into the latter's own applications for end customers, opening the door to telcos' monetization of their differentiated network services. For example, services such as the determination of identity or location of sites can be provided for developers to use in new applications. Or slices with network attributes such as bandwidth or latency are obtained and bundled with applications. Access to these services is made possible via standardized APIs that are available to developers.⁵ The creation of developer communities and the sharing of applications among carriers is an advisable approach for the development of markets.

However, the control points that allow access to the network should be set carefully as they can also be used by competitors to gain access and skim added value ahead of the telcos. If, for example, hyperscalers can access directly properties of the networks, they can create their own network slices for their customers and combine them with other services such as edge clouds and network-related applications. Telcos run the risk of being reduced again to the role of infrastructure provider and of losing their relationships with customers.

Efficiency: Expanding and operating telco legacy networks consumes significant resources today. The complexity that has developed historically means that a large number of systems must be taken into account when changes are made. Many heterogeneous IT systems leave no alternative to personnel-intensive processes.

Telco production of the future should seek to automate operations as much as possible with the aim of reducing manpower requirements and accelerating processes. Operations should be highly automated during the phases of plan, build, and run so that network services can be produced at competitive costs.

The growing integration via new interfaces of the factory into ecosystems based more and more frequently on the division of labor generates new opportunities for outsourcing activities and optimizing the degree of in-house added value. For instance, services such as software development for network applications or network planning can be outsourced to partners.

Sustainability must also be guaranteed in the telco factory. Models for upcycling and recycling raw materials, for instance, can come into play as a response to environmental and social requirements to avoid risks to reputation. Environmental, social, and governance (ESG) criteria are influencing customers' purchasing decisions and the capital markets' assessment of a company to an ever growing degree. A telco should ensure that the production of its services uses resources as efficiently as possible. A centralized cloud infras-

⁴ On the RAN market, for example, just three vendors served around 850 mobile network operators in 2021 and accounted for 75% of the total global market and its volume of \$30 billion. Source: Evgeny Shibanov, Nikolay Zhelev, "Radio as a Service: a new RAN sourcing model", <https://www.detecon.com/en/journal/radio-service-new-ran-sourcing-model>

⁵ API standardization is achieved using frameworks such as the ETSI Zero Touch Network and Service Management (ZSM) and TM Forum Open APIs and is part of the new 5G and 6G standards.

Chapter 3

structure for service orchestration consumes less energy than decentralized computing power, for example. The use of fiber optic cables will lower energy consumption in comparison with copper cables.

Network sharing concepts ensure optimal use of resources and avoid redundant work. All of these considerations will impact future architectures and partner decisions. The digital telco can benefit from sustainability in several ways. On the one hand, it can become much more efficient and reduce costs for energy and other resources. On the other hand, sustainability is a means of developing new “green” services (e.g., “green” cell phones) and tapping new sources of revenue. Conflict materials such as rare earths can be avoided in the construction of hardware. Fuel cells with climate-neutral hydrogen can replace diesel generators.

3.2. A blueprint for the target vision of the telco factory of the future

But what does the blueprint for modern production in a factory look like? How can existing as-

sets and new technologies be combined to produce services that are flexible, innovative, efficient, and sustainable?

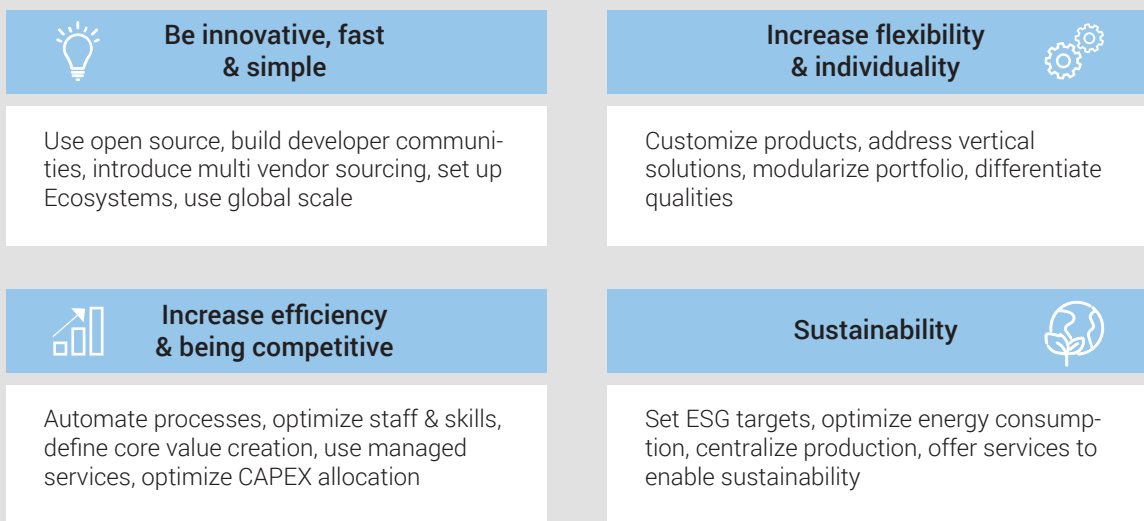
The target architecture of production that must be built or modernized for this purpose distinguishes between three levels.

1. The physical and logical infrastructures represent the foundation for production. They are one of the most important assets of telecommunications companies. The primary challenge is to integrate different access networks - own and third-party assets - into a company's own network.

2. The intelligence of the network factory is at the heart of the production as it performs the tasks of orchestration and automation. Various technologies are used in the “brain” of the factory to combine intelligently the differentiated network assets into services for end customers that are highly automated and integrated.

3. A new overarching management for the new factory must be set up in the phases plan, build, and run. The new technologies necessitate new

Figure 9: The new telco factory must provide four central capabilities for future success.



Source: Detecon

processes and a realignment of the organization. The right methods for collaboration should be introduced and, most importantly, the right skills should be acquired. All these activities are bundled in a new operating model.

3.2.1 Infrastructures: the foundation of production

Infrastructures are the essential asset of telcos. Customers' demands on the quantity and quality of the network's services are constantly rising. The requirements are determined by the trend toward differentiation of properties and the increasing division of labor in the provision of infrastructures. Telcos should adjust their capabilities for

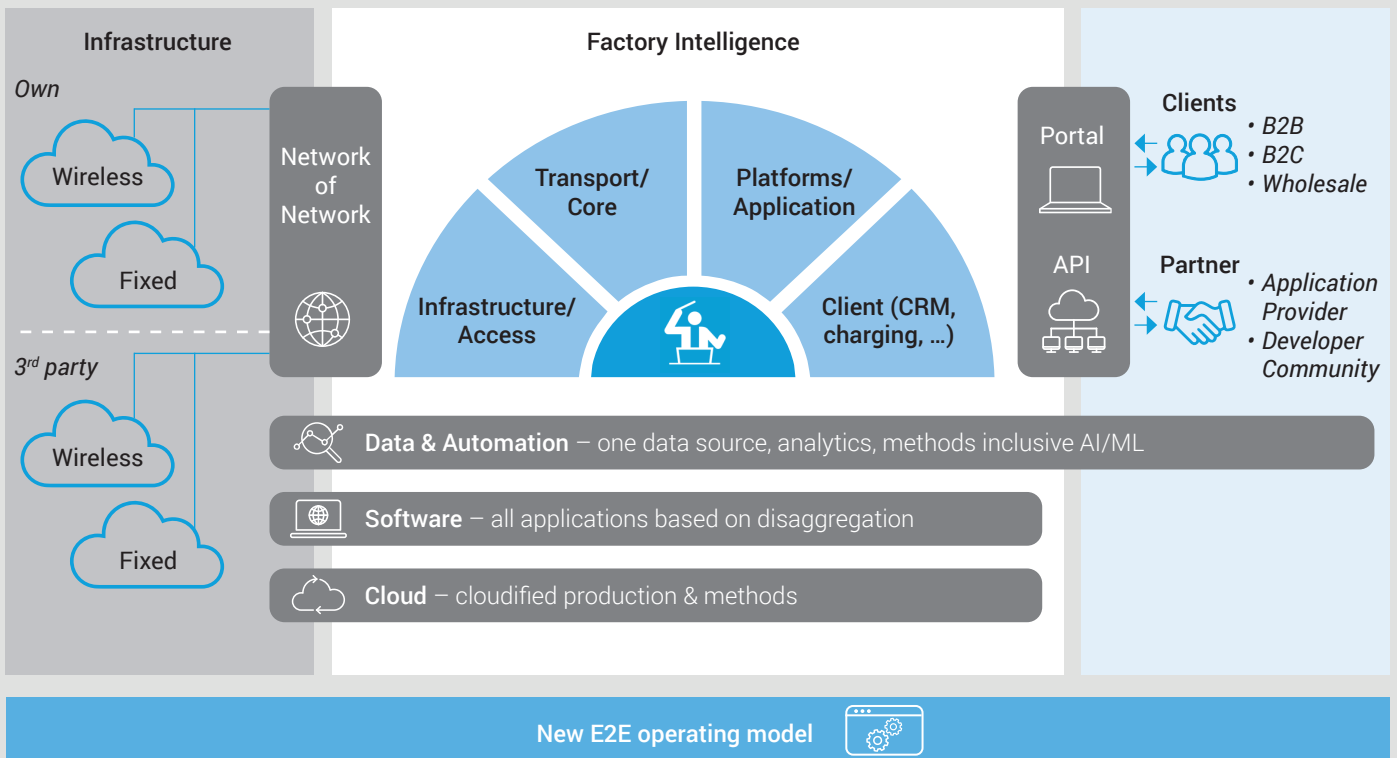
handling interfaces in their production along the same lines.

Essential properties that must be created at the infrastructure level can be distinguished as described in the following.

1. Coverage should be full-area to assure customers of seamless connectivity without interruptions. White spots in mobile communications must be rigorously eliminated.

Companies expect full-area, cross-border coverage without any loss of quality. Mobile in-house availability (offices, stadiums, train stations, airports, etc.) will gain in importance.

Figure 10: The blueprint for the new factory consists of infrastructure steered by network intelligence and an overarching operating model.



Source: Detecon

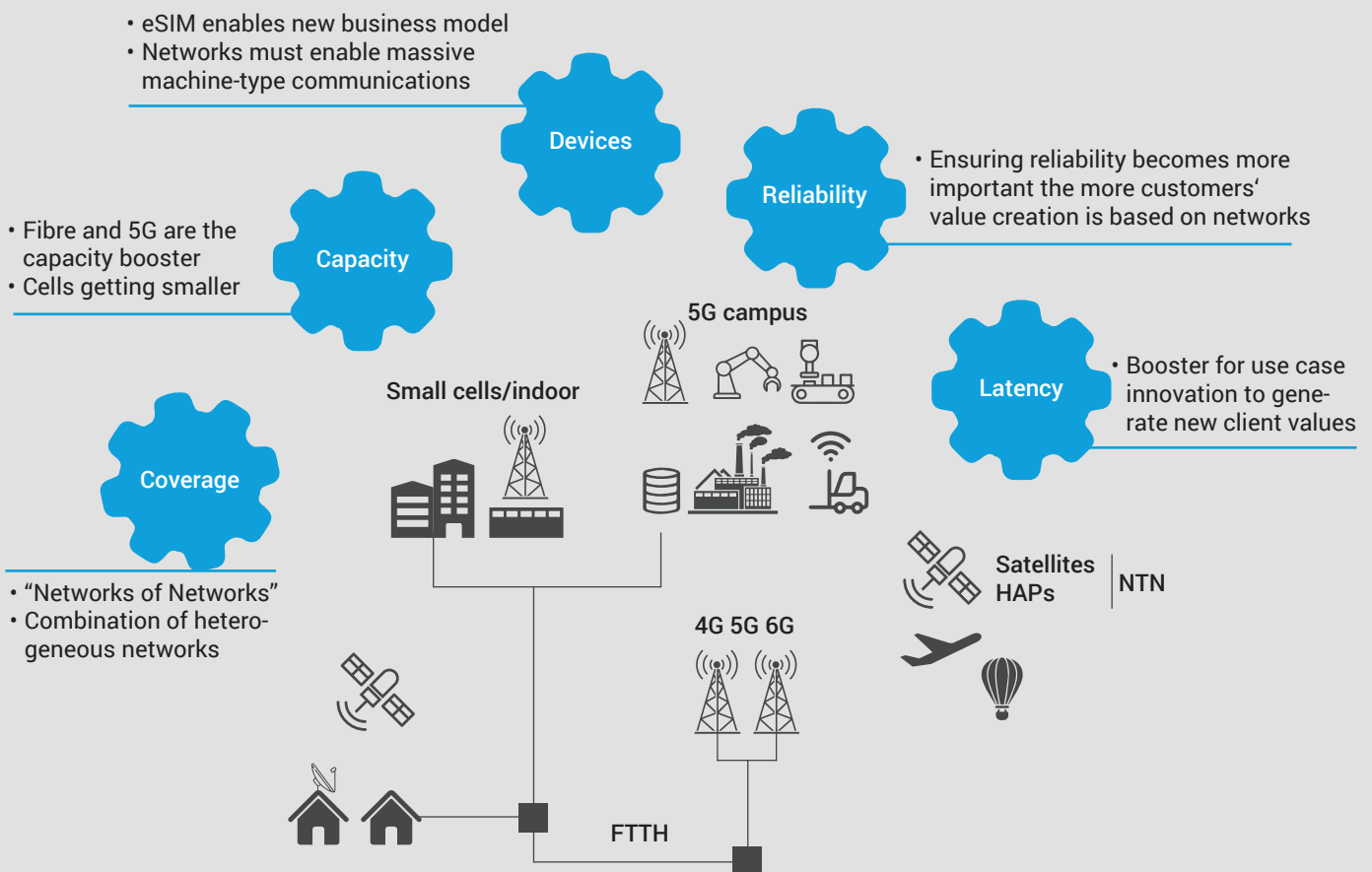
In the fixed network, the availability of high-performance fiber optic infrastructures without any gaps is the fundamental requirement for digitalization. The demands for coverage are so extensive that they can no longer be met by single carriers alone. There is a lack of time, resources, and CAPEX for its realization. Instead of one carrier using its own infrastructure exclusively, there will in the future be more and more carriers combining their own physical access infrastructure with the networks of other providers. Large telcos should view themselves more frequently as orchestrators of a “network of networks”. Additional wholesale and -buy capabilities enabling the integration of various infrastructures must be built up so that this can be achieved. Network sharing

models that exploit to the full the regulatory and competitive frameworks are also becoming increasingly important in mobile communications⁶

While traditional fixed and mobile networks are the domain of the established telcos with their full-area public networks, new technologies and business models are emerging in access infrastructures that are also accessible to new market players. The challenge for the incumbents is to find a way to deal with this development and to

⁶ Evgeny Shibarov, “Let’s Talk About Network Sharing – Again”, <https://www.detecon.com/en/journal/lets-talk-about-network-sharing-again>

Figure 11: Heterogenous infrastructures must be combined to the “network of networks” with quality differentiation.



Source: Detecon

Chapter 3

integrate these infrastructures into their own networks with the objective of improving coverage.⁷

■ **Low orbit satellites (LEO)** enable new entrants to secure coverage over large areas rapidly, albeit usually with limited capacity and latency. The networks are suitable above all for narrowband (IoT), nomadic, or hybrid (redundancy) applications. This new market segment is dominated by companies such as Starlink (SpaceX) and Kuiper (Amazon). LEOs can be used to provide coverage to entire countries in a very short time. Telcos can partner with these companies and use the latter's infrastructures to improve their own coverage.

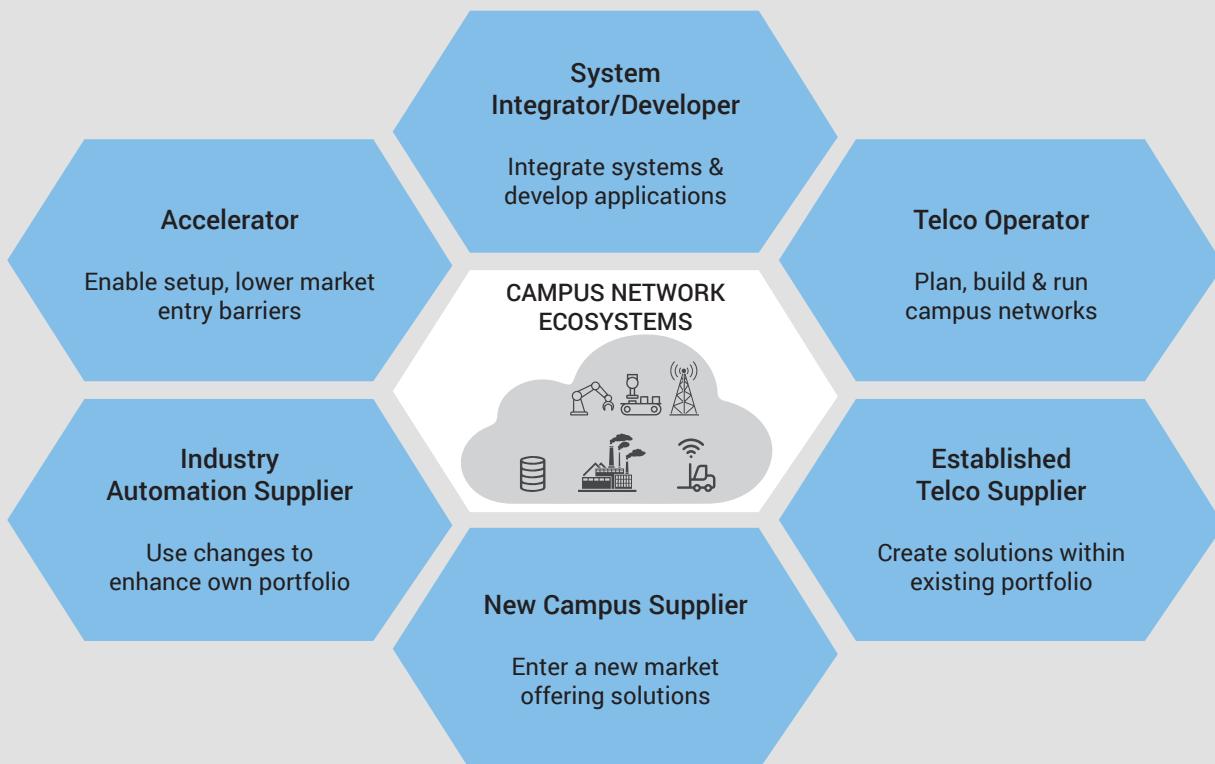
■ Companies can use **5G-based campus networks** to build and operate cellular mobile networks that

are completely under their control. The campus networks can meet the specific requirements of any given company, and innovative services such as automated guided vehicles (AGVs), AR/VR, or manufacturing robots can be deployed. Campus networks are a growth market for carriers and allow them to make use of their assets from the public network such as VPN, mobile slices, and operational experience. The other side of the coin, however, is that they present a threat to established carriers because they pave the way for new players to enter the mobile business and increase competition on the B2B market.

■ **Meshed networks** merge existing infrastructures and help to optimize network utilization. Carriers can benefit from offloading traffic. Meshed networks combine public and private network technologies such as Wi-Fi and cellular mobile communications. The networks are self-organized, and their decentralized structure means they have no central owners, reducing carriers' influ-

⁷ Dr. Hans-Peter Petry: *New Space Economy – Competition or Addition for Network Operators?*, <https://www.detecon.com/en/journal/dr-hans-peter-petry-new-space-economy-competition-or-addition-network-operators>

Figure 12: 5G Campus networks are changing the markets



Source: Detecon

ence and making it difficult to monetize meshed networks.

2. Networks are expected to provide sufficient **capacity**. The volumes of data being transported will continue to rise steadily. Applications that require high bandwidth such as AR/VR or image processing with computer vision will inexorably gain in acceptance. Carriers need to provide in particular fiber optic and 5G architectures that are designed to realize high bandwidths.

Fixed infrastructures will have seen the replacement of copper wires with **fiber optic networks** by 2030 and will be superior to the cable-based DOCSIS networks that will still be in use even then. Since fiber optic technology is mature, allows transmission of enormous bandwidths, and is very durable, it is an attractive financial investment for the long term. Bottlenecks in the realization of fiber optic networks are above all a lack of resources for planning and civil engineering, although the required enormous funds are also an issue.

5G SA (standalone) will be dominant on mobile markets in developed countries in 2030. Emerging or large-area countries will look more to nationwide 4G offering the same experience to all customers. The expansion with 5G will take place here much later or will occur only in specific regions.

6G adoption with full AI-based automation, openness to third-party collaboration, harmonized use of all spectrum and access, and optimization of carbon footprint will be imminent in 2030.⁸ By 2030, 2G and 3G will be limited to sporadic use on specific markets and for special use cases. The freed-up spectrum will be used for 4G, 5G, and 6G ("refarming").

Other air interface-based technologies such as satellite, Wi-Fi, and ultra-wideband (UWB) can also selectively supplement coverage. Owing to the rapidly increasing demands on capacity and

coverage, the mobile networks of the 5th and 6th generations will utilize cells that steadily decline in size, so-called small cells. The interconnection of these base stations for front/backhauling will be achieved primarily with fiber optic, which in turn will be a key driver for the design of future fiber optic networks.

3. The number of **end devices** will rise significantly. The Internet of Things (IoT) will lead to an exponential explosion in the number of devices requiring interconnectivity. The networks should be capable of managing the extraordinarily large quantities of devices used by their customers. Modern network architectures such as 5G already take this into account in their standards. Moreover, connectivity will also be increasingly embedded in devices, often going hand in hand with new business models for a provider. For example, the automotive industry is equipping vehicles with connectivity, and e-book manufacturers include network access in their readers. A DSP can offer the similar capabilities if it uses virtual eSIMs instead of physical SIM cards. However, eSIMs and new business models deprive carriers of their own direct access to end customers. They may be compensated by gains in new wholesale business, although this is usually less profitable than the direct relationship to end customers.

4. **Security and reliability** of connections will become more important. The more extensively companies rely on carrier services for their core processes, the higher the requirements for reliability and protection from attacks become. Providing the appropriate capabilities entails the combination of a wide range of technologies such as 5G, edge, or extensive redundancy concepts in the operation. Moreover, customers' desire for complete control of their data must be considered.

Telcos can satisfy these requirements for example by guaranteeing data storage within the country and supplying secure, private network solutions (both physical and virtual).

5. Network architectures will ensure E2E **low latency and low jitter**. Delay-free transport of data is becoming more and more critical. In the industrial environment, ever larger amounts of data must

⁸ Abdul Rahman, Felix Kirsten, Lothar Reith, "6G ideas on 6G" https://www.detecon.com/drupal/sites/default/files/2021-03/White_Paper_6%20Ideas%20about%206G.pdf

be analyzed within ever shorter time periods so that the feedback on which decisions are made is returned quickly.

If, for instance an industrial customer wants to monitor the control of its production or use automated guided vehicles (AGV), it is dependent on the virtually instantaneous transmission of huge amounts of data. Data can be analyzed in real time, and the results – for example, adjustments of production processes or control of the AGV – can be realized immediately. Low latency production should consider that every single link in the chain of data transport and processing causes delays. Telcos can address this challenge by combining the individual components into solutions that optimize latencies. For example, data can be transported via the air interface using 5G/6G with low latency and processed in local edge clouds close to the data source.

3.2.2 The brain of the telco factory for intelligent production

At the heart of intelligent production is the use of state-of-the-art IT and NT technologies and concepts, which should be linked with one another.

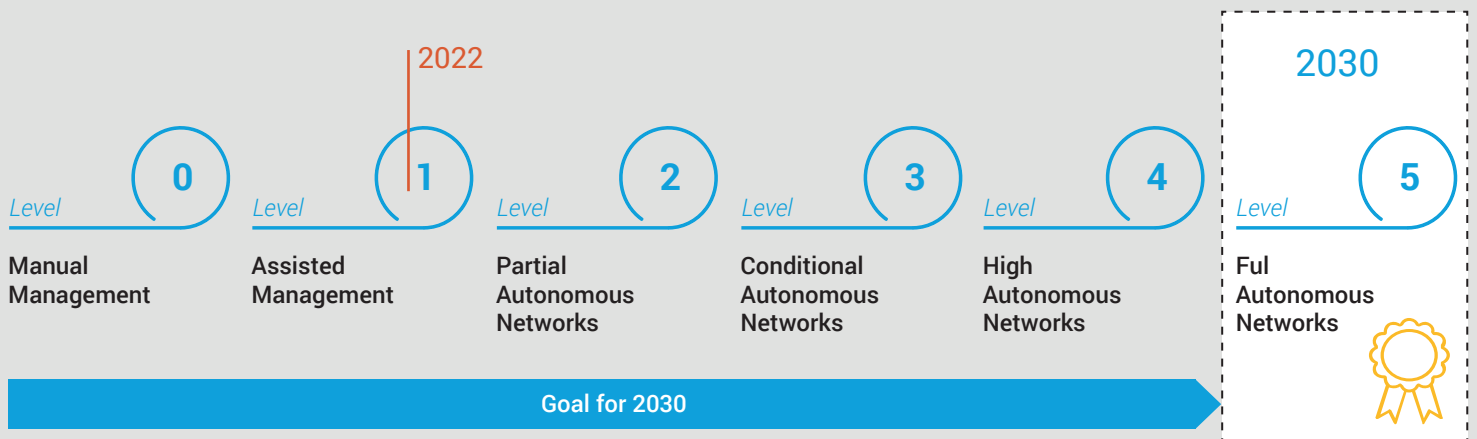
A crucial prerequisite for the new factory is **automation** of the processes within the factory that is

as complete as possible, from the procurement of any upstream services all the way to the customer. Mastering the growing complexity and generating the necessary flexibility and speed will otherwise be impossible. The complex workflows involving a large number of systems and partners can no longer be managed using manual processes with media breaks. Networks will evolve during a series of stages of expanding automation until they reach full autonomy. The completion of this process cannot be expected before 2030.

Automation is the basis for the **orchestration** of the capabilities at the core. The orchestrator is the heart of the new factory. A modular, automated IT stack, the orchestrator makes it possible to establish relationships between the various capabilities of different domains and to combine them. The orchestrator permits various network components such as access, transport, and core to interact. Third-party resources are incorporated as well so that various upstream services can be combined into individual, modular B2B and B2C services.

The prerequisite for automation and orchestration is control of the processes in the network based completely on software. This is where **software defined networking** (SDN) concepts come into play.

Figure 13: Fully automated networks can be achieved in five stages



Source: Detecon

The concept of **disaggregation** can overcome the traditional fixed “wiring” of hardware and software. Today, a handful of vendors offers “black boxes” that integrate proprietary hardware and software for specific NT tasks. Tomorrow, these units will be replaced by “white boxes” in which hardware and software are separate. Inexpensive, commodity “bare metal” hardware will be used to run telco software applications that can also utilize open source code. Network functions will be realized virtually as software in the future (see figure 14).

