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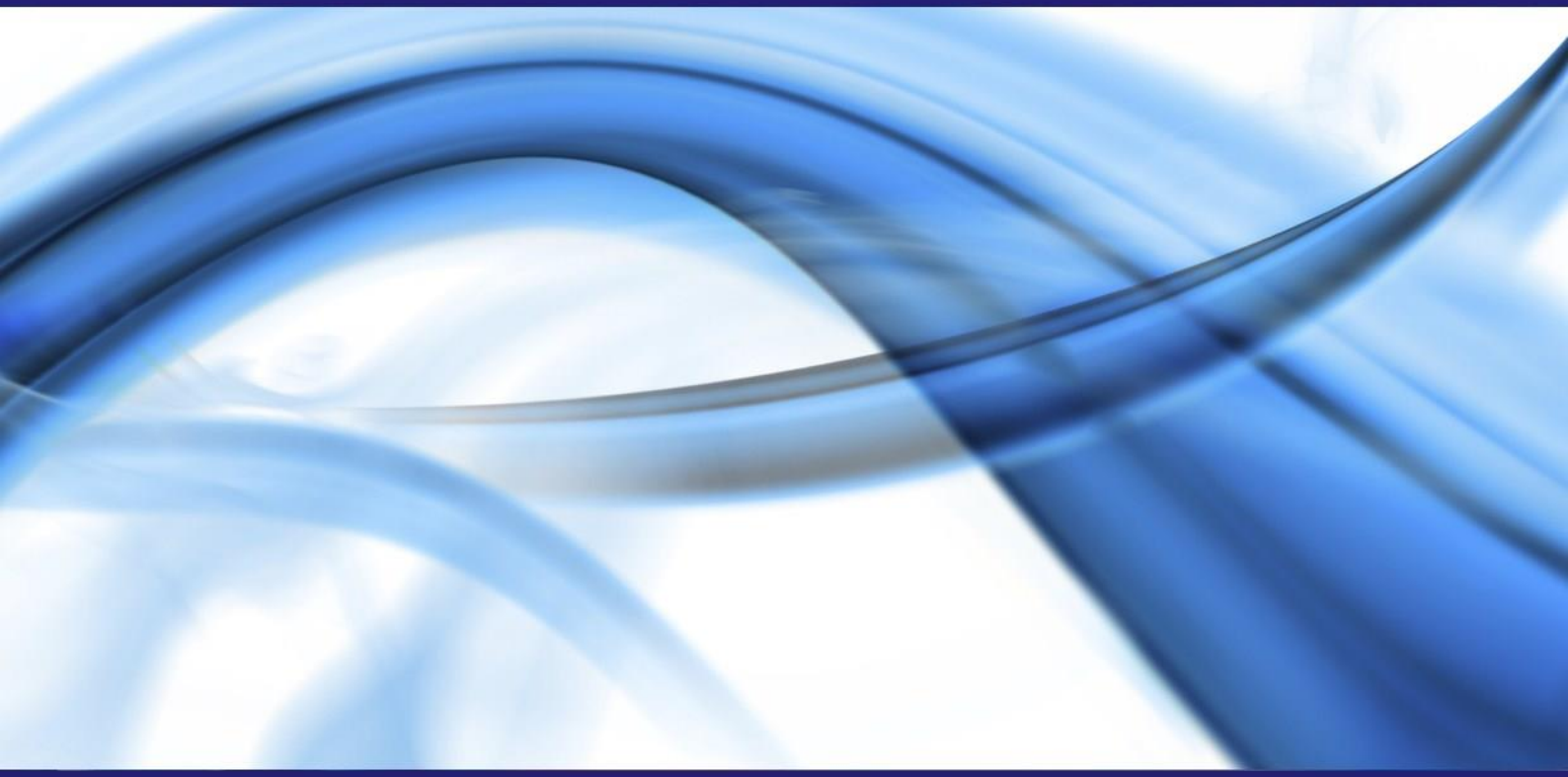

White paper for Huawei

CSP digital transformation: Leapfrogging competition via an Agile Transformation Framework

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1. Executive summary

"We face competition next year from a new market entrant. It will have no core network, no physical network infrastructure – it will buy/rent spectrum and towers and it will use a lot of automation. It will be massively disruptive but not only because of price – but because of all the other things it will be able to do because it's agile." *- Tier 1 European operator*

Communications service providers (CSPs) do not have a choice about digitising their business and operations systems to compete – it is either digitalise or die. However, there are earnest debates on what really is digitisation, and how best to get it done. The big question faced by CSPs is "How do I transform from my legacy systems and processes into a modern, agile operation, without jeopardizing ongoing operations?" In making the transformation, CSPs must tackle both near-term operational challenges associated with supporting new digital services *in a digital manner*.

