PERSPECTIVES ON TRANSFORMING UTILITY BUSINESS MODELS

Paper 7 – Business Model Case Study: Telecommunications Sector

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INTRODUCTION

The telecommunications sector offers a powerful example of transformational change. It has responded successfully to the challenges and opportunities of creating a new customer experience, enabled and encouraged by significant disruption from deregulation, dramatic technology advances, and aggressive competition. Significant numbers of new and varied entrants to the sector have seen the potential of evolving consumer demands and created new services built on new innovative business models. These new business models have played an important role in delivering on the ambition of and realizing benefits for the economy and society.

As the energy sector moves into a period of unprecedented transition, the experience of the telecommunications sector may provide helpful insights that will inform thinking on achieving success and avoiding failure.

What can be learned from the telecommunications sector that could be helpful in energy utility business model development?

The energy and telecommunications sectors are in profound transformation. Telecommunications started this transformation much earlier and therefore has gained experience that could be valuable to energy. There are similarities between the two; both, for example, employ complex infrastructure, are technology-enabled, rely on complex supply chains, and are described by changing value chains. Importantly, both share the same core purpose of serving customers across domestic, commercial, and industrial uses.

There are also important differences. One is centered on the drivers for investment in infrastructure. Since privatization, telecommunications investment has been driven by the revenues that innovation and scale can help achieve whereas in the energy sector, investment has typically been regulated with resilience and affordability as key drivers and return on assets as a primary measure. Fragmentation of the telecommunications value chain is also a marked difference, although there is an increasing trend toward fragmentation in the energy sector. Another significant distinction is that many telecommunications services are genuinely new whereas emerging energy services are replacements for existing ones. Culture, customer perception, current state and pace of progress, the respective demands of health and safety, and policy and regulatory presence are other contrasts of note.

It is both the similarities and differences—as well as the successes and failures—that can offer valuable lessons as energy system transformation progresses.

It is also worth emphasizing that as the two sectors move forward, they are strongly dependent on each other. As we digitalize energy, it increasingly depends on telecommunications as part of the needed digital infrastructure. At the same time, telecommunications depends on electricity to function; when one fails, both will fail. This reciprocal dependency is acknowledged but is not yet sufficiently addressed to ensure good outcomes in both sectors.

In this paper, lessons that might be drawn from the telecommunications sector to illuminate possible new approaches to energy utility business models are considered. The paper does not address the role of telecommunications in digitalizing the energy system.

In earlier work undertaken by EPRI,[1] consideration was given to scenarios that describe possible futures for utilities and how these might be reflected in new or refreshed business models. These scenarios are shown in Figure 1. This paper is intended to provide insights that might contribute to discussions framed using these scenarios; it may be helpful—as a thought experiment—to consider how telecommunications companies might have mapped onto these scenarios as they pondered their future evolution.

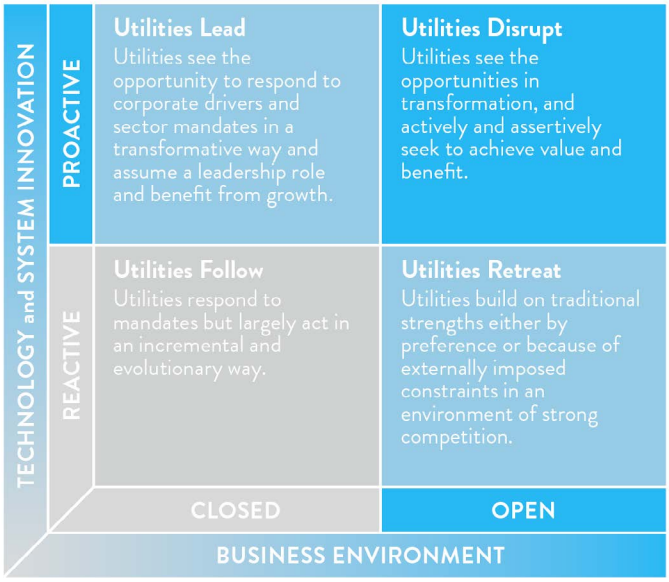

Figure 1. *Energy system transformation scenarios for utilities*

The scenarios—and the thought experiment—may prompt questions that apply to the energy case, such as:

- Changing relationship with customers
- Possible responses to changes that are happening or could happen in the landscape, either in the commercial environment or the innovation environment
- Changing drivers for infrastructure and innovation investment
- Conditions that must be true in order to respond in a particular way
- Differences in ownership of assets and networks
- How resilience can be assured
- Perspectives of other stakeholders and how they might align or conflict
- The transformation destination being sought
- Possible strategic options for reaching the destination successfully

Thinking about how a telecommunications operator may have perceived these scenarios and then back-casting from the position of knowing how that sector has transformed might reveal interesting insights. One important lesson from telecommunications is that there is a need to be agile and responsive to emerging circumstances and opportunities; transformation is characterized by uncertainty. A particularly important aspect of this is the way that telecommunications service providers completely transformed from being "network-led" to being "customer-led." This is intimately connected to the broad and deep digitalization of the economy and society. Utilities are late to digitalization, but customers are expecting a more digital experience in their relationship with their energy services and the companies that provide them.