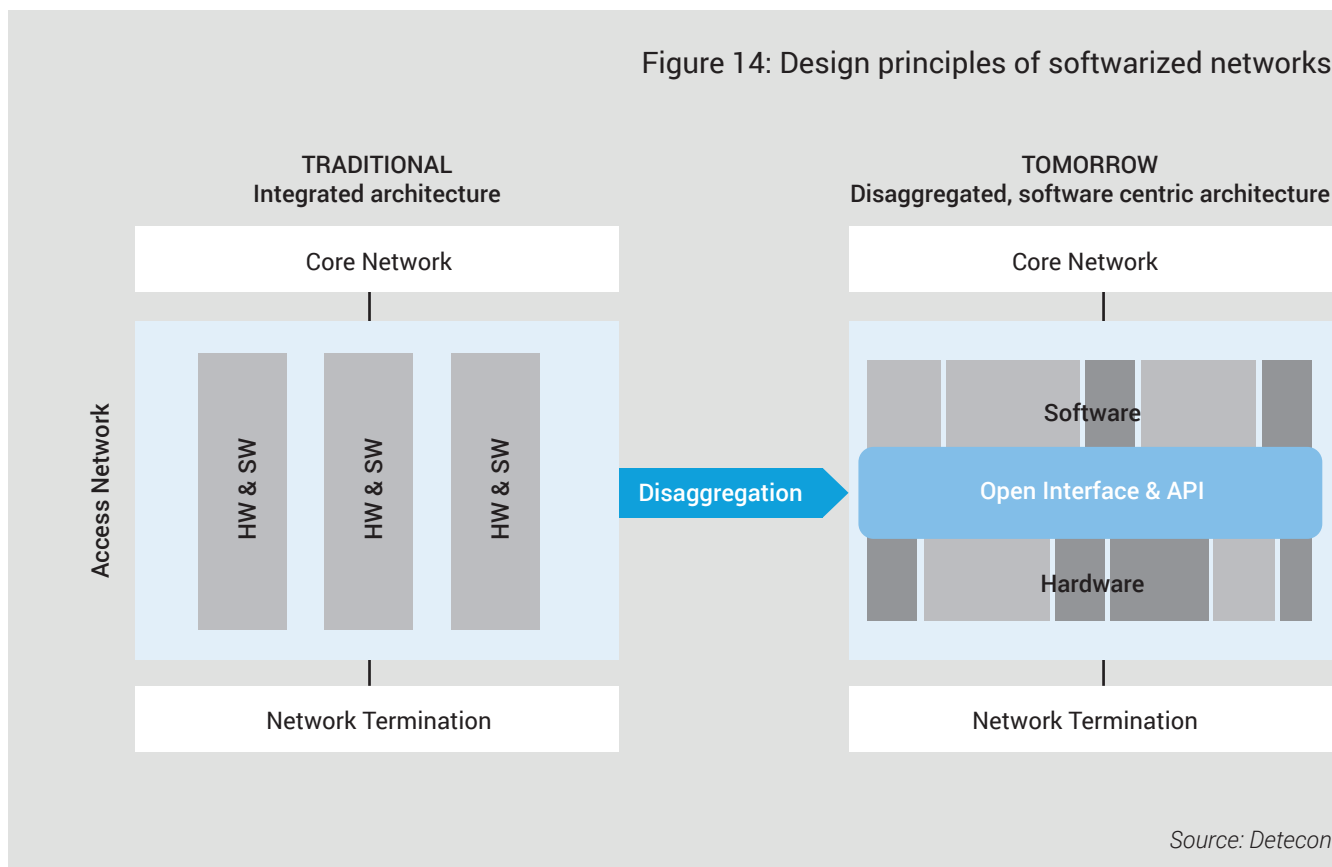
In the **fixed network**, several operators have joined forces in a cooperative effort to drive access disaggregation forward. These telcos have formulated their thoughts on the redesign of the central office for fixed line production in a target vision, the “Central Office Re-architected as a Datacenter” (CORD), that is now supported by the ONF (Open Networking Foundation) alliance.

Key elements of this approach are modern data center technology with commodity “white box” hardware, cloud architecture methods such as microservices and SDN capabilities, the separation of data and control levels, open source software, and software developer communities.⁹

Disaggregation is also being realized in mobile access. **OpenRAN** is a ready-to-go concept that disaggregates today’s uniform, vertical RAN architecture (SingleRAN).¹⁰ Antennas and hardware are separated from the software, which is based

9 Klaus Hilbers, *Access Disaggregation: Reassessing the Way Fixed Networks Are Set Up and Operated*, <https://www.detecon.com/en/journal/access-disaggregation-reassessing-way-fixed-networks-are-set-and-operated>

10 Abdul Rahman, Nikolay Zhelev “OpenRAN: Opportunities and Challenges for Telcos.” <https://www.detecon.com/en/journal/open-ran-opportunities-and-challenges-telcos>



Chapter 3

on open standards. Telecom operators are joining together in industry alliances such as the O-RAN Alliance and the Telecom Infra Project (TIP) to drive the growth and maturity of the OpenRAN ecosystem. If digital telcos succeed in creating the capability to integrate and manage the components across the board, they will have the chance to build centralized RAN management systems within carrier groups that leverage synergies across the boundaries existing between countries and networks. It will also give them the opportunity to market these capabilities to other telcos.

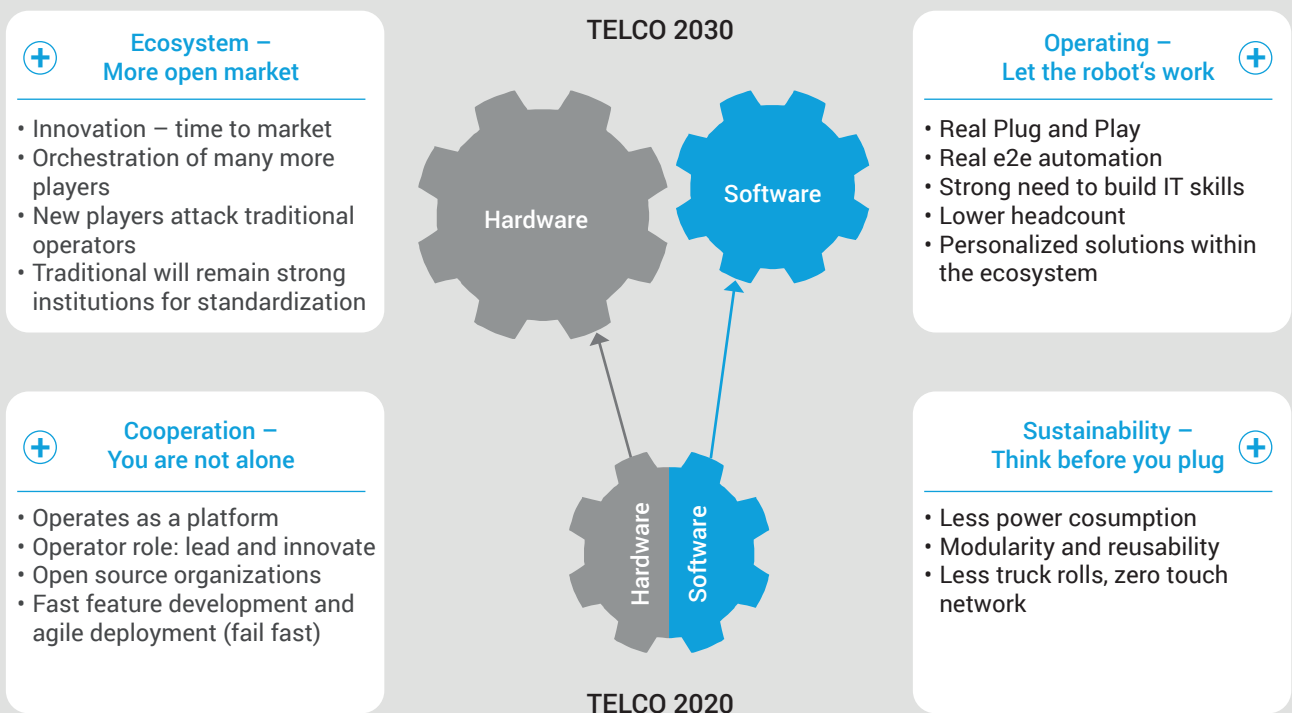
Disaggregation does not come only with advantages, however. Whereas in the past the manufacturer provided aggregated, coordinated E2E solutions for the telcos, in the future the carrier will have to take on this task itself. It must master the mix of components from different manufacturers, piece together proprietary partial solutions, and develop new capabilities to integrate and operate different components.

Operators have the opportunity to create these services themselves. While new processes and employee skills will be required, they will at the same time reap the benefits of automated processes and cloudified environments. Or the telcos decide in favor of outsourcing and look for a partner, e.g., a system integrator, who pieces the components together. This, however, replaces previous dependencies with new ones.

A **cloud architecture** is the most efficient environment for software defined networks. Cloudification enables centralization and scalability of production. It is the key for the reduction of complexity and for efficient operation with fast time to market. It becomes possible to benefit from mature IT principles that are already being used successfully in other industries.

Virtualized network functions realized as software are gradually being moved to the cloud. New technologies such as the core in the 5G standard

Figure 15: Advantages of disaggregation of networks



Source: Detecon

are even designed to be cloud native. Cloud environments also allow comparability of architecture, which in turn enables telcos to evolve together and create synergies.

In addition to centralized clouds, distributed clouds at the edge of the network, so-called edge clouds, are becoming increasingly important as a prerequisite for network-related applications.¹¹

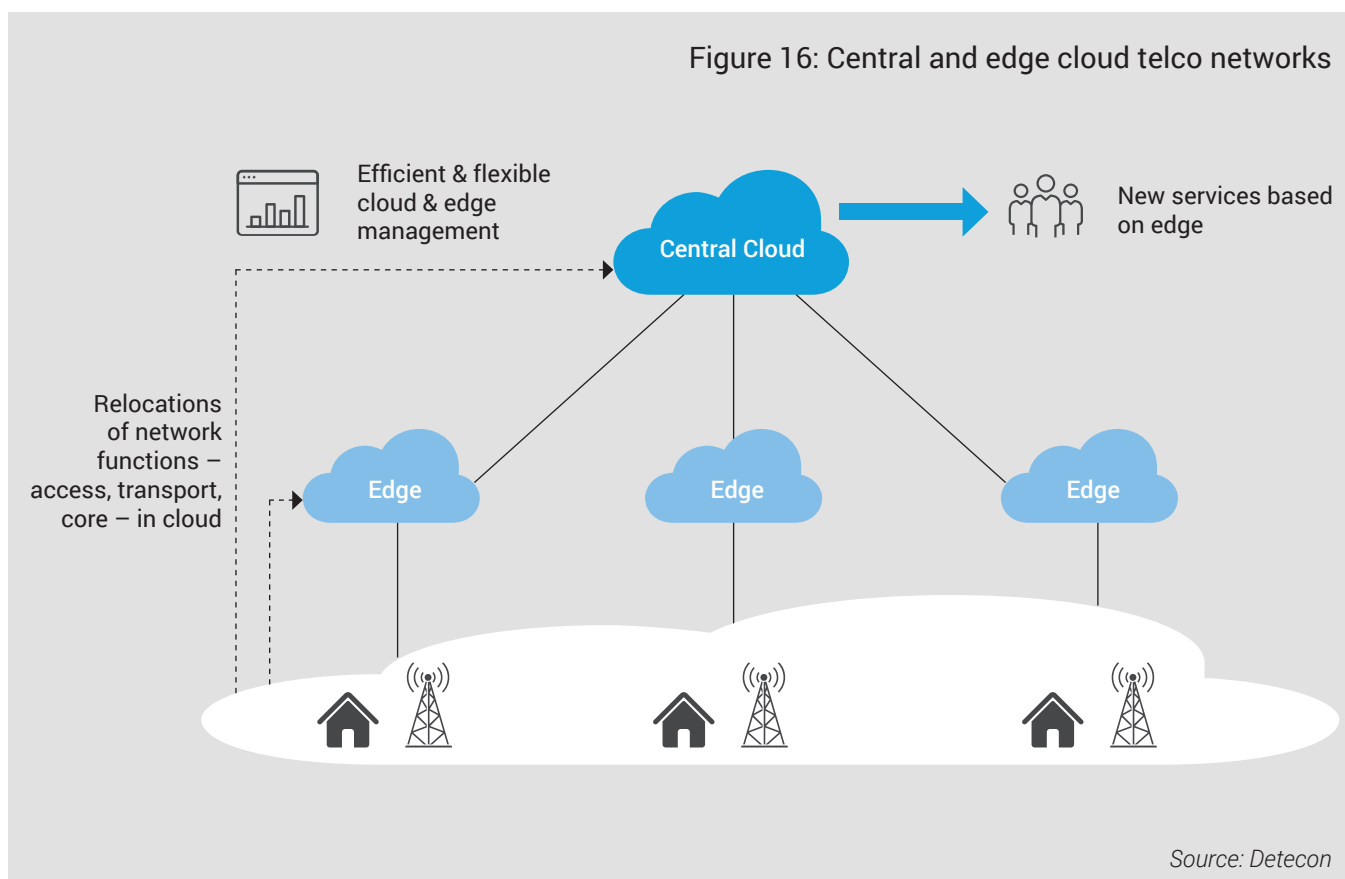
The progressing deployment of 5G will lead to the emergence of more and more use cases requiring the transport and analysis of large amounts of data with minimal delays. For example, there is a desire to relocate computing power from devices to the cloud so that energy consumption and the size of mobile devices can both be reduced. This

presents networks with the challenge of assuring low latency. Transport across multiple networks and processing in distant clouds is contrary to the requirements of many high-performance, real-time applications. The edge cloud moves computing power closer to the end user. Data can be processed directly where they are generated – in “small data centers” on the site, right at the “edge,” the outer limits of a company’s infrastructure. Low latencies in the single-digit millisecond range are feasible. New immersive (nearly) real-time experiences for customers and developers become possible. In addition, the decentralized structures increase resilience and security by filtering and encrypting data in edge clouds before it is sent to the cloud.

Telcos offering these services to their customers should include edge clouds in their production, whether by using the advantage of their decentralized presence in the area or by buying and integrating services from partners such as hyper-

¹¹ Georg Karl Kopf, “Edge Computing: From Hype to Reality.” <https://www.detecon.com/en/journal/edge-computing-hype-reality>

Figure 16: Central and edge cloud telco networks



Source: Detecon

Chapter 3

scalers that offer a comprehensive range of edge services.

Currently, telcos use only a small part of their **data**. The analysis is too time-consuming and the existing skills and abilities are usually still too limited. And yet resolute data management is indispensable for the automation of processes and applications required in the production of digital telcos. Managing the ever-increasing complexity of processes from “plan” to “build” to “run” and realizing flexible, customer-specific production at an attractive price level in the future will not be at all possible without **artificial intelligence (AI)** and **machine learning (ML)**. Telcos face the task of implementing an end-to-end data architecture with data lakes, bus structures, and joint data ingestion if they are to mine the full potential of data.

3.2.3 New procedures for operation of the telco factory

Working with new technologies calls for new methods. Using cloud technology must be learned, data architectures should be planned, built, and run, APIs should be provided, and new developer communities for telco apps should be created and components integrated into disaggregated networks, to name just a few of the operational challenges.

Mechanisms in existence today are reaching their limits because they are too slow and rigid or simply lack the personnel capabilities. New approaches that should be combined into a new operating model for the telco factory are needed. It is important to take a holistic approach and cover various dimensions ranging from processes and organization to governance and culture.¹²

New working methods that enable telcos to produce faster and more flexibly are essential. One example is the DevOp concept: Software-based production from the cloud allows the development of new functions in the network and the operations to be brought closer together in the **DevOp** concept.

DevOps are to be understood as a collection of various methods and tools to build up certain capabilities in an organization with the aim of breaking down the silos that often exist between development and operations. The speed and frequency with which changes are implemented in live operation should be significantly increased and the success rate for changes improved without compromising the required reliability of software systems. It will become possible for telcos to shorten update cycles from months to days or hours.

Telcos should build up or expand their capabilities in four areas so that they can achieve these goals with the aid of DevOps:

■ **Technology:** This point covers the introduction and integration of platforms and tools for release management, continuous integration, deployment automation, continuous testing, continuous delivery, test data management, cloud infrastructure, and the embedding of security directly in the development processes (“shift left on security”).

■ **Processes:** This topic is about modifying and actually practicing processes to make the DevOps team’s work more efficient and autonomous – especially the simplification of change processes, the introduction of customer feed-

¹² Jörg Borowski, Birinder Singh Khuran, “Technology Transformation: Reinvent the Network and Change the Way of Working, Now!” in *Future Telco – Successful Positioning of Network Operators in the Digital Age*, Springer publication

Chapter 3

back processes for DevOps teams as well, or the visualization of the workflow from idea to result.

■ **Culture:** Organizations that turn their DevOps into successes have a trust-based culture (e.g., in the sense of a Westrum organizational culture) that places an emphasis on learning, including learning from mistakes (within the sense of a blameless post-mortem culture).

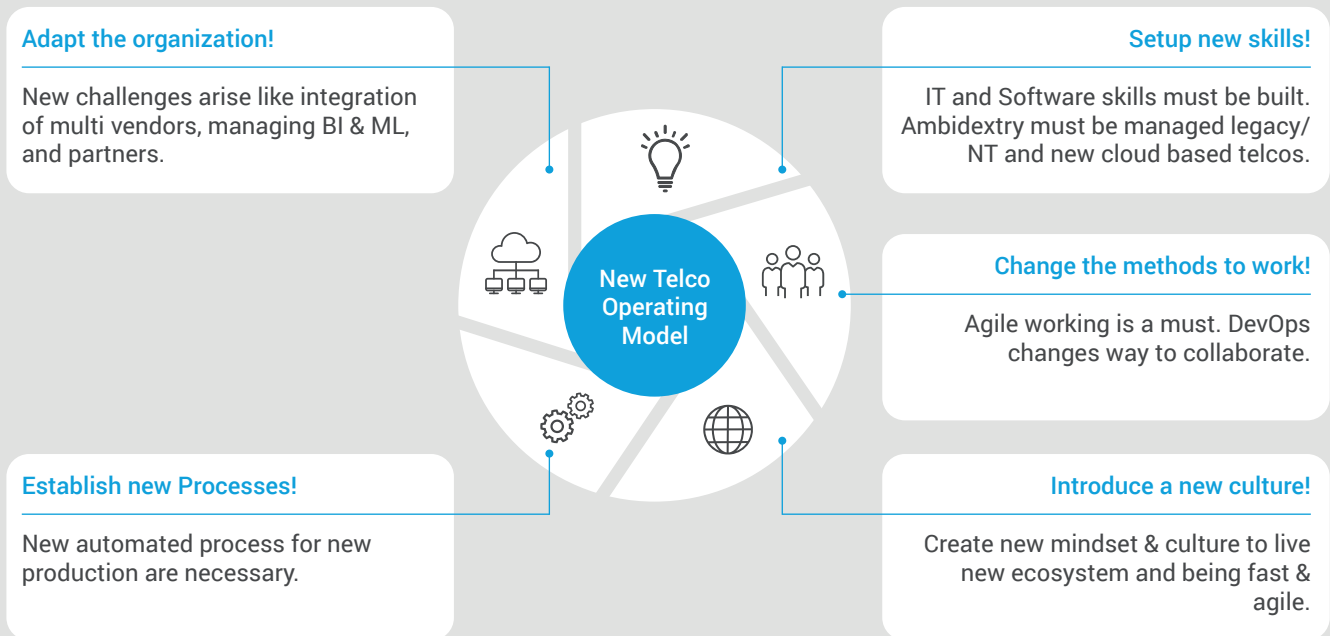
■ **Measurability:** DevOps teams have the ability to monitor comprehensively their system for its continuous improvement and receive proactive error notifications before issues become visible to the customer.

Another dimension that needs to be instilled in the new operating model is the **management of**

the required skills. The demanded qualifications will change. The right people for the management of the network factory of the future must be found. The staff members who plan, develop, and operate the network factory of the future should combine software-oriented skills with networking experience. Employees with cloud and IT skills familiar with agile working on the one hand and experienced network engineers familiar with historically grown networks and proven linear processes on the other represent the “ambidexterity” that must be balanced within the telco.

The necessary changes that telcos should make are very extensive. Although the transformation that must be initiated is driven by technology, it must focus above all on people and the corporate culture.

Figure 17: The new telco production requires a new operation model



Source: Detecon

Key takeaway

The telco factory of the future is the key to a telco's success in the future. The changing B2C and B2B demand and the dynamically changing market structures determine the essential capabilities that the production of the future must provide if it is to be successful in the future. The factory must ensure that individual, customized solutions are provided to customers. Differentiated grades of service must be produced in mobile services, and they require the management of slices. Achieving the objectives of increasing innovation power and shortening time-to-market means structuring the factory so that that it uses APIs for integration into ecosystems based on the division of labor. On the one hand, the new openness enables the development of new revenues and business models, but on the other hand it creates the risk that competitors such as hyperscalers will take advantage of this openness to dominate end-customer relationships and push carriers into the role of strictly upstream service suppliers. Mechanisms must also be established so that open source concepts can be exploited to benefit from global innovation. Ensuring efficient provision of service that is competitive requires maximum use of the opportunities offered by automation as well as of economies of scale. Moreover, the company's own depth of added value must be optimized and achievement of an optimal division of labor is crucial. Finally, production must be structured so that it is as sustainable and conservative in its use of resources as possible.

Various technologies and concepts must be meshed with one another in complex systemic interactions so that these capabilities are produced in the telco factory. A blueprint for the target architecture of a telco factory describes the key challenges in three essential areas:

First, infrastructures lay the groundwork for the production. In the future, customers will expect connectivity to be available at any time and at any place, and it should be tailored to the specific application. The differences between separate access technologies such as fixed and mobile will lose any meaning for customers. The yardstick for the "best" network will be its ability to adapt optimally to the specific needs of the given situation. Telcos must intelligently combine their own infrastructures with those of partners if they are to meet this demand. In a "network of networks", the combination of various infrastructures must satisfy customer needs. Fiber optic will dominate in the fixed network while 5G will be the standard in mobile communications. The mix with other technologies such as satellites, Wi-Fi and meshed networks must be mastered so that full-area coverage with high bandwidths can be offered even across national borders. Low-latency transport of data via E2E chains over short distances, fast transmission media, and decentralized network elements close to the customer is required.

Second, realization requires a primary focus on intelligent, software-based production comprising an orchestrator that establishes the relationships among all the capabilities and that makes it possible to produce customized products in a short time. The rigorous

disaggregation of hardware and software creates the basis for mapping network applications as software and overcoming dependency on a few manufacturers. Without complete automation of processes and the use of all available data in a central data architecture, the growing complexity cannot be mastered and the efficiency of production that is necessary for survival on highly competitive markets cannot be achieved in the long term. Similarly, the cloud environment as the basis for holistic mapping of NT (access and core) and IT (BSS/OSS) production contributes significantly to the reduction of complexity that makes highly efficiently production and scaling possible.

Third, the new technologies and processes demand new procedures. A new, holistic operating model that describes how telcos can mold production using plan, build, and run phases is needed. New working methods such as DevOps or agility are required so that production is more flexible, faster, and more efficient. The right skills should also be at hand, and an appropriate organization and culture must be established.

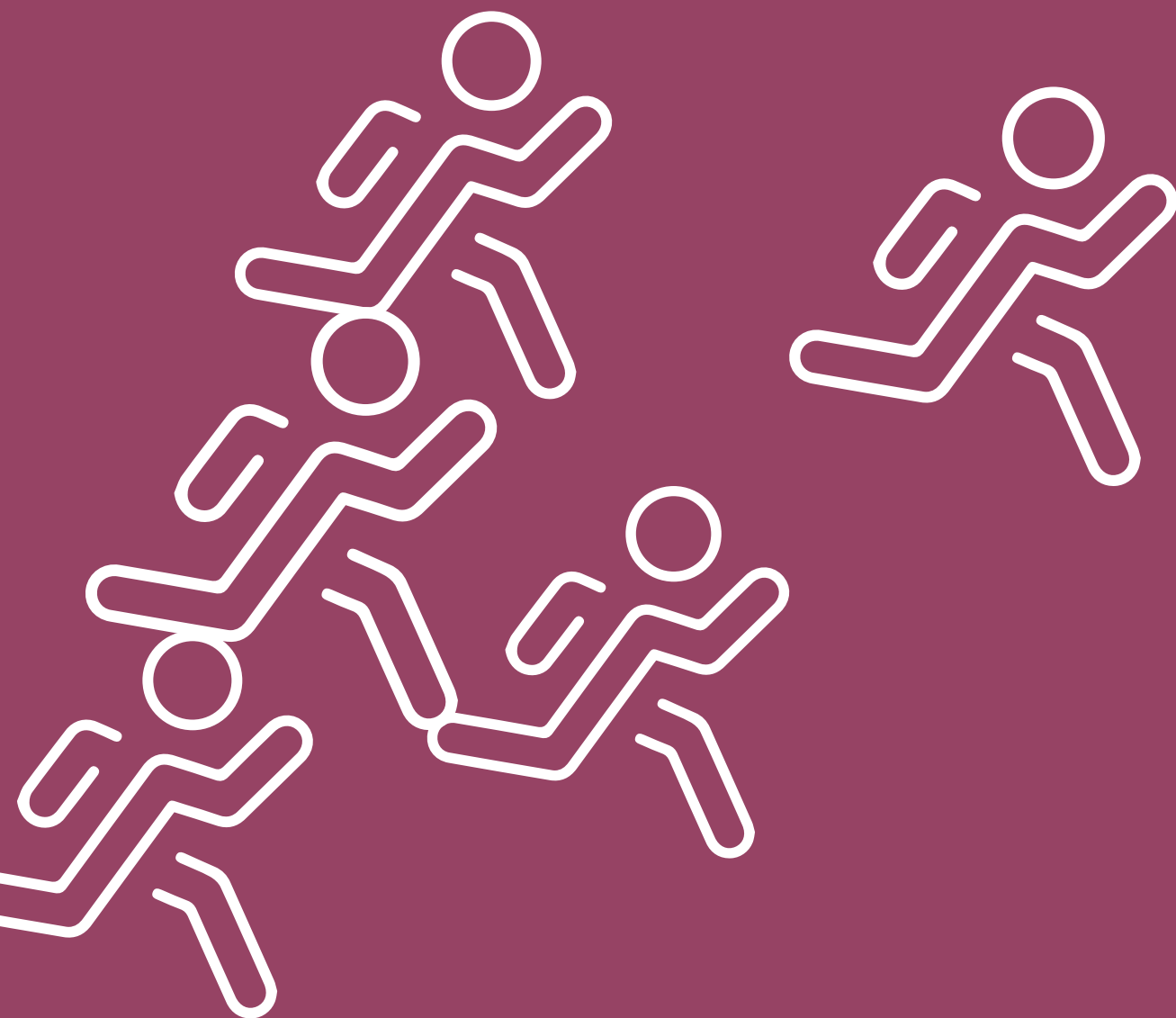
The realization of the new production is highly complex and requires a lot of time and funding. The larger the single telco and the more operators in an alliance, the greater the synergies and economies of scale that can be realized (e.g., through central cloud production). The greater the company's success in utilizing its own network infrastructures, combining them with those of third parties, and producing customized solutions, the more effective it will be in keeping competitors such as hyperscalers at arm's length and positioning itself long-term on the market as a provider of digital services.