Regardless of the transformation path unique to every CSP, each path shares some common characteristics. For instance, the path is driven from a digital vision of the CSP's business and network; the path provides both near-term and long-term value setting priority by the value delivered; the path is customer-centric in design and implemented using fast iteration approaches.

Each CSP's transformation path depends upon its current maturity, competitive state and its goals: in three areas - digital services (beyond connectivity), digital experience and digital agility of business and network operations. A good *Agile Transformation Framework* will take these endpoints and map a path using a set of techniques that come from the traditional communications business combined with new processes and technologies that have been honed by the web-scale companies over the last two decades. Key new areas include:

- Cloud based, agile software for both the business and network that maximise the use of digitalized interfaces, artificial intelligence, automated business processes, ubiquitous orchestration and a virtualized network infrastructure.
- New value chains built on open platforms that will lead to greater collaboration amongst ecosystem partners and new delivery models for software-based systems that will provide greatly decreased infrastructure costs and increased security.
- Implementing new delivery models based on modern software methodologies which will drive agility in development, deployment and operations.

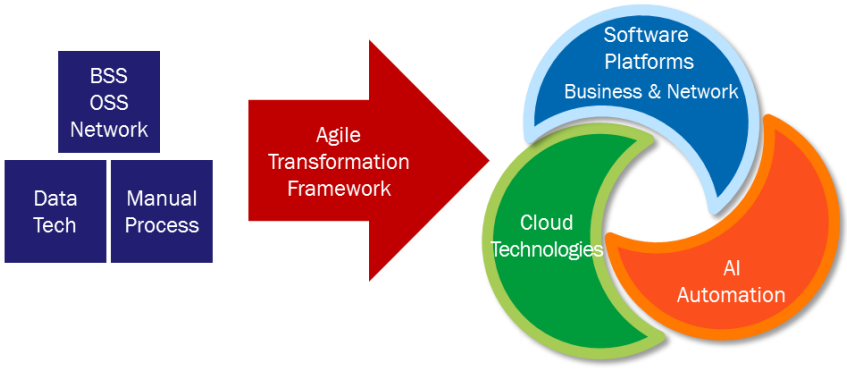

Figure 1: Effect of an agile transformation framework [Source: Analysys Mason, 2018]

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2. The transformation imperative

"Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000."

Pierre Nanterma, CEO Accenture, Davos World Economic Forum 2016[1]

CSPs have a plethora of strategic choices in front them; on the one end of the spectrum is to become a 'digital service provider' by offering new digital services, supporting new business models, entering new value chains and forging new partnerships. On the other end of the continuum is the choice to be a cost leader, providing traditional communication services at the lowest cost per bit, i.e., 'low cost connectivity provider'. Many CSPs may indeed opt to be some sort of a hybrid service provider depending on the business opportunities. But, whatever the vision, CSPs must execute some form of 'digital transformation' to transform their network and operations, that enable them to survive the next round of consolidations and thrive in the new digitalised environment.

The areas affected by the transformation will include digitalised provisioning of both the traditional as well as new digital services. Providing new digital services for the enterprise market is a good starting point for the transformation. While this is an area of fierce competition from new players, it holds strong potential to provide the best returns on investment in the deployment of new technologies supporting digital experience and network virtualisation.

The nature and extent of the digital transformation will differ however, depending on the strategic choice that the CSP makes. This transformation should be guided by what Analysys Mason calls an "*Agile Transformation Framework*." It is an agile set of approaches, transformation tools, execution templates and robust measurement techniques (discussed in detail in section 0).

"We are conducting End to End digitalisation which involves transforming how we interact with our customers ['digitalisation in the front'] and transforming the way we work and operate internally ['digitalisation at the back']" *– CIO of a large global operator*

We demonstrate in Figure 2 that the choice of path for digital operation transformation depends the CSP's current maturity level, its intended future state and current competitive position. These can be set by a few key parameters. The value of these parameters can be used as input to the *Agile Transformation Framework* to determine the best implementation path for a given CSP to follow in its digital and operational transformation.