WHY DID THE PROFOUND CHANGE IN TELECOMMUNICATIONS NETWORKS AND SERVICES HAPPEN?

Change in the telecommunications sector was and continues to be driven by a combination of consumer demand, technology advances, market forces, government regulations, and public and private investment. More details on each of these drivers include:

- **Consumer demand and expectations:** Ultimately, the evolution of telecommunications networks and services has been driven by consumer demand, expectations, and willingness to engage. As users' needs and preferences have evolved, service providers have been compelled to innovate and adapt to meet changing demands for faster speeds, greater reliability, broader coverage, and new services such as mobile data, streaming video, and cloud computing. This effect was and remains connected to the substantial digitalization of the economy and most, if not all, aspects of society.
- **Technology advances:** Innovations in telecommunications technologies, such as digital switching, fiber optics, wireless communications, and Internet Protocol (IP) networking, have played a central role in trans-

1 *Towards Net Zero: The Evolving Utility Business Model and Possible Future Scenarios*. EPRI, Palo Alto, CA: 2022. 3002025745.

forming networks and services. These advances have enabled faster data transmission, increased capacity, improved reliability, and the convergence of voice, data, and multimedia services onto unified platforms.

- **Markets and competition:** The telecommunications industry has been shaped by intense competition among service providers, equipment vendors, and technology developers. Competition has driven innovation, investment in infrastructure, and the introduction of new services and business models. In many cases, market forces have incentivized companies to invest in upgrading their networks to remain competitive and meet evolving consumer demands.
- **Policy and regulation:** Government regulations and policies have also played a significant role in shaping the telecommunications landscape. Regulatory frameworks governing spectrum allocation, licensing, interconnection, and consumer protection have influenced industry dynamics and investment decisions. Deregulation and privatization in many countries have spurred competition, investment, and innovation.
- **Public and private investment:** The deployment and expansion of telecommunications networks have required substantial investment from both public and private sectors. Governments have invested in building critical infrastructure, such as backbone networks and rural broadband initiatives, to promote universal access and economic development. Private companies, including telecommunications operators, equipment manufacturers, and technology firms, have invested in research, development, and deployment of new technologies and services.

The same factors are present in the energy sector, but there is a critical additional one: transformation of the energy sector is driven by its substantial role in responding to the climate emergency. This means that the discretion that characterized change in telecommunications networks and services—and the entrepreneurial motivations that drove it—are either not present or very differently shaped in energy.

Telecommunications companies were—and continue to be—faced with scenarios similar to those in Figure 1. The sector came to be characterized by an open commercial environment and proactive innovation, leading to behavior aligned with the "Utilities Disrupt" quadrant. Some companies did not recognize the nature and pace of change or failed to respond well and either disappeared or were diminished. Others were acquired and absorbed into other organizations; Cable & Wireless Communications becoming part of Vodafone Group is a good example of this in the United Kingdom. Reshaping of the value chain was also an effect that saw the emergence of companies that were arguably more aligned to the other quadrants shown in Figure 1, the tower companies being an example. It was not necessary to disrupt, but it was necessary to be mindful of the choices that were being made, either actively or by default.

HOW DID TELECOMMUNICATIONS NETWORKS AND SERVICES TRANSFORM?

The evolution of telecommunications networks and services has been revolutionary, driven by rapid advances in technology and changing consumer demands as illustrated below:

- **1960s–1970s - Early telephony and Advanced Research Projects Agency Network (ARPANET):** The 1960s saw the introduction of direct-dial long-distance telephone service, reducing the need for operator assistance. In the late 1960s, ARPANET, the precursor to the internet, was developed by the U.S. Department of Defense's Advanced Research Projects Agency (ARPA), laying the groundwork for digital communication networks. Services were dominated by government-owned or regulated monopoly providers. The value chain was relatively simple, with vertically integrated operators responsible for all aspects of service provision, including network infrastructure, equipment manufacturing, and customer service. Consumers were attracted to the ease of communication and were willing to pay to access the benefits.
- **1980s - Digital revolution and mobile:** The 1980s marked the transition from analog to digital telecommunications technologies. This decade saw the emergence of digital switching systems, fiber optic cables, and the first-generation (1G) mobile networks, enabling basic voice communication on mobile phones. This timeframe saw the emergence of deregulation and liberalization policies in many countries, leading to the breakup of telecommunications monopolies and the introduction of competition. This period also saw the diversification of the value chain, with the separation of

network infrastructure, service provision, and equipment manufacturing. Independent operators entered the market, offering competing services and fostering innovation. Digitalization, even in this early stage, offered consumers new convenience and started to transform the relationship they had with communications. The emergence of mobile communications suggested the potential for a whole new experience.

