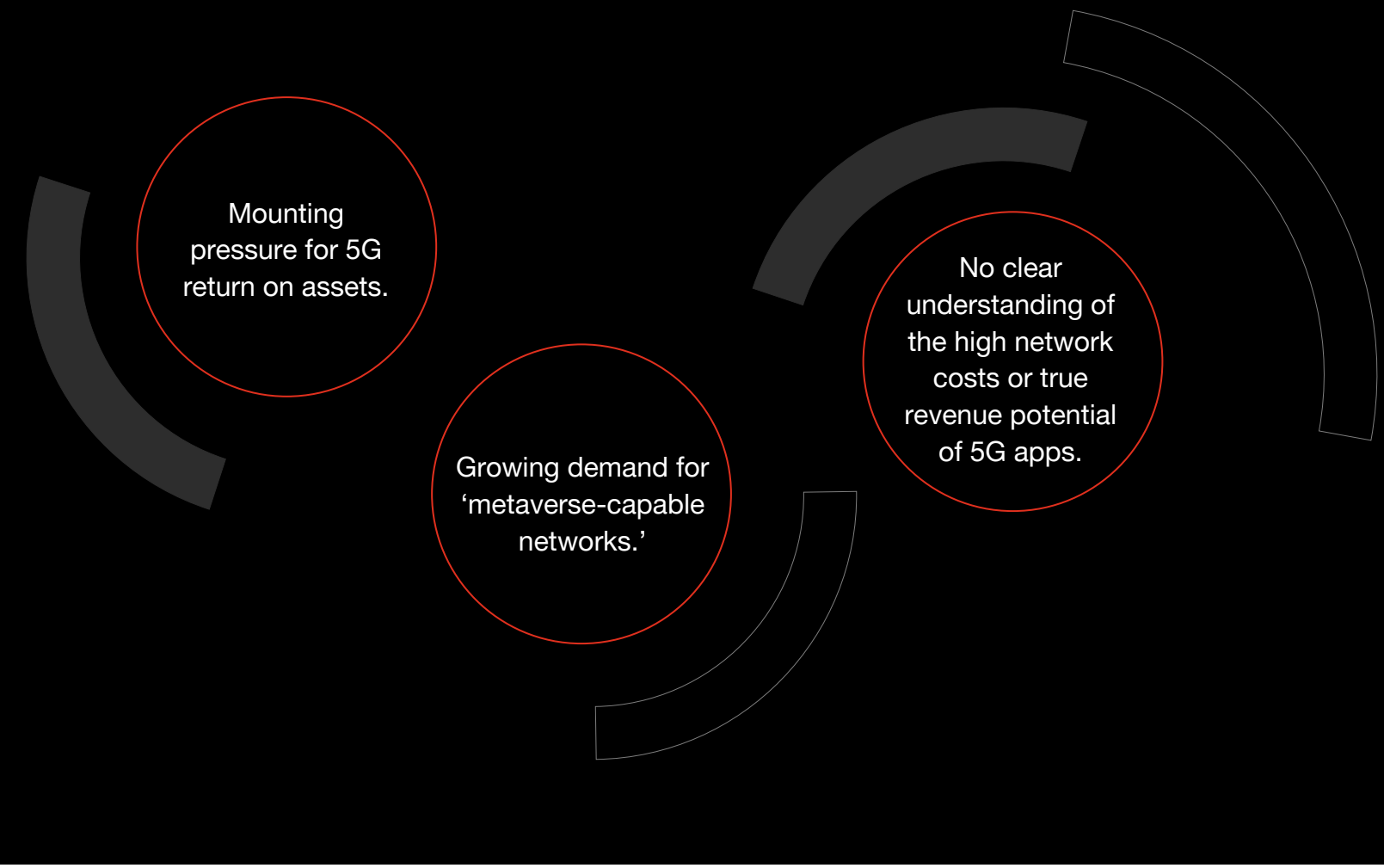
The challenge of monetizing 5G

Three strategies for success in today's rapidly evolving market

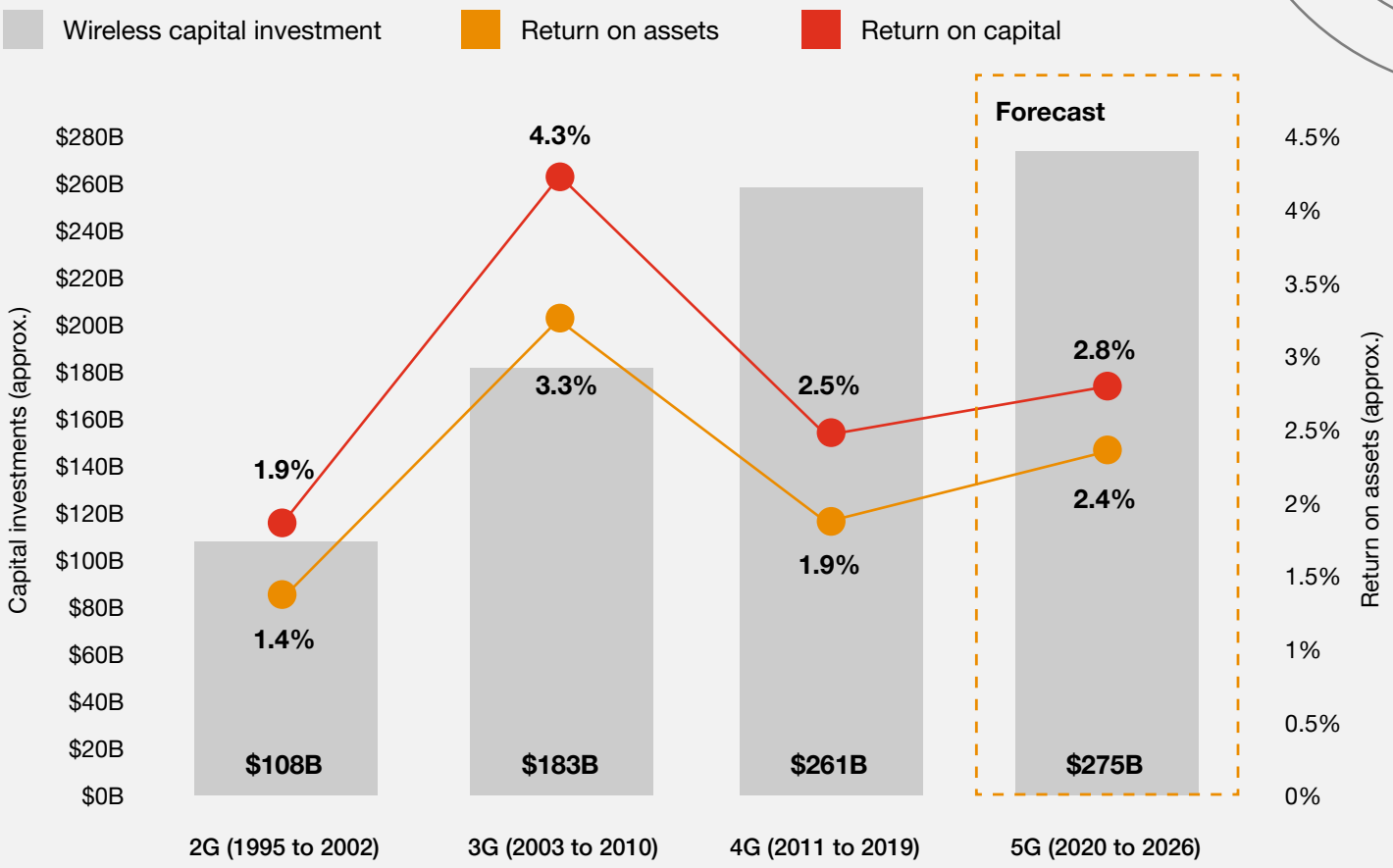
pwc



5G connectivity is poised to transform the way we live and work, integrating virtual reality and artificial intelligence more completely with sectors as diverse as consumer gaming, manufacturing and medicine. The GSMA estimates that 5G will benefit the global economy by more than $960 billion in 2030. The stage is thus set for Mobile Network Operators (MNOs) to monetize their investment in 5G, which is critical, given their steep capital demands. Since the rollout of 2G mobile networks, the amount of capital that US telecom operators have invested in each iteration has grown dramatically. Investments in the 2G