[1] Refer to Pierre Nanterma's article "Digital disruption has only just begun" in World Economic Forum: https://www.weforum.org/agenda/2016/01/digital-disruption-has-only-just-begun/

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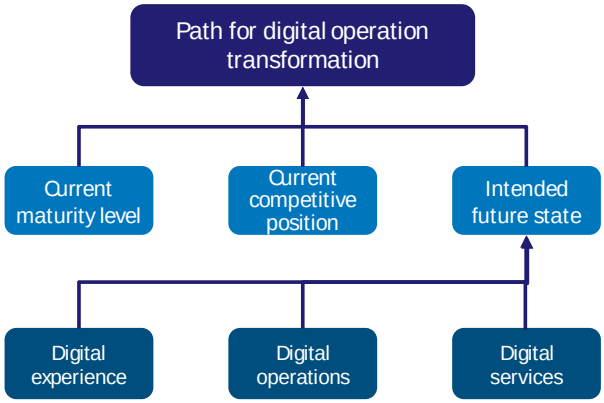

Figure 2: Factors affecting the choice of digital operation transformation [Source: Analysys Mason, 2018]

Current maturity level and current competitive position set the near-term priorities for the transformation process, while the intended future state sets the paths. This future state can be set by setting the goals for three key parameters:

- Digital services: the extent to which the CSP provides digitalised operations for its key services and enters new digital services markets such as IoT, eHealth, electronic commerce, smart homes and smart cities. Even a CSP focussing on a low-cost strategy may just provide low-cost connectivity services for IoT and other digital services.
- Digital experience: differentiation by providing an excellent digital experience for the customers and ecosystems partners with an aim at high customer satisfaction, versus for cost reduction (hopefully, without harming customer satisfaction too much),
- Digital operations: using extreme automation techniques to move from a human-centric to automation-centric set of processes. To achieve a successful target, business will require two major disruptions in the operating model: one for the business operations where a *Digital Business Platform* (DBP) will be required, one for the network equipment and operations, a *Digital Network and Operations Platform* (DNOP) that has merged with a virtualized network infrastructure. These will be discussed further in Section 4.

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3. Transformation: short-term goals and long-term vision

"At VimpelCom we are embarking on the journey of transformation and intend to become one of the pioneers of digital disruption." -VEON

There is no single roadmap for digital transformation applicable to all CSPs. However, there are enough examples in the industry sufficient to point the direction to reasonable pathways as well as to enable CSPs to determine what the characteristics of a good pathway are, and a methodology to get there.

3.1 Characteristics of a good transformation path

While every CSP has its own unique transformation path, every path has some common characteristics. Each path:

a) Is driven from a digital vision of the CSP's business and network – a good vision of the end-state of the transformation should be known before launching the digital transformation, in all three aspects.
b) Provides both near-term and long-term value setting priority by the value delivered – a digital transformation, which will take a redesign of many of the systems and processes, should not provide benefits just at the end of the process, but at each major step.
c) Is customer-centric in design – the business processes should not only be efficient and simple, but incorporate proven design principles that consider customers, their context, and their needs first.
d) Is implemented using fast iteration approaches – rather than a multi-year project, the transformation should be broken into multiple phases (three to six months generally, varied by specific approaches) that build towards the end-state vision.

3.2 HKT example – an end-to-end transformation

Customer behaviour and expectations have changed drastically over the recent years since the emergence of OTT players in the communications market, putting immense pressure on traditional telcos for long term survivability. Although HKT is already the leading telecoms service provider in the highly competitive Hong Kong market - with over 2.6 million fixed lines, 1.6 million broadband lines with FTTH covering over 80% of households, and 4.2 million mobile customers[2] - HKT determined it needs to make the transformation from Communications Service Provider (CSP) to Digital Service Provider (DSP), so as to equip itself with the agility and flexibility in terms of product innovation, service provisioning / delivery, and customer management, in order to address the changes in customer behaviour / expectations as well as the change in business models with the emerging opportunities in IoT and verticals. To meet this strategic objective, HKT launched "Project Earth", a multi-year digital business transformation project to transform all aspects of its operations and network, covering service transformation, business process transformation and network transformation. The primary goal is to increase revenue potential and implementation of enterprise services in 2017-18, followed by consumer services in 2018-2019 and to prepare for the vertical opportunities in the 5G era from 2020 and beyond.

The transformation of the user experience involved primarily the elimination of boundaries amongst systems supporting the various business units of HKT; this is realised by the newly introduced Business Enabling Platform to replace HKT's legacy BSS and OSS which have been constraining HKT's business development. Offering omni-channel interface, advanced service portals, online support, and real-time charging capabilities to

[2] Figures extracted from HKT 2017 Interim Result Announcement

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HKT's customer, the Business Enabling Platform is supported by the underlying cloudified network – the Telco Cloud - to provide the flexibility and agility for service delivery to meet the business needs.