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Competition Landscape in 2030



The telecommunications market in Europe has seen tremendous growth in data traffic since the dawn of the internet while new competitors ranging from new telcos to hyperscalers have entered the arena, keeping margins depressed and making life consistently more difficult for telco players. The latter have reacted by looking for additional revenue streams (e.g., IoT, cloud services), but as of 2022 without much success, and future prospects do not look especially bright. Since realizing that revenue growth would not be forthcoming as hoped, carriers, especially incumbents, have tried to lower their costs, an effort that has met with greater success. In 2022, this seems to be the way to go for the next ten years; from a telco perspective, this would be difficult enough, but more and more have begun to realize that the road ahead will be even rockier than they had feared.

Their concerns relate to changes that have already started and will continue to accelerate until 2030, significantly altering the traditional competitive landscape. While driven in part by shifting demand patterns, these shifts are mostly a consequence of technology dynamics (e.g., network disaggregation, softwarization, sinking costs for LEO developments) breaking apart the added-value chain of the provisioning of telecommunications services. The new situation will not only open the door to new types of specialization and players; it will even alter what it means to be a telco or communications services provider.

Many of the changes, particularly in the technology domain and on the demand side, have already been described. In this chapter, we will concentrate on the impact of all “these changes” on the competitive landscape and some key lessons operators can take away from the events.

Before describing the new competitive landscape and its consequences, we want to take a look at the demand and supply side for core communications services. At this time, such services comprise 80 percent or more of the business for most operators, even after ten years of effort attempting to break into adjacent markets such as cloud-based services or IoT.

Connectivity-related demands like network quality, reliability, seamlessness, or bandwidth are and will continue to be highly relevant. Carriers are already well-versed in meeting such demands. Customer requirements like easy-to-handle service provision and security aspects of communications are more of a challenge, but in view of the effort telecommunications operators are investing here, it seems that most of them will be able to master these customer-related challenges in the coming years, too.

Along with the above-mentioned changes, the demand for the provision of ecosystems is also on the rise, but in-depth integration knowledge is required to meet customer expectations. The integration of connectivity functions with IT and over-the-top services is still a major challenge for carriers.

Although frequently mentioned in plenty of marketing materials or on websites, it is rarely implemented properly; at any rate, the majority of carriers, who remain focused on connectivity, have made little progress. Part of the ecosystem conundrum is that customers, especially large corporations, either do not believe (with some justification) that carriers have the competence to provide such systems or view this task as part of their core value that must not be entrusted to any outside party.

Moreover, this move to ecosystems requires qualified personnel (such as software architects) who operators currently do not have in sufficient numbers, and they will indeed be hard-pressed to recruit enough of these people considering the deep pockets of hyperscalers like Microsoft, Google, and others.

Besides, there is the challenge of utilizing these skills effectively as the organizational and payment structures of most carriers have proven to be less than ideally suited to exploit them to the full (software development expertise is only one example).

Now let us talk about the supply side of connectivity services and the changes in this segment.

Chapter 4

The graphic below shows that pressure on the traditional connectivity market is coming from many different angles.

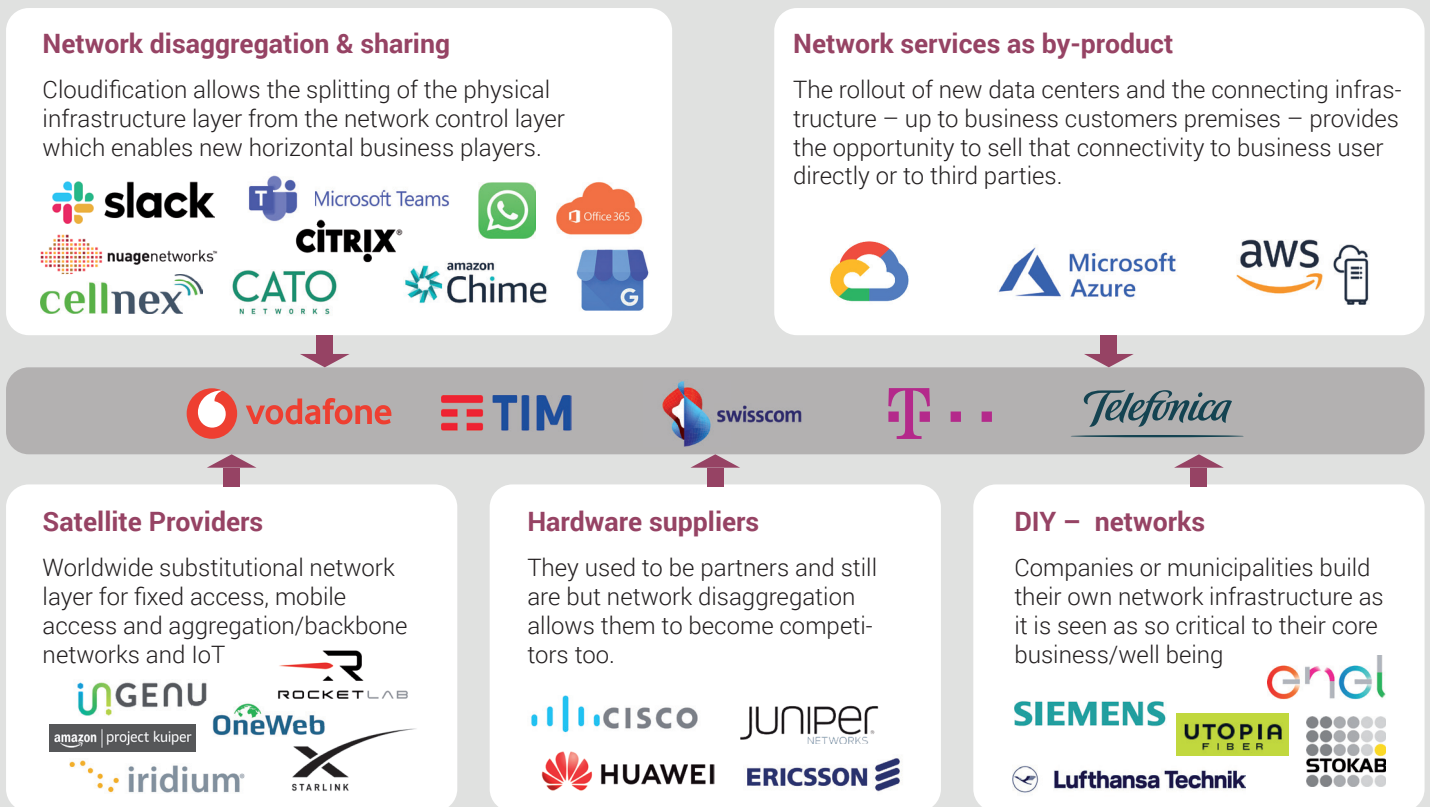
First, you have the network disaggregators, whose activities have been made possible by technology changes. They offer all kinds of “over-the-top” services – typically collaboration software, but more and more frequently extending to sales, HR, or business analytic tools.

This group of players encompasses as well NaaS (Network as a Service) providers who build software-defined networks (e.g., for enterprise services) on top of previously existing systems, addressing business clients worldwide. NaaS players include numerous independent small to midsize operators, but, of course, all hyperscalers offering over-the-top communications services like WhatsApp or Facebook Messenger for private

consumers or Teams, Slack, Google Business Messages or Amazon Chime for business use, to name just a few, also fall in this category, often bundled with cloud services and other business services like O365 or Salesforce.

But network disaggregation is not limited to providing gateways to companies with a software background; it also extends to specialist companies on the hardware side that concentrate on network components. One example is Cellnex, which is currently building/running one of the largest wireless telecommunications infrastructures in Europe and offering its services to all providers. Another example is Helium, which is building a wireless network for IoT based on common efforts and on cryptocurrency payments; Lime, which tracks its scooters via the network, is just one of a growing number of customers for this kind of services.

Figure 18: Pressure on traditional connectivity market



Source: Detecon

Second, you have satellite providers offering not only high-latency, low-bandwidth solutions as in the recent past; new providers like Starlink and (soon) OneWeb and Amazon/Kuiper will be offering low-latency, high-bandwidth products for rural areas or backhaul networks. This development also has a positive side for connectivity providers, particularly if they face regulatory requirements to provide services in remote rural areas.

Partnering with these operators (e.g., offering 5G in a remote village by connecting the mobile tower via satellite backhaul or having them service some remote customers entirely) could save operators an expensive network rollout.

On the other hand, it sets a price cap on services and, depending on technology change and additional satellite capacity, these providers could become additional competitors in areas currently not often addressed by the traditional competitors of carriers. A typical example of the competition that is on the way is the recent offer of Starlink Premium: 150 to 500 Mbit/s with latencies of 20-40 ms, 24/7 premium support, and prioritized connectivity, all for \$500 a month – there is no network neutrality in space yet.

Alongside the “big” satellite players, however, there are small and midsize players that are often overlooked. They focus on the business sector mainly for IoT and information services. “Small-Sats now account for 97% of satellites launched and almost half of all upmass. With hundreds of SmallSat projects underway, this massive shift in satellite markets is poised to only accelerate in the near term” – the 7th Annual SmallSat Symposium in February 2022. The new players will more and more frequently turn into competitors, especially in the IoT segment regarded by many operators to be a growth opportunity, as they provide both specialized software and the hardware to cover huge land areas very cheaply.

Third, there are the DIY (do-it-yourself) networks. They may be provided by either large cooperative ventures that subsequently decide to sell services to third parties or by public services providers who consider connectivity as equivalent to utilities like

water or electricity, who build networks with the support of public funds, and who provide the service free of charge or at reduced rates to customers. These types of competitors, who either do not need to make a profit or who seek to recover only some of their costs, usually push down price levels and diminish telcos’ profits.

The fourth group of “new” competitors is comprised of hardware suppliers. They often work hand in hand with large business customers that require dedicated network services. After these capabilities have been built at great expense and are up and running, offering some of the spare capacities to other customers is the next logical step, and they become new competitors for telcos. Currently, as telcos are still their largest customers, hardware providers are not moving full speed ahead in that direction, but we think that this will change in the next five to ten years as the strategic rationale of the pursuit of profitability will push more and more hardware providers in that direction.

Last, but not least, large cloud providers/hyperscalers continue to expand their data center footprint worldwide, including facilities on business customer premises, and an extensive network must be operated to connect all these locations. Typical examples of the provision of network services as a “by-product” are AWS Outposts services using AWS Direct Connect or Microsoft’s ExpressRoute services connecting to Azure’s data centers for access and VPN services. We say a by-product because the “main” products from a business customer’s perspective are AWS, Azure, or Google’s cloud services. These are the segments where these players make their money and differentiate their services, not in the access services that are provided by - as they and the end customers see it – interchangeable connectivity providers.

Furthermore, the increasingly closely meshed, high-quality, and high-bandwidth networks that AWS, Microsoft Azure, and others are building worldwide to connect their data centers establish an excellent foundation for them to generate additional revenue by selling bandwidth for connec-

Chapter 4

tivity services to third parties, usually small to midsize carriers or large businesses. This is an opportunity for smaller and midsize carriers to expand their service footprint, but for telcos represents primarily new competition on their current market for the sale of national/international connectivity service. Moreover, these networks continue to grow in reach and bandwidth every year as all big hyperscalers add new data centers.

Microsoft, for example, announced in April 2021 its plans to spend billions in building as many as 100 data centers along with the accompanying backbone network every year.

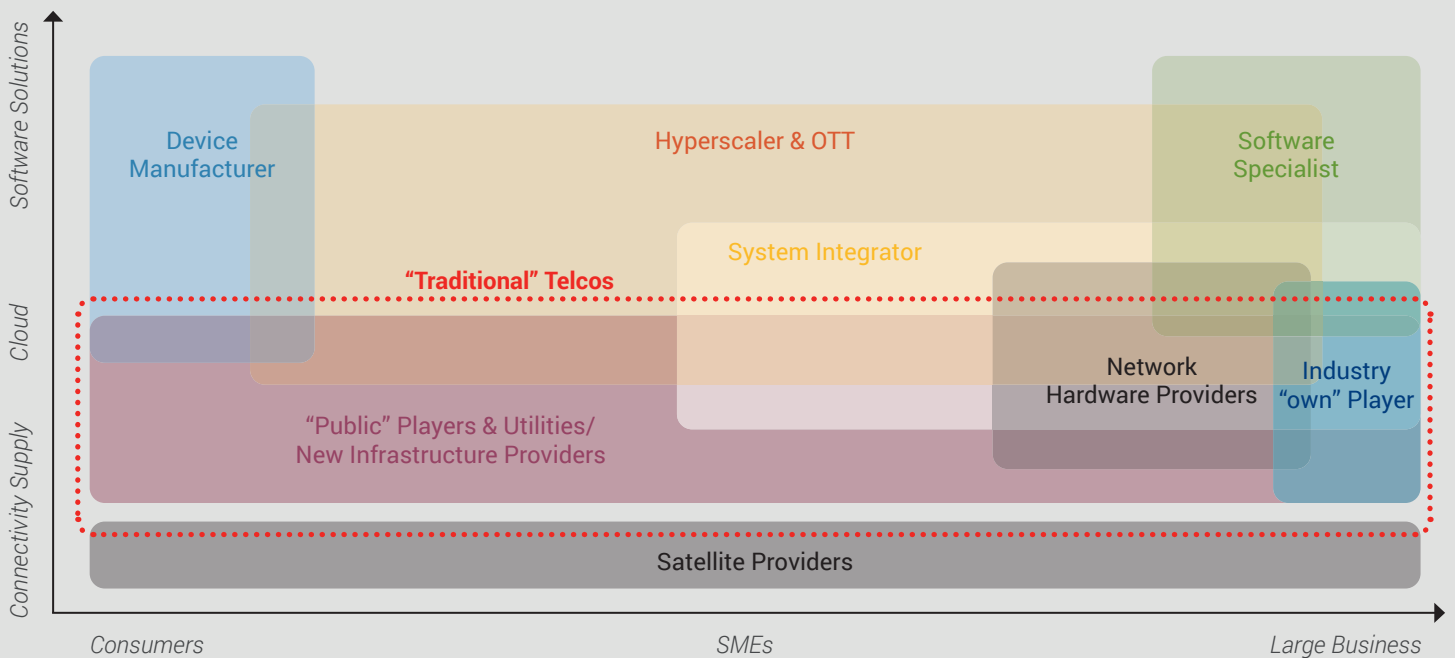
No telco is currently in a position or even willing to expand its international network to such an extent, not to mention the data centers, on its own. The graphic below illustrates the areas that all these new players will be addressing in 2030, if they are not already doing so, including the business segment in which they will be competing head-on with traditional telcos.

Conclusions about the competitive landscape from the telcos' perspective:

The growing demands described above cannot easily be addressed, but operators with a clear focus will be able to rise to the challenge; still, question marks about the role ecosystem provisioning will play remains. In our opinion, very large operators might be able to play a role of this type in some subsegments of the market, but it will nevertheless be only a minor one compared to hyperscalers and device manufacturers or software players.

Technology development, especially in network disaggregation, but also in the other directions of competition, will bring immense pressure to bear on both the top and the bottom line of carriers. Considering that Amazon has annual expenditures for R&D that are greater than Vodafone's total market capitalization, countering the situation through innovations will not be a realistic option.

Figure 19: Competitive landscape in 2030



Source: Detecon

So telcos will need to redouble their efforts in digitalization, automation, and orchestrating internal and external capabilities. Digitalization and automation are necessary to provide the most up-to-date services and to drive down costs and safeguard margins as much as possible. Orchestration of different partner and in-house services, including customer solutions, will be another major differentiation factor among telco players.

■ In the **residential segment**, telcos need to play the efficiency game while cooperating with providers of cloud-based solutions critical for customers, streaming and gaming services, and payment solutions to defend this key segment. Gradual progress in the improvement of efficiency in providing connectivity will safeguard (some) margins as competition among connectivity providers will stay fierce. Data protection, network quality, etc. will be essential, but will be of little help for the top line.

■ The **SME segment** will be a tough battleground for traditional telcos as this segment, currently still profitable, is attacked from all sides. Telcos need to carve out niches such as unified communications or call center as a service in collaboration with software solution specialists as together they can provide a service not easily matched by

hyperscalers or IT service providers. This appears feasible, but will require flexible and in-depth cooperation with partners that telcos have rarely demonstrated to date.

■ In the **large business segment**, telcos need to exploit specific segments where they, together with (ideally non-dominant) security/software solutions and/or integration specialists, can truly offer a USP to certain customers while still turning a profit. This will be very challenging, and in most scenarios, this segment will play a diminishing role for telco as we approach 2030.

■ A special “sub”-segment with significant revenue potential is the public sector as being a local/national player, typically with a long track record and often good political connections, offers a significant advantage over global or niche players. Although public sector requirements are often very specific, the implementation timeframes are usually longer, giving operators the opportunity to hone the skills required by all segments.

■ A new card (and possibly a joker from a telco perspective) in the game between now and 2030 might be dealt in the form of EU regulations requiring hyperscalers and other large software companies to open their closed ecosystems.

Key takeaway

By 2030, only one to two operators who have played the orchestration/efficiency game effectively and who have a large customer base will be able to survive as a fully-fledged digital service orchestrator on each market – all the others will be pushed into niches or into the arms of the hyperscalers.

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B2B: Telco Positioning in an Embattled Market



5.1. Strategic positioning and survival of the fittest

The information and communications technology (ICT) market in general and the B2B sector in particular are developing rapidly and are characterized by high growth rates in some areas. Data and bandwidth requirements are constantly growing, while the coronavirus pandemic has accelerated the trend towards mobile and remote work styles.

These and similar factors have given a substantial boost to the relevance of products such as VPNs, SD-WANs (software-defined wide-area networks), and cloud services. SD-WAN, connectivity, IoT, and cloud voice services are key areas that B2B customers are prioritizing in their ICT and telecoms budgets.¹³

Non-connectivity services will remain a field for further growth, although one that is the scene of fierce competition.

But what does this mean for traditional telecommunications providers? Would they be better off focusing more intently on connectivity and a limited set of services with state-of-the-art efficiency, or should they concentrate on new and/or profitable ways to expand their service line with the addition of a comprehensive set of digital services that will grow their revenue stream?

Do they have a right to play in the new market structures that are emerging? Finding a fundamental answer to this question will take two steps: first, obtaining a differentiated picture of the relevant market and technology trends, and second, determining the changes on the demand and supply sides.

¹³ ETNO State of Digital Communications 2022, p. 56

5.2. General trends for B2B telcos between now and 2030

There are fundamental political, economic, societal and technological trends which currently change the world and the environment telcos are operating in. Before we can understand how telcos can make a difference in 2030, it is crucial to understand the trends within separate industries and what triggers and effects are driving those trends and future changes.

Figure 19 (see next page) below shows selected global trends as (1) triggers of (2) effects and (3) responses within the complex ecosystem of companies and societies. The subsequent trends have been attributed to specific (4) industries that are most likely to impact the response. This leads to a number of developments in multiple connected areas like (5) technology or society where telcos might focus their action plans if they want to play a role as fully integrated digital service orchestrators for B2B customers.

The B2B industry, including telcos, will be facing new challenges from rapid technological advances, but major demographic changes will be of even greater significance. One of the major impacts will be on the operating model, philosophy, and culture of every organization. Demographic imbalances will create new situations and cause organizations to lean toward one of two new paradigms:¹⁴

1. Caring companies – focus is on maintaining a high proportion of permanent employees attracted to a culture with a strong familial focus; in-company training programs and knowledge growth balance out a lack of specific qualifications.

¹⁴ Die Zukunft der Sozialen Marktwirtschaft, 2021, Jan Berger and Dr. Thomas Sattelberger

2. Fluid companies – avoidance of typically rigid structures within the organization and their replacement with more flexible, “fluid” organizations; focus is on obtaining the most highly qualified and skilled employees for specific projects and activities at any given time.

If ICT companies are to thrive in a future B2B world, they will need to examine current global trends and predict possible use cases and the digital products and services that will be required for their implementation. Based on their conclusions, they will have to decide whether to orient their organizational model and philosophy towards caring or fluid companies.

Before we track the trends, their triggers, effects, and possible use cases through the various industries mentioned in Figure 17 above, we will briefly describe below the focus areas that telcos might want to address between now and 2030.

Smart and sustainable cities

The global trend of overpopulation is giving rise to megacities where people and companies share their lives and work. As these enormous metropolises seek to cope with the new challenges of high urban density, they will demand smart forms of organizational arrangements, and smart living services can provide solutions. The construction industry is in the best position to offer smart living solutions in megacities based on advanced mobile networks, intelligent data analysis, and cybersecurity, and they could turn to ICT providers as the source of these services.

Holistic health management

Another opportunity might be revealed by understanding the trends driving social changes and globalization related to nutrition and health, social isolation, and personal security mechanisms. As people grow older and live longer and there are more people inhabiting the planet, the question of

adequate health care gains in importance. Digitalization in health care will be essential for maintaining the level of health services and even make them better and more affordable to many people.

The question then arises as to how ICT B2B providers/telcos can influence and shape the developments affecting health care and social services. One example might be the enhancement of technology – especially artificial intelligence and augmented and virtual reality – for the development and capability of technically (operationally) supporting holistic health management.

Robust and transparent supply chains

Planning supply chains and tracking goods around the globe will become more important as a consequence of global economic dependencies and regional instability. Demand for end-to-end, real-time transparency, dynamically and continuously supervised production and supply stages that permit fast responses, and on-demand integration of new/different steps along the added-value chain will increase. Telcos could play a role in fulfilling these demands by securing the optimal structure of supply chains by using data analytics and orchestrating dynamic integration.

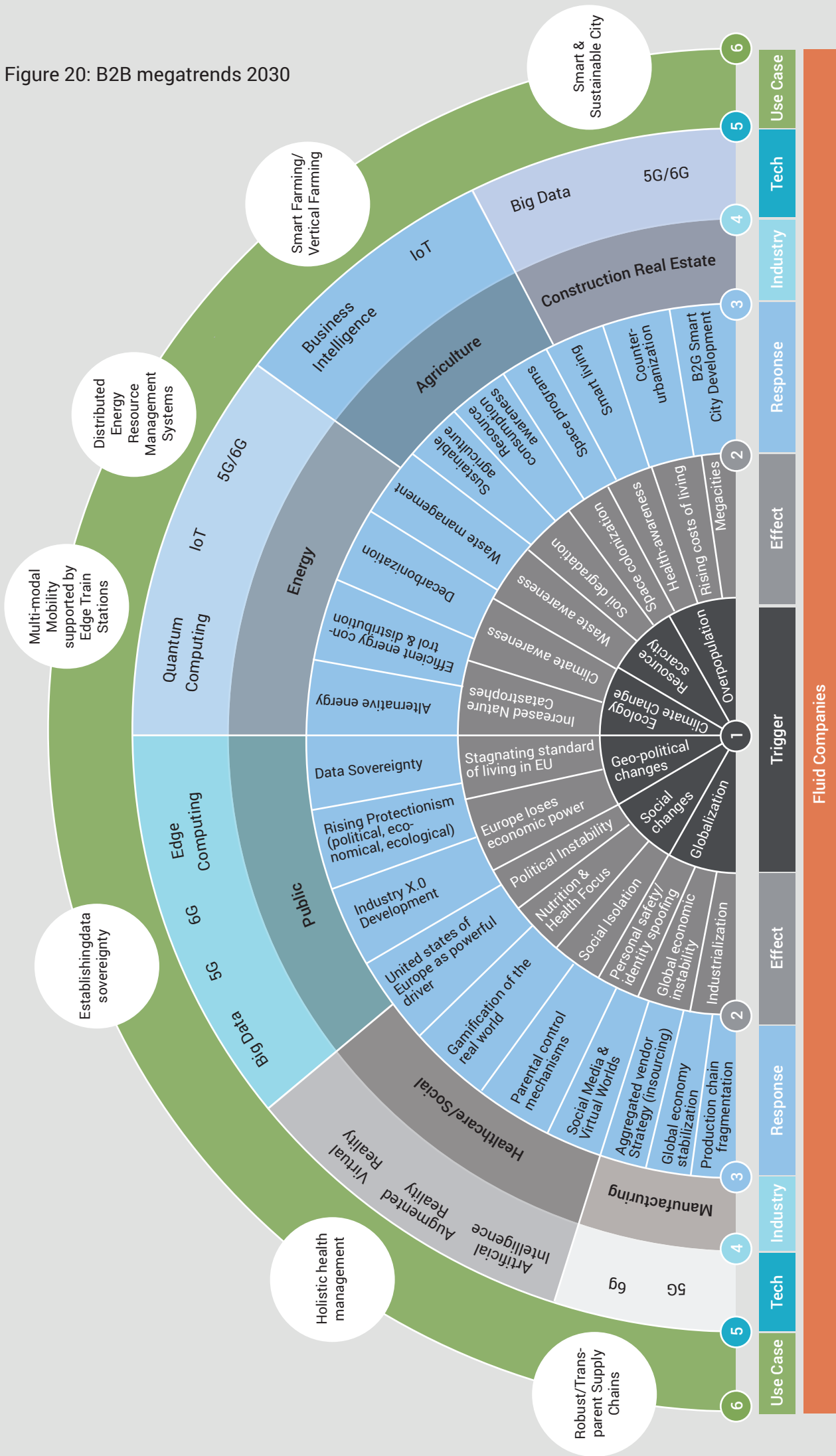
Data sovereignty

The appearance of new social structures and constant shifts in (geo)politics lend ever increasing weight to the importance of protecting our personal data. In the future, telcos within Europe might provide support during digitalization and offer data management for data-driven business models in accordance with European standards and the related applications.

