Tech Mahindra

Accelerating New Value Creation & Capture for CSPs across Industries in the 5G era

In this issue

Gartner

CSP success in the 5G era

Introduction

As more and more people use smartphones for an increasing number of things daily, the Communication Service providers (CSPs) connecting these smartphones are losing revenue, profitability and market relevance to more nimble digital natives and OTT Players. The severity of the problem is highlighted by the fact that the last major technology innovation that CSPs have been to successfully capture value from was SMS; that too for a short period before the advent of instant messaging players like Whatsapp, Wechat, Skype, etc. As the world adopts a mobile-first approach, data volumes continue to grow exponentially and new technologies change the way we work, play and live; CSPs face a paradox of declining revenue and profitability while being saddled with the bill for continuous investments into assets that would form the backbone of the digital world.

Smartphones and always-on connectivity have created the "On-Demand Economy"- a digital marketplace of connected people and things, built on mobile technologies and offering immediate access to goods, services and experiences; delivered in most cases by contract or "Gig" workers. The on-demand economy's expansion into new industry verticals has changed consumer habits, supply chains, regulations, nature of competition, and investment patterns across these industries. It is shifting power away from incumbent businesses both large and small and giving it to on one hand consumers whom now expect to receive what they want, when and how they want it and on the other hand smaller, more nimble digital providers who use a mobile-first approach to give customers what they want, often by shifting the boundaries of traditional industry verticals.

Enterprises across industry verticals are adapting to these trends. Building customer-first business models that incorporate digital technologies to deepen the relationship with existing customers, acquire new customers, build new revenue streams, fix the experience that they offer to their customers, or reduce costs by eliminating inefficiencies in their production, delivery, or supply chains. Despite t worldwide spending on the technologies and services that enable the digital transformation of business being more than a trillion dollar in 2019, success continues to be elusive, with only 16% of organizations believing that they have been able to achieve long term sustainable benefits from their transformation programs. One of the most significant questions being asked today in the boardrooms across vertical industries is: how do we address our embedded technical debt, to ensure success with digital transformation for long term sustainable revenue and profitability growth?

With increasing rollouts of 5G across the world, there is a better appreciation for the value that 5G offers to overcome traditional obstacles and points of failure for digital transformation. 5G offers a new, natively software-driven, open hybrid architecture, with distributed intelligence throughout the network, including at the edge. A hybrid core network that works across multiple radio channels including LTE, WI-FI, NB-IoT, MMWave. APIs for the integration of platforms and ecosystems across third-party partners, developers, services providers. It also provides a new radio access network that provides: enhanced mobile broadband speeds and increased capacity for new bandwidth-hungry applications such as VR, AR or ultra-high-definition video. It offers ultra-reliability and low latency for use cases such as robotics and Manufacturing 4.0. 5G also allows network densification for massive IoT, enabling high density of devices in a specific geographic area for every IoT use case. Further innovations like network slicing in which the same physical network can be split into multiple virtual networks, wherein each network slice are optimized to the requirements of specific applications or use cases, will allow CSPs to make the network more flexible and adaptable in real-time to the multifarious requirements of applications and business models that digital-first businesses will demand.

The TM forum puts the value that will be unlocked by 5G for businesses across government, finance, healthcare, manufacturing, consumer goods, retail, and the TMT verticals over the next decade at over USD 13 trillion. The capability to help businesses embed 5G represents the largest growth opportunity in decades for CSPs and also the last chance for them to become relevant in a digital, connected world.

5G Private Networks or Public Networks- Capture value beyond connectivity.

The growing consensus within the Telecommunications industry is that while retail consumers might pay a bit more for the higher speeds that 5G will offer, it will not be sufficient to recover the over trillion US dollars that CSPs will have to spend for deploying 5G globally over the next seven years. While CSPs might see some efficiency benefits from 5G, profitability from it is highly dependent on their ability to get businesses, individuals and families buying digital or vertical industry solutions bundled on top of access from them. To have any chance of returns from 5G, CSPs will have to learn to capture greater value from digital ecosystems- value that goes beyond just connectivity.

As Enterprises make their plans for 5G, there is growing concern whether CSPs will be able to transform themselves quickly enough or innovate beyond their retail consumer- subscription centric business models and become a significant 5G digital partner to Enterprises or Governments. Concerns which are resulting in a significant number of these Enterprises to consider private 5G networks. Private networks offer significant benefits over public networks to enterprises. These benefits include guaranteeing coverage and capacity in a limited geographic area- usually a campus consisting of industrial facilities with a lot of metallic obstructions. This is done by allowing the design of the RAN to meet specific requirements for coverage or to configure policy control parameters consistent with the use cases for the campus. Private networks give the control for customization of the RAN to the individual Enterprise, who can then customize it as per their specific requirements rather than leaving control with the CSP as in the case of public networks. Private networks also allow the control of critical data to be retained by the Enterprise owning

the network, making it easier to generate intelligent insights for building end to end automated, zero-touch systems necessary for more efficient operations, agility, better quality and innovation, adaptive security or new business models.

A major obstacle for private networks is Spectrum. Private networks can be set up using either licensed spectrum, (a costly option) or unlicensed spectrum. Using unlicensed spectrum presents its own set of challenges including complexities from 5G New Radio. Other challenges for businesses to set up private networks will include technical expertise to design, build, and manage these networks. One thing that we can be fairly certain is that private 5G networks will not be cheap to set up or maintain. This is an area where CSPs have an uncontested opportunity to tender their network management skills to set up and operate private networks for Enterprises.

However, the business case for these private networks will require customization to support the needs of different applications; with each application requiring a different combination of performance attributes such as cost, automation, throughput, latency, QoS, security, etc. Meaning that success for CSPs from private networks will require them to guarantee business outcomes from these networks or by partnering with others whom can help these Enterprises transform and solve the challenges to enabling 5G centric business and operational models. The inability to do this will mean that CSPs will only be looked for connectivity and network management services while other more nimble digital players take away most of the value from 5G networks. Research by Bell Labs Consulting estimates that seventy-five percent of the market opportunity available to CSPs from 5G enterprise/industrial will be due to enabling digital platforms, platform hosting, and value-added applications, while only 25% can be attributed to traditional as well as secure connectivity services.

Digital Transformation to Ecosystem & Platform Business Models

The enhanced offerings that the enhanced CSP business model demand for both Private or Public 5G; will require CSPs to not just transform their architectures, or systems for networks, data centers, back, central and front offices, but also their culture and partnership models to enable new monetization and operational models. These changes cannot be effected without CSPs adopting a Platform Business Model in the first place. Platform-based business models are more effective at bundling new digital products and services with Legacy Telco Services, into broader digital solutions which are more effective in meeting the diverse requirements and needs of customers than existing alternatives. Platforms also enable a consistent customer experience across multiple product lines or customer journeys; a requisite for the way these new digital solutions will be discovered, evaluated, accessed and consumed. Platforms by enabling access to richer digital data, at each point across the value chain, drive deeper insights into business processes and customers enabling more personalized products and contextual marketing while closing the loop on the next wave of innovation.