Project Earth although slated to touch every aspect of its operations and network over its three-year lifetime, needed to start somewhere. But where? First a planning exercise with the design of the user experience and plans for the back-office functions:

- HKT choose to focus on a short-term soft launch, firstly with Mobile Data Management Capability by offering a self-service portal to allow enterprise users directly to control over the data usage of staff as well as the split of personal and business usage billing information for mobile data usages.
- Enterprise Mobile Service is being expanded to include Mobile Cloud VPN, which provides enterprise data and IoT mobile access to a data centre, with VPN access to fixed enterprise locations. A portal for use by Account Managers to capture customer needs, customer orders fulfilment is realised with automated network design and implementation of vCPE, SDN connections, and other components. It reduced the time for service delivery from weeks to days.
- Expansion into Enterprise Cloud and Universal Communications Systems will follow in 1H 2018,
- Consumer services are planned to be included in the transformation project in 2018-2019.

The goal of the project is to create a modern DSP – that operates as customer-centric and service-centric, supported by an agile network and next-generation BSS and OSS – that can compete not only in its current areas but in new markets and services.

3.3 Pursuing the best path via an Agile Transformation Framework

> *"To compete in the digital world, at Telefónica we have developed a company program to transform ourselves to be an end-to-end digital business, focused around the customer and data, and ready to compete in an open ecosystem."* --- *Telefónica*

To plan the multitude of changes necessary to provide an agile, digital operation for a wide variety of current situations and strategies requires an agile set of approaches, transformation tools, execution templates and robust measurement techniques. This we call an *Agile Transformation Framework* (see Figure 3). Depending on each CSP's unique transformation path, the Agile Transformation Framework will essentially map a path from 'as-is' state to 'to-be' based on processes derived from large scale systems transformation in use by web-scale companies and leading edge CSPs.[3]

[3] As an example of a description of a vendor's agile transformation network, see Dr. Howard Liang, ***Accelerating Digital Operations Transformation,*** http://www.huawei.com/minisite/otf2017/news/Howard-Liang-en.html

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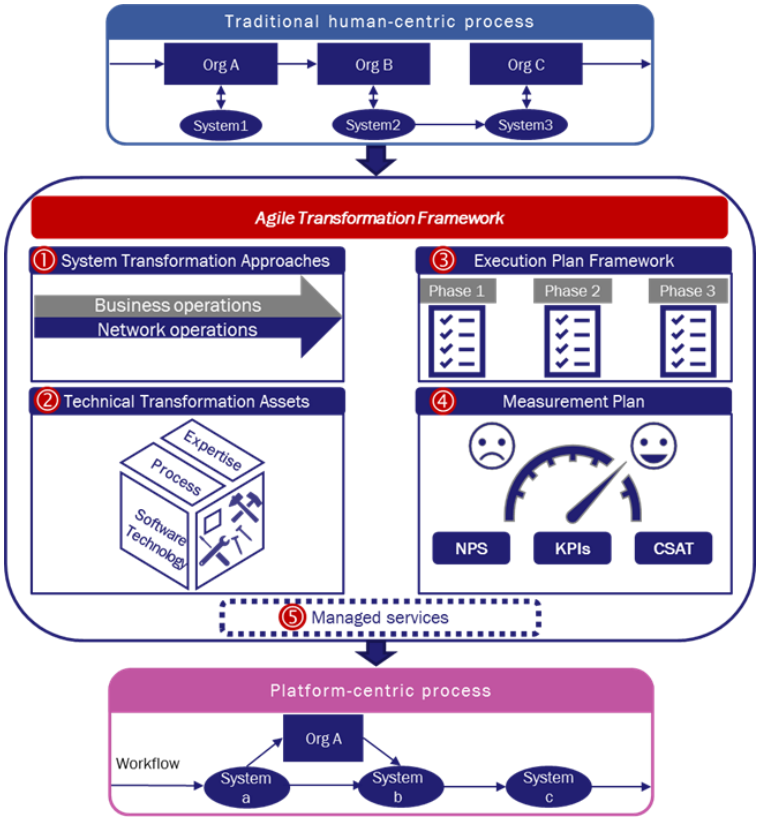

Figure 3: Agile Transformation Framework [Source: Analysys Mason, 2018]

① System transformation approaches – Prescriptive methods for transformation

There are many approaches that can be taken to move from the current set of operational systems to the new, transformed systems. The best ones depend upon the current situation, the investment profile, the desired state and the abilities of the managers involved. These map to both the business and network operations processes and are informed by business cases for digital services, virtualisation of assets (such as vCPE), and changes to operations processes and systems.