Multimodal mobility

Mobility of the future will be offered and used as a seamless service across various mobility platforms, and customers will be able to access all

Figure 20: B2B megatrends 2030



Tech: technology from the perspective of Telcos
 Industry: relevant industry for mentioned use cases
 Source: Detecon

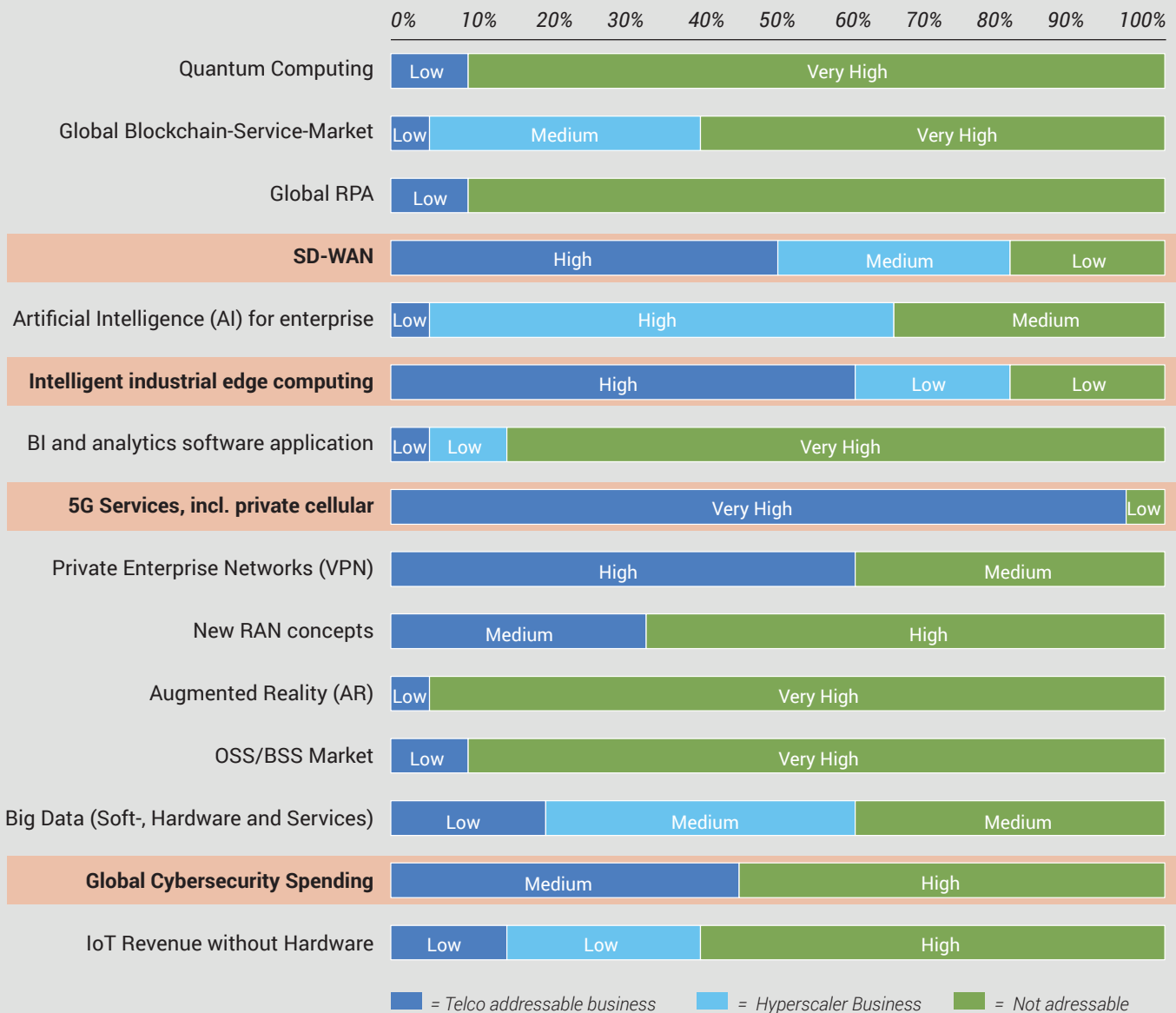
Chapter 5

mobility offerings. Telcos could play a key role in the integration of multiple mobility solutions by creating customized, multimodal mobility products. Mobility as a service, multimodal and intermodal mobility (MIM), and dynamic traffic management will support multiple digital customer journeys and ensure secure and optimal distribution of the load on the traffic infrastructure and connectivity across various ecosystems.

5.3. Promising use cases and portfolio opportunities for telcos

The described trends present to telcos a wide field of options for the generation of new revenue streams that could compensate the loss of revenues from traditional connectivity products.

Figure 21: The share of revenue of technology growth areas that can be addressed by telcos in 2030



Detecon Analysis Based on Research Results and Internal Detecon Materials, 2021-2022

Nevertheless, telcos need to select their portfolio evolution and investment cases with care. Areas of portfolio evolution in which telcos have a clear right to play and therefore have a good chance of securing a substantial market share will be of special interest, and innovation budgets and portfolio development activities should focus on precisely these areas. We have analyzed the market oppor-

tunities for telcos in the pertinent portfolio categories and see opportunities for telcos to achieve success in a heterogeneous range of activities.

As can be seen in the above chart, the greatest potential for telcos will be in providing end-to-end offerings in the 5G sphere from connectivity to apps and adaptation in preparation for 6G. Customers will more than ever want to focus on their core business and leave the increasing complexity in orchestration, integration, and interoperability to others. Telcos could well find opportunities for the provision of services in this area.

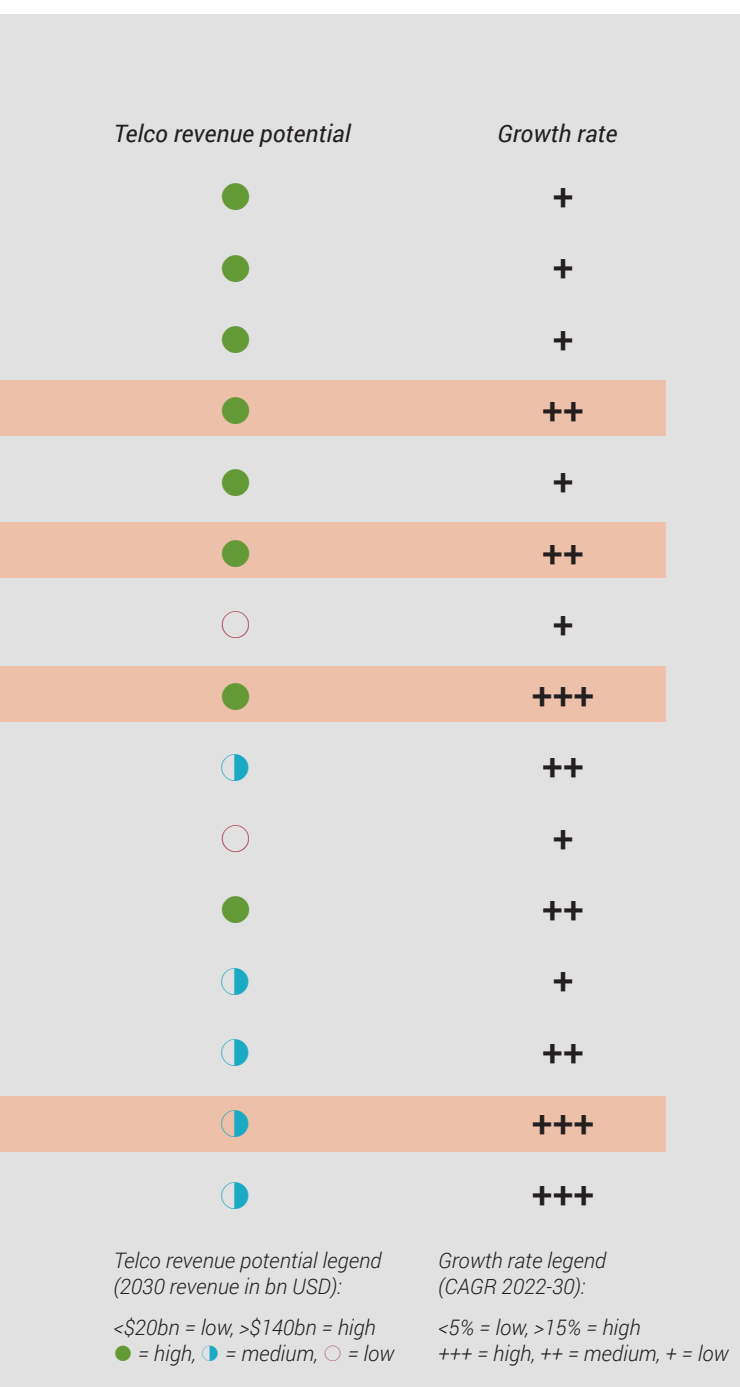
5G technologies will generate two fundamental types of use cases:

1. Those based on development and evolution of 5G; and
2. Those enabling disruptive changes with the introduction of the next generation of wireless technology and 6G rollout.

A new 5G domain will bring with it opportunities for the support of customized services encompassing multiple chances for a deeper foray into industry vertical solutions, especially for telcos. The capability to offer services such as network slicing, dynamic bandwidth on demand, QoS, and others will support a range of new applications emerging for the B2B sector.

Tailored slices can serve specific customer needs and take advantage of users' willingness to pay for these benefits, creating new sources of revenue. Tapping this potential will also demand changes in the market approach. New pricing and sales models that are more strongly oriented to the added value for customers must be evolved. Customer segmentation based on clear differentiation of a multitude of sectors is necessary. Connectivity services will become the source of real added value in digitization such as security, speed, and reliability.

Two aspects will be of key significance during the design of the slices. The first is the specific local market, understanding and identifying the most relevant industry partners; the second concerns



the international hyperscalers as they will dominate products that need to work consistently regardless of the operator.

As convergence of 5G advances, these new areas will be defining the future of AI-related use cases revolving around connectivity, robotics, and security; they will evolve into new and challenging support use cases such as holographic telepresence or immersive communication.

One important aspect of 5G is the capability to create private networks. Enterprises are more frequently building their private communications networks to support the digitalization of their added value. Private 5G solutions are creating in particular demand for high-performance mobile networks, so-called campus networks, which can be controlled independently.

In some countries (Germany is one example), regulatory authorities are making spectrum available exclusively to industry for this purpose. In campus networks, 5G can consolidate all connection requirements on one network¹⁵ and supplement them with edge computing. Campus networks of this type are the basis for digitalization in various industries such as manufacturing or logistics hubs (ports, for instance). The campus network segment is an interesting B2B growth market for telcos. Carriers can use assets from their public network to provide hybrid solutions in combination with private network elements. Telcos can also offer completely private networks for their customers. This might require a slight change in telcos' mentality because the revenue stream does not come from network usage itself familiar to them, but from network design, management, and maintenance only.

¹⁵ Of course, parallel use alongside other access technologies such as Wi-fi and Tetra is possible, but 5G offers the opportunity to shed parallel networks.

Private networks might even cannibalize public networks, but they are nevertheless an attractive opportunity for telcos to be present on enterprise markets.

Still, it may be even more important that telcos can learn what the real need of industry customers is and be able to offer better solutions in the public network, tailored as an add-on for campus owners. Finally, we may see campus owners juggling with data between local campus usage, offerings based on public edge computing, and open hyperscaler solutions. The secure use of data will be key for success.

Edge computing, especially involving 5G on the one hand and finding the right use cases on the other, will provide specialized services for various industries for matters involving privacy sensitivity, low latency, and high data volume. Providing network infrastructure (relevant for 5G) and edge-based horizontal platforms while cooperating with hyperscalers on edge-enabled, end-to-end vertical services and solutions, telcos could be playing a significant role in this area by 2030. However, this will depend on the speed of adaptation and their ability to achieve scalable, secure, and easy-to-use features. Specifically, different use cases might include industrial machinery robots, interactive video streaming, and AR/VR.

AI and augmented reality (AR)/extended reality (XR) might play a quite significant role in the potential success or survival of telcos in the future. AI is the source of opportunities in various use cases varying from automated network problem detection and maintenance, self-healing, and fraud prevention to optimization and robotic process automation (RPA). The application of AI is not limited to the telcos' internal business; it is also relevant for deployment for their B2B customers and the interfaces between them.

AI will also play a significant role when it comes to **cybersecurity**. Telcos can and must expand their security capabilities, which are often quite strong even today. Telcos are in the driver's seat for the provision of secure network infrastructure and managed security services. Their position could be even more dominant in the future as global cybersecurity space, especially in the B2B sector, is expected to be one of the key megatrends in 2030. Even now, cybersecurity is a fast-growing field that is expected to become even more relevant in view of the rising frequency of cybercrime and even cyberwarfare. As cloud solutions become more and more common, security demands will be redefined in terms of zero trust architectures, and telcos can play a decisive role here.

Regarding **IoT options**, telcos could provide the end-to-end services related to interactions between devices and networks, linking the mobile ecosystem to infrastructure and devices by the use of IoT and artificial intelligence. Business customers will require next-generation connectivity management, secure and scalable infrastructure, and the reduction of energy footprints. Much like the consumer segment, business customers will expect simple integration and orchestration of AI or IoT-as-a-Service with zero touch.

Big data/Business intelligence and analytics: Big data is an effective tool for a host of vertical market applications ranging from fraud detection to scientific research and development. Telcos have access to a multitude of data sources from distributed mobile devices, social media, infrastructure sensors, log files and transactional data to content.

Besides these fields of opportunity for specific portfolios, we regard the following general topics to be relevant for telco success in the B2B sector.

Ecosystem orchestration capability will be crucial for the retention of customer relationships. Connectivity-only products will decrease in value contribution and are in danger of being replaced by

an ecosystem solution with an upstream connectivity element. This can be illustrated by an employee workspace set that combines device(s), (cloud) applications, identity and rights management, and connectivity and that could be provided by a telco, an IT service provider, or a hyperscaler (Microsoft, for instance).

B2B customers will be willing to pay for ecosystem orchestration because they can reduce their own IT manpower needs and participate in economies of scale.

They might see a benefit in the greater trust enjoyed by telcos and their better decentral availability (sales and field service capabilities) but only if telcos accept the challenge and enhance the scope of their logistics services and product and service capacities.

Telcos need to be **security champions**, not only in their network and access technologies, but in being able to provide security elements embedded in their connectivity products for customers. Securing such a position would create the basis for zero trust architectures and network security setups for a cloud-based world that requires the protection of tailored security features that can no longer be adequately provided by a corporate firewall.

Moreover, telcos need to be prepared and positioned to take part in the **greening of the value chain**. As in other industries, the demand for socially acceptable standards has crossed company borders; the general public critically examines the observance of standards along entire added-value chains and expects companies, besides adhering to these standards themselves, to require compliance from their own suppliers.

In 2030 – but in fact, much sooner – requirements for sustainability will be as “standard” as work environment standards are today. Non-compliance or even substandard performance in the areas of carbon footprint, renewable energy quo-

Chapter 5

ta, recycling quotas, and similar fields will represent a massive reputational risk. Public awareness in this sense will extend beyond the telcos to include their B2B customers, who will have to provide convincing answers when questioned about their green added-value chain. Sustainability standards and certifications will become a make-or-break purchase criterion at least for a substantial part of the B2B clientele, if not for all.

5.4. Customer segments to address in B2B

In view of the megatrends projected for the next decade as well as the changes on the demand side and in the competitive environment, a clear industry focus that as a minimum goes beyond the connectivity portfolio is indispensable. Moreover, telcos must utilize their resources as effectively as possible. The pertinent question here concerns the decision about the markets and sectors that should be the focal point of their attention. Which markets promise the highest growth or offer the highest share of wallet for telcos?

The highest share of added value that can be addressed by telcos is found in the **public, government, utilities, and health sectors**. Actors responsible for critical infrastructures are particularly sensitive about the issue of **data sovereignty** or the fundamental national regulation (in health, for instance) that a telco can more easily address than an internationally active hyperscaler. If they have the least doubt, decision-makers in these industries would place greater trust in a telco than in an hyperscaler. The greater trust in a telco (and its possible relationship on the national level), the possibility of national control, and independence play an important, even decisive, role in buying behavior.

Outside of the above-mentioned industry sectors, the success of telcos in the B2B arena is a question of their current clientele and already existing

knowledge base as in-depth industry expertise becomes even more crucial in portfolio fields that are not restricted to connectivity. In this sense, opportunities appear in various vertical elements whose relevance varies depending on the industrial base of the specific country, for example:

- Automotive and transportation – autonomous fleets and logistics
- Manufacturing – self-learning monitoring and control (AI-based), XR-supported onsite maintenance and repair
- Energy – smart metering (customized tariffs and efficiency mechanisms).
- Financial services – artificial personal advisor (robo-advice)
- Entertainment – personalized content and AR, VR (virtual reality), and XR

In general, telcos span the entire B2B sector, from corporations to midsize to small enterprises. The products in these segments must be differentiated as large corporations will demand the capability for solution business while smaller enterprises will want highly automated standard products. The acquisition of related capabilities (alignment with the above-mentioned portfolio opportunities), either organically or through effective partnering, will be crucial.

In addition, we see a strong potential for telcos in the B2B midmarket segment where companies want to profit from digitization, but lack the ICT knowledge and manpower to realize these use cases by themselves or with the IT provider of their choice. These companies will be much more attracted to a telco with the appropriate skills and local availability than to an international hyperscaler who possibly does not even provide service

Chapter 5

in their local language. A telco positioned as an orchestrator can become a strong intermediary between international hyperscalers, cloud providers, and the local B2B midmarket segment by compiling complete ecosystems, enriching them with its own services, and localizing them in cooperation with local IT partners.

5.5. Success factors for future telcos in B2B

There are other success factors in addition to the determination of focal segments and a clear portfolio development path that are indispensable for persistence and success on a rapidly evolving market. Access to the pertinent customer group, customer intimacy, capillarity, and coverage of the network (products and services scale) will of course continue to play a key role. Continued B2B business success will nevertheless require greater emphasis on the following elements.

Ecosystems/Partnerships

First of all, building successful ecosystems and partnerships takes time, so telco operators should not wait to start planning and laying the foundations for future ecosystems, including determination of who should be included and in what forms and what results are to be expected. In positioning the added-value chain as a whole, telcos need to create a clear vision of where they want to be and what partnerships will be required to achieve this vision. This vision should also include cooperation in defined areas: 5G access/network, edge computing, or AI/XR, for instance.

The new road map should include extensive new network capabilities and virtualization/cloudification as well as an opening for potential partners, including the building of software-centric access ecosystems.

Another relevant element in the partnership portfolio is the cooperation with local/regional IT providers for the joint address of B2B customers with a local footprint.

Target operating model, culture, skill set, and resources

Telco operators will need to prepare for the inclusion of orchestration/consolidation capabilities extending to the provision of E2E services and the ability to develop dedicated solutions for B2B applications.

In terms of their skill set, telcos need to develop a new level of digital skills and competencies related to cloud/edge computing, AI/AR/VR/XR, and emerging technologies and services. Development processes would also need to be adapted to upcoming changes for the acceleration of innovation cycles as new technologies will require agility and new individual and organizational competencies. This is not simply a change at the process level only. A new culture of continuous and constant learning and evolution will be essential as well.

Furthermore, a deeper level of insight and knowledge specific to the industry is essential for venturing into customer use cases that are not limited to connectivity and moving into orchestration typology. Consequently, knowledge of the industry adequate for the orchestration of industry-specific solutions is an important field of development of the skill set and goes hand in hand with a constant need for further development of customer centricity in methods and mindset.

A look at the available innovation budgets and the innovative power alone makes it clear that telcos are in a different league here when compared to large hyperscalers. The innovation budgets

Key takeaway

As described in the chapter on competitive landscape and in this chapter, only a very few telcos will be able to survive and hold on to a strong market position in the B2B segment – the ones who are able to manage their transformations, muster the required resources, attract people with the needed talents, and build the capability to orchestrate customer ecosystems. They will successfully defend and expand their customer base in cooperation with their partners.

Successful telcos who are in a sound position will understand the global megatrends and align their product portfolio accordingly, venturing beyond connectivity into use cases and industries where they can compete sustainably and secure a profitable market share. They will capitalize on their local footprint and provide full business ecosystem offerings to the midmarket segment.

Based on their efficient, modular connectivity offerings and their security competency, they will expand into additional digital services spearheaded by 5G solutions and use cases that also serve to deepen their industry know-how.

Telcos will have to become masters of AI-supported automation to remain efficient and profitable; digital champions will be able to convey their internal innovations to their customers.

Achieving all this will require employees with a fundamentally changed and enhanced skill set and a company culture with even more extensive agility capabilities. Essentially, telcos need to become more fluid so that manpower and knowledge resources can be deployed flexibly to cover key topics. Simultaneously, they will invest sustainably in building their ecosystems as extensions of their connectivity offering and avoid overstretching their resources.

of Amazon, Alphabet, and Microsoft, for example, are growing at double-digit rates every year and have reached heights that exceed Deutsche Telekom's total national revenue. In addition, it has been observed for years that hyperscalers, thanks to their capital resources, obtain innovations for themselves on a large scale through the acquisition of startups. A glance at the importance and characteristics of the culture of innovation also reveals that hyperscalers are much more agile and flexible on the market than traditional telecommunications companies in this respect as well, despite the size they have now reached.

Service portfolio and channels

Finding new ways in the portfolio, service innovations, and development to address business customers will be critical. Digital communication channels and new digital/heightened reality customer experiences that have been established or are being established in the B2C world must be created and improved rapidly. More traditional means of communication and collaboration still prevalent in the B2B world will diminish in relevance or even cease to exist entirely. In addition to paid services for coverage of optional product configurations, maintenance and administration services will be a chance for telcos to skim off more managed service revenue and secure for them a better position as partners for B2B customers.

Technology

Cloudification and softwarization of the network elements will be necessary for transformation of

the cost base so that profitability in the changing B2B environment remains possible. There are, however, still other aspects that telecom operators will have to address in the technology layer (e.g., E2E automation open interface and API software common infrastructure) or the introduction of agility and automation into a new multi-edge-cloud environment with secure access for all users.

In summary, telcos should consciously decide which fields they want to include in their focus and where they would be better off cooperating or entering into partnerships with their competitors or hyperscalers, gaining the opportunity to offer a competitive solution package.



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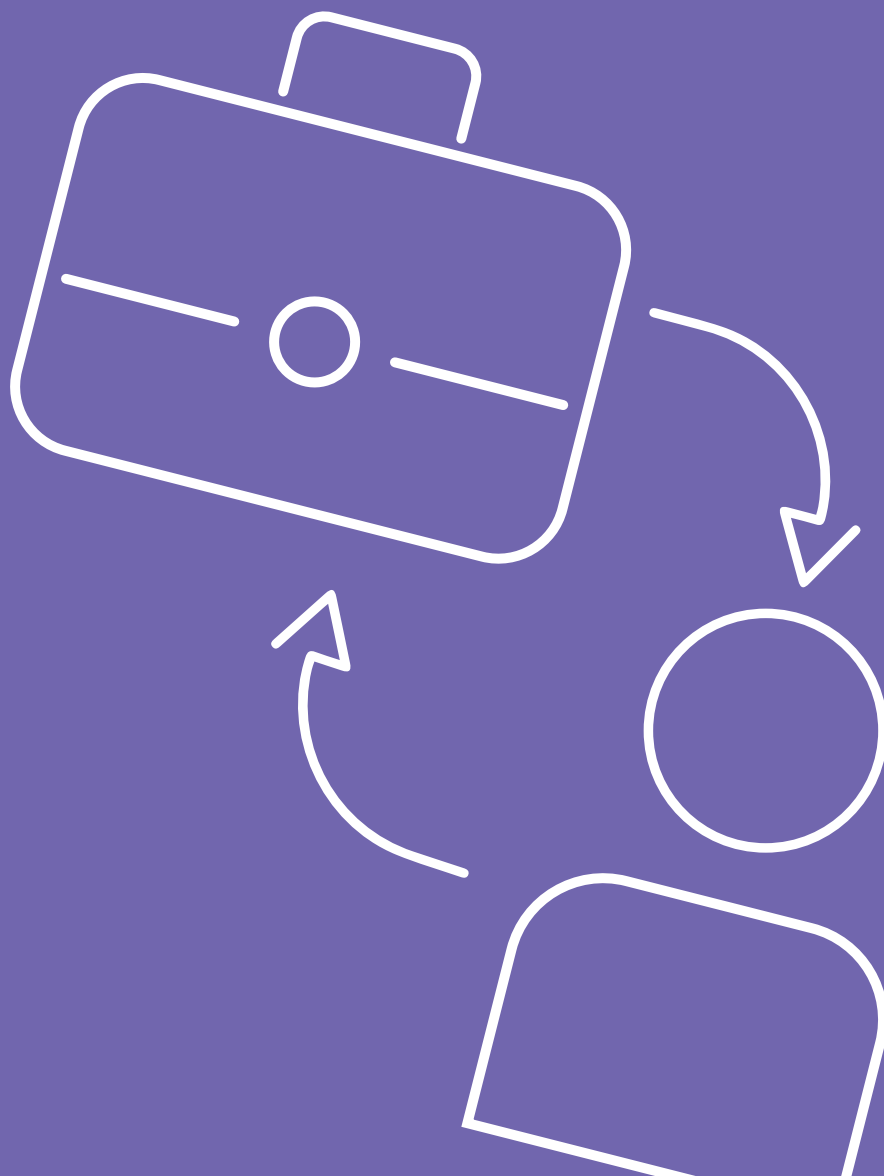
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Key Trends and Telcos' Strategy in B2C



Will telcos succeed in B2C during the years to come until 2030 and beyond? The good news is that connectivity — or to be more precise, digital applications and devices relying on ubiquitous connectivity — will become more prevalent in **consumers' daily lives**.

However, there are developments foreshadowing potential tectonic **shifts in the competitive landscape of the** industry that will go far beyond the known cannibalization of telcos' voice and messaging services by OTT players. Hyperscalers such as Amazon, Google, and Microsoft are well positioned to take over core domains of network operators by leveraging the virtualization and cloudification of network functions and providing them as a service through their highly scalable global network of data centers. Their actions are relegating the telcos' share to the lower segments of the industry's value chain. Moreover, they could even take control over the end customer relationship by integrating network connectivity through whole buy into their digital services that they provide through highly scalable **digital business ecosystems**. This trend can already be observed in B2B and may impact telcos' B2C business, too. For instance, Apple could provide certain applications with embedded connectivity based on 5G network slice offerings from wholesale telcos.

Based on the analysis of key digital trends in communications, media, and entertainment on the one hand and digital home, health and care, and mobility on the other, we have determined eight broad expectations from consumers that will confront digital services and their providers over the next ten years and that will be key to delivering outstanding customer experience. We will show how telcos can develop from their vertical business model to become successful orchestrators of digital business ecosystems — not by copying the approaches of hyperscalers, but by leveraging their own key assets for consumers' future demands.

6.1 Key Trends 2030+ in B2C

1. Communications

How will consumers' personal communications evolve during the next ten years? A look at the past can be used as an aid for an initial assessment. During the last twenty years, consumption patterns have changed considerably as demonstrated by these examples:

- Shift of calls from fixed to mobile networks; later from telcos to OTT players like Skype
- First the adoption of texting and then, from around 2009, a shift to instant messaging, which is used far more even than text messaging before. By end of 2021, there were six billion MAUs of messaging services worldwide; WhatsApp had the largest share, namely more than two billion MAUs
- Adoption of video calls with an unprecedented surge during the coronavirus pandemic
- Adoption of social media channels, e.g., Facebook, YouTube, Instagram, and the later abandonment of some in favor of new channels, e.g., TikTok's recent growth among the Gen Z.

Most of these dynamic changes have been, and will continue to be, driven by **new technologies**, followed by cost **advantages** and most importantly by frequent **addition of new functions** that are extremely convenient to use, e.g., pictures, videos, recordings, integration with other apps. The spread of social media in particular is related to their address of a greater range of consumer needs that obviously go far beyond the very early ones such as communicating with family and friends.

In the coming years, we expect 5G technology, graphical computing, and real-time applications to mature and to improve the quality of **video calls**, e.g., Facetime, WhatsApp, Skype, and **video conferences** such as Zoom, paving the way for sustainable mass market adoption. Juniper, for instance, forecasts an increase of active mobile video call users worldwide from 1.6 billion in 2020 to 4.5 billion in 2025, generating data traffic that in 2025 will be five times higher than in 2020. Similarly, consumers will increasingly turn to **video messaging** that allows subconscious communication cues such as tone of voice and facial expression.