For adopting a platform business model, CSPs have to reconsider their approach to Digital Transformation. Traditionally digital transformation programs have been designed by CSPs as multi-year, multi-million dollar investments; focused on building digital capabilities within their legacy stacks to improve operational efficiency through business process simplification and greater automation across these business processes. While operational efficiency derived cost reduction continues to be an important outcome for CSPs, the scope of transformation changes in a Platform business model with the priority becoming revenue growth from new business models and ecosystems. According to a study by BearingPoint, 50% of the CSP participants surveyed expect

a 16%+ revenue increase within two years from their ecosystem partnerships; yet most CSPs are yet to embark on the execution of an ecosystem strategy, frustrated primarily by challenges that act as perceived barriers to the successful execution of their ecosystem strategy.

In previous generations of telecom (2G, 3G, 4G), the network was set up first. Post the new network being operational across a majority of the customer base, the focus shifted to commercial and operational model innovation to monetize the new network- largely by increasing adoption of higher-priced service plans based on the new network among existing or new subscribers. Further transformations in the IT systems were driven by requirements of the business case for these new models, requirements which were converted into a straight line multi-year transformation program, with milestones delivered sequentially using waterfall methodologies. 5G on the other hand is envisioned as a canvas that connects people, devices and things across physical and digital mediums. This is a completely new conundrum for CSPs, requiring them to build a bold vision and strategy based on collaboration and partnerships to extract value from digital ecosystems. The cornerstone of CSP transformation strategy for 5G will require them to implement new technologies or methodologies such as open-source software, artificial intelligence, Agile & DevOps, cloud & virtualization; but also to rethink their culture and organization structures especially for reskilling the workforce. Gartner predicts that ".. by 2023, 35% of roles within CSP organizations will be either new or redesigned."[1] CSPs will have to first take care of the cultural factors if they are to have any chance of success with the technology and strategic imperatives required to achieve digital dexterity. CSPs will also have to be conscious of the external factors. Geopolitical changes, regulatory & economic shifts, global pandemics and the emergence of new digital competitors can impact transformation programs significantly or even render them irrelevant.

CSP transformation programs for 5G will have to be designed for a world with continuous change. This will necessitate transformation programs to change from a big bang, multiyear program; to one that allows CSPs to continuously innovate their operating and business models in response to continuous change across both the enterprise and retail business units of the CSP. To do this, CSP transformation programs will need to adopt a Software Factory model based on Enterprise Value Streams for building the same set of software-driven capabilities that Facebook, Amazon, Netflix, Google use to release software updates thousands of times a day; without breaking anything. The complete set of Enterprise Value Stream Maps defines the various ways that the CSP can orchestrate its capabilities to create value for its stakeholders; allowing it to design more representative business and operating models which would not be possible using inside out or bottom-up approaches. Further decomposing value streams into value stream stages (sub-streams where each stage has a clear value contribution of its own to the overarching value stream)

provides a clearer understanding of how value is created or delivered; as well as the business capabilities necessary to support these value-adding activities while eliminating value-negating activities. As the business model gets translated into an operating model, the value stream stages within a value stream map can be mapped with existing business processes or new business processes based on the operating model that best fits the CSP.

Value Streams will not only maximize value to the CSP through the effective design of the most efficient business and operating models, it will also enable the use of Agile and DevOps at scale across the CSP. Value streams provide an option to break up the transformation program into smaller branches based on Value stream mapping and then further decompose these branches into micro projects based on the value stream stages and their mapping to business processes. A key requirement for the adoption of agile methodologies at scale across the CSP. Agile focuses on addressing business needs through rapid and iterative cycles based on adaptive planning, short feedback loops, transparency, continuous improvement and a focus on quality, allowing the business to rapidly respond to changes within their domain without losing momentum or vision. Scaled Agile will lead to hundreds and thousands of new functionalities, products or releases being ideated, developed, tested, deployed and updated for operations through CI/CD. In such a situation, the value stream based factory model will serve as a control tower overseeing the entirety of the CSP transformation program including software delivery, people, processes, and tools independent of methodology, level of automation, or tools being used within the program by answering questions such as "What is the status of my epics?" or "What is the quality of our application delivery?

Success from 5G CSP Platform Business models

As CSPs look at effecting their Platform strategy, they will be conscious of the fact that the most successful platform business model is the Marketplace- typically 25% of Unicorns are classified as Digital Marketplaces at any time. A Platform based marketplace model would allow CSPs to create multiple new revenue streams by selling connectivity bundled with digital lifestyle products and services in addition to vertical industry solutions for Retail, Logistics, Banking, Finance, Healthcare, Manufacturing, Energy, Utilities, Drones, Video Surveillance, Smart Homes, Smart Buildings, Smart Cities and many more to both enterprise and retail customers using a common platform. This is the only way that CSPs can ensure that customers have a consistent, trusted experience as they bundle more and services to the same customer or family; innovating their business models for greater value generation and capture by moving from a business model based on selling products and services to one that assures outcomes to customers. Collaborating with other partners and stakeholders to ensure successful outcomes through their Marketplaces or Platforms is going to be the most important determinant of how successful CSPs will be with 5G. Forcing them to change way value is created by guaranteeing a higher level of performance (the outcome from a product rather than just the product) than what they are used to. It will also change the delivery process (to delivering outcomes), while profit realization becomes highly dependent on the ability to personalize and contextualize the offering to the requirements of customers.

With CSPs transforming from a simple to a more complex, outcome defined, offerings portfolio; they will need to open up their business model to collaboratively and iteratively work with customers and other stakeholders, in a joint endeavor to align requirements, needs and challenges into outcome-based solutions. CSP transformation programs will be centered on ensuring that the design and architecture of the digital platform enable new value propositions by creating,

communicating, delivering and capturing greater value from its ecosystem strategy. Critical elements that would allow the CSP platform to be designed to adapt to the requirements of the business or operational model that best guarantees success from 5G.

Value Proposition is the first step for CSPs in shifting to an outcome-based business model. Value Proposition is the key-value defined in terms of outcomes that the platform and bundle of products and services offered over the platform deliver to customers versus existing solutions. CSPs while defining the value proposition from their offerings will need to work collaboratively and iteratively with other partners to achieve clarity and consensus on the targeted outcomes. The platform hence will need tools that will allow iterative collaboration among the different stakeholders who are partnering to deliver an outcome to a business or retail customer. Iterative collaboration will also require labs to prototype rapidly and validate success in meeting the target outcomes consistently and reliably. Key propositions that CSP platforms and their 5G based offerings will have to deliver to the retail customer better than existing alternatives will include convenience, efficiency, social engagements, lifestyle enhancement, security and trust. For enterprise customers it will be operational efficiency, revenue growth, access to new markets or risk mitigation.

Value creation encompasses key processes, resources and partners necessary to create the value proposition as a unique differentiator for the CSP. McKinsey defines ecosystems as a set of connected digital services that enable users to fulfill multiple needs on a single platform. CSPs by providing connectivity are already at the center of most digital ecosystems, what they need is to rework their ecosystem and platform strategy to generate further value for themselves from these ecosystems in line with the investments they are making into 5G. All CSPs are not equal and their strategy will need to align ambition with their existing core assets and scale for value creation by:

- Growing their core business by leveraging existing customer base of digital ecosystem partners to get access to new customers while deepening the relationship with existing customers. The focus here is on new distribution channels to acquire customers, simplify transactions and improve the customer experience.