② Technical transformation assets - Providing an industry reference model

Systems integration and transformation planning have already required strong expertise in its people, backed up with standardized Best-in-Class processes. But beyond that, modern systems integrators are bringing to bear specialized software systems as part of their offering, often providing functions to support new technology and governance of the systems. Artificial intelligence system and governance systems will be particularly important in digital transformations.

For digital transformations, these assets must also include knowledge of the new cloud native architectures, microservices, DevOps processes, CI/CD software delivery mechanisms, and digital experience and digital services support constructs. They must also include training of the CSPs' staff for these new technologies.

③ Execution plan framework - Prioritizing early transformation benefits

A strong execution plan framework needs to support a multi-phase plan of multiple projects, each three to six months in duration. This will reduce risk and demonstrate near-term benefits to the business, helping to secure continued executive buy-in. Moreover, prioritization of the projects should be made to receive short-term benefits from the early stages of transformation. Milestones for these benefits should be articulated.

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④ Measurement Plan – Ensuring results

The measurement plan should include sets of current internal KPIs, a method of estimating customers' NPS or CSAT scores from those KPIs, and a new set that measures the progress of the organisation in its digital transformation in business agility, cost, new technology, and provision of new services.

⑤ Managed Services – Outsourcing the transformation

Managed services may be offered as an option. This option would provide CSPs with the opportunity to outsource the systems transformation program, providing an operate-transform-transfer process. The transformation process may also involve implementing and supporting new digital services.

4. Operational agility will set apart the successful CSPs from the obsolete

One common aspect shared by all successful digital-native companies is their architectural agility which enables them to adopt a 'fail fast' approach in embracing new opportunities. This approach allows them to experiment with emerging business models without making significant investments or impacting ongoing operations. For CSPs, weighed down by legacy architecture frameworks, such an approach is inconceivable without overhauling their system structure.

For most CSPs the biggest impediment in embracing digitisation and experimenting with new business models is the systems already in use, which limit their ability to support innovative digital services. CSPs generally adopt a phased approach to how they transform their support systems, as it is less risky than a complete overhaul of underlying systems in one go.

4.1 A phased approach to architectural evolution

Every CSP has their own unique journey path towards digital transformation. Since system transformations usually tend to be costly, complex and risk prone exercises, the overall process is often broken up into smaller steps. While most CSPs embrace a multi-step journey towards transformation beginning with the quick-win stage and then proceeding onto the final stage, there are some CSPs who attempt a radical overhaul of their support systems by skipping the quick-win stage altogether. Both these stages are detailed below.

Quick Win Phase – Seeding the architecture with the next-generation technology

In the initial phase of digitisation, CSPs should prioritise issues that have an immediate impact on business or operations. This mostly revolves around supporting new digital services (probably enterprise-focussed) or improving efficiency by reducing cost of operations. When compared with an end-to-end transformation project, the quick-win stage offers rapid deployment. While the changes made to the overall system architecture are limited in this phase, the impact on business can be substantial. This step also plays a key role in building momentum and support, solidify executive buy-in within CSPs for the investments necessary for larger transformation.

In this stage, CSPs usually adopt one of two approaches for system transformation: overlay or adjunct. **An overlay system** has been shown to be a popular approach, especially when an omni-channel digitalised user

interface is desired. The overlay system forms a layer above the multiple siloed systems and encapsulates and abstracts information from the systems beneath. This gives CSPs access to data from multiple systems within a single layer which can cut down on complexity significantly. The overlay system is used as a platform for further development and eventually replaces the functions below. This approach is often called a dual-speed IT approach. The planning, development, and deployment processes associated with the overlay system bring into the CSP modern cloud-native processes.

No matter the approach taken, there is a very strong emphasis on short term results that will have a significant business impact. However, the quick-win phase also plays the important role of seeding the CSP with the new software technologies and expertise, which will later expand to become the prevailing environment. The seeding stage can often be implemented as a series of multiple projects in different selected areas of the CSP to spread these faster.

Agility Phase – overall architecture transformation

In this stage CSPs build on the technology seeding, moving on to a comprehensive transformation of their support system architecture that is fully based on cloud-native technologies. For CSPs who would skip the quick-win phase, the end-to-end transformation would be quite daunting because it necessitates considerable time and substantial investments before the benefits are visible. On the other hand, for CSPs who progressively move from quick-win phase into agility phase, the risks are better contained and the benefits can be realised relatively quicker.