- **1990s - Internet expansion and mobile revolution:** The 1990s witnessed the commercialization and widespread adoption of the internet, leading to the establishment of the World Wide Web. This decade also saw the introduction of second-generation (2G) mobile networks, enabling digital voice and messaging services. Additionally, the development of digital subscriber line (DSL) technology revolutionized broadband internet access. The 1990s saw rapid technological advances, globalization, and the convergence of telecommunications, media, and technology industries. The value chain became increasingly complex and fragmented, with the emergence of specialized players focusing on specific segments, such as network infrastructure, content creation, software development, and service delivery. Multinational corporations expanded their presence globally, driving consolidation and cross-border competition. Communications-based services were becoming more central to both home and work life; a broad set of sectors were seeing the potential of how to transform their services and business models to create new offerings to their customers.
- **2000s - Broadband proliferation and mobile data:** The 2000s saw the rapid expansion of broadband internet access with the widespread deployment of cable and DSL services. Third-generation (3G) mobile networks enabled faster data speeds, paving the way for mobile internet access, multimedia messaging, and early mobile data services. Rapid technological advances and service convergence continued at pace. The value chain remained on its trajectory of fragmentation and reinvention, with new and specialized players emerging. Competition strengthened. Communications-enabled services were becoming strongly embedded in the economy and society. People began to rely on the tools these services provided them in their personal and business lives.
- **2010s - Mobile broadband dominance and 4G long-term evolution (LTE):** The 2010s saw the dominance of mobile broadband, with the proliferation of smartphones and the widespread deployment of fourth-generation (4G) LTE networks. This decade also saw the rise of over-the-top (OTT) services, such as Skype, WhatsApp, and Netflix, delivering voice, messaging, and video content over the internet. OTT providers, including hyperscalers such as Microsoft, Amazon, and Google, leveraged existing telecommunications infrastructure to deliver content and services directly to consumers over the internet, bypassing traditional distribution channels. This disrupted the value chain, challenging incumbent players and creating new opportunities for content creators, application developers, and digital platforms. Digitalization, enabled by ubiquitous telecommunications, was embedded in peoples' lives to the point where they depended on the services and capabilities it provided them. There was increasing expectation that a digital experience would be offered and that it would work well.
- **2020s - 5G and Internet of Things (IoT):** The 2020s have been characterized by the rollout of fifth-generation (5G) wireless networks, promising significantly faster speeds, lower latency, and greater capacity. 5G is expected to enable transformative applications such as autonomous vehicles, remote surgery, and augmented reality. Moreover, IoT has gained momentum, connecting billions of devices and sensors to the internet, revolutionizing industries like healthcare, transportation, and manufacturing. The emergence of IoT and edge computing is reshaping the telecommunications value chain, with a growing emphasis on distributed computing, data analytics, and real-time processing at the network edge. New players, including edge service providers, IoT platform providers, and vertical industry solutions, are entering the market, creating new value propositions and revenue streams. Digitalization is now the default assumption regarding the provision of many services, whether by government, businesses, retailers, or service providers—including utilities. Convenience, comfort, health, and entertainment are heavily digital-centric and rely on the telecommunications infrastructure that underpins them. Consumers assume and demand digital engagement.

Throughout this evolution, telecommunications networks and services have become increasingly interconnected, converging voice, data, and multimedia communication over unified platforms. The future is likely to see further in-

tegration of technologies such as artificial intelligence (AI), virtual reality (VR), and edge computing, shaping the next phase of telecommunications innovation.

Parallels can be drawn with the energy transition. The new distributed architecture of the networks and systems, intense digitalization, a changing policy and regulatory landscape, and increased consumer engagement are shared. Achieving pace of change, harnessing technical and delivery innovation, and offering improved customer experience are also themes that guide developments. The customer assumption of a digitally enabled experience is yet to become embedded in utilities; this change has started but is not yet as pervasive as it is in other sectors such as retail or banking. There are also points of difference that need to be considered, both in terms of the circumstances today and how these may change over time, the respective regulatory environments being a very important example.

HOW HAVE TELECOMMUNICATIONS BUSINESS MODELS CHANGED?

Telecommunications business models have undergone significant changes to enable and exploit advances in technology, regulatory reforms, market dynamics, and evolving consumer preferences.