Advancements in various **holographic** technologies take the experience of personal communication to the next level. Trials of innovative applications and devices featuring 3-D holographic **video calls** on special displays have already begun (e.g., Singtel, SK Telecom/Verizon 5G holographic test calls). For the moment, however, the 3-D impression they offer is limited. The projection of **life-size 3-D holograms** of persons in real time have already appeared at industry exhibitions such as the CES (PORTL, ARHT, Imvers 3D, and others). But there is still a very long way to go before these forms of communication without screens and glasses (“naked-eye”) become mainstream. Among other issues, they require special cameras and scanning equipment, 8k video resolution for each eye, end user data rates of 10 Gbps, and ultra-low latency. Especially the latter two QoS characteristics will not be possible until 6G technology becomes commercially available in the years after 2030. The success of the holographic technology for call use cases will also depend on the number of use cases addressing needs other than direct communication (e.g., entertainment, gaming, user-generated 3-D content, viral content, shopping). An entire new ecosystem including technology, applications, and content developers will have to be built.

In contrast to the above remarks, we see in the mid-term some chances for growing acceptance of **VR calls**, during which persons equipped with VR headsets meet as their avatars and communicate with one another in virtual rooms. Players in multiplayer VR games are already conversing with their co-players by these means today. This could pave the way for the adoption of a **type of video conferencing using AR**.

2. Entertainment and media

In the media and entertainment sector, consumers are adopting **video streaming** services such as Netflix, Amazon Prime, Disney+, and others as an add-on to their free TV or **pay TV services** with increasing frequency. This trend is driven by technology enablers (e.g., cloud, fiber optic networks, 5G, digitalization of media production), shifts in the media industry when aggregators (e.g., Amazon Prime) and native streaming services (e.g., Netflix, Hulu) enter the content production or large publishers start offering streaming subscriptions directly (Disney+). National broadcasters will also stay in the game as they have caught up with the digitalization of their platforms.

In consequence, most households in 2030 will have **multiple streaming subscriptions**. Furthermore, the consumption of linear TV and video streaming will become more flexible, meaning people will watch more on their smartphones and tablets while away from home and on the move. Parallel to the adoption of autonomous driving towards the second half of this decade, in-vehicle TV and video streaming will become mainstream.

Artificial intelligence (AI) and analytics will improve smart content discovery across platforms with highly personalized and recommendation functions in awareness of context.

The hype of new formats like VR movies or 360° videos from around 2014 has cooled down, yet may experience a renewed upward curve because of the increasing adoption of VR games.

The future of **digital gaming** will be a bit more sophisticated since different types of games such as casual, role, sandbox, simulation, shooters, or real-time strategy make different demands on screens, GPU/CPU, controller, and connectivity. Owing to these differences, console-, PC-, and smartphone-based systems will continue to co-exist. The largest trend across all platforms, though, is **cloud gaming**, which, according to statista and newzoo, will grow in value from US\$669m in 2020 to US\$6.532bn in 2024. Similarly to the situation for video/TV, users will increasingly maintain **multiple subscriptions** from cloud gaming platforms to play at home and on the move. **AR/MR/VR gaming** will grow significantly as well with the advance of 5G technology because it provides high bandwidth in combination with ultra-low latency, important QoS characteristics for the user experience. Furthermore, edge computing can take over the GPU and CPU functions from AR/VR headsets, which can then become lighter. The popularity of VR games increases with **social use cases**, i.e., multiplayer games where players meet as their avatars and play with or against one another.

Social media and commerce – metaverse

The global success of social media has shown that consumers' needs go beyond personal communication, video, and (single-user) gaming. Social media companies have become extremely successful by addressing needs like meeting and staying in contact with people worldwide, social recognition, self-expression, fame, and commerce. Multiplayer games where players meet and communicate in virtual rooms can be regarded as a kind of predecessor of what is currently being discussed as the **metaverse**.

There is no broadly accepted definition of this term. But to put it simply as a rough definition, it combines the concepts of social media and immersive experience. An oft-quoted and more elaborated definition is provided by Matthew Ball: "The metaverse is an expansive network of persistent, real-time rendered 3-D worlds and simulations that support continuity of identity, objects,

history, payments, and entitlements, and can be experienced synchronously by an effectively unlimited number of users, each with an individual sense of presence." All major players like Facebook, Google, Microsoft, Apple, Amazon, Nvidia, and Epic issue frequent announcements of related investments. Even though it is too early to forecast the scale, governance (central, decentral, open/closed platforms), and adoption of these platforms, it is certain that developments of immersive technologies, AI, and blockchain will support an increasing number of use cases in entertainment, communications, and commerce in a world where the borders between physical and digital world become increasingly blurred.

3. Healthy lifestyle – digital self-optimization

Health awareness and a healthy lifestyle have been trending for decades. It started with changing nutrition habits in the 1970s followed by different phases adding fitness, new types of sports, work-life balance, and, most recently, mindfulness to the equation. The trend towards **smart wearables** supporting healthy lifestyles started at the turn of the millennium. Twenty years later, studies show that digital devices tracking their **owners' health data** such as heart rate, blood pressure, or glucose levels are being used by only 5 percent of the EU's population between the ages of 16 and 74. However, about 20 percent of the same age group use smart watches or smart fitness bands designed to track digitally similar data as well as **activity** and **fitness**.

The onset of the coronavirus pandemic triggered stellar growth of around 20 percent for the global market of fitness trackers in 2020. The very same events turned publicly funded coronavirus warning applications into mainstream applications. For instance, the German app registered more than 40 million downloads by early 2022. Even though the latter is not entirely attributable to the general trend of health awareness and lifestyle, it is evidence of consumers' increasing acceptance of the digital tracking of their private health and activity data.

Chapter 6

Another driver for the adoption of smart watches is the integration of new features and applications based on digital platforms for developers offered by smart watch vendors (Apple, Wear OS from Samsung, and Google/Fitbit). Today, devices have voice interfaces and assistants, connectivity modules and GPS, navigation, music streaming, and payment functions. Even more interfaces than those in use today will become available, including personal sport devices and body sensors for the measurement of blood pressure, glucose levels, and other vital signs.

Monitoring of data will not be the end of the development. AI/ML will be utilized at an accelerating rate to suggest options or even make decisions for consumers for the improvement of their fitness. zwiift and xert are just two examples of training applications offered as a subscription model that designs and adapts a personal training program based on progress and vital signs, replacing the human training coach. Along with

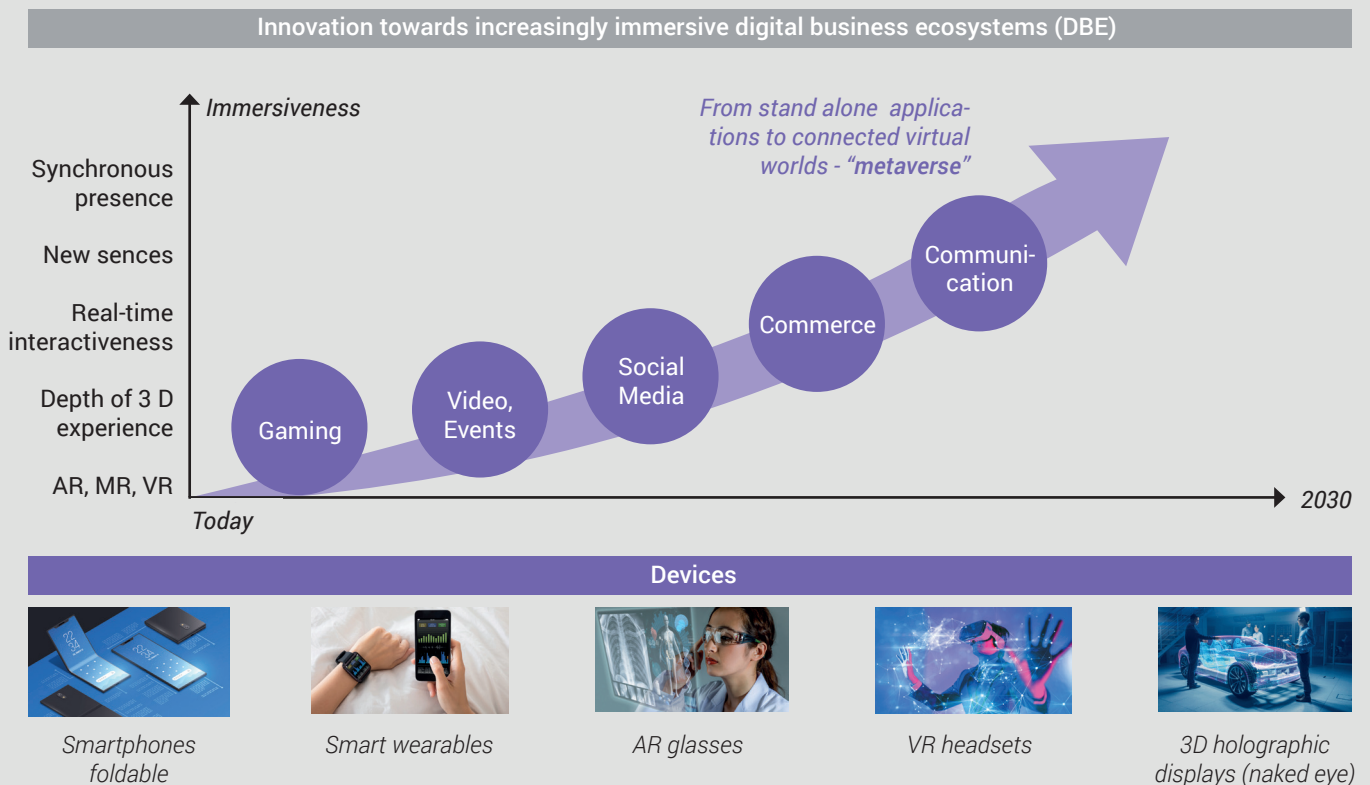
smart watches, which will become more mainstream, **smart clothing** and **smart glasses** with AR/MR features will be adopted by sport enthusiasts, whether they are indoors (at home or in the gym) or outdoors.

Sociologist forecast for the next decade a large upsurge in consumers' health competencies that will pave the way for more holistic and sophisticated solutions monitoring data concerning nutrition, fitness, sleep quality, work-life balance, and events and combining them with data from external sources to develop recommendations for consumers' **"self-optimization"** and preventive health care. **Smart assistants** will define parts of consumers' daily routine that may even involve automated shopping for groceries, tickets, etc.

4. Smart living

Innovations in the smart home industry offer consumers technologies and services to improve their

Figure 22: Overview key trends 1



Chapter 6

lifestyles and home experiences with a strong focus on simplification, security, and energy cost savings. During the pandemic, consumers have been spending more time at home, which has led to increased adoption of smart home devices and applications. Furthermore, a survey conducted by Omdia in 2021 revealed that about 57 percent of telcos believed the smart home market offered the most substantial growth opportunity in consumer digital services.

The use of *interactive voice assistants* (Alexa, Echo, and others) at home is becoming standard. In many households, there will be smart speakers in almost every room connected with the internet, TV applications, robots, and other IoT devices ready to perform any request ranging from a general search to playing videos or music, making restaurant reservations, ordering a taxi, turning down/on lights, operating blinds, adjusting heating/air conditioning to starting robots such as a vacuum cleaner, lawnmower, or window cleaner.

In view of the rise of energy costs because of the climate crisis and, most recently, the war in Ukraine, we will see solutions for energy cost savings like smart plugs, light bulbs, thermostats, and blinds on the rise in the short term. For similar reasons, though entailing significantly higher investments, photovoltaic systems, vehicle to grid/home solutions will become mainstream in the second half of the decade.

Especially in urban areas, *home security* solutions will become more relevant. Examples include smart alarm systems, professional monitoring services, smart locks, smart video doorbells, and smart security cameras. Concerns about costs, data theft, and device hacks are inhibitors for greater acceptance. Consequently, telcos have opportunities relating to *subscription services* covering video surveillance/storage and cybersecurity services for such home security solutions.

5. Urbanization – smart cities integrate with smart living solutions

By 2030, more than 60 percent of the global population will be living in urban areas, compared with 56 percent in 2020. Europe will achieve urbanization of 82 percent in 2030. Obviously, that trend has been slowed by the outbreak of the pandemic. But as with other external shocks such as the financial crisis in 2008, the effect will not be permanent, and we can expect this development to resume. Even though urbanization varies from country to country and city to city, it is giving rise to similar challenges everywhere: mobility and traffic congestion, delivery and logistics parking, housing, safety and security, energy, waste, and pollution, just to mention the most common ones. As technology advances, we will observe an acceleration of different smart city deployments worldwide. Although they vary in scope and stakeholders involved, all build on *telecommunications networks* connecting and integrating a *vast array of devices and connected objects* (cameras, sensors, controllers) in public areas for real-time data collection and advanced AI/ML-based analytics for prediction, control, and automation of processes to manage the above-mentioned challenges for cities.

Implications

- Immersive experiences will **complement** today's digital experiences, gradual replacements to follow
- Full adoption of cloud-based services with **multiple subscriptions** per user for certain
- Landscape of apps with an increasing **variety of QoS/QoE** requirements will evolve for sure
- Selective adoption of new devices and touchless user interfaces. Smartphones to stay.
- Shape of immersive ecosystem(s) (central/ decentral, closed/open, players) still unpredictable

Touchless user interfaces



Voice

Gesture

Gaze

Obviously, today's smart city deployments are driven by city management issues and as of now are still less relevant for telcos' B2C business. Nevertheless, during the next decade we can expect **smart living** solutions, especially for use cases related to energy, security, waste, pollution, water, and ambient assisted living, to become an integral part of the business ecosystem. Telcos with stakes in smart city deployments today will be well positioned to drive the integration with B2C applications.

6. Aging society – silver society and digital health and care

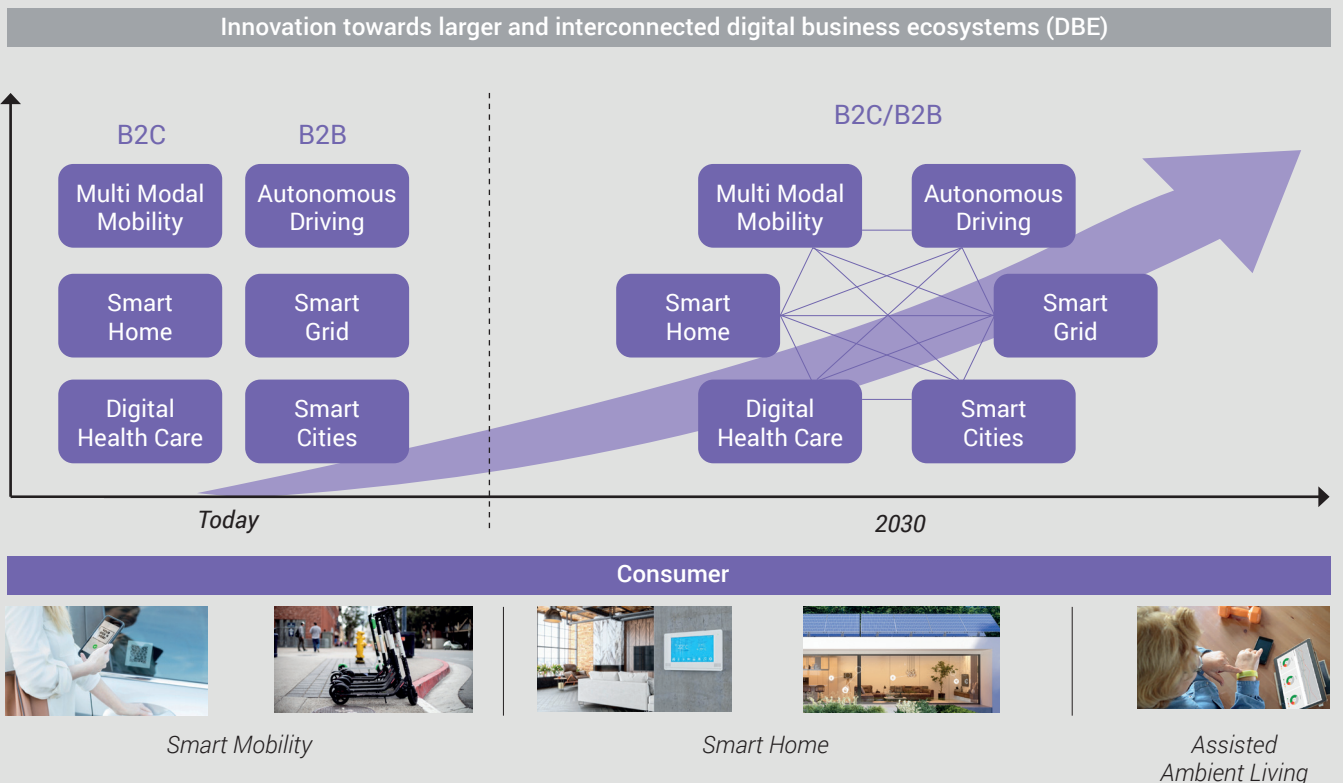
The next decade will be characterized by baby boomers entering retirement and pursuing an active and affluent lifestyle, particularly in high-income countries. Studies show that the over-60 age group spends more than younger people in general and especially for travel (tourism, family visits), entertainment, and home improvements. Opportunities for telcos in domains such as

broadband connectivity with seamless integration of television/video entertainment, enhanced video communications, and smart home applications, including surveillance cameras, smart locks, lights, blinds, plugs, home robots, and assistants, will be abundant.

Another factor is that the share in the population of elderly people with health issues and disabilities, often living far away from their children, will grow significantly, and this will drive the acceptance of digital health and care solutions aiming at improving the seniors' quality of life by enabling them to remain independent and carry on with an active lifestyle. Some of the example solutions below are offered directly to elderly people and their families (B2C):

- **Virtual health assistants:** reminder services for medication, health information and advice, appointment services, video appointments with doctors, home delivery of medication, connectivity with neighborhood communities, etc.

Figure 23: Overview key trends 2



Source: Detecon

■ **Smart wearables** with fall detection and other sensors triggering automatic alarms and emergency calls

■ **Connected health devices and apps** developed for certain chronic diseases such as diabetes for the collection and analysis of health data, nutrition, and medication to improve health and patient outcome

■ **Connected home care robots** to train or support certain movements

Ambient assisted living refers to solutions that integrate the above with various stakeholders of the health care system such as doctors, hospitals, and ambulances, and nursing organizations are being increasingly implemented within the framework of **smart city deployments**, yet another example of the merging of B2C and B2B ecosystems.

Key drivers & implications

- Urbanization, aging society and increasing sustainability awareness will drive acceleration across domains.
- Lifestyle meets necessities, hence B2C and B2B merge; today's multiple isolated developments will increasingly merge to more integrated ecosystems.
- (Real time) AI based data analytics and automation are decisive value streams in these domains.
- Again, a landscape of cloud-based services with a **large variety of QoS/QoE requirements** will evolve.

Business/Public



Autonomous movility (OEM)

Smart Cities (Municipalities)

Smart Grid (Utilities)

7. New mobility – mobility ecosystems for mobility as a service

Trends such as the heightening of environmental awareness, declining importance of car ownership, increasing adoption of a healthier lifestyle, all in conjunction with improving integrated mobility infrastructures, will change consumers' **mobility patterns** toward a more **multi-modal** use of different means of transportation (automobile, (e-)bike, (e-)scooter, bus, subway, train, plane) based on alternative business models (ownership, rental, subscription, sharing, on-demand, ride-hailing) pursued by different providers.

Moreover, **Mobility-as-a-Service** solutions supporting consumers in planning, optimizing, booking, navigating, tracking vehicles, and paying for their trips in one place using digital applications will continue to gain in importance. Telcos are well positioned to develop and offer such services to consumers directly, separately, or as an add-on to subscriptions. Furthermore, telcos could play a key role as orchestrators or partners in the broader mobility business ecosystems since the services depend on the exchange of real-time data at very low latencies across numerous moving data points over large geographic areas to which telcos have access. Add to these elements the development of **connected** and **autonomous vehicles** or, in the more distant future, even air taxis, and we will see the rise of more **sophisticated mobility business ecosystems** that serve both B2C (in-vehicle connectivity) and B2B (railway, commercial vehicles for delivery, taxi, bus, etc.).

8. Climate crisis and environmental awareness

Drastic reduction of greenhouse gas emissions to mitigate the climate crisis is the global environmental challenge of the decade. Global agreements of the United Nations (e.g., COP 15, 26), additional regulations at regional (EU) and national levels are being developed and implemented with the objective of transforming energy production and consumption. These measures have a direct impact, especially on the supply of products and services in any industry. On the demand side, consumers' environmental awareness is increasing,

Chapter 6

not least because effects of global warming are already being felt by the public.

This trend will accelerate the demand for solutions that support consumers in **reducing energy consumption** and greenhouse gas emissions at home (e.g., smart thermostats, lights, blinds, and plugs) and on the move (e.g., mobility-as-a-service).

Furthermore, we anticipate the accelerating merger of smart energy solutions for consumers (B2C) and **smart grid solutions of utilities** (B2B) into an integrated ecosystem. **Smart grids**, viewed against the backdrop of the **e-mobility** trend, will integrate more and more public and private **charging stations** for electric vehicles. As is the case for private photovoltaic installation, this will require innovative and secure connectivity-based digital services and solutions for utilities, enterprises, and consumers.

Moreover, **electric vehicles** will soon become as well **batteries** for the public grid or the home (V2G, V2H), requiring intelligent energy management solutions with **multi-directional integration** of homes, vehicles, and the grid. Thanks to their 5G networks, telcos can (for instance) offer nationwide dedicated network slices with low latencies to grid providers as well as suitable connectivity solutions for the PVCs and electrical chargers to **prosumers** with advanced analytics for predicting and coordinating power demand and supply.

6.2 Conclusion – consumers' expectations are rising

Looking at these trends in their totality, we will see an increase in **number** and **type of networks** connecting an exponentially growing number of **objects** at home (cameras, sensors, robots, lifts, etc.) and on the move (trackers, vehicles, drones, etc.). At the same time, personal devices like smartphones and tablets will be supplemented by a whole generation of new **devices for immersive experiences**, including VR/AR headsets and glas-

ses, 3-D holographic displays, or gloves featuring new **intuitive interfaces** such voice assistants, cameras that can recognize gestures and gaze, and holograms.

The first trend in connectivity-based applications is moving toward **increasing immersion**, from today's 2-D TV/video and video communications at ever higher resolutions to highly interactive virtual multiplayer video online games via AR that add virtual holographic interactive objects to the physical world to VR that completely captures users' attention to a visually and acoustically closed virtual environment with which they can interact. The field of view, depth of 3-D- and even 360° walk-arounds become possible. Entertainment, social media, communications, and commerce will add related applications to their portfolio. However, fully immersive applications will not supersede current elements, i.e., the hyped metaverse or web3 will exist simultaneously. The landscape of cloud-based services will be characterized by a large range of QoS/QoE requirements.

The second line of trends in applications revolves around **increasing automation**, addressing needs like efficiency, safety, and security in the domains of smart home, health care, and mobility. If these applications are to function, sensitive data and AI-based algorithms are decisive. Furthermore, the integration with smart grid and smart city solutions will generate much higher benefits so we see related B2C and B2B ecosystems merging. Likewise, the increasingly immersive applications in turn lead to the evolution of a landscape of cloud-based services with a **large variety of QoS/QoE** requirements.

Based on these common elements in all these findings, we see customers' expectations rising with respect to eight key dimensions of the digital customer experience.

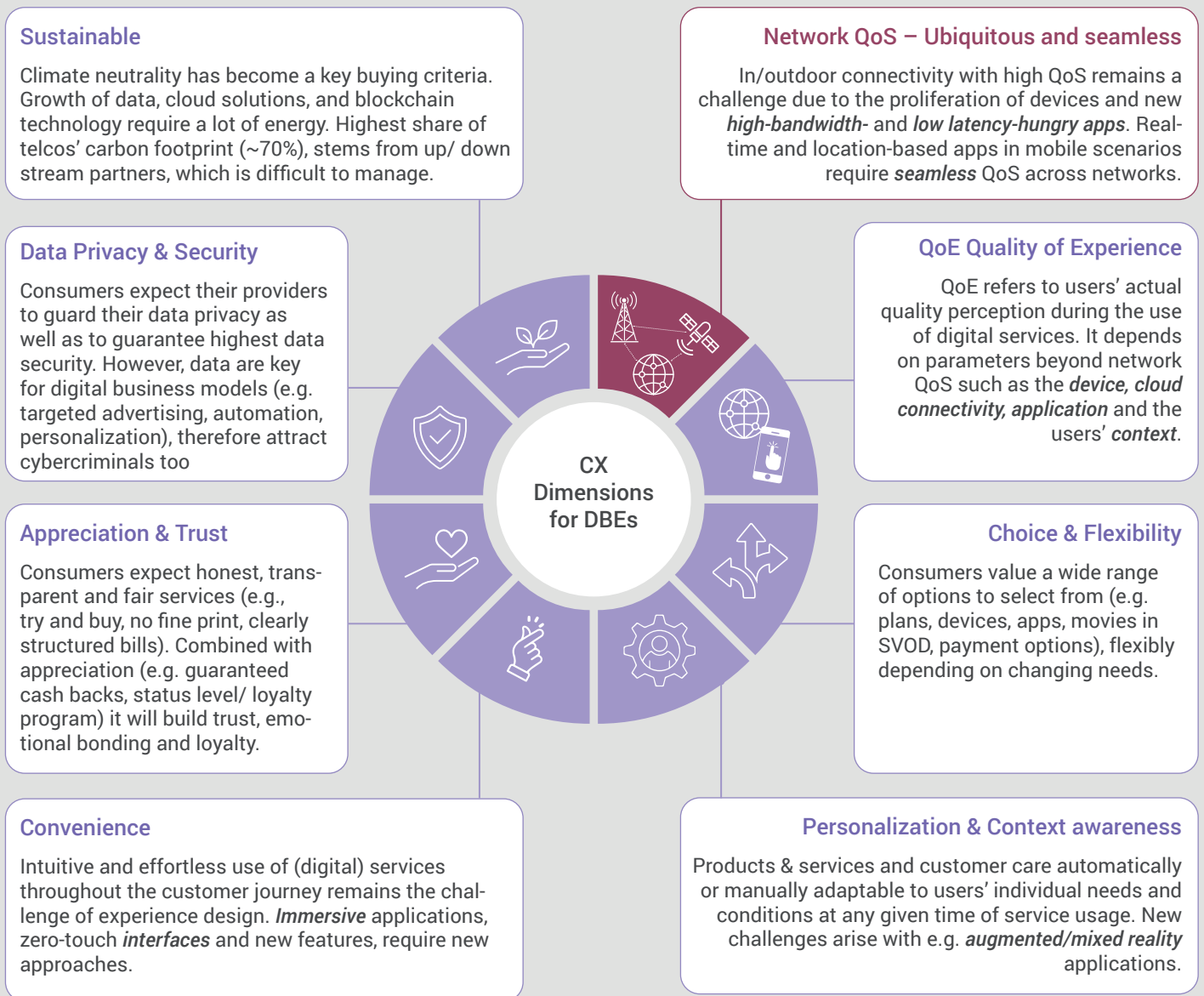
Chapter 6

1. Ubiquitous connectivity with QoS

Consumers continue to expect accessibility and usability of their digital services anywhere and anytime at certain QoS levels – i.e., no white spots (**full-area coverage**), no outages (**full availability**), and no service quality degradation (consistent QoS). These expectations are demanded of any new generation of network technology as soon as users experience improved QoS such as higher bandwidth (up/down link), lower latency, and

less jitter and delay. After the initial excitement, the new QoS levels become the new elevated standard and falling back to older network generations will have a highly negative impact on customers' experience. Given the proliferation of connected devices as well as innovative applications hungry for bandwidth and low latency (e.g., cloud gaming, location-based services, AR/VR, autonomous driving, all competing for the same network resources), ubiquitous connectivity with high QoS will continue to present a challenge to telcos.