cycle totaled more than $100 billion and are forecast to grow to more than $275 billion by the time 5G build-outs are completed in the next three to five years, according to Reuters.

Both capital expenditures and operating expenses will likely be very high with the deployment of 5G standalone networks and their fully virtualized, cloud-native architectures. Against these large capital outlays, returns have been anemic across all generations, ranging from 1.5% to 4.5% of return on assets (ROA).

Wireless capital investment by generation vs. Return on assets for pure MNOs



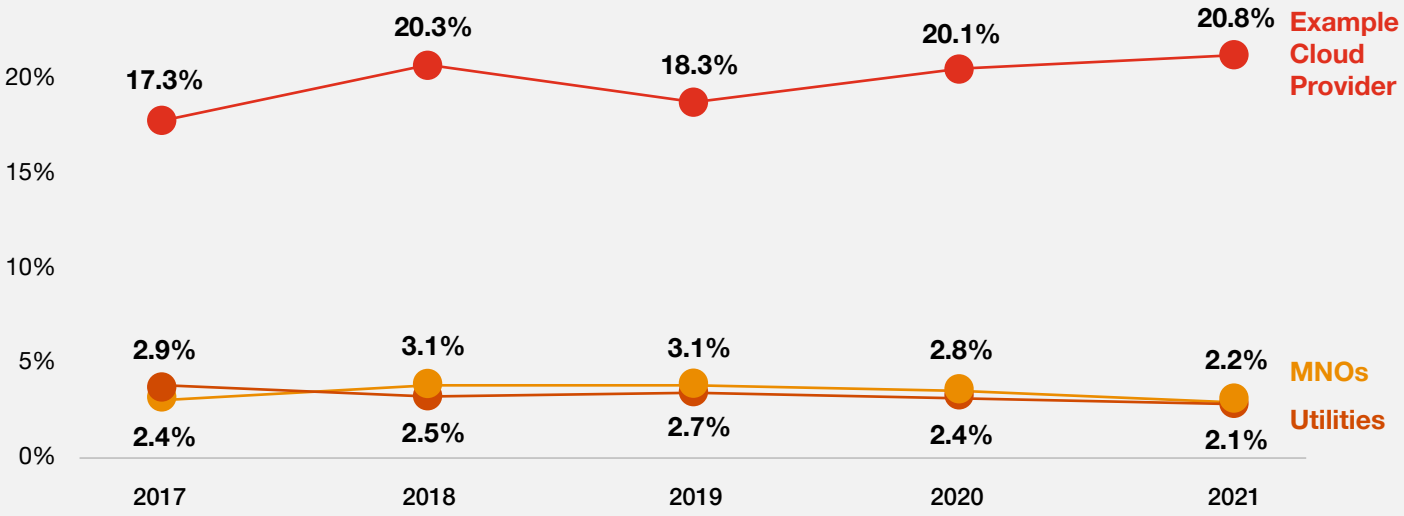
Source: PwC Analysis, CTIA and CapitalIQ data

It's clear that telecommunications executives understand the need for transformation. PwC's recent global CEO survey found that 46% of telco CEOs believe that if their companies continue on their current paths, their businesses would not be

economically viable in 10 years. As 5G becomes an everyday reality for both investors and consumers, carriers are going to face increasing pressure on two fronts:

- **Improve return on assets.** As capital markets and stakeholders begin to focus on investment returns in a high-inflation environment, there will be growing scrutiny on telcos and wireless carriers, especially in comparison to other capital-intensive investment opportunities. An exemplar cloud services provider (CSP) has demonstrated ROA of 17% to 20%+ over the past five years, which compares to the 2% to 3% ROA range of MNOs. The ROA of MNOs approximates that of regulated entities like utilities, which explains investor angst.