- **1950s–1970s - Monopoly providers:** During the 1950s and 1960s, telecommunications services were primarily provided by government-owned or regulated monopoly operators. Pricing and service offerings were typically determined by regulatory authorities, with limited competition and consumer choice.
- **1980s–1990s - Deregulation and competition:** The 1980s and 1990s witnessed the deregulation and liberalization of the telecommunications industry in many countries. Business models shifted towards a more competitive landscape, with multiple operators vying for market share through differentiated services, pricing strategies, and customer experiences.
- **1990s–2000s - Privatization and commercialization:** Many countries privatized their telecommunications operators, selling state-owned assets to private investors and transforming them into commercial entities. Privatization led to increased efficiency, innovation, and investment in infrastructure and services as operators sought to maximize profits and shareholder value. Business models diversified, with operators exploring new revenue streams beyond traditional voice services, such as data, internet, and value-added services.
- **2000s–2010s - Convergence and bundling:** The 2000s and 2010s saw the convergence of telecommunications, media, and technology industries, blurring traditional boundaries and creating new business opportunities. Operators embraced bundled service offerings, combining voice, data, internet, and entertainment services into single packages to attract and retain customers. Business models evolved towards multi-play and quad-play strategies, offering integrated services across fixed-line, mobile, broadband, and television platforms.
- **2010s–Present - Digital transformation and OTT services:** The rise of digital technologies and internet connectivity has disrupted traditional telecommunications business models. OTT service providers leverage existing telecommunications infrastructure to deliver content and services directly to consumers over the internet, bypassing traditional distribution channels. Operators are adapting their business models to compete with OTT providers, offering their own digital content, applications, and value-added services to differentiate their offerings and retain customers.
- **Throughout - Subscription- and usage-based pricing:** Throughout the decades, subscription-based and usage-based pricing models have been prevalent in the telecommunications industry. Subscription models offer consumers fixed-rate plans for unlimited or limited usage of services, providing predictability and convenience. Usage-based models charge consumers based on their usage of telecommunications services, such as minutes, data volume, or messages sent, offering flexibility and cost control.

Telecommunications business models have evolved from being rooted in monopolistic, government-controlled entities to being driven by competitive, market-driven enterprises that embrace innovation, diversification, and digital transformation to meet the evolving needs of consumers and businesses in an increasingly connected world. In terms of the scenarios in Figure 1, they moved to the “Utilities Disrupt” quadrant.

In the energy sector, there is much discussion about comparable changes that could emerge. The electrification of heating and transport is likely to open potential for new types of offerings—Energy-as-a-Service, Comfort-as-a-

Service, and Mobility-as-a-Service, for example—that are reminiscent of the perspective that modern telecommunications services take. As an illustration, Energy-as-a-Service can be directly compared with a mobile phone plan in how it can be structured and how customer engagement is delivered. The collaborations that underpin such offerings are also helpful as energy utilities seek insight into how to refresh their offerings.

The provision of flexibility in new renewables-based energy systems is another potential focal point for disruption as new players are attracted to offer new services that affect assets, systems, and operations on both sides of the consumer meter.

WHO WERE THE WINNERS AND LOSERS IN THE TRANSFORMATION OF THE TELECOMMUNICATIONS SECTOR?

Figure 2. *Telecommunication towers*

There have unquestionably been winners and losers in the transformation of the telecommunications sector; this fact may provide insight for energy utilities and other players in the energy sector as they address the implications of change.

Who were some of the winners:

- **Infrastructure providers:** Companies that provide essential infrastructure components such as fiber-optic networks, data centers, and mobile towers have emerged as winners. They benefit from the increasing demand for high-speed connectivity driven by technologies like 5G, cloud computing, and IoT.
- **Tech giants:** Companies like AT&T, Verizon, Vodafone, and China Mobile have become dominant players globally, leveraging their infrastructure, services, and brand recognition.
- **Internet service providers (ISPs):** With the rise of the internet, ISPs like Comcast, Charter Communications, and BT Group have flourished by providing broadband and related services.

- **Mobile network operators (MNOs):** Players like T-Mobile, Verizon, and Telefonica have benefited from the mobile revolution, driving and responding to the growing demand for voice and data services.
- **Equipment manufacturers:** Companies that manufacture telecommunications infrastructure, devices, and software solutions, such as Ericsson, Nokia, and Huawei, have profited from the deployment of new technologies like 5G that enable faster, more efficient, and increasingly ubiquitous telecommunications services.
- **Content providers:** Companies such as Netflix, Amazon Prime Video, Spotify, and Disney+ have capitalized on the proliferation of high-speed internet and mobile connectivity to deliver streaming media content, disrupting traditional TV and radio industries. They've become integral parts of the telecommunications value chain, providing entertainment, news, and other content directly to consumers.
- **Innovators and disruptors:** OTT services like Skype, WhatsApp, and Zoom have disrupted traditional telecom operators by offering voice, messaging, and video conferencing services over the internet. These services often bypass traditional telecom networks, leading to increased competition and lower revenues for incumbents.
- **E-commerce platforms:** Platforms like Alibaba and Amazon have expanded their offerings to include telecommunications products and services. They serve as distribution channels for devices, accessories, and digital subscriptions, capturing a share of the value chain.
- **Emerging markets:** Telecommunications growth has been particularly significant in emerging economies, with companies like Bharti Airtel and MTN Group expanding their reach and market share.

Reflecting on the scenarios in Figure 1 suggests that winning telecommunications companies responded to change in both the commercial and innovation contexts. Not all were disruptors; some strengthened their positions in the "Lead" or "Retreat" roles. Few if any were followers, or if they were, they are unlikely to have survived; Nortel Networks and Lucent Technologies are two examples from the equipment manufacturing side that failed to recognize the environment in which they were being required to operate.

