



White paper

Delivering superior customer experiences in the 5G era: three key assurance cornerstones

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1. Executive summary

The extremely high competition in the mature telecommunications market, coupled with an intensifying race to launch 5G, means that communications service providers (CSPs) must increase their focus on delivering superior customer experiences in order to gain competitive differentiation, retain existing business and win new customers. A study by Analysys Mason showed that CSPs had very similar Net Promoter Scores (NPSs) to players in the highly commoditised utilities and transport industries. This is not a good sign for CSPs that want to be perceived as digital service providers and compete against digital-native web-scale companies. CSPs must at least match the level of customer experience provided by these web-scale players in order to increase their chances of improving their NPS.

CSPs must recalibrate their customer experience strategies to tackle the increasing network complexity as they embark on various network transformation initiatives such as network function virtualisation (NFV), software-defined networking (SDN) and 5G. This complexity will be further compounded by consumers' growing expectations for real-time on-demand experiences. The digital services that CSPs hope to offer to consumers and businesses will also introduce another level of complexity. It is vital that CSPs implement the following three assurance strategies in order to continue to deliver a superior customer experience and to improve their NPS (even as they execute new strategic initiatives).

- Evolve the network operations centre (NOC) into a service operations centre (SOC) or develop a standalone SOC to gain end-to-end visibility of the customer experience and the underlying network performance, and abstract network and service complexity.
- Implement machine learning and artificial intelligence (ML/AI) where applicable to develop algorithms for pattern recognition, anomaly detection and the prediction of degradations in network performance, service quality and customer experience, and to suggest resolutions days or weeks before the customer experience is affected.
- Link automated assurance systems and processes with network orchestration systems to drive closed-loop automation.

These cornerstones will become even more important in the 5G era, in which CSPs will increasingly make use of virtualisation, cloud, edge computing and network slicing. To achieve a superior level of customer experience, network and service assurance must take a dominant role in CSPs' strategies. CSPs must use a multitude of data sources across the network, enhance their end-to-end view in the SOC and empower automated assurance with real-time capabilities by incorporating ML/AI solutions.

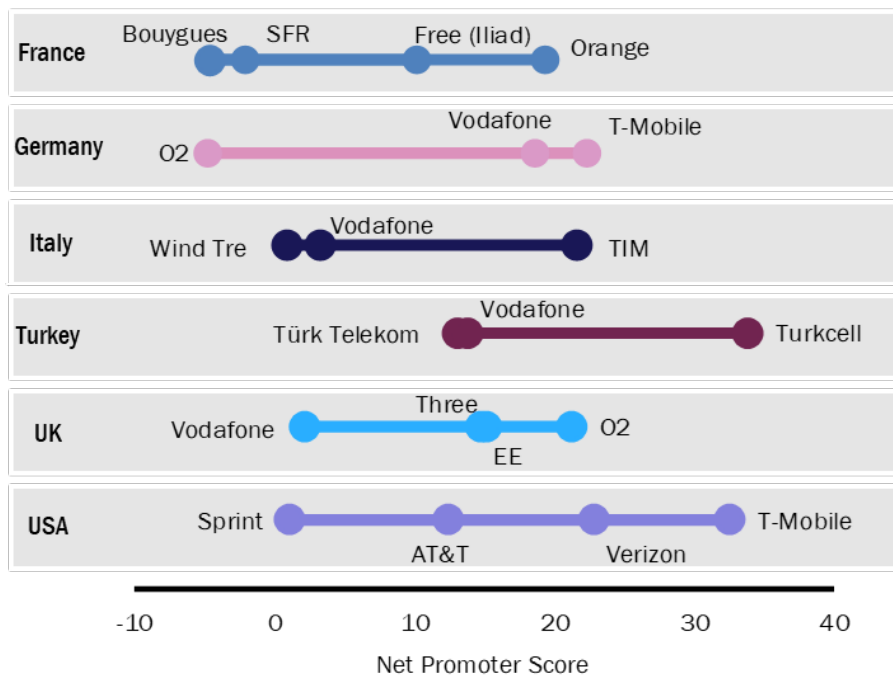
2. Assurance needs to be at the heart of CSPs’ customer experience strategy amid increasing network complexity