Return on assets by industry



RoAs are exemplar based on range of companies in specific industry
Source: PwC Analysis, CTIA and CapitalIQ data

- **Deliver on demanding service-level agreements to support 5G killer apps, such as metaverse applications.** Improving ROA is intrinsically tied to successfully managing the costs and revenues of 5G applications. Many operators face a growing clamor from application providers and up-stack players to create "metaverse-capable networks," without much clarity on how application revenue will be shared with them. Thus, operators risk becoming trapped in a "give more, get less" scenario of providing pure-play connectivity, while up-stack companies monetize the 5G applications.

What carriers are missing:

High network costs of new 5G applications

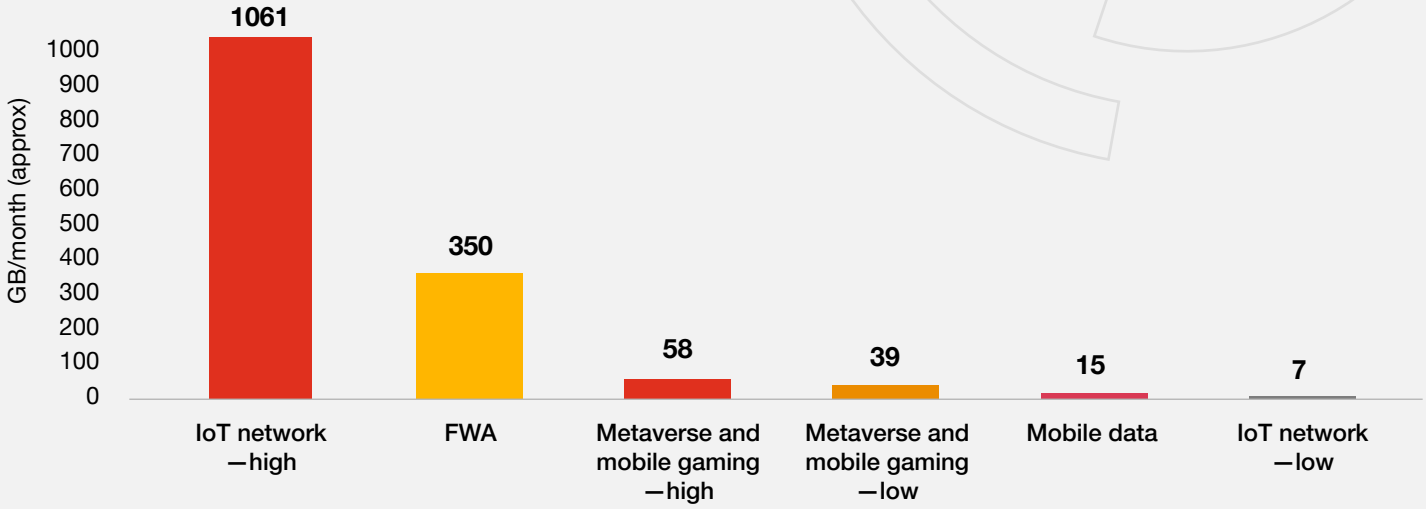
Operators are rolling out fixed wireless access (FWA) services to consumers with much fanfare, and there is increasing buzz about near future 5G applications, such as enhanced gaming or smart factories. At the same time, the associated network costs are currently unclear or undefined.

According to our analysis, FWA services could cost more than 22 times as much as mobile connectivity services. Immersive and augmented experiences—such as virtual-reality apps, mobile metaverse and gaming—could cost three to four times as much. Network costs related to the Internet of Things (IoT) are even more challenging to estimate and track, primarily because of the extremely wide range of connected devices and applications available.