A common theme of success for the winning organizations is that they were enabling the creation, provision, and use of services that customers wanted and were willing to pay for; customers perceived these services to improve their personal and working lives. There is a strong lesson here for energy utilities.

Who were some of the losers:

- **Traditional landline providers:** Companies heavily reliant on legacy landline services have seen declining revenues as consumers increasingly shift towards mobile and internet-based communication. Without transitioning to modern technologies and services, these providers will become obsolete. In the United Kingdom, the switching off of the Public Switched Telephone Network (PSTN) marks a significant milestone for these companies. These traditional telecom operators have faced challenges from OTT competitors and declining revenues requiring them to adapt by diversifying their service offerings, investing in network upgrades, and enhancing customer experience to try to survive and remain competitive.
- **Legacy telecom equipment manufacturers:** Companies that failed to adapt to technological shifts or faced stiff competition, like Nortel Networks, struggled and eventually faced decline or bankruptcy.
- **Retailers of physical devices:** Retailers whose businesses are centered on selling telecommunications devices, such as smartphones, face competition from online channels and direct-to-consumer sales by manufacturers. Those unable to differentiate through value-added services or channel experiences will struggle to compete.
- **Providers of outdated technologies:** Companies that fail to keep pace with technological advancements, such as those still reliant on 3G or outdated broadband technologies, risk losing market share to competitors offering faster and more reliable services.
- **Cable television providers:** Traditional cable TV providers have faced challenges as consumers shift towards OTT streaming services, requiring them to adapt their business models and offerings. These companies must offer bundled broadband and streaming packages or risk losing market share to digital competitors.
- **Companies negatively impacted by regulatory barriers:** Regulatory changes and antitrust actions have sometimes hampered the growth or operations of certain companies, such as the forced breakup of AT&T in the United States.

- **Companies with outdated business models:** Entities relying solely on outdated business models without embracing digital transformation have found it challenging to remain competitive.
- **Companies with weak digital presence:** Telecommunications companies that neglect digital channels for sales, marketing, and customer service risk losing customers to competitors with superior online experiences. Investing in digital transformation is essential for remaining relevant in an increasingly digital world.

In the cases highlighted, losing has typically arisen because of failure to recognize the nature and scale of change and to embrace innovation, adapt to changing consumer preferences, and invest in next-generation technologies. Some companies failed by virtue of misplaced ambition or lack of ability or commitment to deliver. This highlights the need to reflect on the scenarios illustrated in Figure 1 and to develop and pursue a strategy that takes advantage of existing strengths.

WHAT IS THE TELECOMMUNICATIONS VALUE CHAIN TODAY?

Figure 3. *Parabolic satellite dish space technology receiver*

All aspects of the telecommunications value chain have been affected by transformation driven and enabled by customers' demand for new and valued offerings. Components of the value chain include:

- **Network infrastructure providers** are the entities responsible for building and maintaining the physical infrastructure that enables telecommunications services. This includes companies that deploy and manage fiber-optic cables, mobile towers, satellite systems, and other transmission facilities. Network infrastructure providers lay the foundation for communication networks and ensure connectivity across geographical regions.
- **Equipment manufacturers** design, produce, and supply the hardware and software components needed for telecommunications networks. This includes devices such as smartphones, routers, switches, base stations, antennas, and network servers. Equipment manufacturers play a central role in developing innovative technologies and solutions that enhance network performance, capacity, and reliability.
- **Service providers** offer telecommunications services to end-users. This includes telecommunications companies, ISPs, mobile operators, and cable operators. Service providers offer a range of services, including voice communication, broadband internet access, mobile data, television services, and enterprise solutions. They

compete based on factors such as network coverage, speed, reliability, and pricing.

- **Content and application providers** create and distribute digital content, services, and applications that run on telecommunications networks. This includes streaming platforms, social media networks, online gaming platforms, e-commerce websites, and cloud computing services.
- **Regulatory bodies** are responsible for overseeing the telecommunications industry and enforcing regulations. They set standards, allocate spectrum, license operators, ensure fair competition, protect consumer rights, and promote universal access to telecommunications services.
- **Retailers and distributors** are intermediaries that sell telecommunications products and services to end-users. This includes telecom stores, online retailers, resellers, and distributors that market and distribute devices, SIM cards, prepaid vouchers, and subscription plans. Retailers and distributors play a vital role in reaching customers, providing support services, and driving sales.
- **Value-added service providers** offer additional services and features that enhance the functionality and appeal of telecommunications services. This includes services such as voicemail, caller ID, call forwarding, SMS alerts, mobile banking, location-based services, and security solutions. Value-added service providers differentiate offerings, generate additional revenue streams, and enhance the overall user experience.

The telecommunications value chain is dynamic and evolving, driven by technological advances, regulatory changes, and shifting consumer preferences. Collaboration and integration among stakeholders across the value chain are essential for driving innovation, expanding market reach, and delivering high-quality telecommunications services to users around the world.