Figure 24: Dimensions of customer expectations in digital



Source: Detecon

2. Seamless connectivity with QoS

Furthermore, consumers expect their services to work seamlessly across different networks without requiring any adaptations such as a change in network selection or settings on their part. The automatic, uninterrupted handover between mobile networks or between mobile and Wi-Fi is crucial especially for real-time applications such as video calls, streaming, AR, or location-based services used on the move such as mobility-as-a-service, digital fitness with AR, or tracking. This factor will indeed be mission-critical for autonomous driving when maintaining the QoS at a constant level will be equally important as the seamless handover. In view of the proliferation of different types of networks (4G, 5G, Wi-Fi, LoRa, etc.) and the various providers, these rather fundamental consumer expectations will prove to be a challenge.

3. Quality of experience

Obviously, consumers expect more than just coverage and availability. They care about high quality of experience (QoE), which is linked to QoS parameters of the network such as bandwidth, latency, jitter, packet loss, and delay, although top performance of all parameters at all times is not necessarily essential. Certain imperfections in the network may not be noticed when using certain applications while others (high latency, for instance) may render an application completely useless. QoE refers to users' actual experience when using the services. It depends on many more factors beyond the QoS of the network. The quality of the current application, the cloud infrastructure and its connectivity, and the quality of the user device and interface influence the QoE as well. Last, but not least, the conditions of users' surroundings such as light, noise, temperature, distraction and stress level, or socio-demographics also play an important role for the QoE.

4. Personalization and context awareness

Research shows that consumers increasingly expect personalized services and experience that are seamlessly integrated into their daily routine. E-commerce, streaming services, and naviga-

tion solutions such as Amazon, Netflix, Spotify, or Waze, which deliver targeted messages and offers based on consumers' previous actions, purchase history, demographics, browsing behavior, current location/planned destination, and the customers' current ambience, are well known. In the future, consumers' expectations will not be limited to sales and customer care messages, but will encompass more and more often the contemporaneous behavior of the digital services to which they subscribe. In other words, consumers will expect all kinds of personalized assistance services – vehicle booking, restaurant booking, and solutions such as autonomous driving or robots that do the vacuuming and that automatically perform the service and make decisions for and on behalf of consumers.

5. Choice and flexibility

The accelerated innovation of digital services has an amplifying effect on consumers' expectations about choice; the more they are offered, the more they expect next time: large catalogues of content, range of devices, social media features, in-app purchases, different payment and delivery options, and so on. Second, consumers will expect greater flexibility for their subscription services allowing them to book, cancel, or substitute services (ideally, whenever necessary, e.g., short contract terms and short notice periods). In many cases, flexibility will also encompass the seamless migration of personal data from one (cloud) provider to another, which today is not always and everywhere the case.

6. Convenience

Consumers expect *effortless* experiences throughout their journeys from initial brand exposure to purchases, onboarding, authentication, use, payment, accessing support, or the addition, replacement, and cancellation of services. *Minimum time* and minimum *resource* input from the user during each phase of the journey are the most basic expectations.

Known levers for delivering effortless experiences include omnichannel and identity management, single sign on, plug & play functionality of

services and devices with or without embedded connectivity, and intuitive interfaces (e.g., voice, gesture, gaze, and process automation), to name just a few. While the above apply in general to any digital service, another important factor for convenience is **interoperability**. Every individual, every household has its own set of needs and expectations that evolve over time and motivate consumers to test, adopt, replace, and add new digital services to their **personal digital portfolio**. Even if digital services and devices are from different providers, consumers demand that they **integrate** seamlessly wherever and whenever useful, whether for money transfers using messaging apps, search across applications, voice assistants for home appliances, or other applications. This is one of the key success factors of the so called **super-apps** or multi-purpose platforms in Asia such as WeChat in China, paytm in India, or Grab in Singapore that allow consumers to use a broad range of highly integrated digital services through a single app. In Western countries, data privacy regulations (GDPR in Europe and similar statutes) represent a barrier for a comparably convenient integration of services since they are accompanied by access to a vast array of consumer data.

Since the future will involve many different devices (voice assistants, TV screen, tablet, smartphone, smart watch, VR/ AR interfaces, etc.), convenience of the experience also encompasses access to the full functionality of the services from any device.

Assuring convenience of use for future **immersive applications** may prove (initially) to be a challenge because of inherent features to which users will have to become accustomed: 3-D, increased field of vision, new senses, avatars, augmentation of reality, need for headsets or glasses, or the potential lack of consistency or interoperability with legacy applications that will continue to coexist.

7. Data privacy and security

Digital services providers require user data (personal and sensor data) for the operation of their digital services (e.g., robots) and for the provision of personalized customer experiences. Others

collect user data with the aim of generating revenues by selling the collected data for targeted advertising. From the consumers' perspective, the collection of data is a double-edged sword. They appreciate convenient, personalized, and free services, but a loss of privacy is inevitable even if the collection is compliant with regulations. Digital service providers must understand the ambivalence of their customers' expectations towards convenience and privacy and always dimension the collection and use of their data carefully.

With the increasing dependency of consumers' daily lives on digital services, issues related to cybersecurity such as malware and other attacks, data theft, identity theft, fraud, deepfakes, and spam represent a growing concern for consumers. They expect their service providers to maintain at all times state-of-the-art secure solutions that they can fully trust so that they can use the services without any worries.

8. Sustainability

The significance of sustainability considerations as an important **criterion for purchase decisions** for digital services and devices is on the rise. Some consumers will even be willing to pay more for reduced emissions, and they will critically question their providers' sustainability reports. The risk of **reputational harm** cannot be overstated as has been demonstrated by the discussion about so-called "greenwashing."

While the zero emission targets for Scope 1 and 2 of the GHG Protocol are manageable for telcos (DT, for instance, plans net zero for Scopes 1 and 2 by 2025), the reduction of indirect emissions from down- and upstream activities (Scope 3), which account for approximately 80 percent of telcos' GHG footprint, is far more difficult to achieve because of the involvement of third parties such as suppliers and channel partners. Especially the reduction of emissions during the **production**, **actual use**, and **end-of-life treatment** of **smartphones**, routers, STBs, and IoT devices will prove to be critical. The same applies to the emissions caused by cloud solutions and blockchain technology.

Chapter 6

6.3 Telcos' positioning in B2C

Telcos' high margin revenues from voice calls and messaging will continue to fall owing to the success of the competitive OTT players' (WhatsApp, Skype, Zoom, etc.) free messaging, voice, and video call/conferencing services with their enhanced features. Consequently, adding free voice calls and text messaging to data plans will no longer be of any value for consumers and will not secure telcos' **top line**. Even if telcos manage to optimize their costs by introducing technologies for automation, zero touch provisioning, self-healing networks, etc., the growing demand for data due to the surge of video streaming, video calls, and AR/VR cloud gaming will again lead to an increase of production costs that will eventually outweigh the realized savings, putting pressure on the **bottom line**.

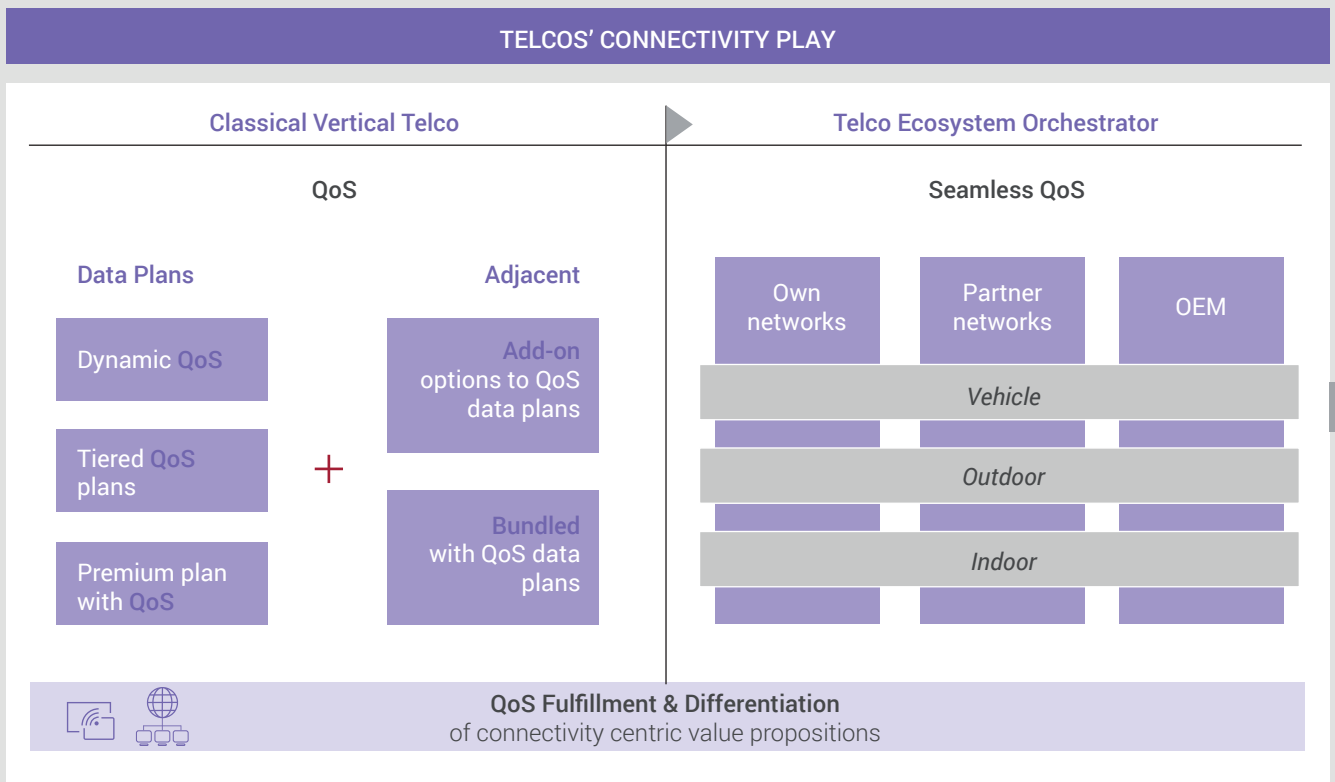
We recommend that telcos wanting to secure long-term success in B2C move away from their

vertically integrated telco business model offering connectivity-centric value propositions and instead in the direction of becoming orchestrators and/or complementary partners of digital business ecosystems providing digital value propositions. Along this journey, they should develop their USPs from differentiated QoS to optimized QoS/QoE and ultimately to a full-fledged digital customer experience (CX). This is a valid approach regardless of the actual type of digital business ecosystem, whether VoD/streaming, online gaming, immersive experiences, autonomous driving, digital health and fitness, smart home, or others.

1a: QoS differentiation of data services (classic vertical telco)

The new capabilities of 5G in combination with edge computing allow telcos for the first time to provide QoS-differentiated services that can address a wider range of consumer needs and use

Figure 25: Telcos' path towards digital business ecosystems



Source: Detecon

Chapter 6

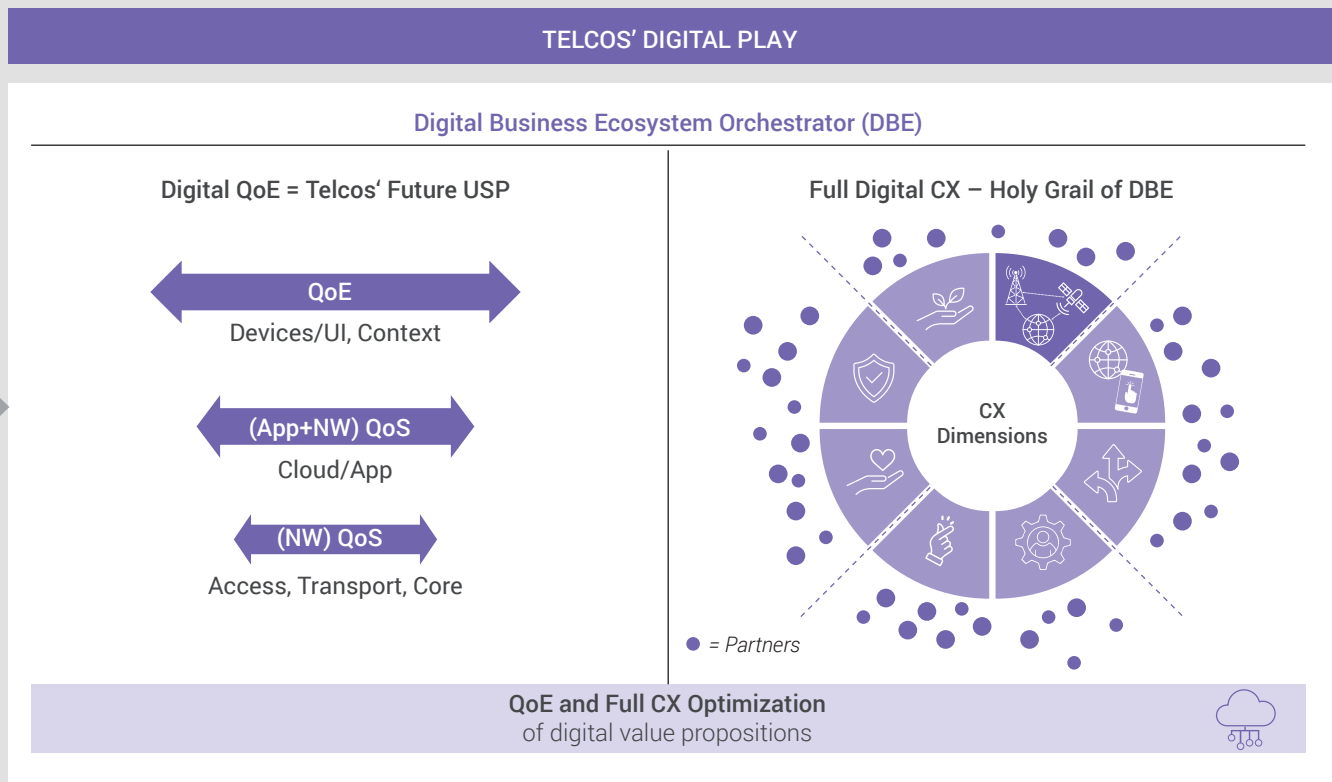
patterns related to the type of apps, use in stationary or mobile mode, in certain locations, frequently or occasionally, and other factors. QoS criteria are bandwidth (up/downlink), jitter, latency, and delay.

Premium plans can be used to motivate some of the early adopters of 5G (or later 6G) to move to high-value plans with a higher QoS and at a premium price. Other plans will not have access to 5G services. This would mean following the same business logic as during the launch of earlier network upgrades to 3G and 4G. It may generate higher revenues for some time. However, this effect, if it appears at all, can be expected to disappear before long in view of an adoption rate of 5G devices that is approximately four times higher than the rate for 4G/LTE devices.

Mobile operators have more options if they introduce 5G SA (standalone) because this technology features options for network slicing and the differentiation of offerings alongside QoS for mobile and fixed wireless lines that are dependent on the demands of applications, the specific situation, and consumers' willingness to pay.

Tiered QoS offerings: 5G offers that differ with respect to bandwidth and/or latency depending on the applications their customers use regularly – e.g., highly dynamic multiplayer games or XR games requiring ultra-low latency; video streaming requiring high bandwidth, but not such low latency; video calls requiring high bandwidth in both directions; standard internet applications requiring only best effort.

Dynamic QoS offerings: This option, also known as QoS on demand, is especially attractive to occasional cloud gamers, metaverse roamers, video streamers, and certain sport or fitness AR applications, e.g., biking or skiing. Value propositions could range from “QoS-on demand buttons” that activate the QoS features in the network as



requested by consumers to more sophisticated solutions that would automatically detect the application in use and adapt the QoS automatically without customer interaction.

These offerings will be a solid basis for mobile telcos' future business. But they will not be enough to give them an edge against the competition from other telcos or from hyperscalers, who could use 5G network slices on a wholesale basis to offer their digital content and services with embedded QoS connectivity. Telcos will be forced to move further up the added-value chain.

1b: QoS differentiation bundled with adjacent services

Seeking to generate added value, telcos have been integrating digital services from third parties into their portfolio for quite some time. The most recent and common examples are sponsored audio or video streaming subscriptions (such as Netflix, Disney+, Spotify) and/or free mobile data use for these services, smart watches with fitness app subscriptions, or security and cloud storage services. These adjacent services are offered either in conjunction with data bundles or as add-on options.

As briefly outlined above, we will see a myriad of new digital content and services that telcos could include in their portfolios during the coming decade. In particular, 5G value propositions that combine devices such as AR/VR headsets, glasses, wearables, and digital services with dedicated QoS will take the business practice of bundling with adjacent services to the next level. Possible opportunities include low-latency (multiplayer) cloud gaming, mobile AR games, exclusive online sports events, and concerts with real-time 360° AR views.

Nevertheless, even though the attractiveness of such bundles optimized for QoS is comparatively high, the margin potential of this retail-oriented vertical business model is still limited. High costs for procuring devices and digital content, the risk of low QoE despite high network QoS due to lack of end-to-end control, and the risk of being

outcompeted by hyperscalers who can develop new experiences more swiftly are major barriers to success. Still, adding adjacent services to the portfolio is a means of differentiation from other telcos and, more importantly, it serves as a test stand for the development of more comprehensive value propositions and new business models.

2. Converged telco ecosystem for seamless QoS

Even though 5G technology features major advantages for QoS, the economics of its operation will prohibit its replacement of fixed networks. On the contrary, in view of the variances in economic factors and new unlicensed spectrum, we will see different types of wireless services, including 4G, 5G, NB IoT, Wi-Fi 6, and fixed networks. Telcos that excel in the orchestration of networks with the aim of delivering a **seamless connectivity experience** of uninterrupted QoS regardless of the connected access network and resilience to changes in the access networks such as a device switching between Wi-Fi and 5G will have a competitive advantage that hyperscalers will be unable to replicate easily. This strategy, also known as convergent strategy, has been pursued by telcos for a long time, mostly by acquiring and integrating fixed and mobile networks.

However, telcos will also have to cooperate with other **network providers**, e.g., competitors or partners in sharing schemes or public Wi-Fi providers. And in addition, cooperation with **OEMs** like Apple and Samsung are important so that the network connections of smartphones and/or routers can be steered remotely according to the user's present situation and the demands of the applications. In this respect, various efforts for standardization such as 3GPP, Broadband Forum, and IETF and proprietary developments have been launched, and telcos will have to observe closely and support these efforts so that they can defend and develop their USPs in convergence. If they play their cards well, telcos can become orchestrators of the **convergent telco ecosystem** in their footprint, which may prove valuable for more ambitious moves toward becoming an orchestrator of digital business ecosystems.

3. Digital business ecosystem play

In the digital economy, companies like Apple, Google, Amazon, and Uber have been extremely successful in building comprehensive value propositions by intelligently integrating products and services — devices, applications, content, customer services, payment services, data analytics, advertising, logistics, ICT infrastructure, etc. — from various more or less independent partners on digital platforms. Their business models stand out for a higher degree of openness and autonomy for the participating developers and/or service providers. The added value for consumers regularly stems from broader choice and functionality, convenience, and flexibility as well as continuous innovation. Economically, they are highly profitable because of their ability to roll out products and services globally at low cost. The impact of these **digital business ecosystem (DBE)** activities has been the disruption of many industries.

Viewed generally, DBEs reveal their advantages over vertical business models, especially in unpredictable or potentially disruptive environments, when components from different parties can be easily and flexibly combined while still requiring a certain degree of coordination to achieve a convincing customer experience. This factor and a high potential for fast scaling due to direct network effects or indirect network effects of two-sided business models are the key criteria for the success of DBE over vertical models.

Unpredictability and potential for disruption can be seen in the currently hyped visions and investments in immersive experiences, metaverse, and web3 for entertainment and commerce. The same applies to new mobility/autonomous driving and smart home/grid smart home (among others). At the same time, there is a high potential for disruption in the telecom industry.

Telcos have a **right to play** the **orchestrator** role in DBEs if they understand the above-mentioned success factors, leverage their own unique assets and capabilities, and, most importantly, continuously develop in collaboration with partners the scope and scale for comprehensive and superior digital customer experiences.

Current unique assets and capabilities telcos can leverage for DBEs include:

- Valuable customer base: telcos have a direct and long-lasting relationship with a large base of end customers
- Control of network QoS: only telcos have the capability to fully control the network QoS
- Remote access to consumers' equipment such as smartphone, router, set-top box
- Systems and experience in mass market billing/CRM
- High credibility as trusted providers for data security as well as guardians of data privacy
- Local champions: compared to hyperscalers, telcos have a strong local brand positioning and local presence such as infrastructure shops and logistics; moreover, they have far more experience in dealing with national regulations and stakeholders.

Leverage QoS and develop QoE platform as USP

As outlined in the previous chapter, the quality experienced by consumers (QoE) depends on many variables and parameters. Some of them, such as network QoS, are directly manageable by telcos. Others are controlled by third parties (cloud and application providers, OEMs, etc.). And a third category is completely beyond the control of any of the players since they are related to the conditions of users and their environments. Nonetheless, telcos have a golden opportunity if they develop their **core competency in QoS management** of the network by steering it toward **QoE optimization**, even in real time. 5G technology and edge solutions secure especially valuable support for meeting the requirements of immersive or other applications demanding low latency and can adjust QoS dynamically. Innovative AI/ML technologies are key for analyzing data across multiple hubs and nodes in the network and for developing algorithms for automatic adaptation of the network and computing QoS to the requirements

of the applications and the (changing) context of their use. This also involves cooperation with the above-mentioned providers (app, cloud, smartphone OEMs, VR/AR headsets, routers, sensors) to obtain access to the relevant data. In some settings, the optimization of QoE may also necessitate retroactive access of AI/ML algorithms to modify the configurations of the applications and cloud infrastructure. Finally, the integration of personal and context data from users, if they opt in, will improve the algorithms thanks to their full end-to-end view and remote access to device settings (see converged telco ecosystem play). In this respect, telcos are best positioned to develop relevant types of **QoS/QoE platforms and competencies** that they as orchestrators can introduce into digital business ecosystems that are highly dependent on QoS/QoE.

Orchestrate for Digital CX

Regardless of the specific DBEs in which telcos invest as orchestrators, it is important to develop and continuously enhance the platform and environment (5G/edge, GPU/CPU, open APIs, AI/ML tools, search engines, developer tools and libraries, and secure cloud) with and for partners (content partners, application developers, payment services providers) because the latter are key for delivering complementary **choices** and **new functions** in terms of services, applications, and content to consumers.

Given the pivotal role of AI/ML for QoS/QoE optimization, telcos should secure the in-house availability of these competencies.

Excellence of customer experience is achieved (among other ways) by (non-intrusive) **personalization** and adaptation of the services, whether NBO/NBA recommendations, home robot activities, autonomous driving, or others, to the customer's **situation and requirements** at any given time. DBEs with multiple service components require an overarching **AI/ML** that includes all partner services in its data analytics and algorithms for personalization. Should customer sentiment also be systematically integrated, the chances

that the **"data flywheel"** for customer experience can be set into motion are very high. Telcos may leverage related synergies since they must invest in any case in AI/ML for the pivotal QoS/QoE optimization. Still, the AI/ML technology should be open to partners who are also striving to provide personalized and context-aware experience to customers (e.g., adaptation of movie trailers, AR applications).

One of the biggest challenges in digital business ecosystems is the orchestration of complementary partners to ensure delivery of a **consistent** and **convenient** experience throughout the customer journey. The required efforts include the definition, alignment with, and enforcement of common standards, business rules, processes, and UX design for harmonization and seamless interoperability. Investments to develop this capability, whether by acquisition or in-house development, are a good recommendation for telcos doubling as orchestrators. It will be one of the sweet spots for generating **indirect network** effects on both sides of the business model, i.e., attracting both partners and consumers.

Since telcos enjoy high credibility as providers of **data security** and guardians of **data privacy**, they can and should contribute data security services through the platform directly (SOCs, digital identities, and identity management). Similarly, the protection of data privacy requires orchestration in the form of the definition of rules and their enforcement for all ecosystem partners. Considering the new data protection regulations (DSA, DGA) in the EU, telcos could take a position as trusted **data intermediaries**, especially for DBEs like smart home, mobility, and smart cities and grids.

From the perspective of the **sustainability** dimension, **publicly listed telcos** in particular have made progress in the reduction of greenhouse gas emissions in Scopes 1 and 2. The objective for a telco in its role as DBE orchestrator is to ensure the selection of compliant partners and enablement of junior partners to ensure timely reduction of emissions across Scope 3.

In what digital business ecosystems should telcos invest as orchestrators?

There is no general answer. Among other considerations, it depends on the telco's resources and capabilities. For example, telcos who already provide cable or IPTV services have valuable resources such as digital platforms, access to users' routers/set-top boxes, and experience in curating digital content. Obviously, cloud gaming and other immersive experiences in media and entertainment are the next logical steps, and some telcos like TIM, Vodafone, Turkcell, and Singtel have already moved in this direction by launching their cloud gaming propositions.

Telcos with strong capabilities in systems integration for B2B and relations with public clients have opportunities to orchestrate DBEs for smart home, smart mobility, and digital health (B2C) and to integrate them into B2B-oriented smart grid, smart city, and digital health (B2B) in the future. Telus in Canada, for example, is providing a full range of tightly integrated B2C and B2B digital health services. In contrast to entertainment-related DBEs, hyperscalers refrain from engaging in such industries because they are heavily regulated at the national level, a circumstance that limits scalability.

Jio Reliance in India is an example of a telco engaging in multiple digital business ecosystems in view of Reliance Group being a holding active in many different industries.

In countries where large segments of the population lack banking services, telcos succeed as orchestrators of extended mobile financial services for consumers — MPESA in Africa, Millicom in Latin America — since they have BSS systems, experience with mobile money transfers, and relevant B2B relations.

6.4 Need for transformation

Telcos have already carried out digital transformation programs. Many focus on technology advancements within the existing, mostly vertically

integrated business model. But the bar on the path towards becoming an orchestrator of DBEs is set far higher.

1. Apply a different strategic approach

Achieving success will not be possible unless telcos pursue a fundamentally different strategic approach to target markets and value generation.

Even though telcos' existing customer base is an asset that they can utilize for network effects, they should reach beyond the limits of this one asset because their *markets* are highly mature and are characterized by high churn. Otherwise, valuable partners will hesitate to make any long-term commitments to their ecosystems. Furthermore, telcos should consider complementary partners within the ecosystem as potential customers, especially if such agreements improve the experience of end customers. Telcos could offer carrier billing, data security, and identity management.

Second, *value propositions* of successful digital business ecosystems typically grow steadily and at a *rapid* pace through the addition of new content and services from a growing number of partners. Such development is in stark contrast to the limited dynamics of data connectivity services, notwithstanding innovations that come along solely with new technology generations such as 5G. Consequently, as orchestrators telcos must enable fast-paced innovation through open platforms and cooperation with associated partners. The latter are particularly important for delivery of the QoS/QoE promise concomitant with the frequent releases of new (partner) services.