Many IoT solutions—including asset monitoring, retail radio-frequency identification (RFID) and smart-meter reporting—require low data rates and have very low duty cycles. Alternatively, intelligent connected devices, such as tools to perform remote surgery or robots operating on factory floors, require extremely high bandwidth and ultra-low latency. Such IoT applications can be prohibitively expensive—costing up to 70 times as much as mobile connectivity services—from a network perspective.

Network costs by service

(average data consumption as proxy)



Source: PwC Analysis

About our analysis: We used average data consumption as a proxy, as network costs can be represented as a function of carried data load. As a baseline, we considered the average data consumption of mobile subscribers in North America across high-, medium- and low-tiered mobile connectivity plans. These subscribers are assumed to consume on average 15GB/month, but wide ranges from 10GB to 30GB/month have been reported.

For mobile metaverse and gaming, we considered the high and low data rates of three popular mobile gaming titles played on mobile phones and tablets. FWA data consumption was based on operator estimates for FWA services. High-end IoT cost was modeled on Level 4 autonomous vehicles, which require 6 to 12 video feeds at a rate of 3Gbps and an average drive time of 1.6 hours/day. Low-end IoT cost was modeled on a sensor network of 10 sensors requiring 250 kbps for 30 seconds/hour.

Carriers typically look at network costs as infrastructure capital outlays that are service agnostic. The missing link is the specific knowledge of the network cost of each service. Consider this analogy: *What is the capital cost of a truck?* compared to *What is the trucking cost of transporting watermelons versus oranges?* Additionally, it is true that all bits are not equal in terms of the network cost to serve, as each service comes with different service-level agreements. In this analysis, we used the typical consumer mobile connectivity plans as our baseline. Such plans don't offer explicit latency and other quality-of-service (QoS) guarantees. The other services explored herein likely have higher or comparable QoS requirements, and therefore it is reasonable to examine the relative costs of the services based on the bits transported by the network, on average, for each service.

What carriers are missing:

Lower-than-anticipated revenue potential of FWA and 5G apps

Are potential 5G services revenues commensurate with the associated costs? The answer is complex and it illustrates the critical importance of getting the 5G services mix and associated pricing right, in order to monetize 5G profitably.

Our analysis is based on an illustrative pricing plan. Baseline revenue potential—based on low/medium/high commercial mobile connectivity plans available in the United States—ranges from $4 to $5.67 per GB. Here's how that compares to mobile connectivity plans:

- **Fixed Wireless Access may have 30 to 40 times *less* revenue potential.** FWA pricing is constrained by comparable wireline fiber and cable internet plans. Most FWA subscribers are willing to pay only as much as wireline plans cost, yet they expect a similar quality of service for internet connectivity.

- **5G killer apps may have 2 to 3 times *less* revenue potential.** Pricing for 5G killer apps, such as metaverse and mobile gaming, is constrained by fees subscribers currently pay to game and content providers. The revenue potential for these applications may be far less than expected, even after assuming a generous share of up-stack revenue plus connectivity revenue.