For CSPs who today stand on the cusp of embarking on a digital transformation journey, the two most crucial considerations should be to ensure they define the right strategy upfront based on key architectural considerations and select the right partners for the journey.

4.2 Key architectural considerations for transformation into a DSP

A cloud-based framework of support systems is what enables CSPs to cross the ‘agility chasm’ to become true digital service providers. For CSPs planning to embark on the digitisation journey today, there are three key architectural considerations to keep in mind to ensure a comprehensive transformation of underlying legacy infrastructure over the next decade (see Figure 4).

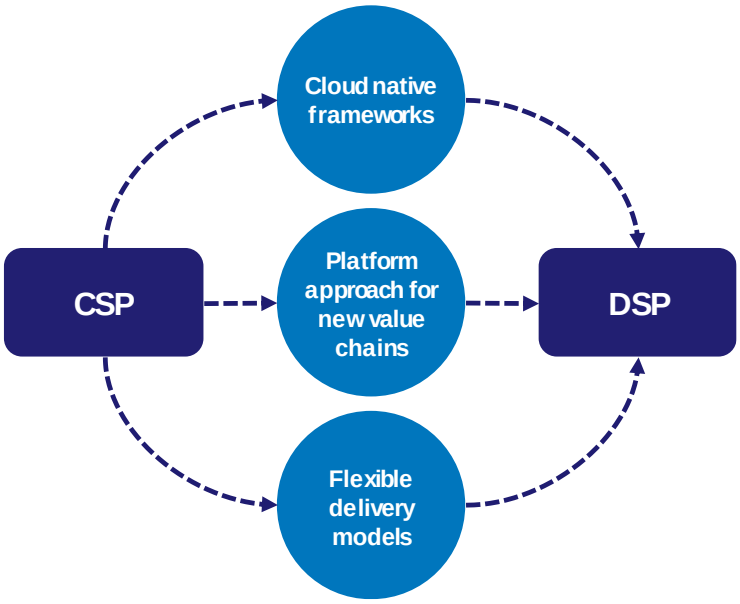

Figure 4: Key architectural considerations to transform from CSP to DSP [Source: Analysys Mason, 2018]

Cloud native frameworks

Current CSP software architecture used within B/OSS and network elements are monolithic in nature and seen as being too slow, complex and inefficient to support the rapid pace of change in the digital economy. Monolithic systems do not work well within cloud environments, which is an integral part of next generation architecture. Digital native technology companies such as Facebook, Amazon, Netflix and Google (FANG) have embraced microservices based architecture in their core operations. These are small, cloud-based, self-contained components that can be developed and launched swiftly and scaled individually. These properties, coupled with new automation tools make cloud-native software systems cheaper to deploy, immune to hardware failure, quick to bring to market and responsive to market demand.

> *"As our network services progress to become more and more cloud native, they will come onto our new operations platform and we'll turn down our old OSS."- Tier 1 North American operator*

CSPs need to move to a microservices-based software architecture. They should identify and select partners who have expertise and experience in developing cloud-native applications and in transitioning legacy frameworks to a modern architecture model. This is a critical step as the selection of a technology partner is one of the most important factors that will determine the pace of progress and overall success of the transformation.

Supporting new value chains (platform approach)

In the past, CSPs were the controllers and gatekeepers for all types of partner services used in their own infrastructure. Digital economy initiatives have upended this model and evened out the playing field, with CSPs having limited control over alternative services offered by OTT providers (often over CSP-owned infrastructure). CSPs need to develop capability to support new value chains (see Figure 5), to improve customer engagement and to build a thriving ecosystem of services around their key offerings to both consumer and enterprise customers.

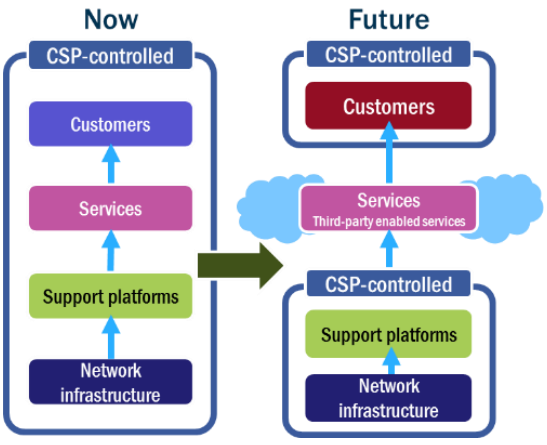

Figure 5: Evolution of CSP value chain [Source: Analysys Mason, 2018]

The capability of supporting multi-step value chains allows CSPs to expand their coverage and revenue streams well beyond connectivity services. CSPs are often constrained in how well they monetise their large customer bases because of system level limitations that restrict their role as a reseller or enabler of new services. In the light of declining revenue growth and margins, building such capability can drive significant ancillary revenue for CSPs. More importantly, this approach will help to create a thriving ecosystem around CSPs' core services, which will improve loyalty and lifetime value of their customer bases.