- Increase existing customers' lifetime value through cross-selling and upselling by making enhanced offerings, by adding additional customer paying or the third party paying use cases to their traditional offerings.

- Tap adjacent markets by building end-to-end offerings by bundling new solutions with their core offerings to serve new business customers and enhance the value offered to customers in the core

businesses. The adjacent market strategy will require new innovative products and services to be created and delivered through existing value chains or the bundling of solutions across different customer segments including retail and enterprise.

CSPs can take different approaches for greater value creation; leveraging existing competencies, knowledge and supply chains in designing and deploying efficient carrier-grade 5G networks; or partnering with players with expertise and proven technologies in other areas to build new offerings for ecosystem models that will shift the boundaries of traditional industry verticals. For successful value creation, CSPs will need to build into their Platforms tools that allow them to identify value creation opportunities or areas of improvement and then simultaneously validate very quickly, how effective is the CSP solution in creating the value potential and meet targeted outcomes. Other tools that CSPs will need to integrate into their platform will include tools for:

- Discovery of products or services to ensure that the right information is available for the offering and all stakeholders have trust in the value they are getting from any transaction.

- Enabling engagements based around communities for developers, businesses and retail customers to engage with the brand beyond mundane transactions.

- Customer lifecycle management tools to leverage data about customers to increase customer lifetime value, customer experience scores, product planning and operational efficiency.

- Data monetization tools that will enable third party-funded revenues targeted placements, preferred listings on the marketplace, or through targeted offers.

Value capture is the percentage of the overall created value that is retained by each stakeholder in the transaction. This is the biggest problem that CSPs have faced over the years. Their ability to capture value from digital technologies beyond connectivity is abysmal largely due to their undifferentiated, commodity business model; wherein customers can easily substitute services from CSP with services from another CSP without any cost to themselves. Also with unlimited, all you can eat pricing plans being the prevalent offer, CSPs have little or no ability to raise prices even as consumption volumes grow manifold. The compound annual growth rate (CAGR) for traditional Telcos is only 0.7 percent worldwide, with Telcos in Western Europe, Central, and Eastern Europe facing negative growth despite spending billions of dollars on new generations of networks and IT transformations. While CSPs will be able to lower costs with the introduction of 5G, unless they can innovate their business models beyond providing general-purpose connectivity, to deliver something unique and special that cannot be substituted at will by the customer; they will not be able to capture any additional value from their investments in 5G. To capture value from 5G, the platform will need to have functionalities that:

- Attribute value generation objectively to different parties in a transaction, wherein several stakeholders are contributing to value creation by delivering a part of the expected outcome to the customer.

- Change the price-setting mechanism from cost plus a fixed margin to value-based pricing based on the inherent value of the CSPs offering. Value-based offerings will also have to be sold through different commercial models including prepaid, auctions, commissions, freemium, third party payees, advertising, and service contracts.

Value Delivery encapsulates everything which guarantees that every paying customer is a delighted customer- by ensuring that value which is delivered to the customer from the offer is beyond their expectations and it's consistently delivered on time every time. Value delivery will encompass everything that sets the customers' expectations about the value from the offering in the first place; and then the tools, processes and strategy to ensure that the offering surpasses the customer's value expectations when consumed, used or delivered to the customer. Both setting customers' value expectations and delighting customers by ensuring that the value delivered is beyond customers' expectations are equally important. Customers will not buy from you unless they have a higher expectation of value from your offerings compared to substitutes. If the performance of the offerings is better than expectations, the customer's perception of quality will be high. If performance is lower than expectations, the perception of quality will be low—no matter how good the offer is in absolute terms. Essentials elements that the platform will need to include from a value delivery perspective include:

- Intermediary distribution models to ensure that the offer is consistently delivered to delight the customer every time, irrespective of the number of intermediaries involved in delivering the offer.
- The same value is delivered to customers' every-time. There needs to be predictability about the value that is delivered for the customer to have a consistent customer experience. For predictability, the offer needs to be consistent- means delivering the same value over time. Even if you are offering something more, it needs to be positioned as something different and not mixed with the original offer. Over time the most iconic products are those that are most predictable- everyone knows the taste they can expect when they open a bottle of Coca-Cola.
- Tools for scalability that allows the offer to be duplicated effortlessly and quickly while being multiplied across multiple ecosystems. It should also allow for amplification of changes within offers that are being duplicated or offered across multiple ecosystems. This will enable small incremental changes in value creation and value capture to deliver huge results across the whole value chain.
- Marketplaces that cater to three combinations: Business-to-consumer (B2C), business-to-business (B2B) and consumer-to-consumer (C2C). As value moves beyond the boundaries of verticals, CSPs will benefit from not just catering to retail or enterprise use cases, but also provides the option of merging consumer and enterprise domains.

Effective communication of the value proposition is at the core of designing and implementing new business models or realizing the value proposition from 5G for CSPs. The more effective the communication/conversation is, the more likely the outcome will be achieved. Platform-based ecosystem models will mean that communication about value has to be synced between multiple stakeholders, including both the customers and providers in a transaction. If customers don't think they are getting value for money, they are not going to buy in the first place. Also essential to building a long term relationship with the customer is the ability of the platform, product and services to meet the expectation of the customer. For effective value communication, the platform will need tools that

- Allow communication and story delivery of the value proposition as a message to multiple target groups, such as customers, suppliers, investors using different channels or mediums.
- Making stories viral through physical and social media using network effects, word of mouth, incentives, community building.
- Loyalty programs and incentives to drive increased purchasing behavior on the marketplace including through selected listings in and outside the marketplace, providing promotions and price bundling, and

developing an algorithmic recommendation system that presents desirable offers to customers based on their previous behavior.

- Mechanisms to convert members into active users, spun repurchase and lock-in mechanisms to prevent customers and active users from churning by building greater engagements and social bonding with the users. This will require tools that enable CSPs to assess the impact that they are having on customer's lives and how to improve that impact by creating and capturing more value from associated transactions.

As CSPs will look at implementing their Platform ecosystem strategy, they will look at replacing traditional operational and business support systems (OSS/BSS) based architectures with an open digital architecture consisting of software-defined components that decouple the front end and backend systems of a CSP for greater agility, lower integration costs and faster time to market. The common denominators that will form the foundation of what CSPs will need to define new value propositions or how they create, communicate, deliver and capture value from their ecosystem platform business models for 5G will include:

- The ability to use of a single Digital Identity for a customer across multiple services being provided by the CSP or its ecosystem partners. In a world of rampant digital transactions, the fraudsters and cyber hackers are not going to be far behind. The absence of a secure, trustable, decentralized ID that can bind a person's identity to their smartphone or any other device; and which can then be used universally for government, financial, public or any online services will result in the whole ecosystem model failing to take off in the first place. CSPs by virtue of providing the last mile connectivity to the device can offer the most viable solution to the requirement for a trusted Digital Identity. As per the GSMA; adaptive authentication solutions based on operator data can verify a user to 99.9% accuracy within just three online interactions, enabling CSPs to help businesses mitigate against the biggest enablers of Identity Fraud-Identity Theft, SIM Cloning or Call Diversions. CSP based solutions for Identity management will help businesses fight the estimated $5.2 trillion loss that Fraud and Cybercrime will cost them globally by 2025.