2.1 CSPs that wish to launch digital services face fierce competition from companies known for their superior customer experience

Customers’ expectations regarding their experience from digital services are being framed by the superior service delivered by alternative service providers such as Amazon, Apple, Google and Netflix. Customers expect at least the same levels of customer experience from their CSPs. Therefore, the delivery of superior customer experiences is essential to CSPs’ transformation efforts and is pivotal to winning and retaining customers. Learning and applying customer experience best practice from web-scale players will be key for the realisation of CSPs’ ambitions to succeed as digital service providers.

However, current market evidence suggests that most CSPs have similar NPSs to transport or utilities providers. Analysys Mason’s *Connected Consumer Survey* tracks CSP customer satisfaction in terms of NPS (an industry standard metric for customer satisfaction). The 2018 survey results¹ show that CSPs in Europe and the USA had NPSs between –5 and 40 (Figure 1); web-scale players typically score 50 or above.² Furthermore, the results from the UK Customer Satisfaction Index 2017 show that an NPS of 50 is the threshold at which customers are willing to spend more because they know that they will receive excellent service.³

Figure 1: Net Promoter Score for selected mobile service providers, by country, Europe and the USA, 2018



Source: Analysys Mason, 2019

¹ For more information, see Analysys Mason’s *Connected Consumer Survey 2018: mobile customer satisfaction in Europe and the USA*.

² As reported by CustomerGauge in June 2019.

³ The Institute of Customer Service (2017), *UK Customer Satisfaction Index 2017*. Available at <https://www.cambridge-water.co.uk/media/2228/appendix-a43-uk-customer-satisfaction-index-report.pdf>.

The *Connected Consumer Survey* also revealed that network service quality (in terms of coverage and speed) was the second-strongest factor affecting CSPs' NPSs, after customer service. This was more important than other factors considered in the survey including price, data allowance and voice quality. Customer satisfaction with network service quality was also strongly linked with a lower likelihood to churn. For example, O2 in the UK and T-Mobile in Germany had the highest NPS in their respective countries (Figure 1), and customers of these CSPs also had the highest level of satisfaction with their network service quality. Similarly, the survey showed that customers received poor network coverage and speed from Wind Tre in Italy, Türk Telekom in Turkey and Sprint in the USA, and these CSPs all have the lowest NPSs in their respective countries.

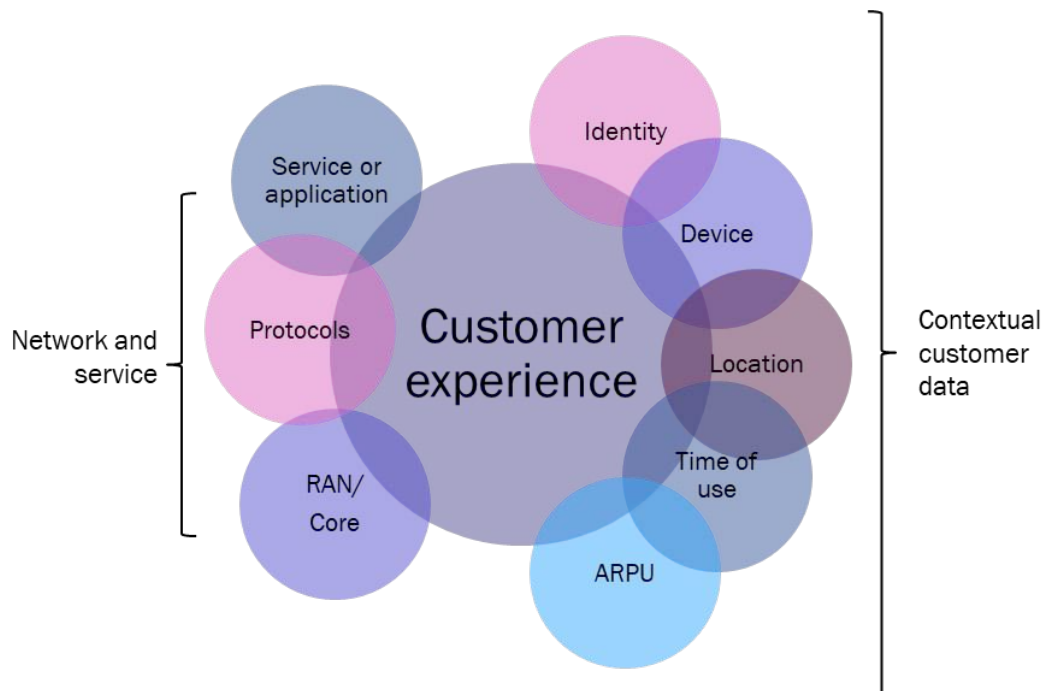
These results demonstrate that customer experience depends on a range of factors, and the overall customer satisfaction will result from an interplay of different components.