Monetization mechanisms in DBEs also follow different rules than those of the telco business (unlimited data rates, for instance). In DBEs, access and/or license fees on the one hand and revenue shares on the other are generally relevant. Subsidization of partners or customers could support the achievement of a critical mass, especially in the early phases.

Key takeaway

The first set of B2C trends relates to **increasingly immersive experiences** that will complement today's digital experiences in media, entertainment, commerce, and communications. Smartphones will remain, but **new devices** (AR/VR glasses, headsets, wearables, voice assistants) and **touchless interfaces** using gestures and gaze control will become major elements of consumers' lives. By 2030, **cloud-based services** will have been fully adopted and will be accessed through multiple subscriptions in video, gaming, education, and lifestyle. The currently hyped concepts of **metaverse** and **web3** will evolve into new **digital business ecosystems (DBE)** toward the end of the decade.

Second, owing to urbanization, climate crisis, aging society, and increasing health awareness, digital B2C services such as **smart home, mobility, health, and care solutions** will mature, grow, and be increasingly integrated into B2B ecosystems such as smart grid, smart cities, digital health, and autonomous driving. The same trends as those mentioned above will be observed in cloud adoption and subscriptions. Finally, the adoption of consumer IoT devices such as cameras, sensors, trackers, and robots will gain traction.

As the digitalization of consumers' daily lives continues apace, their expectations relating to the following dimensions of digital **customer experience** will grow significantly and they will consider ubiquitous and seamless connectivity, QoS/QoE, choice and functionalities, personalization and context awareness, convenience, data security and privacy, and, finally, sustainability across Scopes 1 to 3 to be self-evident.

Digital business ecosystems will continue to enjoy advantages over vertically integrated business models in profitably delivering superior customer experience. They will leverage platforms and direct and indirect network effects. Solely the forms they will take in the future — degree of centralization, openness, scope, players, etc. — are less predictable.

Telcos have a right to play the role of orchestrator of **digital business ecosystems**. They can draw on their unique capability to steer network QoS. By leveraging AI/ML technologies in close cooperation with partners (network, applications, cloud, and OEMs), they will be in the best position for the development and continuous optimization of the wide range of QoS/QoE requirements of innovative digital applications, features that will appeal to developers and consumers and convince them to join in.

However, if they want to have a right to win as orchestrators in DBEs, telcos will have to pursue a **new strategic approach**, build partnering excellence, and invest in AI/ML, flexible BSS, and immersive technologies. Finally, they will have to instill an operating model that resembles those found in agile software companies.

2. Build partnering excellence

Telcos are well experienced in selecting, contracting, and managing various vendors of network equipment, devices, and systems. Many even engage system integrators. But partnering for DBEs requires a completely different approach and set of capabilities. Partners will join only if they recognize benefits from the access to capabilities of the orchestrator and/or other partners and if the components of all partners deliver superior value propositions and experience to the same target customers. It is evident that selecting and convincing an initial set of complementary partners is crucial. Furthermore, the ongoing partner management in DBEs involves the continuous monitoring of the balances among the partners to prevent exits and churn of valuable partners because of imbalances. In this context, multi-homing of partners in various, even potentially competing DBEs requires special attention.

3. Invest in new technologies

The need for investment in AI/ ML technology has already been outlined during the discussion of QoS/QoE optimization and of personalization of services. It cannot be overstated. In a DBE, the data management has to integrate both partner services and their data so that the ecosystem as a whole benefits from accelerated improvement of customers' experiences and the strong competitive advantages that result.

Highly flexible BSS are required for the new vertical telco model for the support of multiple QoS tiers and QoS on demand and to strengthen continuously involvement with customers. We strongly recommend that DBEs pursue a greenfield approach, the decoupling of the DBE's BSS functions from the complex carrier IT environments as much as possible.

Furthermore, telcos should invest selectively in technologies for *immersive* experiences and web3 since these elements are projected to be the drivers of a whole new generation of DBEs in media, entertainment, and commerce. However, it is important to monitor carefully related developments because some of them might face major setbacks due to a lack of adoption and very high energy consumption (blockchain is just one example).

4. New operating model

DBEs, especially those in entertainment, media, and commerce, are highly agile. Telcos will run a high risk of failure if they fully integrate DBE orchestration into telco operations. We recommend considering a more independent setup that still allows an effective and efficient integration of the central component — the QoS/QoE optimization — on the one hand and, on the other, an agile operating model that can keep pace with digital partners and competition.

Being successful as a DBE orchestrator also requires a different mindset and leadership. It is about orchestrating external resources and engaging with dynamic developer communities rather than controlling internal resources. Leaders must have visionary persuasion skills instead of hierarchical control. Their function is that of architects and coaches more than of planners and controllers. Their visionary leadership incentivizes experimentation and the creation of an extensive community of data scientists, software coders and developers, and UX/CX experts and the securing of access to R&D and developer communities.



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Telcos at the Crossroads: The Future of Telecommunications Is Bright — but Will Telcos Win?



The future of telecommunications in the sense of data exchange using modern transmission technologies undoubtedly looks bright. Both the past and the projected future growth of traffic on the world's data networks speaks for itself. The question of the degree to which telcos will benefit from this growth in the future remains open, however. Our answer: "It depends ..."

7.1. Where do telcos stand today? Different perspectives are possible!

The many and diverse factors that we have outlined in the previous chapters will have an impact on future market constellations. We will now divide the key driving factors into three groups according to their likely impact on carriers' future competitiveness.

If we believe the forecasts of various analysts, the future of the telcos is questionable – from the perspective of "the glass is half empty". And there are indeed many arguments supporting this pessimism.

On the other hand, telcos definitely have competitive advantages over new competitors, a reason for optimism – from the perspective of "the glass is half full".

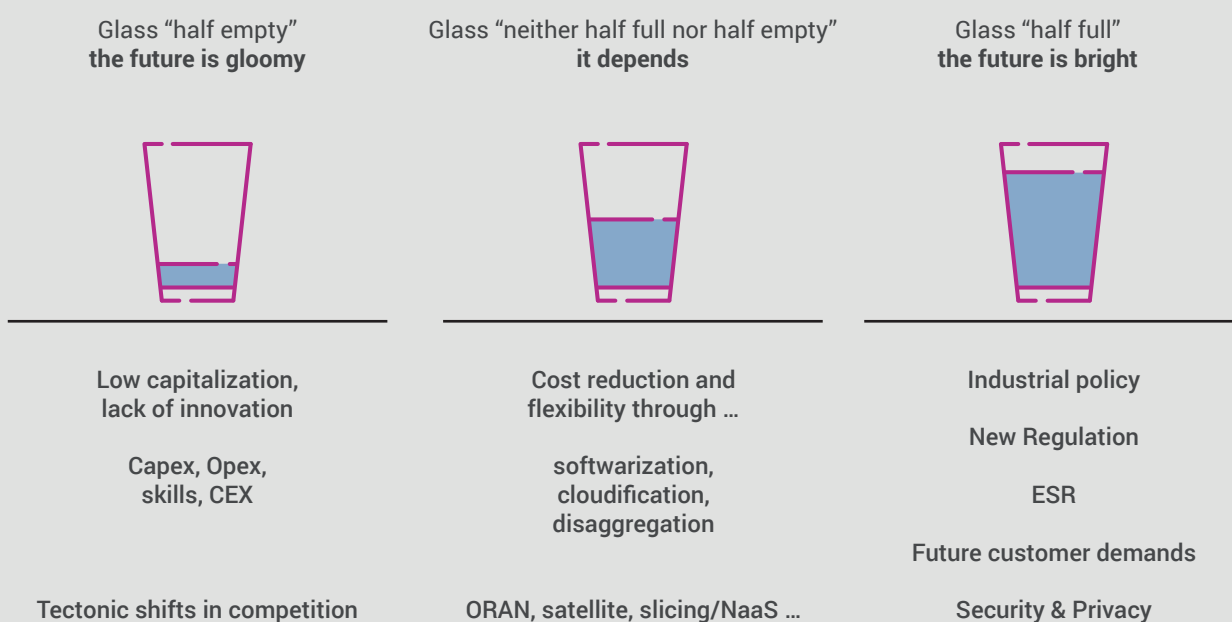
After all, we see multiple developments in various directions, and no one can say at this moment which way the pendulum will swing – from the perspective of "it depends".

7.1.1. The pessimistic view: the glass is half empty

Top line

Most telcos have seen their market capitalization stagnating or even falling for years. The capital market obviously takes a rather skeptical view of the established, vertically integrated business model of the telcos. Competitors such as the hyperscalers, the large device manufacturers, or focused providers such as towercos and FTTPcos (KCOM in the UK is one) land far higher in the ratings.

Figure 26: Glass half empty or half full: what determines the perspective for telcos?



Source: Detecon

Chapter 7

At the beginning of February 2022, for example, Cellnex's stock market value was at roughly the same level as Orange's. At the same time, Microsoft had reached a market capitalization of US\$2.3 trillion, almost seven times that of Europe's ten largest traditional telecommunications groups (Deutsche Telekom, Vodafone, Orange, Swisscom, Telefónica, BT Group, Telenor, Telia, Liberty Global and Iliad) combined. Telco revenues are at best stable or declining, ARPUs/ARPA are stable or declining, margin development is pointing in the same direction, organic growth is almost non-existent. COVID-19 has been an additional factor hindering growth prospects through gains in market share as customers have become less willing to switch.

Despite a significant increase in traffic in the networks because of the pandemic, telcos are enjoying few benefits in the form of higher revenues as a consequence of widespread flat rates and the "more for the same" pricing policy approach that has prevailed for years. Major internet players are virtually the sole beneficiaries. In 2021, Google, Apple, Facebook, Netflix, Amazon, and Microsoft for the first time accounted for significantly more than 50 percent of all global data traffic while telcos have simultaneously had to invest massively in infrastructure to handle this traffic.

Telcos' attempts to tap new revenue streams with innovative service ideas have largely failed, have fallen well short of their high hopes, or have been foiled by hyperscalers within a short time. There is a lack of convincing services, of scalability and attractiveness for partners, and of the skills required for a successful introduction of innovative services to the market. Mobile wallets are one striking example; MNOs around the world had a number of initial advantages (such as their existing access to customers) over other providers.

Despite massive investments, however (in the case of Softcard, a joint venture of AT&T, Verizon, and T-Mobile, to the tune of several hundred million dollars), they were unable to compete with Apple Pay/Wallet. The business with individualized solutions or complex, industry-specific projects are not compatible with the telcos' processes and

systems, geared as the latter are to standardized mass business. Connectivity continues to be their key revenue driver, and they remain de facto one-product companies. The service side has been taken over by the hyperscalers and a plethora of OTT players, and customers generally enjoy a significantly better experience (CEX) with these competitors than with telcos.

The generation of USPs by telcos vis-à-vis customers is almost exclusively based on network quality or price. Price competition is harmful to providers in the long run. Differentiation in terms of network quality is expensive and is becoming more difficult as grades of quality converge.

Under these conditions, the prospects for rising revenues and earnings appear rather bleak.

Bottom line

Telcos are investing huge sums in the acquisition of frequencies, gains in network coverage and capacity, compliance with auction requirements, new network architectures, and network modernization. 5G, the future 6G and small cells, FTTH – in other words, issues of capacity and coverage – significantly increase the need for capex. The softwarization and cloudification of networks, the construction of distributed data center structures, the disaggregation of access networks, and the integration of fixed and mobile networks also lead to mind-boggling capex or opex figures.

Many telcos are facing challenging questions of financing and know-how in this area. Cash flow is often inadequate to provide the financial resources for expansions of capacity and coverage. Many telcos are consequently confronted with a rising level of their already high debt, which puts additional pressure on stock market values.

At the same time, private equity companies are investing massively in telecommunications infrastructures as moderate returns on capital with low risks can be expected in the long term. Cooperation activities including joint ventures, wholebuy, network sharing, asset sales or carve-outs, and sales and lease back models are the means used

Chapter 7

to preserve or gain liquidity with the consequence that the opportunities for differentiation through multiple grades of network quality will dwindle.

The realization of cloudified and softwarized network production entails in particular challenges relating to expertise as well as financial difficulties for telcos. The construction and operation of the distributed data center structures that are required and the development of the necessary software are the core competencies of specialized providers or hyperscalers. Their cost advantages and commanding lead in competence are unassailable so that cooperation ventures or the sourcing of such services often remain the only options.

There are numerous examples (including 1&1/Rakuten in Germany, Starlink/Microsoft Azure, Kuiper Satellite/AWS, AST Space Mobile/Rakuten in Japan, Vodafone/AWS Edge Cloud in Germany).

The high investments required and the closing of the know-how gaps will overwhelm many telcos. A weakening of their own market positions, concentration on certain core competencies, cooperation, and consolidation are likely to be the result.

Tectonic shifts in competition

New competitors are successfully occupying discrete links in the telcos' added-value chain. On the infrastructure side, the activities of satellite network operators or the so-called "new space economy" deserve mention.

In particular, LEO constellations offer alternatives to traditional terrestrial connectivity and are an excellent fit with certain use cases such as global IoT connectivity (e.g., Fleet Space Technologies from Australia) or enhanced mobile broadband (eMBB; e.g., Starlink) in remote areas. Towercos such as American Tower, Cellnex, or Crown Castle occupy the passive layer of added value in mobile networks, but occasionally advance to the position of wholesale network operators by purchasing and offering as neutral hosts active RAN network components. Their focused activities are

being rewarded by the capital market in the form of high rankings in the current low-interest phase.

A new dynamic movement is emerging in the sector of city and campus networks. Numerous providers such as the classic vendors (Ericsson, Nokia, etc.), specialized providers such as EDZCOM or Citymesh in Belgium, hyperscalers such as AWS, large industrial equipment outfitters, e.g. Siemens, that regard connectivity as a component of their automation systems, or so-called neutral hosts focusing on location and indoor coverage of specific industries are forcing their way onto this market. The same development can be seen on the fixed network side where many small local or national fiber optic providers (e.g., energy suppliers) and financial investors, who also see a profitable and secure business model here, are moving into the sector. Hyperscalers are also investing in fiber optic infrastructure. In the meantime, they have become some of the largest investors in global submarine cables. They are also investing heavily in connections to their own data center structures and in access to the sites of large enterprises to which they offer their cloud services, including connectivity (e.g., Outpost from AWS, Microsoft Express Route). Following the failure of Google Fi in the United States in particular, the realization of close-meshed, nationwide, fixed network infrastructures is unlikely to be of any interest, at least in countries with well-developed infrastructures.

However, the internet giants are exploring various other ways to approach the connectivity business. Facebook for one is pursuing the Facebook Connectivity Initiative in various permutations (Teragraph, Free Basics, HAPS [High Altitude Platform Station], Open Cellular, etc.) and has driven forward the TIP (Telecom Infra Project). Amazon has pushed vertical integration in the direction of infrastructure in other industries (e.g., logistics).

As outlined above, the internet giants are also playing an increasingly important role in the operation and cloudification of telco networks. Google, Microsoft, and AWS, for example, are present on the market with their own solutions for mobile edge computing and are moving ever

Conclusion: The future is gloomy

The totality of the challenges on the revenue and expense side, the management of technological risks and opportunities, and the branching out and intensification of competition will overwhelm most telcos. The telcos' traditional business model with its vertical integration threatens to become obsolete in the very near future. The process of fragmentation will continue and even accelerate. There will be a multitude of players at every stage of the added-value chain, or a distinct ecosystem requiring orchestration for customers at each and every stage and/or across multiple stages will emerge. Precious few telcos will be in a position to deal with this situation. They do not have the human resources, the know-how, the necessary market position, and the financial means. Many telcos will be forced to abandon key added-value sectors and to focus instead on their traditional core business (networks), ideally taking on the role of a horizontal coordinator at the lower added-value level with all the entailed consequences for companies and employees. They will have to relinquish their contact to consumers. Only a handful of telcos will have the chance to occupy any additional sectors beyond network operation and to serve consumers.

closer to the customer with their data centers. An announcement by Dish and AWS in April 2021 caused a stir in the US. Dish announced that it would rely entirely on the AWS public cloud infrastructure for its 5G network rollout.

On the service side, the dominance of these players among business and private customers is obvious.

7.1.2. The ambivalent view: the glass is neither half full nor half empty

Technological developments harbor both opportunities and risks for telcos. Like many other industries, telcos face the challenge of embracing digitalization as a process of profound transformation. They will have to accept collateral damage along the way, perhaps by cannibalizing their own customer base and revenues with new products and services or by giving competitors new opportunities.

During a transitional period, they will have to bear the complexity and associated costs and investments associated with the establishment of new digitalized processes for the provision of services while simultaneously continuing operations or with the gradual dismantling of legacy systems and processes.

Technological progress is unstoppable, so it is better to forge ahead to the forefront of the movement than to wait it out. Steps must be taken to exploit the associated opportunities and mitigate any risks.

What does this mean in concrete terms? In terms of the digitalization of customer interfaces, the opportunities are obvious; there are enormous gains in efficiency as well as possible improvements in customer satisfaction.

There are plenty of role models in this respect, e.g., among the major internet players. The cloudification and softwarization of networks and the decoupling of hardware and software from each other promise efficiency, flexibility, automation, and new use cases and products.

Nevertheless, dependency on upstream suppliers may increase as may the risk that these upstream suppliers will become empowered as competitors and realize new business models that will in turn threaten telco revenues. The discussions about ORAN vividly illustrate the ambivalence of new technologies for telcos. ORAN-based networks and the disaggregation of access networks in mobile and fixed networks reduce dependence on the established vendor landscape, possibly creating new entrepreneurial freedom, but also possibly creating new dependencies on new players and opening the gates to consumer business for them.

The same can be said about network slicing or NaaS. On the one hand, this technology will create new business models and revenue categories for the telcos; on the other hand, it will enable other players to act as de facto network operators, to integrate the networks more easily into their own products as an upstream service, and to consolidate and expand consumer relationships in competition with the telcos. The introduction of the eSIM is another example of ambivalence. The positive aspect is the elimination of costly logistics processes for the telcos; the negative side is the possible yielding of a control point for the consumer relationship to the device manufacturers.

Last, but not least, the latest developments in the satellite business or the New Space Economy also harbor opportunities and risks in equal measure. Connectivity solutions from satellite operators threaten the core business of telcos and can meet the requirements of many use cases, especially of global IoT. At the same time, this opens up an opportunity for possible cooperation ventures in the direction of global network coverage for the telcos.

7.1.3. The optimistic view: the glass is half full

Industrial policy on the advance

The last several years have been characterized by growing protectionist or industrial policy tendencies. The three major global economic blocs —

Conclusion: It depends

Technological innovations are forcing the fragmentation of the telcos' traditional, vertically integrated added-value chain. An ecosystem comprising different solution providers and competitors is being created at every stage of the added-value chain, increasing the complexity of coordinated service provision. The larger players (in this case, the hyperscalers or the traditional IT service providers or integrators) will attempt to take advantage of their software expertise, their high-performance cloud infrastructures and services, and the considerable strength of their consumer relationships and to assume the role of orchestrator of the various added-value stages for consumers. This will put them in direct competition with the telcos and, if they are successful, will relegate the latter to the role of an upstream service provider or wholesale provider without any contact to consumers. For the telcos, however, technological advances also represent a lever they can use to position themselves successfully for the future on both the top and bottom lines of their future business model, whatever form that may take. There is no alternative to the adoption of a new model. Whether and to what extent telcos will play a leading role with consumers in the future will depend on their assets, ambitions, and abilities to acquire the requisite competencies and complete the digital transformation before it is too late.

Chapter 7

China, the USA, and the EU – have implemented programs and initiatives seeking greater protection and promotion of their domestic economies. Examples include the Chinese government’s Digital Silk Road initiative and the USA’s Infrastructure Investment and Jobs Act (IIJA), which includes a “Build America, Buy America” requirement.

The EU is also active, e.g., in the form of the industrial strategy updated in the light of the COVID-19 crisis or of the recent initiatives to build its own satellite system and to strengthen the European chip industry. Many of these initiatives focus especially sharply on the digital economy, based on the conviction that the future prosperity of national economies can be safeguarded solely by an internationally competitive digital economy of their own or by digitalization of the economy.

This conviction has taken tangible form in Europe inter alia in the DGA (Data Governance Act) or the GAIA-X initiative, which seeks to realize an open, European cloud solution and data infrastructure that complies with the high standards of the European legal framework. Examples can also be cited for the USA such as the ban on Huawei or the disputes with ByteDance and TikTok, above all in response to Chinese economic expansion.

At the heart of all these initiatives is the desire to attain or regain autonomy and competitiveness of their regions or to develop “digital sovereignty.”

“New Regulation” defines new rules of the game

Society, business and politics have in the meantime developed a high level of sensitivity regarding the actions of the large digital corporations. The rapid growth and the related influence of the latter are drawing more and more attention to the negative effects of their actions.

The criticism is massive and is directed at a broad spectrum of concerns ranging from the monopolization of markets, abuse of market power, sealing-off of certain markets, shameless exploi-

tation of legal tax loopholes, and accusations of disinformation and manipulation to carelessness in handling sensitive data and a lack of transparency and responsibility. Lawmakers and regulators worldwide have begun to address these issues.

There have been numerous attempts in the past to curb the market power of the internet giants or to punish unethical behavior. In recent years, the European Commission has levied antitrust fines in the billions on Google, Microsoft, Facebook, and others.

At the end of 2020, the United States Department of Justice filed a lawsuit against Google. The company was alleged to have abused its dominant position in internet search operations and the related advertising business. Amazon was sued for discriminating against merchants on the Amazon platform. In the EU and the USA, Apple is under scrutiny and must answer in court to allegations of charging app developers unjustifiably high fees for use of the Apple App Store.

Furthermore, the debate concerning the introduction of a digital tax or a global minimum tax on companies indicates that the platform economy could sooner or later lose the advantage it currently enjoys from the legal exploitation of tax loopholes.

Besides these current or past measures, there are future-oriented developments that will establish a new regulatory framework for entrepreneurial activity in the digital economy in the future. Presumably the most prominent example is the EU Commission’s announcement on December 15, 2020, of a proposal to replace the more than 20-year-old “e-Commerce Directive” with the “Digital Markets Act” and the “Digital Service Act”. The former is aimed in particular at the business models of the so-called operators of “core platform services” or “gatekeepers” and provides for ex ante regulation with pertinent obligations or prohibitions.

Prohibited actions include price discrimination, preventing the uninstallation of pre-installed apps, misappropriation or own use of business users' data, and similar measures. Obligations include ensuring interoperability, requiring data sharing, enabling data portability to another provider, etc. The "Digital Service Act" focuses on the protection of consumers, their fundamental rights in the online world, liability regulations for providers, and transparency obligations for providers concerning the algorithms they use, and online advertising. In addition to these initiatives at the EU level, the 10th Amendment of the Act against Restraints of Competition (GWB) in Germany or the initiatives in the UK regarding the so-called "Digital Task Force" are noteworthy regulations at the national level in Europe.

These initiatives are expected to open the "closed shops" of the major platform operators, to bring down the "the winner takes it all" logic in the digital economy, to encourage innovations from less prominent players, and to mitigate negative network effects.

ESR will become the new currency

The environmental and social responsibility of companies is a growing concern and expectation for various stakeholders, with the consequence that environmental social responsibility (ESR) is gaining in importance from the corporate perspective.

For one, there are the needs originating with customers that are evidently becoming more and more decisive for purchasing decisions; for another, awareness of the "green" restructuring of society and the economy, which the political establishment is driving with massive support, continues to rise.

Another important driver is the search for "purpose" among employees. Employers will surely have increasing difficulty finding suitable employees in sufficient numbers if they do not reflect the latter's values in environmental and social terms.

These factors essentially affect all market players: telcos because of the energy consumption of 5G; hyperscalers because of their data centers and their high energy and water consumption; device manufacturers, who must take an E2E view of their products in environmental terms. Some hyperscalers, however, find themselves under especially close scrutiny because their business practices are perceived by growing numbers of people as antisocial (insecure jobs, hate speech, fake news, monopolization, etc.).

Future customer demands

The need for high-performance connectivity in the fixed network and mobile communications has risen significantly in importance and has even been accelerated by the experience of the COVID-19 crisis. During the crisis, private customers, business customers, and politicians alike have experienced the immense significance of a functioning telecommunications infrastructure.

In times of working from home and distance learning, gaps here have become and remain starkly evident, and they must be closed promptly. In the same vein, performance features such as reliability, full network coverage horizontally and vertically (the famous "underground garage"), and guaranteed KPIs such as latency and up- and download (rejection of the best-effort principle) are becoming enormously important. Satisfying these elements is a prerequisite for credibly serving major needs of a broader scope such as personalization, convenience, contextuality, and the need to offer industry-specific and customized solutions to business customers.

Yet another need will gain enormously in importance: the more the digitalization of personal lives and the economy spreads, the greater the actual and perceived vulnerability of people, companies, and systems in the event of system failures, criminal attacks, or misuse of data will be. While private individuals are still frequently motivated primarily by the desire for convenience and continue to display a certain carelessness in the safeguarding

of their personal data, the observance of security regulations, and protection of their privacy in the digital world, the criticality of security and protection of their digital systems now enjoys extraordinarily high priority for companies.

Both decision-makers in companies and private customers will be keeping these aspects more and more consciously in mind when making decisions to buy. Governments and regulatory bodies are paying greater attention to the issues of security and protection of personal, corporate, or state data. In the EU in particular, legal and regulatory measures have either already been implemented or are under discussion (e.g., GDPR, discussions and rulings on Safe Harbor/Privacy Shield, EU Digital Service Act). These will lead to the emergen-

ce of a new market for data that operates beyond the data pools of the major hyperscalers.

Since network operators in particular have been very strictly regulated for years, are subject to local sanctions, and have at their disposal expertise relating to analytics and management of data in compliance with the stricter regulations, a new and attractive business field could emerge here – for example, the assumption of a trustee function in a (regional) digital ecosystem. In this respect, business customers' need to reduce dependencies on a single large cloud provider will also grow.

The current discussions about, and the increasing demand for, so-called multicloud solutions are indicative of this trend.

Conclusion: the future is bright

The new regulatory concepts will result in significant restrictions of the market power of hyperscalers, gatekeepers, or so-called VLOPs (very large online platforms) in the next few years. They will be forced to open up their usually closed ecosystems. There will be innovations and startups with a realistic chance of competing against the internet giants on the market or that join with the latter in building up an independent and sustainable business model. Telcos, just as many other industries, will benefit from the situation as a level playing field that guarantees fair competition, distributes the power bases in negotiations more fairly, and enables cooperation on an equal footing will be established. Telcos, which tend to be viewed as national players in the eyes of political decision-makers, will benefit from industrial policy initiatives. The marketing of their services will be supported by their national roots, their generally good brand awareness, and the usually high level of trust in the brand and its business practices. These assets are in ever sharper contrast to the image of global hyperscalers.

When identifying suitable market segments for telcos, the focus should be on areas where customized solutions are in demand and where increased national or regional specifics prevail – be it language or country-specific submarkets (e.g., energy, transportation, health, education, public authorities, security). For the hyperscalers, deeper, market-specific market cultivation is associated with high initial and ongoing expenses, so telcos enjoy an advantage in time and economics. Since many of these industries also have the character of critical infrastructures, meeting demands for availability and (data) security more satisfactorily may also represent a positive differentiation for network operators.