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Flexible delivery models

As digital transformation gets underway at many CSPs, the delivery models employed to provide support services are receiving closer scrutiny. Of particular interest to CSPs is the support infrastructure adopted by web-scale companies, which have been able to successfully mix agility, scale and performance.

CSPs are increasingly keen to shift to an online support framework to improve the agility and perceived quality of service. In order to adopt cloud native models of application development, it is essential for CSPs to embrace modern software development and deployment methodologies such as DevOps and Continuous Integration/ Continuous Delivery (CI/CD).

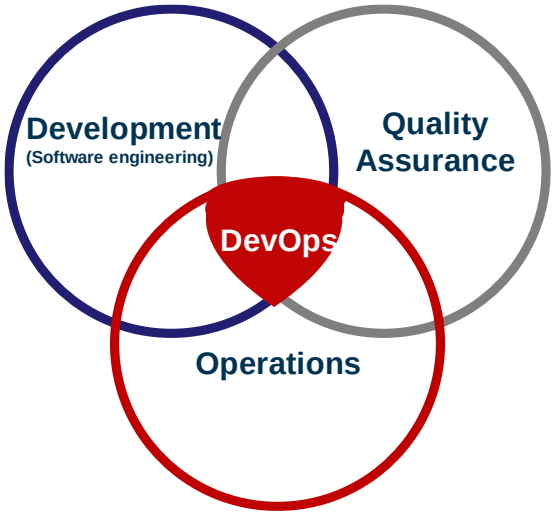

Figure 6: Overview of DevOps [Source: Analysys Mason, 2018]

Most CSPs today have separate teams for software development and operations. These teams are often disjointed with limited flow of information between them. Modern cloud-based architecture frameworks demand a much more cohesive methodology for development and deployment of software systems. DevOps and CI/CD are essentials of modern software delivery mechanisms which allow for extensive collaboration of development and operations teams and provide support for extreme automation. For CSPs without extensive experience, a vendor or systems integration partner can supply the needed expertise in these new technologies.

5. Conclusions and recommendations

The question surrounding digitalisation of operations, both business and network, is not an "if question," but a "how question." The approaches and technologies have been created and successfully implemented in web-scale companies. To compete successfully in the next decade demands that, *in the short term*, CSPs:

- Assess their current situation against an articulated target vision,
- Create valuable short-term projects that seed their BSS and OSS architecture with the new software technologies and processes that they will later grow to digitalize their operations,
- For those CSPs not wanting to go it alone, they should work with a trusted advisor with a proven Agile Transformation Framework to plan their business and network operational journey towards greater agility and lower cost.

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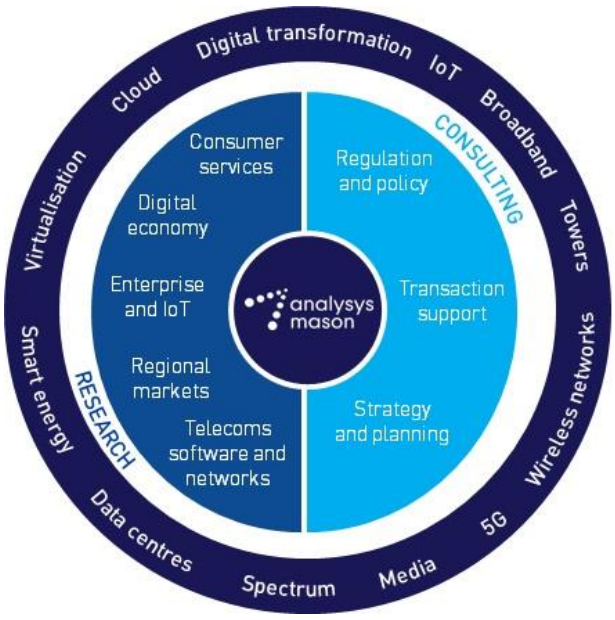