CSPs also have other opportunities from establishing a Digital ID program that will allow individuals to adopt digital transactions through their smartphones across multiple use cases or industry domains. As per the World Bank ID4D database, nearly one billion people globally lack a legally recognized form of identification and are excluded from the formal economy. While the remaining 6.6 billion people have some form of identification, over half cannot use it effectively in today's digital ecosystems to unlock access to banking, government benefits, education, and many other critical services. The McKinsey Global Institute estimates that benefits from a secure, trustable digital identity to businesses, individuals and the government; through digital interactions among government, consumers, workers, microenterprises, taxpayers and beneficiaries, civically engaged individuals, and large businesses would create benefits in the form of higher productivity, cost savings. For the government this would lead to savings of 110 billion hours annually through streamlined e-government services, including social protection and direct benefit transfers for welfare schemes targeted at the most marginalized sections of society. For businesses, a more secure, verifiable ID in the customer registration process could reduce customer onboarding costs by up to 90 percent, and in the payroll process end up reducing payroll fraud, saving organizations up to $1.6 trillion globally.

- Specific Industry Vertical Solutions across Manufacturing, Public

Sector, Financial Services, Healthcare, Technology, Media, Insurance, Retail, Transport, and Logistics. While 5G will be revolutionary in its impact, the impact will not be uniform across all verticals and use cases. CSPs will have to focus on specific use cases and industry solutions that provide immediate benefit and for which a business case can be built for the specific investment. Building these vertical industry solutions will require collaboration for co-innovation and co-development with enterprises, industry organizations and startups and will require CSPs to build labs for the rapid prototyping of industry solutions with other stakeholders.

- Hybrid Cloud-Native intelligent networks designated either for Campus specific use cases or City-specific use cases, that supports complex endpoint devices (handheld terminals, cell phones, wearables, switches, drones, TVs, planes, surveillance cameras, self-driving vehicles, and smart buildings), each having varied requirements for analytics and Artificial Intelligence training, Inferencing, and retraining at the edge or the core of the network. These cloud-native networks will need to integrate into IT systems that are based on open digital architectures and which allow enterprises to leverage the increasing intelligence and capability of connected endpoint devices for their competitive gains.

- Adapting for greater agility and flexibility by building applications that are highly modular, distributed and can be continuously updated, are cloud-native, use technologies such as containers and server-less computing built on Microservices architectures and agile/DevOps.

- New tools, platforms, processes and procedures to expand the population of digital innovators beyond the traditional developer base. Enabling collaboration between traditional developers and these new developer class - business consultants, data scientists, data operations, whom will develop new functionalities or applications using visually guided, model-driven development tools and low code/ no-code development platforms to create and refine digital solutions.

- Accelerate the pace of digital transformation by being able to integrate and reuse code or functionalities from public and private code repositories into larger applications. Critical to do this will be compliance /testing units that reviews and certifies external code segments for vulnerabilities, quality, functionality, and reuse before making them available in code repositories.

- Enterprise applications that incorporate conversational AI platforms, enabled by the combination of NLP with translation, search, analytics, AI, and speech technologies to emulate the human-to-human conversational experience for RPA and other cross-domain use cases.

- Enhanced security and Data privacy solutions for customers to trust CSP and Enterprises with their data. This would include the use of “pervasive encryption” across databases, applications, network traffic, file systems, storage units, system logs, and APIs for communicating outside the platform. Enhancement of cybersecurity architectures with AI to account for the rapidly expanding digital attack surface (hybrid cloud infrastructures, IoT, mobile, and DevOps environments).

- Tools that enable multi-cloud transparency through open protocols for the deployment and delivery of capabilities in a distributed multi-cloud environment along with Management products that offer AI-enabled automation, eliminate sub-optimal resource utilization, limited access to best-available technology innovations, longer problem identification and resolution cycle times, and limited vendor leverage.

- Collaborate strategically with Cloud Service Providers on what is most commonly referred to today as Telco Cloud. The application of cloud computing technologies to telecom as an alternative to the complex spaghetti infrastructure and IT systems that CSPs have in place for their OSS, BSS or network-specific functions like routing and switching. Looking at existing Telco clouds being deployed by CSPs, its quite pertinent to understand that there is no one size fits one all Telco cloud and CSPs will have to understand the difference between different workloads and applications and what kind of cloud will be suitable for each workload or application while building their Telco Cloud strategy; including what applications should be hosted on internal/ private clouds and what applications should be hosted on public clouds. Another question that will have to be answered is whether the benefits of cloud migration will offset the cost of refactoring the applications for containerized Microservices.

- One of the key impediments to CSPs' business model transformation into Digital Service Providers was the complexity of transforming the network, to support simultaneously the wide variety of technical requirements that digital services use cases will entail within a single set of standard network functions. 5G has been designed to support not only a diverse set of devices or form factors but also the unique needs of the applications that are running on each device. Examples include wearables for advanced telemedicine applications, virtual/augmented reality, UHD video and machine-to-machine (M2M) applications that require single-digit-millisecond latencies such as driverless cars. The framework to achieve this within the 5G ecosystem is Network Slicing. Network slicing would allow a single physical 5G network to be sliced logically into multiple virtual networks, wherein each virtual slice can be optimized to serve the specific requirements of the application and its associated use cases, thus providing the flexibility to the CSP in enabling multiple use cases concurrently on a single physical network. Network Slicing would allow the CSP to deploy only the necessary features within the network to support the requirements and needs of specific market segments and eliminate the overhead of unneeded functions and features. This not only reduces the investments that CSPs have to make in the network for specific business segments or industry verticals, but it also enables them to get to market much faster with solutions that are better suited to meet customers' requirements.

- Here are several reasons to believe that CSPs across the world will now focus more on wholesale business, and would keep their retail wing separate to make it more responsive to exponentially growing market and disruptions caused by ecosystem-based services. This will require CSPs to master multi-brand business models to ensure that they can communicate value from the offering succinctly. This will include brands for specific customer segments in the retail segment or for industry vertical solutions. Critical to their multi-brand strategy will be for CSPs to understand what services and businesses will benefit from a central brand and what services will be offered under other brands including those of partners.

Conclusion

CSP transformation programs will now have to be designed for a world where continuous change is the norm. CSP Transformation programs will need to adopt a "Software Factory" model to build the same set of software-driven capabilities that Facebook, Amazon, Netflix, Google use to release software updates thousands of times a day- without breaking anything. A factory where the assembly lines are established on Value Streams.