The energy value chain has been broadly static for some time, being framed in the architecture of central supply and top-down delivery. There have been commercial variations reflecting local regulatory environments, but in general terms, there has been a clearly identifiable structure with a recognized set of participants. This is already changing, with the pace of change likely to increase. Decentralization and the use of more distributed resources are reshaping the value chain enabled by digitalization and the ability of consumers to take a more active role. The role of the consumer must be more strongly recognized. The willingness of people to engage and participate in their relationship with telecommunications and many other sectors must be translated into the utilities sector more deeply.

WHAT TELECOMMUNICATIONS BUSINESS MODELS ARE AVAILABLE TODAY?

Telecommunications business models encompass various strategies and approaches adopted by companies within the telecommunications industry to generate revenue and deliver services to customers. Here are some common telecommunications business models:

- **Subscription-based model:** Under this model, customers pay a recurring fee for access to telecommunications services, such as mobile phone plans, broadband internet subscriptions, and cable television packages. Subscription-based models offer predictable revenue streams for service providers and typically involve tiered pricing plans based on factors like data usage, speed, and features.
- **Pay-per-use model:** In this model, customers are charged based on their usage of telecommunications services. For example, mobile phone users may be billed for each minute of voice calls, each text message sent, or each megabyte of data consumed. Pay-per-use models offer flexibility for customers who may have varying usage patterns and preferences.
- **Freemium model:** The freemium model offers basic telecommunications services for free while charging for premium features or additional usage beyond certain limits. For instance, a messaging app may offer free messaging and voice calls over the internet but charge for features like video calls, file sharing, or international calling. Freemium models attract users with free offerings and monetize through upselling premium features or subscriptions.
- **Advertising-supported model:** Some telecommunications services are offered for free or at a discounted price, with revenue generated from advertising. For example, free email services may display advertisements to users, or free mobile apps may include in-app advertisements. Ad-supported models rely on generating revenue from advertisers based on user engagement and targeting.

- **Bundling model:** Telecommunications companies may bundle multiple services, such as internet, television, and phone services, into a single package for a discounted price. Bundling encourages customers to subscribe to multiple services from the same provider, increasing customer loyalty and lifetime value. Bundled packages often offer convenience and cost savings compared to purchasing services individually.
- **Wholesale model:** In the wholesale model, telecommunications companies sell their services to other businesses, which then resell them to end-users. For example, a mobile network operator may sell bulk access to its network to mobile virtual network operators (MVNOs), which then offer branded mobile services to their customers. Wholesale models enable smaller companies to enter the market without building their own infrastructure.
- **Value-added services (VAS) model:** Telecommunications companies may offer value-added services on top of their core services to differentiate themselves and generate additional revenue. Value-added services may include cloud storage, cybersecurity solutions, home automation, entertainment content, and business productivity tools. VAS models focus on enhancing the customer experience and addressing specific needs or pain points.
- **IoT connectivity model:** With the rise of IoT, telecommunications companies offer connectivity solutions for IoT devices and applications. IoT connectivity models may involve subscription-based plans tailored to the unique requirements of IoT deployments, such as low power consumption, wide coverage, and high device density. IoT connectivity providers may also offer additional services like device management and data analytics.

Telecommunications business models continue to evolve in response to technological advances, market dynamics, and changing customer preferences. Successful companies adapt their strategies to meet the evolving needs of customers while maximizing revenue and profitability in a competitive industry landscape. Energy utilities are facing the opportunity to move from business models based on returns on assets or the sale of units of energy to more varied ones. Taking a service perspective could be a key aspect of business model evolution and create a new form of customer relationship.

HOW WILL TELECOMMUNICATIONS BUSINESS MODELS CHANGE IN THE FUTURE?

The telecommunications industry is poised for continued evolution and transformation, driven by emerging technologies, changing consumer behaviors, and evolving market dynamics. Details on each of these drivers include:

- **Adoption of emerging technologies:** Telecommunications operators will adopt emerging technologies such as 5G, edge computing, AI, and IoT to create new revenue streams and enhance operational efficiency. For example, operators may offer premium services tailored to specific industries or use cases, such as smart cities, connected vehicles, remote healthcare, and immersive entertainment experiences. By embracing innovation, operators can stay ahead of the curve and meet the evolving needs of customers in a rapidly changing digital landscape.
- **Diversification of revenue streams:** Telecommunications operators will continue to diversify their revenue streams beyond traditional connectivity services. This may include offering value-added services such as cloud computing, managed services, IoT solutions, cybersecurity, and vertical industry applications. By expanding their portfolio of offerings, operators can capture new revenue opportunities and differentiate themselves in a competitive market landscape.
- **Subscription-based bundles and packages:** Operators will continue to offer bundled service packages that combine voice, data, internet, and entertainment services into single offerings. However, these bundles may become more personalized and customizable, allowing consumers to select the services and features that best fit their needs. Subscription-based pricing models will remain prevalent, providing consumers with predictable costs and simplified billing.
- **Monetization of data and insights:** Telecommunications operators possess vast amounts of data about consumer behavior, network performance, and usage patterns. In the future, operators may explore new business models centered around the monetization of data and insights. This could involve offering data analytics services to third-party partners, leveraging anonymized data for targeted advertising, or selling aggregated insights to advertisers, researchers, and policymakers.