2.2 CSPs must offer superior customer experience in order to differentiate themselves as digital service providers

Traditional connectivity services have become commoditised, and the fierce competition between CSPs has resulted in limited variation in the services, promotions and discounts that are offered. CSPs therefore need innovative ways to differentiate themselves. One approach is to deliver a superior customer experience, much like the web-scale players. A superior customer experience will be essential, not only to change customers' perception of CSPs, but also for the success of new digital services and business models.

Assurance systems and processes must be at the heart of any CSP's customer experience strategy. Assurance systems provide visibility of the network and the services that are delivered over the network, which is key to developing an end-to-end view of the customer experience. Figure 2 depicts a multi-faceted view of the customer experience, including the network and service functions and additional contextual customer data.

Figure 2: A multi-faceted view of the customer experience

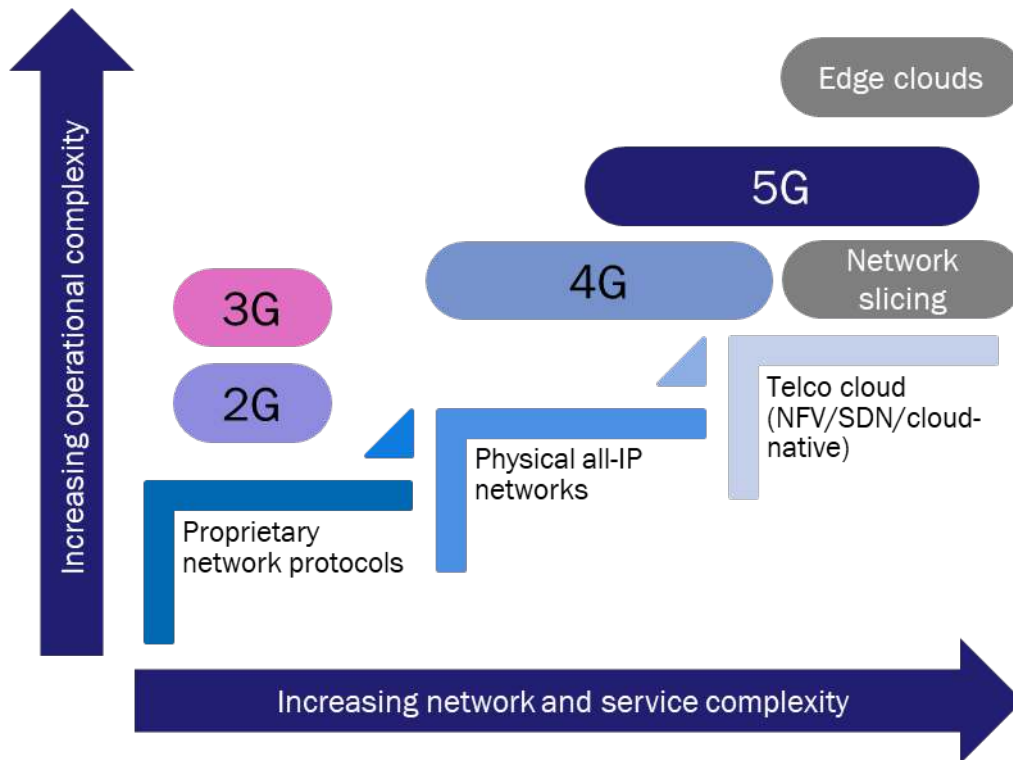


Source: Analysys Mason, 2019

2.3 Assurance will be the key to delivering superior experience in the face of rapidly increasing network complexity

Legacy networks used proprietary network protocols which meant that the service quality was closely tied to the performance of the network over which communications services were delivered. However, with the emergence of all-IP networks, multiple services and connections are now delivered on a best-effort basis, so the service quality is no longer solely based on the basic network performance. This will continue to change as