The complete set of Enterprise Value Stream Maps defines the various options for the CSP to orchestrate its capabilities for value creation allowing it to design more representative business and operating models which would not be possible using inside out or bottom-up approaches. The design and architecture of the digital platform will be critical to ensure that the technology platform is agile enough to implement the different business and operational models that CSPs will need as part of their ecosystem strategy.

This will include the critical functionalities that CSPs will use to define ecosystem-based value propositions or how CSPs create, communicate, deliver and capture value for the new digital opportunities originating from 5G.

Source: Tech Mahindra

[1] Gartner Inc., Market Trends: Top Five Disruptions for CSPs, Worldwide, 2018-2023, 28 March 2018, G00349638

Digital BSS for hybrid ecosystems

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BlueMarble is TechMahindra's Digital Platform Transformation Accelerator that focuses on enabling service providers to transform their existing IT infrastructure towards a modular, flexible and agile architecture. BlueMarble implements a microservices architecture and a domain driven design based on open source components that enables CSPs to accelerate the transformation of the business IT systems, especially commerce, product catalog and order management. Using BlueMarble along with virtualization and as a service models for the network, allows CSPs to build "Slice to Price" based end to end functionalities- that best align with their business and operational models for creating a consistent omni-channel customer experience, increasing sales or reducing operational costs.

Introduction

In the beginning communication services providers, especially in the mobile domain, have being driving technology evolution, but are now largely trying to catch up to technological advances that drive value creation and capture for digital ecosystems. With the advance of 5G in mobile, a new round of innovation is about to happen. Unfortunately, with the evolution of technology also the complexity of the supporting business applications has increased. Integration technology is used to combine business functionalities for new product creation and service delivery within CSP ecosystems, but many times fail to provide essential consolidation well in time to meet the requirements of digital and millennium customers. Together, the challenges of legacy IT systems, new market demands and customer expectations, require revisiting IT systems- putting the focus on realistic ways to move towards a simpler architecture.

Rethinking Customer Experience, Business Models and IT

The experience of customers when interacting with their Service Provider will become a decisive factor for brand loyalty and spending. Some suggest even more important than network coverage and pricing. The expectations towards customer experience are constantly moving to higher levels, driven largely by the experience offered by Internet based companies providing seamless and consistent interactions across different channels and devices, while optimizing each transaction to the channel that they are best suited for. While there is a significant move towards digital, unassisted channels, the assisted channels especially retail stores remain a core element of branding. In many service provider channel flexibility and consistency is challenged by the

historic evolution of channels on top of specific Business Support Systems. Often resulting in dedicated infrastructure from service implementation to the corresponding front-end application. Breaking these silos across service portfolios, like fixed, mobile or cable and contract types, postpaid and prepaid is an essential requirement for evolving the customer experience to the next level.

For Internet-based companies the move towards platform business models has been a major driver of growth. Communication Service Provider are working on establishing themselves as the center of digital and physical services. In the mobile space especially the introduction of 5G capabilities provides CSPs with new business models and services based around the ability to sell bandwidth slices. The specific design of 5G and its focus on support Internet-of-Things and connected device services with low latency and low bandwidth modes, support a new set of services targeted at enterprise customers. In order to efficiently support these business models a high degree of automation is required, while maintaining the required flexibility for adapting to changing business models.

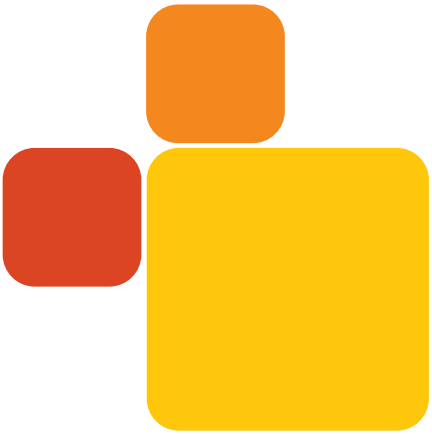
In light of all these challenges and requirements rethinking the IT architecture for business support is essential. While many of the changes are driven by customer experience and new business models, there are a number of technology evolutions that drive changes in the IT architecture. However, moving existing, monolithic application workloads to the cloud can only be the first step. The need for increased flexibility and agility for implementing new features and capabilities drives the need for a different IT architecture. Breaking up existing monolithic applications that have been designed around big functional areas like Billing or CRM, into smaller, more flexible and easier to manage components is essential. This enable to adapt capabilities individually, based on customer or performance demand.

This evolution of BSS has been the guiding paradigm for TechMahindras' BlueMarble portfolio of business services, which provide a micro-services based, cloud-native set of solution around omni-channel commerce, product catalog and order management. These components have supported clients in evolving their legacy IT systems towards a consistent, omni-channel customer experience without the need for large scale, big bang transformation projects. With the scalability required for Tier 1 Communication Service Providers the solution drives business consistently across several lines of business and across all channels, for digital, physical and partner products. This creates a single, consistent customer journey for all services, across all touchpoints.

Driving 5G business for all customer segments

In order to successfully turn 5G investments into business, it is important to understand, validate and fine tune new business models. This is why TechMahindra has started very early to put together a solution, called Slice-to-Price that enables multiple 5G enabled end-to-end business to be deployed over a physical 5G network through Network Slicing; wherein each network slice and its associated IT systems are configured for the specific requirements of the business and operation models that best guarantees success for that line of business. The solution has helped clients to understand the opportunities and revenue models inherent in the 5G technology for consumers and even more for enterprises.

With networks being virtualized and re-defined as software to be offered as a service, BlueMarble integrates with the virtualized network infrastructure and standardized interfaces / APIs that manage the network and its associated resources to create product offerings based on 5G slices within the BlueMarble Catalog. These can be integrated with existing products to create a consistent product portfolio and to enable offers based on bundled propositions. Based on these products the BlueMarble Commerce solution provides a consistent sales process across the complete portfolio for consumer and enterprise customers, with



the flexibility to quickly define specialized offerings for target segments or use cases. These can be automatically provisioned and deployed in the network, significantly simplifying the operation and reducing errors. The consistent customer experience also allows to quickly adapt to changing needs and flexibly adjust network infrastructure.

These initial deployments using BlueMarble, have allowed us to validate and deploy to market rapidly, a large number of different 5G products and uses cases as part of the Slice to Price framework by integrating different modular- hybrid technologies and applications required for meeting the specific requirements of customer experience, revenue monetization, operational efficiency, network infrastructure that innovations in business models require for CSPs to run better, change faster and grow greater. It also enables closing the loop on further business and operational model innovation by providing the intelligence and prototyping tools to quickly build and test the next wave of innovations- perpetuating innovation for greater value creation and capture from continuous change.