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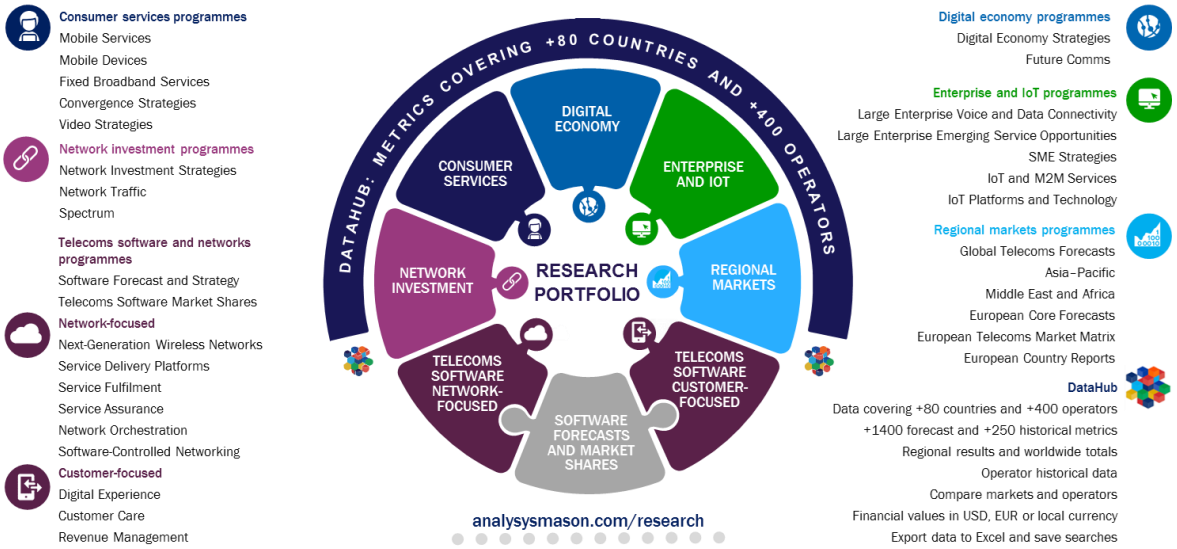

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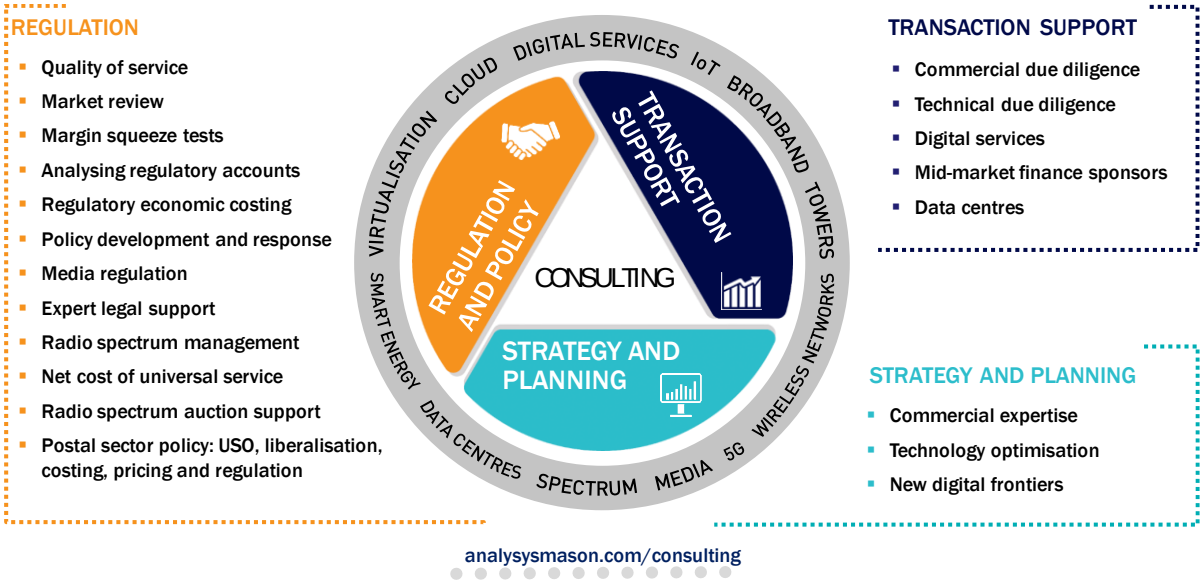

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