networks move to NFV, SDN and cloud-native architecture where networking resources are programmatically altered and allocated based on service demands. Figure 3 shows the increasing operational complexity as operators develop more-advanced networks and promote digital services.

Figure 3: The interplay of operations complexity and network and service complexity



Source: Analysys Mason, 2019

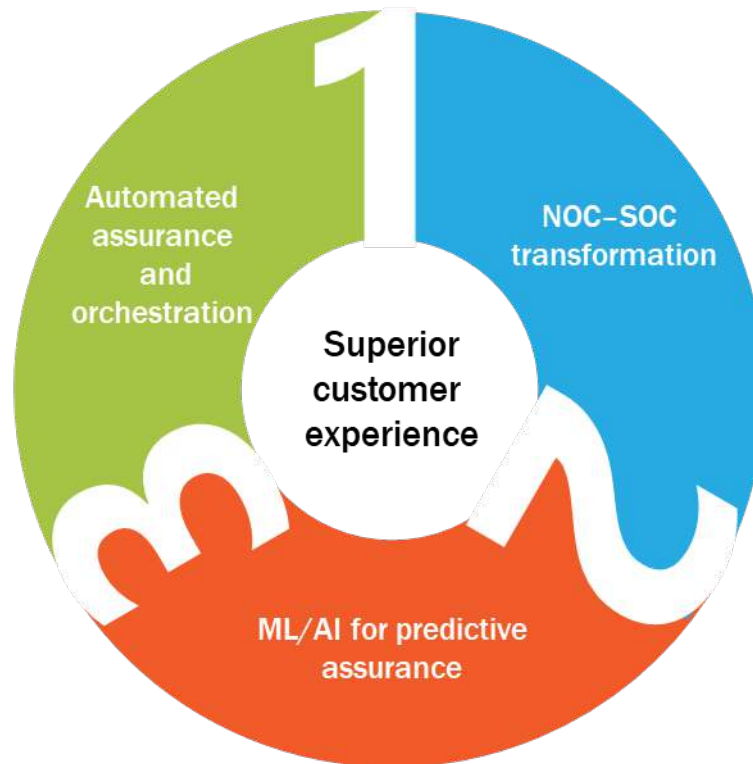
CSPs face the risk of unintentionally relegating customer experience if they continue to focus on network virtualisation, 5G network roll-outs and the push towards digital services. Instead, CSPs can use service assurance to allow them to abstract network and operational complexity from customers and gain end-to-end visibility across network domains while still executing their strategic initiatives. A modern, unified and homogenous assurance framework allows CSPs to track, pre-empt and predict anomalies in network performance, rapidly identify service faults and assure customer experience. CSPs must take a three-pronged assurance approach to futureproof their operations and deliver a superior customer experience.

3. The three assurance cornerstones to delivering a superior customer experience

The three assurance cornerstones to delivering a superior customer experience are the following (Figure 4).

- Evolve the NOC or develop a standalone SOC to gain end-to-end visibility of the service quality and customer experience.
- Apply ML/AI to enable predictive assurance which will ultimately improve the customer experience.
- Link automated assurance functions with orchestration systems to automatically make changes to the network, thereby significantly reducing the time to resolve windows.