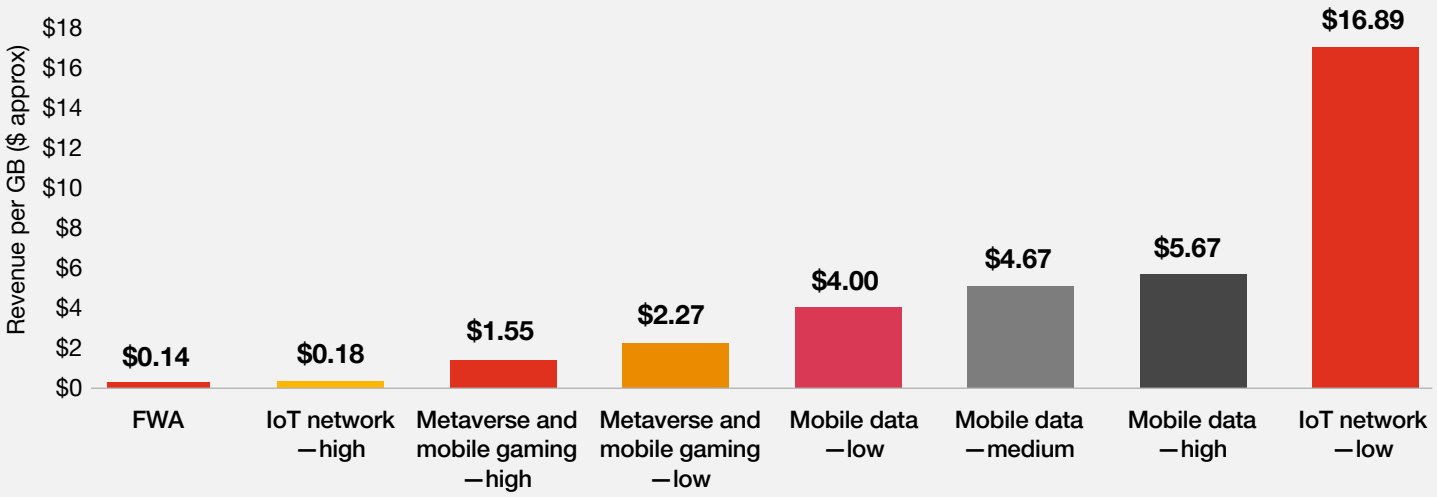
- **IoT presents a huge range of revenue potential—from approximately 70 times *less* to 4 times *more*.** Nothing illustrates carriers' struggles with monetization as starkly as IoT does. A broad range of customers, across industry verticals and use cases, has made it nearly impossible to define and capture this revenue opportunity effectively. Typically, MNOs offer IoT connectivity plans that are capped gigabyte-per-month for a set number of devices.

  IoT can be highly profitable when such plans service low-data-rate applications, such as IoT-based metering as well as retail and supply-chain management.

But even in such use cases, low-power wide-area network (LPWAN), 5G private networks and WiFi6 offer competitive alternatives. At the high end, data-intensive IoT applications, such as smart cities apps and autonomous vehicles, can be hugely unprofitable, unless carriers find a way to monetize on a use-case-by-use-case scenario rather than one based simply on connectivity plans.

Revenue for current and future mobile applications

Pricing per GB based on high-end mobile connectivity plans



Source: PwC Analysis

About our analysis This is based on an illustrative pricing plan that leverages commonly available pricing information for commercial cellular connectivity plans, gaming plans and IoT connectivity plans. This assessment demonstrates the degree of pricing flexibility and the extent of revenue potential for current and future 5G services.

Service Type	Illustrative Pricing $/month	How illustrative pricing is determined
FWA	$50	Commercially available FWA plans
IoT Network—High	$85	Commercially available unlimited mobile data capacity plan
Metaverse and Gaming—High/Low	$100	Commercially available unlimited mobile data plan plus $15 fee for gaming content. Assumes the 70% of gaming content fee is passed through to gaming content provider, MNO revenue is $89.50
Mobile Data—Low	$60	Commercially available low mobile data capacity plan
Mobile Data—Medium	$70	Commercially available medium mobile data capacity plan
Mobile Data—High	$85	Commercially available unlimited mobile data capacity plan
IoT Network—Low	$60 (5GB limit)	Pricing based on commercially available IoT plans

What carriers should do to monetize 5G

Fortunately, telecom operators currently possess infrastructure capabilities that outpace the needs of their subscribers, and few network operators have fully leveraged their existing bandwidth to achieve their full growth potential. To successfully monetize 5G and improve the ROA on 5G capital investments, MNOs and carriers should immediately enact three strategies:

1. **Get a handle on true network costs for 5G applications and educate the consumer.** Carriers have historically struggled with their total cost to serve even with pure connectivity services. They should develop the ability to forecast, plan and track network costs on future 5G services much more accurately. In addition, carriers should develop a well-reasoned and effective plan to communicate the size and nature of these costs to subscribers, regulators and up-stack application providers. This is essential to generate future pricing power and to combat up-stack player demands for “capable networks” without commensurate revenue sharing.