- **Partnerships and ecosystem collaboration:** Collaboration with ecosystem partners, including technology companies, content providers, IoT manufacturers, and vertical industry players, will become increasingly important for telecommunications operators. Partnerships can enable operators to expand their service offerings, enhance customer experiences, and create new value propositions for customers. Joint ventures, alliances, and ecosystem platforms will facilitate collaboration and innovation across the telecommunications value chain.
- **Focus on customer experience and engagement:** Telecommunications operators will prioritize customer experience and engagement as key differentiators in a competitive market landscape. This may involve investing in digital channels, self-service platforms, and personalized interactions to enhance customer satisfaction and loyalty. Operators will leverage AI, chatbots, and predictive analytics to anticipate customer needs, resolve issues proactively, and deliver seamless experiences across touchpoints.
- **Sustainable business practices:** As environmental and social sustainability become increasingly important considerations, telecommunications operators will integrate sustainability principles into their business models. This may involve reducing energy consumption, minimizing electronic waste, promoting digital inclusion, and supporting social impact initiatives. Sustainability initiatives can enhance brand reputation, attract environmentally conscious customers, and drive long-term business value.

Telecommunications business models will continue to evolve to meet the demands of an increasingly connected world. By embracing digital transformation, fostering collaboration, prioritizing customer-centricity, and embracing sustainability, operators can position themselves for success in the future telecommunications ecosystem.

Telecommunications companies have learned that transformation is an ongoing, continuous process, not a state that is achieved at some milestone. Players in the energy sector will learn the same lesson in due course and therefore should be mindful of the need for their business models to be capable of adapting to emerging challenges and opportunities, including, and perhaps especially, customer expectations. The principles noted above may provide insight into possible directions to pursue.

WHAT LEARNINGS CAN BE TRANSFERRED AND APPLIED?

Drawing lessons from the telecommunications sector can offer valuable insights for the development of energy utility business models, including:

- **The customer is central to change:** Society and the economy recognized the benefits of digitalization that a transformed telecommunications system enabled. The response was strong across the businesses and organizations that served people well, which in turn had a positive reinforcing effect, driving further change. New and previously impossible services were offered, new forms of customer interaction emerged, and new approaches to customer service were made possible. These changes quickly defined the new norm. This effect is only starting to happen in energy utilities, but the potential is real. The energy sector has the advantage that it can learn from the positive and negative experiences of the telecommunications sector, but also many others, such as finance, health, and retail for example.
- **Embrace technology innovation:** The rapid evolution of telecommunications networks underscores the importance of embracing technological innovation. Organizations across industries should prioritize investment in research and development to stay ahead of the curve and remain competitive in an increasingly digital world.
- **Focus on customer-centricity:** Telecommunications companies have shifted their focus towards providing personalized services and enhancing customer experience. Energy utilities can follow suit by offering tailored energy solutions such as time-of-use pricing, energy management tools, and renewable energy options. By understanding and meeting the evolving needs of customers, utilities can foster stronger relationships and increase customer satisfaction. Consumer preferences and behaviors drive the demand for new services and features. Businesses must stay attuned to evolving consumer needs and expectations, continuously adapting their offerings to meet changing demands and preferences.
- **Enable decentralization:** The telecommunications industry has evolved from centralized to decentralized networks, empowering users with greater flexibility and connectivity. Similarly, energy utilities can enable decentralization by integrating distributed energy re-

sources (DERs) and consumer energy resources (CERs) into the system. This can enhance grid resilience, support renewable energy integration, and enable more efficient energy management.

- **Promote interoperability:** Interoperability among telecommunications networks has been crucial for seamless communications and connectivity. In the energy sector, interoperability can enable the integration of diverse technologies and systems, facilitating the smooth operation of smart grids, microgrids, and energy management platforms. By promoting interoperability standards and collaboration among stakeholders, utilities can accelerate innovation and drive the adoption of new technologies.
- **Invest in infrastructure resilience:** Telecommunications networks prioritize infrastructure resilience to ensure reliable service delivery, especially during emergencies or natural disasters. Similarly, energy utilities must invest in resilient infrastructure to withstand extreme weather events, cyber threats, and other disruptions. This includes upgrading aging infrastructure, implementing grid modernization initiatives, and diversifying energy sources to enhance reliability and security.
- **Pursue digital transformation** has been a driving force behind the evolution of telecommunications networks and services. The energy sector can leverage digital technologies, such as data analytics, IoT, artificial intelligence, and blockchain, to optimize energy production, distribution, consumption, and management.
- **Promote regulatory flexibility:** Regulatory frameworks in the telecommunications sector have evolved to adapt to changing market dynamics, technological advances, and consumer needs. Similarly, regulatory frameworks in the energy sector should be flexible and adaptive, facilitating innovation, competition, and sustainable development while ensuring consumer protection and grid reliability.
- **Focus on sustainability and resilience:** The telecommunications sector has increasingly focused on sustainability and resilience, with initiatives to reduce energy consumption, carbon emissions, and environmental impact. The energy sector should prioritize sustainability and resilience by transitioning to renewable energy sources, enhancing energy efficiency, and strengthening grid infrastructure to withstand extreme weather events and other disruptions.
- **Engage stakeholders and foster collaboration:** Collaboration among stakeholders, including government, industry, academia, and civil society, has been instrumental in driving progress in the telecommunications sector. Similarly, the energy sector should engage stakeholders and foster collaboration to address complex challenges, drive innovation, and achieve shared goals such as decarbonization and energy access.
- **Promote digital inclusion and equity:** The telecommunications sector has made efforts to promote digital inclusion and equity, ensuring that underserved communities have access to affordable and reliable communications services. Similarly, the energy sector should prioritize energy access and affordability, particularly for marginalized communities, while promoting equitable distribution of benefits from the energy transition.