Source: Tech Mahindra

Designing for Real People: Capturing value from a consistent Experience

Amy Heymans, Mad*Pow Founder & Chief Experience Officer

*Mad*Pow is a purpose-driven, strategic design consultancy that strives to work on projects that promote health, financial wellbeing, and social impact. Since 2000, Mad*Pow has been collaborating with customers to make a positive influence on people's lives and solve real world problems. Mad*Pow's senior team of 80+ designers, strategists, behavior change experts, researchers, technologists, and creative thinkers are focused on helping their clients with experience innovation, behavior change, and digital solutions. www.madpow.com*

Communication Service Providers (CSPs) are undertaking rapid digital transformation with the hopes of harnessing 5G and other new technologies to help them grow their business and capture the trillions of dollars available in new revenue opportunities. However, in order to succeed, CSPs need to look at their digital transformation differently. Along with considering new products, services, ecosystems, and enterprises, they need to factor in experience at the core. According to an article by **Robert Hingston** of Sigma Systems published in the June 2019 issue of Pipeline, "Any CSP that is not yet pivoting to a customer-centric, digitalized product and service delivery model faces a challenging journey amid the digital disruption."

I've seen it proven over and over again through our work here at Mad*Pow that a dollar spent understanding the consumer from a qualitative perspective buys down risk associated with spending a lot of time and money on something and getting it wrong. That's because quantitative data tells us what is going on, but it doesn't tell us why it is happening or how we might improve the situation. A good blend of qualitative and quantitative methods combined with participatory design and other co-creation methods will go a long way to ensuring the problem space is fully understood and the solution space is adequately explored and narrowed.

As technology has become more central to our lives, businesses look to designers like me to help create their websites, software, and mobile applications, making sure things will work well for the people using them.

At Mad*Pow, the feeling of connection to the people who use those applications and websites is what drives us to work on projects with a purpose. We are designing for real people with real lives, goals, and challenges.

It is only through understanding the nuances that drive them that we are able to design solutions that will be adopted, utilized, and ultimately deliver positive experiences and improve their lives and meet their needs and desires.

That is the approach we took when we worked with Dartmouth-Hitchcock to help develop ImagineCare. Dartmouth-Hitchcock sought a proactive and patient-centric digital solution that allows clinicians to monitor and care for patients remotely and continuously, without a visit to the hospital.

We set out to delight both patients and the medical professionals who would be staffing the virtual clinic. Mad*Pow conducted extensive stakeholder interviews, followed by a design workshop with key stakeholders to help everyone get on the same page.

We drew on the collective experience, adopting a universal design approach for the creation of a digital solution incorporating various Bluetooth sensors, iOS app, clinician dashboard and web app, in addition to video calls, phone calls and web chat. This type of product is possible only through the connectivity capabilities provided by 5G.

Collaboration is key. We must collaborate with the end consumer to understand their value proposition and how they rely upon connectivity in their lives, whether it's health, finance, or daily living. If CSPs collaborate with other organizations and integrate with other systems, they can maximize new platforms that deliver on the consumer value proposition, as well as their own organization's KPIs. Don't build it yourself and don't build in a vacuum. Truly collaborate with consumers and other organizations to bring things to market together.

Source: Tech Mahindra

Research from Gartner:

CSP CIOs' Role in 5G Platforms as Accelerators for New Value Creation Across Industries

The increasing adoption of 5G is challenging CSPs' existing operating models. To align technology resources to business outcomes, leverage digital ecosystems and enable differentiating value across various industries, CSP CIOs must take advantage of this challenge and implement 5G as a platform.

Impacts

- 5G use cases with substantial revenue generation are yet to crystallize for communications service providers (CSPs), thus impeding their progress. They are moving ahead with implementation cautiously, often focusing on a small number of anticipated opportunities.
- CSPs failing to recognize that 5G is more than a mere connectivity technology — to be commoditized fairly quickly — will miss the opportunity to build 5G as a platform for differentiation beyond networking and connectivity.
- An inside-out, network technology focused approach to implementing 5G is limiting 5G's ability to becoming a successful platform for enabling value across industries.

Recommendations

To transform the CSP digital operating model for 5G as a platform, CSP CIOs should:

- Initiate your 5G journey by identifying the capabilities that are required to "introduce" 5G as a platform that is agnostic of specific use cases or industries, including being agnostic of any specific CSP solution requirements.
- Create differentiating value beyond networking and connectivity by:
  - Identifying horizontal (common across industries) and vertical (specific to industries) requirements that can be served through a platform operating model.
  - Investing in data and artificial intelligence (AI) capabilities in conjunction with multiaccess edge computing (MEC) and Internet of Things (IoT) as part of your 5G platform initiatives.

- Implement 5G as a platform by building the core IT stack components that enable easy and open internal and external integration, with an emphasis on creating value through digital ecosystems and disruptive business models.

Strategic Planning Assumptions

By 2022, network-based CSPs will be facing new competition from cloud-based CSPs and loss of opportunities due to continued connectivity-oriented market focus.

By 2025, 5G technologies would have matured and commoditized, with little differentiation across the solution providers offering 5G and related technologies.

Analysis

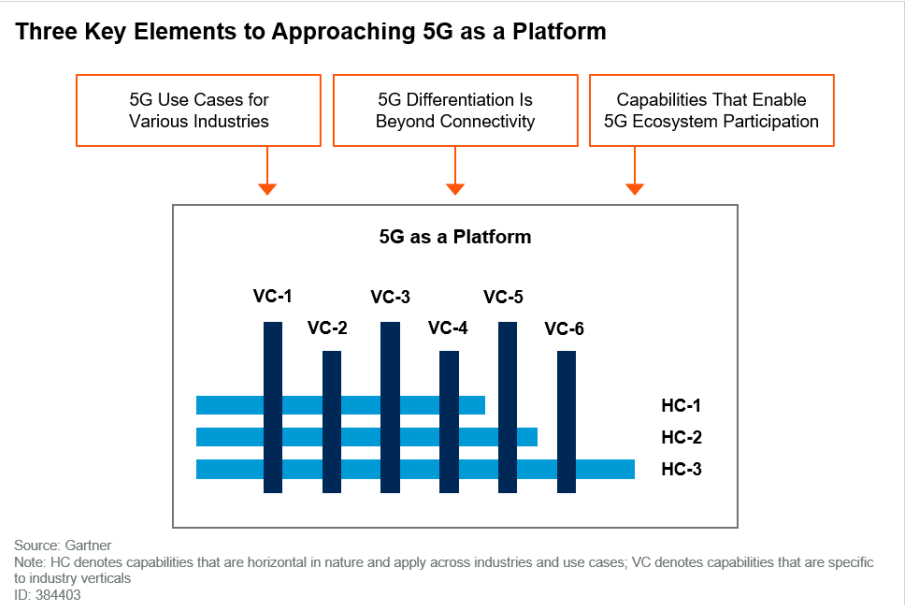
Network-based CSPs across the globe are actively implementing 5G, even though revenue generating use cases are lacking. Even in the "clearest" use cases, such as enabling more reliable connectivity through low latency, high bandwidth and high density of endpoints, CSPs are not fully capturing the potential in creating revenue generating use cases by focusing their energy on connectivity and networking.

A successful CSP 5G implementation should not approach 5G as a technology that only improves the past connectivity technologies. Instead, it should approach 5G as a platform that enables business outcomes for various industries, where enhanced connectivity is only one part of the solution (see Note 1).