2. **Improve service management capabilities, including pricing, offer creation and service evolution.** Carriers' service and offer-management capabilities are not addressing the complexity of creating a profitable 5G service mix. Carriers should significantly improve this function by:

Improve market understanding to better time consumer adoption of 5G apps. Today's operators require a new level of technological savvy to anticipate tomorrow's trends—and determine which of these trends may yield the greatest return on investment. It may be short-sighted to wait for the metaverse to come to fruition while millions of intelligent devices await reliable and secure connectivity. Operators need to talk with their partners in the 5G ecosystem—including end users and up-stack companies—to understand what features of 5G are most valuable to them.

Improve offer management to create the optimal service mix. Currently, pure connectivity plans are the major service offering from MNOs. Yet, IoT offers a range of industry-specific opportunities for up-stack revenue that carriers have not captured. As consumer adoption trends for 5G killer apps gather steam, carriers should create and market offers that go well beyond connectivity plans for both consumers and enterprises. For example, a meaningful way to capture revenue from gamers may be to offer subscriptions by the hour or by the gaming session, as opposed to by the month or megabyte.

The optimal service mix for profit growth is likely to evolve quickly. Network slicing may allow carriers to sell guaranteed bandwidth to enterprise customers for applications that require especially low latency. Service innovation will also require partnerships with best-of-breed players in particular ecosystems, such as mobile payments and mobile gaming. Carriers should build the muscle to innovate and rapidly refresh service offerings to best serve digital consumers.

Improve pricing strategies. Capturing a meaningful share of 5G revenue can go beyond appropriately valuing network access; carriers should also convince the mobile ecosystem that the prices they've set are warranted. Pricing power and customers' perception of value are inextricably intertwined. To make their case for value, carriers should go on the offensive in marketing their services. They should better understand subscribers' pricing propensity and thresholds, based on 5G application type. FWA has demonstrable limits on pricing. IoT can offer a range of possibilities on pricing as long as offers are created to better address consumer and enterprise IoT needs. It's likely that gaming and metaverse companies are not going to cede application revenue share easily, so carriers' pricing functions should evolve significantly to help address these complexities.

Foster stronger industry partnerships and enabling technologies. Operators should execute profitable revenue-sharing models with cloud-service providers, gaming companies and over-the-top media services that deliver meaningful upside for all parties. One key to doing so will be explicitly quantifying carriers' participation in said partnerships, so they are not perceived as mere "dumb pipes."

Carriers will need application programming interfaces (APIs) to help streamline user experience and bill accordingly—capabilities that don't yet exist. Those APIs also will need to be consistent across carriers, a situation that argues for a consortium to standardize them to allow for apples-to-apples pricing comparisons. In fact, monetizing 5G more fully calls for greater collaboration among carriers and the many brands whose services rely on their networks. To help realize this growth, MNOs should work to develop stronger corporate partnerships.

3. **FWA in the short term, with richer IoT services, may be the right service mix while we await the metaverse**. Offering FWA makes sense only when significant excess capacity is available within the 5G infrastructure. FWA should be augmented by IoT connectivity, especially for use cases requiring lower data rate and latency requirements. Carriers should make use of this time lag to better plan and price future, higher bandwidth 5G services.

The path forward

Carriers will be increasingly challenged to demonstrate better returns on invested capital for massive 5G capital outlays, while simultaneously meeting the demanding service-level agreements of future 5G applications. Network costs are likely higher—and revenue potential is likely lower—than carriers understand for these applications. Critical strategies for improving ROA and monetizing 5G successfully involve accurately valuing network features, quantifying network costs and communicating them to all stakeholders, as well as improving 5G offer management, pricing and service evolution.

Contact

Deepak Ayyagari
Principal, Telecommunications
deepak.ayyagari@pwc.com

Dan Hays
Principal, Telecommunications
dan.hays@pwc.com

Darren Shea
Director, Telecommunications
darren.shea@pwc.com

www.pwc.com/techeffect