While telecommunications and energy have distinct business models, both industries face similar challenges and opportunities, including regulatory compliance, technological disruption, changing consumer preferences, and sustainability concerns. Adaptability and innovation are essential for companies in both sectors to thrive in an increasingly competitive and dynamic market landscape.

In considering these lessons, it is important to reflect that the respective transformation will not be like-for-like. There are differences that must be accounted for. Some of these relate to the technology, some to commercial demands, others to policy and regulation. However, it is worth bearing in mind that in 1980, few would have foreseen the extent of transformation in telecommunications. In other words, there is value in not being constrained in thinking as energy transforms.

Telecommunications has the benefit of longer experience of transformation, but there are growing concerns that the current business model is exhausted. Revenue increasingly flows to the OTT players and hyperscalers. Regulation drives competition, which is seen as successful in delivering more data to consumers for lower prices, but returns for operators can be lower than the cost of capital. This has led to selling infrastructure to other parties, such as tower companies, in order to be financially sustainable. AI is seen as a key to unlocking even greater efficiencies while delivering new services to consumers.

CONCLUSION

Figure 4. *Global business concept of connections and information transfer*

Telecommunications has moved from traditional landlines to mobile networks and broadband internet; the energy sector is undergoing an analogous fundamental change, from fossil fuels to cleaner and more efficient sources of energy. There are lessons to be drawn from the similarities—and differences—that can be applied in developing energy utility business models.

In previous decades, both telecommunications companies and energy utilities relied heavily on centralized infrastructure. Large, monolithic power generation plants and telephone exchanges characterized the architectures of the respective systems. The telecommunications industry became more decentralized with the advent of mobile networks allowing for greater flexibility and resilience, much like the transition toward decentralized energy generated from DERs using wind and solar does for the energy system. Smartphones empowered individuals with instant communication; similarly, CERs empower consumers by giving them greater control over their energy usage and providing an opportunity to participate more actively in the system.

Data is also a key driver and enabler of change. The telecommunications sector now depends on data-driven insights to create new services, optimize networks, and improve customer experience. Energy is beginning to see the opportunity in leveraging data in a similar way. Smart meters, IoT devices, and advanced analytics could reveal energy consumption patterns, help utilities optimize operations, and enable personalized services for customers.

Interoperability is an important concept in the telecommunications sector, allowing different equipment and networks to interwork seamlessly, enabling global connectivity. Similarly, in the energy sector, interoperability could facilitate integration of diverse equipment and technologies, particularly as these become increasingly digitally enabled to deliver energy solutions.

Collaboration is another attribute of the telecommunications transformation experience. The telecommunications industry has applied a partnership and alliance-based approach, fostering innovation and driving growth; GSMA,[2] a

2 https://www.gsma.com/aboutus/

global organization unifying the mobile ecosystem, is an excellent example. Energy utilities could benefit from collaboration with technology companies, startups, and regulatory bodies to navigate the complexities of the energy transition and accelerate delivery of beneficial outcomes.

A further significant factor in telecommunications sector transformation was culture change. There was a strong spirit of innovation and pursuit of positive disruption. Technical and commercial imagination and enthusiasm characterized the sector. Arguably this became too heated, with a correction happening in the dot.com crash, but despite this, very significant progress was made, and a foundation was built for ongoing development.

This culture shift encompassed the customer. Digitalization was driven and enabled by telecommunications in concert with broader digital developments as well as the desire that people expressed to engage digitally—with each other and with the businesses and other organizations that provide them goods and services.

The energy sector has not yet achieved a cultural shift. There are signs in some quarters that it might be emerging and with that, the future may be more focused not only on technology or infrastructure, but also on embracing change, fostering innovation, and putting customers at the center of the transformation.

About EPRI

Founded in 1972, EPRI is the world's preeminent independent, non-profit energy research and development organization, with offices around the world. EPRI's trusted experts collaborate with more than 450 companies in 45 countries, driving innovation to ensure the public has clean, safe, reliable, affordable, and equitable access to electricity across the globe. Together, we are shaping the future of energy.

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