Figure 4: The three assurance cornerstones to delivering a superior customer experience during digital transformation



Source: Analysys Mason, 2019

The first two points enable CSPs to correlate network- and service-level data in order to understand the impact of network performance on the customer experience and to develop predictive ML/AI models to take pre-emptive action. The third ensures that the assurance and orchestration systems are suitably automated and connected so that meaningful changes can be applied based on input from the SOC and predictive assurance capabilities.

The next sections delve deeper into each cornerstone, the interplay between them and how they will become more important in delivering a superior customer experience in the 5G era.

3.1 The evolution to a SOC will be necessary to drive top-down operational processes that are focused on service quality and customer experience

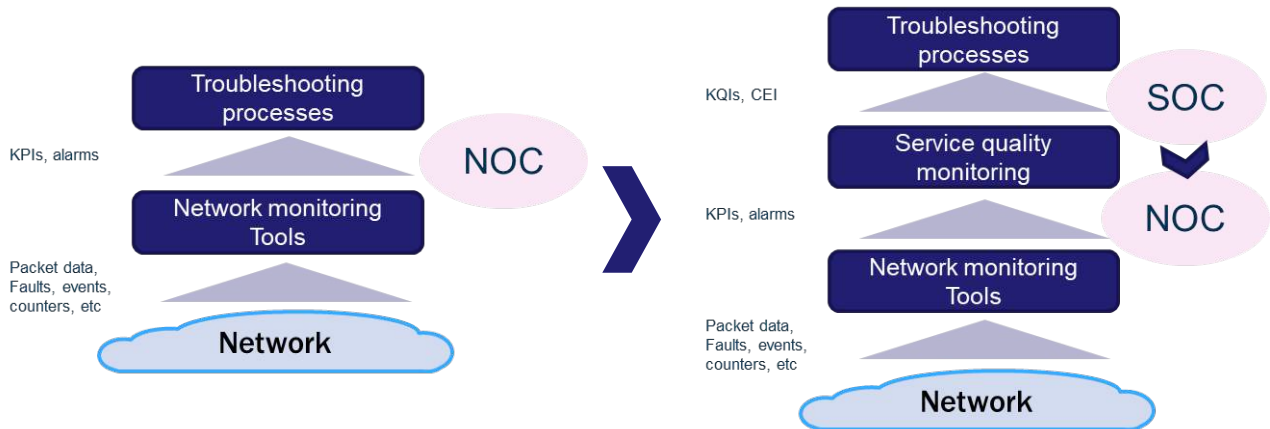
CSPs must move away from the traditional bottom-up network-oriented operations approach that focuses on resolving network issues without considering how they affect the service quality. Typically, network monitoring tools capture network data to generate key performance indicators (KPIs). When the KPIs breach predefined thresholds, troubleshooting and other operational processes are triggered in the NOC, but these are purely based on the network performance KPIs themselves.

The proposed service-oriented operations approach is based on the principle that operations must primarily focus on resolving issues that affect service quality and customer experience. As a minimum, a SOC can provide the quality status of each service, and more-advanced implementations can provide a much more granular view, giving the quality of each service on a per-customer basis. The information can be further enriched with other contextual customer data such as location and device type (see Figure 2).

The ability to prioritise troubleshooting and root-cause analysis on the network issues that most significantly affect the customer experience is at the heart of a SOC. This is achieved by:

- collating multiple data sources from the network using a combination of network analytics and service quality monitoring tools in order to generate service quality KPIs
- using the most-accurate network and service topology and predefined service models to identify service impact (that is, threshold KPI breaches)
- applying the latest customer data to generate the most-granular view of the customer experience in the form of a customer experience index (CEI)
- automatically triggering troubleshooting processes when service quality KPIs and CEIs are breached.