The platform approach, in the context of 5G, incorporates a broad spectrum of 5G-related capabilities. These capabilities include MEC, network slicing, increased endpoint density, data, AI, better resource management and an extensive set of capabilities that enable proactive ecosystem interconnectedness (see Figure 1).

Many of these capabilities are horizontal in nature and apply across industries and use cases (denoted with "HC" in Figure 1). Example horizontal capabilities are the ability to slice the network, manage infrastructure for businesses, service orchestration, capturing usage, provision quality of service or even offer specialized information such as location. Certain capabilities are specific to industry verticals (denoted with "VC" in Figure 1), such as very low-latency requirements of emergency services and dense multiaccess management for sports and cultural events. A business-oriented platform approach means a careful identification and implementation of horizontal and vertical capabilities by leveraging ecosystem partners.

Figure 1. Three Key Elements to Approaching 5G as a Platform



Source: Gartner
Note: HC denotes capabilities that are horizontal in nature and apply across industries and use cases; VC denotes capabilities that are specific to industry verticals
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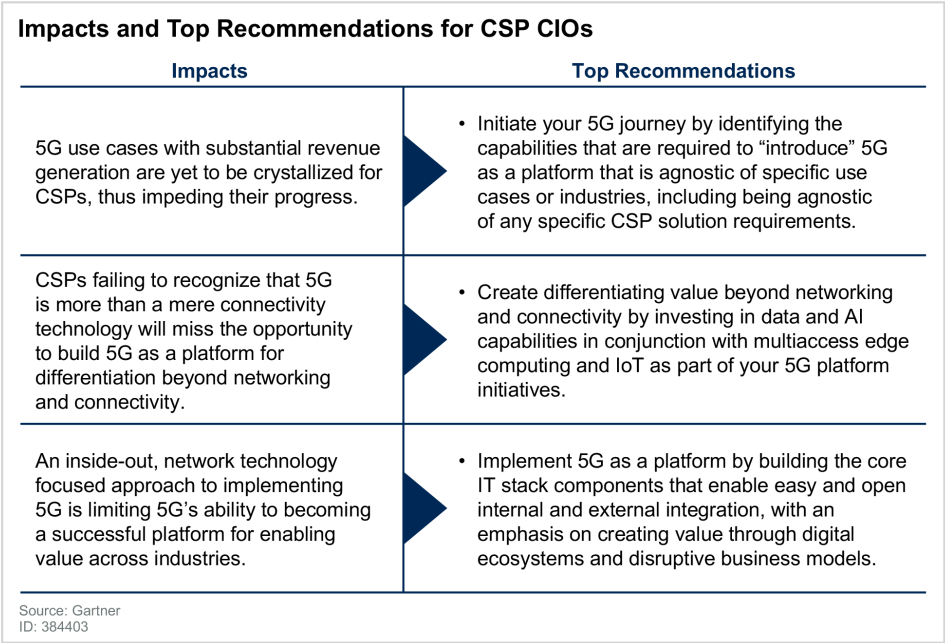
Figure 2. Impacts and Top Recommendations for CSP CIOs



Impacts and Recommendations

Cautious 5G Investments Due To Yet To Be Crystallized Revenue Generating Opportunities

Like any new and emergent technology, specific use cases may lack initially. Often, it is used to improve existing offerings and solutions, with a focus on optimization and efficiencies.

5G, like the previous connectivity technologies (4G, 3G, 2G), is indeed a connectivity technology that improves on previous generations and enables higher bandwidth connectivity, lower latency, better resource utilization and higher density of endpoints. Nonetheless, the scope and spectrum of connectivity possibilities enabled or to be enabled by 5G makes it unparallel in enabling value for businesses. Part and parcel of 5G is network slicing, edge computing and AI, enabling an orchestrated approach to use cases.

Because of these comprehensive sets of capabilities inherent in 5G, especially those beyond enabling connectivity, CSP CIOs are being challenged in envisioning 5G implementation, considering:

- Many of the existing connectivity-centric uses cases can continue to be served with the current technologies.
- 5G is still evolving and will continue to do so for many years.
- Present IT and operating model transformation efforts can't ignore the requirements that 5G will present in the future.

Use cases with substantial revenue generation are lacking for the time being. Nevertheless, CSP CIOs, in collaboration with business development need to identify the core, basic and fundamental capabilities that any use case requiring enhanced connectivity enabled by 5G will need. Part and parcel of this approach is to consider:

- The needs of multiple industries — in the form of common and specific requirements.

- Common functionalities required to orchestrate 5G capabilities with existing connectivity resources and technologies.

- Ability to integrate the emerging 5G platform with broader set of ecosystems.

- Treat the application and solutions layer of CSPs as a separate industry, just like other industries.

With the above in mind, CSP CIOs must approach 5G implementation agnostic of any specific use cases (i.e., horizontal capabilities in Figure 1). While revenue-generating 5G use cases are developing slowly, CIO should be hard at work to enable the basic, core and fundamental competencies that will be applicable across industries and across use cases.

This also means that CIOs need to be cautious not to implement point solutions for any specific industry, including point solutions for their own, the CSP industry. Doing so, they will be repeating the mistakes of the past in building siloed solutions, tying resources to specific solutions without the ability to be scaled beyond specific use cases.

Thus, CSP CIOs and CTOs, responsible for implementing 5G as a platform are facing a key challenge. While CTOs are focused on the technology enablers and design of the 5G network, CIOs will be tasked with building the IT stack to support and enabling the "services" that are delivered using network capabilities. Both CIOs and CTOs must shun the past way of thinking where technology implementations were closely and directly tied to the "home" industry (i.e., CSP or telco), and agnostically build this new platform (tech and nontech) so it is applicable to all industries that may benefit from it. What this means to the technology strategists is that the platform must be built with modularity in mind, where no particular capability is tied to any one industry (not even CSPs), such that they can be reused and applied across industry-specific business needs. We address the specifics of the implementation approach and key elements in the following sections.

Recommendations:

- Initiate your 5G journey by identifying the common capabilities that are required to "introduce" 5G as a platform that is agnostic of specific use cases or industries, including being agnostic of any specific CSP solution requirement. Some of these common capabilities are: ability to slice the network, manage infrastructure for businesses, service orchestration, capturing usage, provision quality of service or even offer specialized information such as location.

- Treat the telecommunication and/or CSP industry as one of the many industries where 5G can accelerate value creation, by proactively NOT building it to specific CSP use cases or scenarios.

- Liberate the thinking processes about how 5G implementations should look like, by building talent with digital native know-how.

Go Beyond "5G as a Connectivity Technology" to Build "5G as a Platform" for Differentiation

CSPs around the world have already recognized that networking and connectivity are no longer elements for competitive differentiation. They are looking at using new and innovative technologies with focus on enabling transaction, data and AI, not only for operation excellence but to create new value beyond networking and connectivity.

5G will enhance consumer experiences with its high bandwidth and low latency via 5G handsets and other 5G enabled devices, giving rise to new consumer experiences related to gaming and virtual reality (VR). However, 5G is more than consumer experiences directly. Rather, it is enterprise-focused, with emphasis on the ability to enable solutions and services for various industries with various SLAs, and potentially on demand.