7.2. Telcos! Choose your battleground!

7.2.1. From infrastructure provider to digital service orchestrator

Is the glass now half empty or half full for the telcos? What business models will exist in the future and which ones can be successfully realized against the backdrop of the company's own assets and capabilities and in view of the described technological developments, changes in the competitive landscape, changing customer needs and industry policy initiatives, and regulatory adjustments?

First, let us address the question of possible business models. In our view, there will be three basic types of telcos respectively network operators in the future: the infrastructure provider (IP), the digital service enabler (DSE), and the so-called digital service orchestrator (DSO). These are broad categories; the transitions from one to the next are fluid, and segment-specific hybrids are possible. The typology is based on their positions at certain stages of the added-value chain and the customer segments they serve. The DSO covers all stages of the added-value chain of a telecommunications provider, including as well the stages occupied by the DSE and the IP. The DSE also includes the stages covered by the IP. Solely the DSO will have broad and deep contact with consumers.

The IP and the DSE essentially focus on a wholesale business model; the DSE can also serve special segments of consumers.

In addition, there are certainly other types that (for example) cover solely the upper stages of added value in the direction of the customer. This would be the case with resellers or MVNOs, for instance. Another option would be for vertically integrated carriers to abandon the passive layer of the infrastructure in whole or in part. Some carriers have decided to take this step, carving out their mobile

towers (e.g., Vodafone) or pushing for structural separation between networks and services/sales areas (e.g., Oi in Brazil with New Oi, a customer-centric asset-light company, and V.tal, a neutral network company). In the following, we will focus on the three types mentioned above: IP, DSE, DSO (see figure 27).

The **IP (infrastructure provider)** builds primarily passive network elements (cell towers, fiber optic networks, ductwork, etc.) and typically markets them to other telcos (DSE or DSO). Occasionally, active components and network operation are also offered. Examples include towercos such as Cellnex, Neutral Hosts, or housing associations that hand over existing infrastructures in buildings to telcos for the marketing of their services.

The **DSE (digital service enabler)** covers the business area of IP, i.e., builds passive network elements, equips them with active components, and operates these networks and markets more highly aggregated upstream connectivity services to DSOs, Resellers/MVNOs, hyperscalers, or even to individual business customers. Typical products include IaaS, NaaS, network slices, PaaS, direct connectivity lines, managed bandwidth, etc.

This type is essentially a wholesale business model as well; consumer relationships in the business customer segment exist only in isolated cases, and the private customer segment is occupied solely as a niche, if at all (certain segments in the private customer segment or an extremely limited connectivity-related portfolio).

The **DSO (digital service orchestrator)** covers the business area of the IP and the DSE. Added to this is a strong presence in consumer business with private and business customers with the aim of going beyond connectivity alone to offer a broad spectrum of proprietary and partnered services in the sense of an ecosystem (see figure 28).

7.2.2. Prerequisites for the digital service orchestrator

Which providers will now be able to position themselves vis-à-vis the consumer in the role of “digital service orchestrators” across the various added-value stages and their related ecosystems? Which carriers should focus more on network operations and on marketing network resources in a wholesale business model, leaving the management of consumer relationships to others?

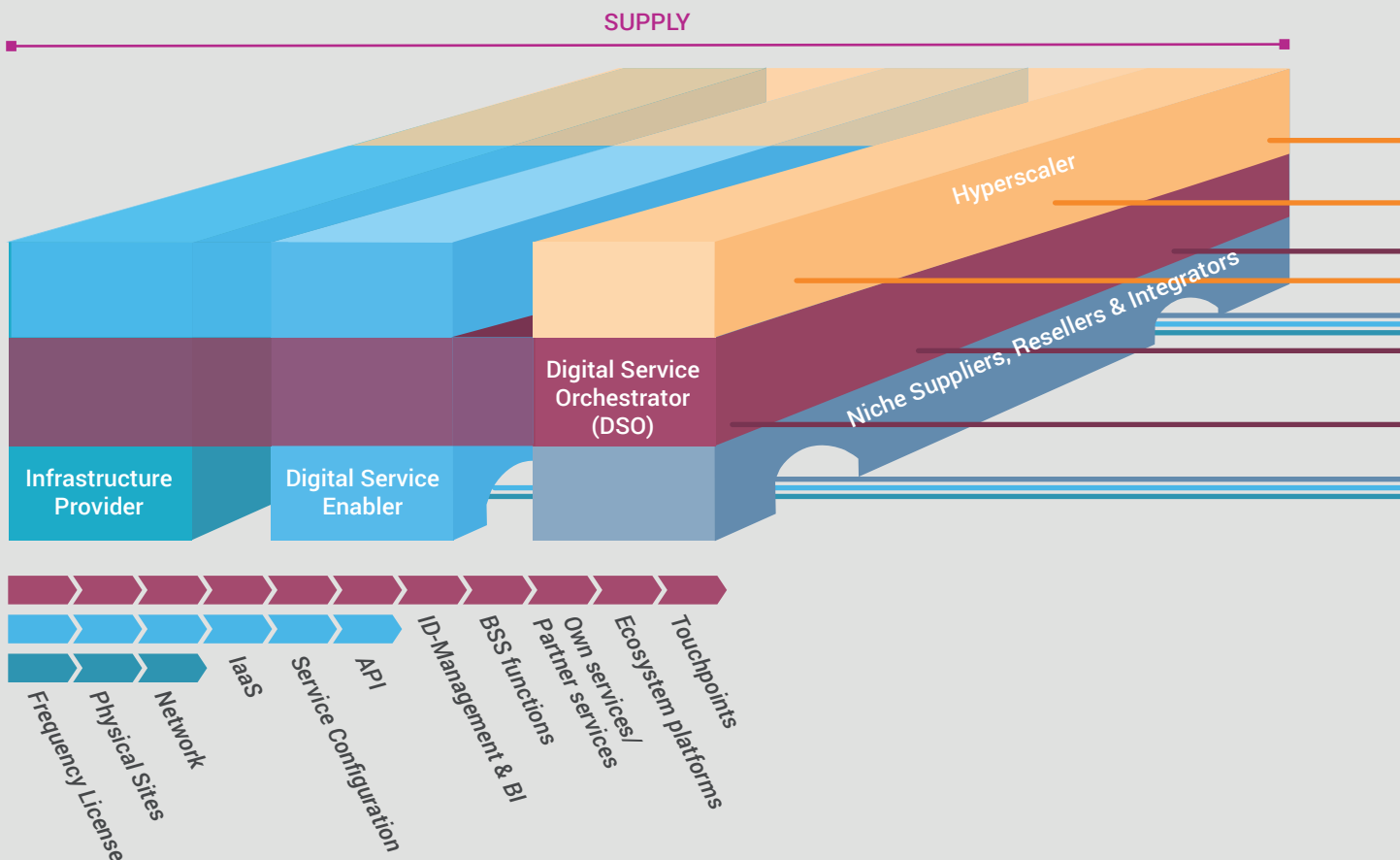
The highest aspirations, the greatest added value, but also the greatest complexity are associated with the position of the DSO. Traditional telcos are likely to be eager to implement this model as it is still most in line with their self-image. We believe, however, that only a small number of telcos have the prerequisites for the assumption of this role in the future. For most, the road would be too rocky,

the costs too high, and the prospects of success too low. Securing a position below the level of the DSO would be economically advisable in many cases.

The prerequisites and assets a carrier should ideally have for positioning itself as a DSO are manifold. Here are some thoughts in this direction:

- Telcos are better equipped to meet the challenges of DSO if they operate both network domains (fixed and mobile). There are significant capex and opex synergies in capacity and coverage issues, in planning, building, and operating the networks. The degree of integration of the networks is a key comparative competitive advantage over other telcos that have only one of the two network domains. Furthermore, truly integrated or convergent services for consumers are possible.

Figure 27: Typology of future telco business models



■ Much the same is true of simultaneous presence on the private and business customer markets. Here, too, success on the one is a prerequisite for success on the other as synergies on the cost and supply side are possible. Major investments in networks and service platforms can be spread over a larger customer base. When it comes to the individual segments, the following applies:

In the business customer segment, industry-specific expertise and presence in sectors that are primarily national/regional (health, public, etc.) are of immeasurable importance for telcos as is expertise in the professional provision of customized solutions and projects (e.g., campus networks) instead of merely standardized mass products such as SIM cards and fixed-network lines.

In the private customer segment, similar logic applies when it comes to selecting the right part-

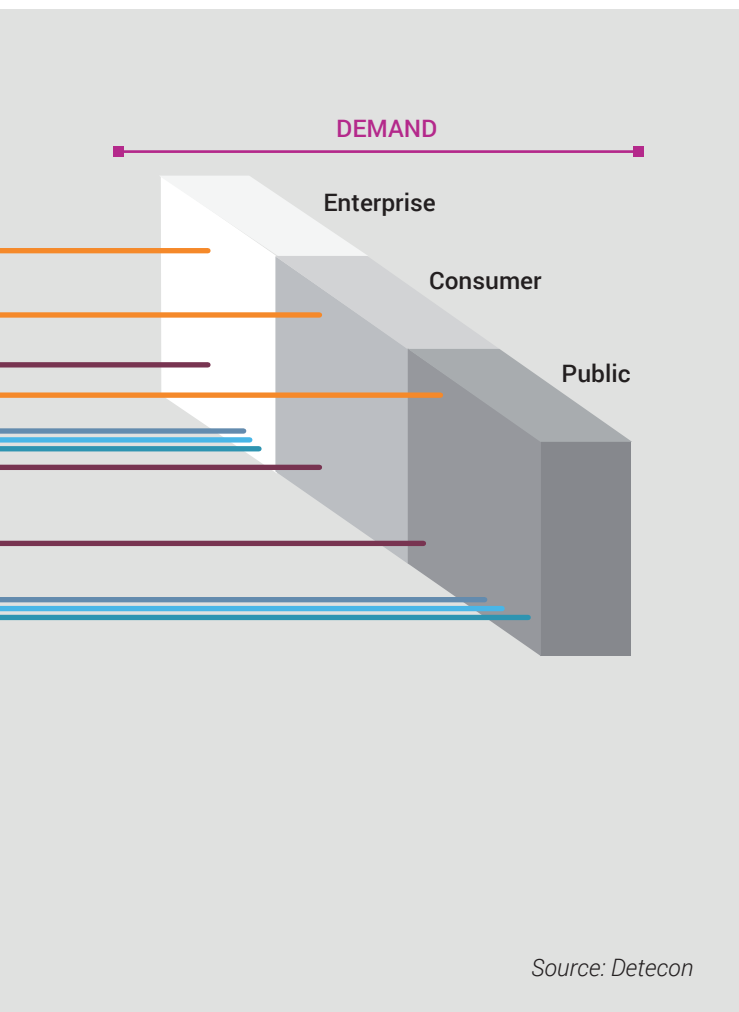
ners for rounding out the company's own portfolio. Again, being able to demonstrate or enter into partnerships with companies that have above all a national focus would be a key asset. These companies tend to represent the long tail for global hyperscalers and are not of primary interest. For example, marketing cooperative activities with national or local television stations and print media (analogous to Apple News+, Lecture Numérique from Orange, Readly, and others) would be possible and would score points on the content side with the company's own customers and support the cooperation partners in the digitalization and reach of their classic products.

■ Financial strength in its various facets (EBIT/DA, liquidity, market capitalization, debt, etc.) is by nature a core asset. It determines the degree of independence, the ability to finance the necessary investments and the transformation process or to grow inorganically, and to direct actively the expected consolidation process.

■ Size in terms of number of customers and market share is another important asset. It is not absolutely essential to realize synergies/efficiencies in building networks across telco holdings in different countries.

Past experience has demonstrated that this is difficult because networks are local, regulation is local, spectrum is allocated nationally, and even distribution operates under local rules. Size is especially important because it determines the attractiveness of telcos as cooperation partners in the ecosystem at every stage of the added-value chain.

The larger in terms of consumer reach, the more appealing and the more attractive the company is for potential ecosystem partners such as hyperscalers, OTTs, vendors, software developer communities, content providers, startups, etc. And, of course, size is important for the ability to manage more effectively key investments and costs in networks and platforms, for skill building in response to the new technologies, and for the distribution of these costs among a larger number of customers.



Source: Detecon

Chapter 7

■ The brand and its appeal are also of major importance. These factors make possible differentiation from hyperscalers; the trust of customers and stakeholders in the integrity, reliability, transparency, and security of the telcos' business conduct and offerings can be an ace that telcos can use extensively to their benefit in view of the virulence of the data protection issue, the ESR issues, and the industry policy discussions about "digital (national or regional) sovereignty."

The concluding thought is that only those telcos that have the above assets or meet these requirements have a realistic chance of successfully positioning themselves as digital service orchestrators (see figure 29).

7.3. What the future will look like – the chaff will separate from the wheat!

Only a few telcos will meet the requirements outlined above for taking the position of a DSO, so the question arises as to what the market structures among telcos will look like in the future.

We would also like to present a few thoughts on this subject:

■ Market structures will continue to branch out. A large number of new players will establish themselves at the various added-value levels. This can be seen in the emergence of connectivity providers of all types.

Figure 28: Characteristics of future telco business models

	Infrastructure Provider (IP)	Digital Service Enabler (DSE)	Digital Service Orchestrator (DSO)
Key Customers & Business Models	<ul style="list-style-type: none"> • DSE, DSO, IP • Hyperscaler • Wholesale • Public • Integrators, niche players 	<ul style="list-style-type: none"> • DSE, DSO • Large industry customer, public, very few residential • Hyperscalers • Integrators, niche players 	<ul style="list-style-type: none"> • Business & residential customers • Few large industry customer, public • Hyperscalers • Integrators, niche players
Key Strategy & People Needed	<ul style="list-style-type: none"> • Make low-margin Infrastructure profitable and expand into new value creation/ active & CaaS • Infra-wholesale business champions, new business developers for joint convergent infrastructures for IaaS 	<ul style="list-style-type: none"> • Build value-based portfolio of services around one-click-zero-touch-connectivity operating systems • People bridging deep-tech connectivity with human & data-centered design and wholesale product champions 	<ul style="list-style-type: none"> • Orchestrate digital business ecosystems • Leverage AI empowered QoS/QoE end2end (plus trusted data security, local presence, customer base) • Orchestration platform DevOps, industry and residential ecosystem experts
Target Operating Model & Production	<ul style="list-style-type: none"> • Lean and mean TOM according to private equity infrastructure KPIs • Managed wholesale infrastructure services 	<ul style="list-style-type: none"> • Modular platform- and product-centric network & service operating systems • White-label capabilities & platforms prepared for scale 	<ul style="list-style-type: none"> • Networked digital business ecosystem operating system ensure for end-to-end solutions • Firm grip on telco-grade QoS of DSE's operating systems and other partners

Source: Detecon

The spectrum ranges from satellite operators, HAPS, and neutral hosts for building networks to campus network providers. The activities of the many local providers of fixed network capacity and towercos, which are moving beyond purely passive tower infrastructures into the marketing of active components, are also noteworthy.

Examples include Cellnex with its acquisition of EDZCOM and Vantage Towers' recently announced collaboration with Signify. At the upper levels of the added value chain, the hyperscalers, the traditional vendors and integrators, and many smaller companies — specializing either in a market segment or a specific service — will join the large device manufacturers in competing for the consumer.

■ There will simultaneously be a consolidation and cooperation process among the traditional telcos. The pressure is especially great in Europe, where there are so many network operators in an economic area of about 500 million inhabitants. Given the prevailing principles of competition law, however, it will remain a national game of three to four players.

The consequence is that in-country M&A activities will be difficult to realize. Close in-country cooperation among network operators is an alternative. They will play a role mainly on the network side so that the immense investments (e.g., tower sharing, network sharing, joint ventures, co-investments for network expansion) can be financed. However, this makes any differentiation based on varying grades of quality of the networks increasingly implausible.

As a consequence, a USP before customer is possible solely on the service or CEX side. Playing this side successfully will be challenging for many telcos, given the aforementioned competitive situation with hyperscalers, and presumes they have the assets described above.

■ The consolidation process in the sense of telcos being acquired by other telcos will take place across national borders. Attempts of this nature

have been made in the past, such as the recently failed initiative to merge Vodafone and Orange.

Ultimately, national sensitivities have often prevented the progress of international consolidation in Europe. These reservations will clearly fade into the background in the face of market and competitive pressures over the next few years.

A conceivable preliminary step might be the acquisition of minority or cross-shareholdings among telcos. As a consequence, we will see almost exclusively opcos owned by a handful of pan-European telco groups on most European markets.

■ In addition to consolidation, there will be a trend toward sharper focus among traditional telcos. We assume that in every country one to two telcos — typically the two market leaders — will have the opportunity to perform the described role of a DSO and continue to maintain broad consumer contact. The prerequisite for their success, however, is that they are in possession of the assets and capabilities described above and that they single-mindedly strengthen and leverage these features in the time remaining to them.

These telcos must be able to operate in ecosystems and partnerships at all stages of the added-value chain. Their presence on the consumer side will be secured by a portfolio of services organized on a partnership basis that relies on the functional integration of partner services and its own innovative, convergent services. Services developed in-house, in contrast to hyperscaler services, should primarily scale nationally or locally and address market segments that also tend to have a national focus.

Significant opportunities for carriers related to new business models, distribution channels, services, or the revitalization of existing services will arise from new regulatory developments and from industrial policy initiatives, areas where Europe has often been a pioneer. Nevertheless, massive efforts to optimize the customer experience across all touchpoints will be required for the realization of these opportunities.

Chapter 7







■ The other one or two national telcos in each country are more likely to find themselves in the role of a DSE that gradually abandons its retail business (in whole or in part or by carving out the retail part like in the aforementioned example of Oi in Brasil with New Oi and V-tal), pursues primarily a wholesale business model, and seeks its salvation in close cooperation with other telcos, MVNOs/resellers, and the hyperscalers – even to the point of the hyperscalers acquiring holdings in these DSEs.

This role or the wholesale services of the DSEs to the hyperscalers or other telcos (DSEs or DSOs) will extend to the traditional provision of lines service, beginning with the large international corporate customers, campus networks, or in the IoT sector and expanding step by step to encompass smaller customers as well. The FTTPcos that have emerged in recent years are orienting their activities in the same direction.

■ Smaller national, regional, or local carriers will focus on network rollout and operation, all the more so if they serve solely the fixed network (IP or DSE). In the future, they will act as wholesale operators and serve other carriers on the network side with products at a low added-value level (e.g., solely passive infrastructures or managed bandwidth). Their presence on the consumer side is expected to be limited to isolated niches in the private customer segment. These telco types will also be subject to a consolidation process that will run nationally and internationally.

■ National mobile-only carriers will be a future model for niche-related B2C offerings or will be viable solely in the form of a wholesale carrier (DSE). They also run a fundamental risk of disappearing from the market altogether as a consequence of the consolidation processes if they do not succeed in gaining access to fixed network infrastructures through M&A activities. They have

Figure 29: Assets for the adequate future positioning of telcos

	Digital Service Orchestrator (DSO)	Digital Service Enabler (DSE)	Infrastructure Provider (IP)
 <i>Telecommunications networks</i>	Integrated	Mobile or fixed	Mobile or fixed
 <i>Customer segments</i>	Full coverage	Consumer-oriented	Wholesale, enterprise
 <i>Market reach</i>	Multinational	National	Regional
 <i>Brand</i>	High appeal	Medium appeal	Low appeal
 <i>Financial resources</i>	Massive	Medium	Few
 <i>Customized solutions, national/local expertise</i>	High competence	Medium competence	Low competence

Source: Detecon

cost disadvantages on the production side compared to convergent carriers. On the service side, they lack the ability to offer convergent products. As a consequence, they will flee into the arms of hyperscalers or other large carriers in the form of close collaborations.

■ The future of the independent resellers or MVNOs found on some markets is uncertain. They may disappear from the market in the next few years because they cannot compete against the second- or multi-brand strategies of established carriers. Another possible reason is that they will face increased competition from hyperscalers or device manufacturers. By exploiting their technological opportunities (eSIM, network slicing, NaaS, resale and bundled offers that include a mobile contract; Amazon Prime is an example), and through cooperation with the DSEs, the latter could push the MVNOs out of the market.

On the other hand, regulations in many countries obligate MNOs to allow MVNOs. This could be a lucrative business model for the DSEs in particular as they do not have to fear cannibalization effects because their presence on the consumer market is limited, but they can utilize their network more effectively. Opportunities may also arise for focused MVNOs such as the IoT MVNOs that have emerged in recent years (eg. 1NCE). Another option, although one that requires large amounts of capital, is to “upgrade” to a full-fledged mobile network operator (MNO). MásMóvil, for example, successfully took this path in Spain in 2016, and 1&1 in Germany has been moving ahead with similar plans in Germany since 2021.

These hypotheses are particularly valid in countries with affluent populations, saturated, competitive markets, well-developed fixed and mobile infrastructures, and the outlined regulatory and political framework conditions (e.g., Europe or the USA).

In many other regions and on emerging markets, hyperscalers and satellite network operators are also likely to play much larger roles on the network or connectivity side with their own infras-

tructures, competing directly with established carriers in this domain as well.

Besides the economic and regulatory framework, the specific topography and population distribution remain decisive factors for the costs and revenues of infrastructure and services. In these countries, fixed network infrastructures are often available solely in metropolitan areas; competition among various network operators is limited; rural areas are either not served at all or only by third-generation mobile networks; customers' willingness and ability to pay is modest; and population density in many areas outside the urban metropolises is very low.

The next technology leap – building greater capacity and increasing network coverage – is usually beyond the financial means of operators and cannot be supported by a commercial business case. Yet the availability of connectivity is a prerequisite for use of the actual core services of the hyperscalers or internet giants. In such a setting, it would almost certainly be worthwhile for hyperscalers to enter such connectivity markets with the aid of innovative technologies such as satellites or HAPS and to enter into direct competition with telcos.

Under such conditions, the laws of a natural monopoly for network-based business models take effect. The idea of simply expanding a network and then marketing it to various retailers as a strictly wholesale business model seems obvious. This development can even now be observed in some countries such as Red Compartida in Mexico or Unified National Networks (UNN) in Brunei.

These are examples of cases in which technology-specific 4G or 5G networks are built and operated nationwide by one operator or even the entire fixed network and mobile infrastructure of a country is entrusted to one company with the objectives of avoiding duplicate investments, optimizing network utilization, and leveraging synergies in uniform production in favor of lower consumer prices.

7.4. How to prepare for 2030

If the ideas described above are accepted, the first step is to take an honest inventory and self-assessment of the company's own assets, capabilities, and realistic ambitions. The outlined future positioning alternatives must be weighted against one another in the light of the conclusions.

A decision must be made as to which positioning and which business model is attractive and promising in the long term. Telcos that become convinced that the DSO role is for them will need to undertake different preparations than carriers favoring the DSE or IP role.

On the production side, some homework must first be done in the area of network digitalization – regardless of the chosen roles. The differences will appear in the extent of cooperation with third parties.

DSOs, which will almost inevitably find themselves cooperating with hyperscalers, must give absolutely top priority to retaining key points of control in the direction of differentiated service delivery and consumer contact. They should also represent independently a greater own share of cloudification and softwarization of the networks and a greater share of workloads.

Beyond this points, however, they should meticulously manage their dependencies: e.g., secure a broad base for their collaboration activities with vendors, hyperscalers, DSEs, IPs, integrators, etc., bring several players on board for specific tasks and functions, and be highly selective in choosing specific partners and platforms for their ecosystem. Essential elements for this position are the development of the skills required for mapping certain workloads themselves and managing (i.e., orchestrating) the complex ecosystem.

The DSEs are in a different situation. They largely relinquish the ambition of maintaining and culti-

vating consumer contact over the long term and focus on a highly efficient, automated, and flexible network factory. They will seek in-depth cooperation with hyperscalers, resellers/MVNOs and telcos that will utilize their network capacity to the full. The key question for this type is this: How do I become a hyperscaler and telco love brand?

When addressing customers, DSOs will in the future compete with other DSOs and with hyperscalers, terminal manufacturers, OTTs, and possibly MVNOs that are empowered by other telcos, the DSEs. Unlike the latter, DSOs do not limit their focus to the production side and instead include the marketing side of their own and partnered services that are directed at consumers and the consumer relationship. Products and services offering maximum convenience in their use to customers will be successful. The model requires the presentation of a world of offerings consisting of end-to-end, coordinated services and transaction options. The job of the orchestration is to create and maintain platforms to integrate various ecosystem partner services with regard to presentation, billing, feature integration, and servicing.

Differentiation or added-value generation through suitable design of the portfolio of offerings takes into account – in addition to the customers' needs – the company's own assets as well as the assets and non-assets of the potential partners. Various promising fields of action are the result.

Above all, the primary focus should be on locally or nationally scaling services. Similarly, addressing segments that are primarily locally or nationally significant or specific in nature (e.g., health, public, midsize companies, national media, etc.) should be prioritized. Their requirements and specifics can often be served to no more than a limited extent by highly scaled providers. A regional network in which carriers assume an orchestration function can in these instances offer a more suitably adapted range of services based on specific expertise and local presence.

In this line of offerings, the topics of ESR, security, data protection, and privacy can serve as further differentiators for the ecosystem of the orchestrating telco and its partners. The involvement of local actors in the ecosystem with its beneficial consequences for regional prosperity is likely to be welcomed and encouraged by many different stakeholders in politics, business, and society.

Besides the regional specificity of ecosystems, lucrative playing fields for DSOs can also be located along the dimensions of “quality of service” and “secure data.”

Surviving in this competitive environment in the future demands the successful conclusion of the telcos’ initiatives (many of which have already been launched) concerning crucial supply factors:

- Undeviating convergence of networks in production and supply
- Offers of industry-specific solutions
- Ability to deliver complex custom projects for business customers
- Realization of high customer intimacy via big data and identity management
- Customer touchpoints at the level of hyperscalers

Finally, we would like to highlight one of the key opportunities for carriers that is currently still hiding in the shadows.

It is immensely important for all telcos – but especially for DSOs – to examine the consequences of the emerging new regulatory framework for the digital economy in search of potential opportunities. The regulatory changes in Europe (DMA, DSA, DA, DGA) or in the USA that have been described represent opportunities for telcos as well as other industries both on the production side and on the marketing side.

Doing so can redefine the interaction with major internet players, OTTs, hyperscalers, and major device manufacturers with their ecosystems that will in equal measure be the essential cooperation partners, customers, and competitors for the telcos. New marketing opportunities will appear: better use of app stores, new business models (data intermediaries), or better negotiating positions in cooperative ventures with hyperscalers on the production side (requirements for interoperability and data portability).

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About Us

Detecon is a leading technology and management consulting company operating globally with headquarters in Germany; it has been combining classic management consulting with high technological competence for more than 40 years. The focus of its activities is on digital transformation. Detecon supports companies from all areas of business to adapt their business models and operational processes to the competitive conditions and customer requirements of the digitalized, globalized economy with state-of-the-art communication and information technology. Detecon's expertise bundles the knowledge from the successful conclusion of management and ICT consulting projects in more than 160 countries.

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