It is expected, such as with any new technology, that 5G will be used to improve existing CSP operations. While this is beneficial and needed, limiting the implementation and development of the 5G platform based on existing use cases will be limiting and impeding in the long run. CSPs that fail to recognize that 5G as a technology will be commoditized fairly quickly, will miss on the opportunity to build 5G as a platform that creates value with data, AI and edge computing.

So, what can CSPs do to avoid using 5G as a "pipe and/or commodity layer," and turn it into a platform for differentiation?

CSPs should turn their attention to the ecosystem, with focus on the coming together of 5G, IoT, MEC, data and AI. Focusing their attention and exploring use cases that can be enabled with these five elements, all of them together, or a subset of them, will trigger the ideation of value creating use cases beyond networking and connectivity. While the connectivity part of 5G will be soon commoditized, 5G as a platform can be a catalyst for new value creation.

Therefore, the goal of 5G as a platform is not only to make consumption of connectivity and networking on-demand, but more so to enable a horizontal technology platform that is agile, flexible, open, expandable and easy to scale, so it can deliver use cases for various industries. To achieve this, its focus is not on connectivity, rather on enabling data flows (collecting and transporting data), enabling various transactions among and between machines, processes and people, and using AI to extract meaningful insights that create value. Nokia's 5G Future X and Ericsson 5G Platform are examples of vendor offerings with comprehensive 5G-related sets of capabilities, in addition to those specific to networking and connectivity.[1,2]

With differentiating value emerging from the use of data, transactions and AI, these capabilities must be proactively built into 5G as a platform, independently of any specific use case. This shift in creating value with data and AI, is disruptive for many network-based CSPs, and requires a data-driven approach to value creation.

Therefore, CSP CIOs and CTOs should start building the technology infrastructures (inclusive of networking and IT) that orchestrate internal and external resources to be aligned to CSPs' business outcomes, as well as the business outcomes of CSPs' enterprise customers. In this approach, CSP CIOs (and other tech strategists), in close collaboration with business development, will build a comprehensive platform that creates value not only from connectivity and networking, but one that incorporates a broad spectrum of 5G-related capabilities. These capabilities include edge computing, network slicing, data, AI, and better resource management. This approach will enable CSPs to "dynamically" use and apply 5G and related capabilities as required by the business needs of various industries.

The value creation focus of these platforms should be at the intersection of 5G, edge computing, IoT, data and AI, together or a subset, with special focus in creating value with data and AI, and their unique application in each industry. What IT components do we need to enable this? This is what is addressed in the next section.

Recommendations:

- Create differentiating value beyond networking and connectivity by:

- Investing in data and AI capabilities in conjunction with edge computing as part of your 5G platform initiatives.

- Identifying horizontal (common across industries) and vertical (specific to industries) requirements that can be served through a platform operating model.

- Make the 5G connectivity-related capabilities as "plug-and-play" as possible, as soon 5G technology will become a commodity.

An Inside-Out, Network-Technology-Focused Approach to Implementing 5G Is Limiting 5G's Ability to Become a Successful Platform

CSP CIOs recognize that the primary barriers to their digital transformation are related to people, culture and processes. This stems from a predominantly engineering-oriented mindset and culture. It's also a symptom of siloed structures and the deep integration of technology and solutions, often as point solutions, as it used to be in the past.

Even with forward-looking CSP executive leadership, whom have a vision to create value beyond networking and connectivity, the potentials of 5G as a platform will be limited to a great extent if CSP management still operates with a predominantly traditional and engineering mindset. These concerns are exacerbated even further given that 5G is even more complex than previous connectivity technologies, and it must be open for a broad ecosystem participation from the start.

So, how can CIOs and CTOs, together with other technology strategists, approach 5G implementations to build this resilient, reusable, adjustable and on-demand platform, that is equally applicable across various industries? The following are some of the top guiding principles for building 5G as a platform:

- Enabling easy access to personalized, use-case-specific connectivity and networking on demand.

- The ability to combine capabilities and SLAs on demand per use case and per industry.

- Ecosystems openness through standard based and open APIs (i.e., non-CSP-specific APIs).

- Its scalability beyond the initial use cases.

- Industrialization of platform capabilities.

- Continuous delivery and automation.

- Modernizing part of the network, data centers and enterprise products (for all of these, operating model elements needs to be modernized).

- Business support system (BSS) and operations support system (OSS) are extremely important components of 5G as a platform and must be treated as priorities that focus on openness, distributed management and automation.

- It provides a "bridge" between traditional infrastructures and the platforms for digital capabilities that are built using network function virtualization (NFV), software-defined networking (SDN), MEC, network slicing, IoT readiness and AI.

- The capabilities of 5G as a platform should be built with product-centric approaches.

Recommendations:

- Implement your 5G platform by building the core IT stack components that enable easy and open internal and external integration, and a comprehensive value creation for various industries, agnostic of any specific use case.

- Build an orchestration and provisioning IT stack and/or layer that is vendor-agnostic and inclusive of the resources that are provide by the broader ecosystem.

- Avoid building 5G point solutions, or siloed solutions, by building the 5G as a platform with product-centric approaches in order to increase reusability of components and capabilities across industries, as well as enable industrialization.

- Start investing in people, skills and culture transformation by instilling behaviors similar to those of digital-native companies.

Evidence

[1] "5G Future X: Deliver Breakthrough Network Performance and Reduce Costs," Nokia.

[2] "A Complete 5G Platform for Smooth Network Evolution," Ericsson.

Note 1
Platform Definitions

- **Platform business** — An enterprise that enables value-creating interactions among people, businesses and things.

- **Platform business model** — A design that consummates matches among providers and consumers, and/or facilitates the creation or exchange of goods, services and social currency, so that all participants can capture value.

- **Digital platform operating model** — A practice that enables shared value creation through business ecosystems that can collaborate, orchestrate, create, and match providers and consumers.

Source: Gartner Research, G00384403, Mentor Cana, Amresh Nandan, 6 December 2019

About Tech Mahindra

Tech Mahindra represents the connected world, offering innovative and customer-centric information technology experiences, enabling Enterprises, Associates and the Society to Rise™. We are a USD 5.2 billion company with 125+K professionals across 90 countries, helping 973 global customers including Fortune 500 companies. Our convergent, digital, design experiences, innovation platforms and reusable assets connect across a number of technologies to deliver tangible business value and experiences to our stakeholders. Tech Mahindra is the highest ranked Non-U.S. company in the Forbes Global Digital 100 list (2018) and in the Forbes Fab 50 companies in Asia (2018).

The Mahindra Group is a USD 21 billion federation of companies that enables people to rise through innovative mobility solutions, driving rural prosperity, enhancing urban living, nurturing new businesses and fostering communities. It enjoys a leadership position in utility vehicles, information technology, financial services and vacation ownership in India and is the world's largest tractor company, by volume. It also enjoys a strong presence in agribusiness, aerospace, commercial vehicles, components, defense, logistics, real estate, renewable energy, speedboats and steel, amongst other businesses. Headquartered in India, Mahindra employs over 2,40,000 people across 100 countries.

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