Figure 5: Top-down and bottom-up approaches to service assurance



Source: Analysys Mason, 2019

Figure 5 provides an overview of the evolution to a SOC, which affects a CSP’s operations organisation structure and calls for new operational skills, operating processes and systems. The SOC also acts as an intermediary function between CSP departments. It provides the necessary operational processes that are specifically designed with services and customers in mind, and aligns with customer-facing departments such as customer care and marketing. Customer care representatives can have a much richer conversation when a customer calls if they are armed with a deeper insight into the customer’s service quality, or they may even be

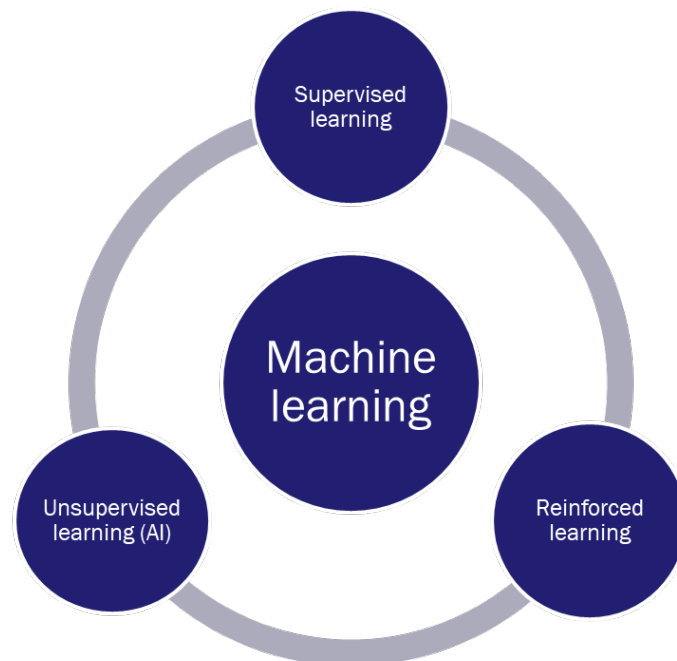
able to take proactive steps before the customer experiences a degradation in service quality. The marketing department can make well-informed and near-real-time decisions on marketing campaigns and next-best offers based on highly granular customer experience data.

3.2 ML/AI will enable real-time and predictive assurance

Over the years, NOC and SOC performance has greatly benefitted from the use of network analytics capabilities based on big data technologies. Rapidly maturing ML technologies provide an advanced level of sophistication for the generation of insights and predictions about relevant use cases. The trust in ML-driven insights is increasing, so CSPs are now preparing to implement ML at scale to drive real-time and predictive assurance.

However, the accuracy of ML-based predictions depends on two key factors: the training of ML algorithms and the training data sets used (Figure 6). ML algorithms can be trained (supervised learning) to recognise anomalies and patterns and to recommend actions for resolutions using large sets of historical network data. A feedback loop can be used to further tune the algorithms in order to increase the accuracy of the predictions and recommendations over time (reinforced learning). Many network operators ultimately aspire to master unsupervised learning (AI) in order to achieve the vision of zero-touch networks and operations. In unsupervised learning, the algorithms have not had prior training on how to classify or label patterns, but instead employ grouping or clustering techniques to organise the data in order to understand potential structures and patterns before predicting outcomes.

Figure 6: Three training approaches to machine learning



Source: Analysys Mason, 2019

ML algorithms can be applied to identify network issues and anomalies by monitoring network data. As CSPs' application of ML improves, the technology will ultimately become capable of identifying the circumstances that may eventually lead to service degradation. This will enable predictive assurance capabilities, where the CSP can identify an emerging anomaly and then plan and deploy a remedy days or weeks in advance of any impact on the customer experience. As trust continues to develop, predictive ML- and AI-based assurance will

become capable of initiating proactive remedies automatically as soon as an anomaly, or an emerging anomaly, is detected and specific KPIs are breached.

ML techniques can be used to gain visibility into encrypted network traffic. Understanding the user plane traffic is becoming increasingly important for CSPs as they look to provide better mobile broadband experiences, to transition to being digital service providers and to offer more-digital content and services. CSPs are better-placed to design and optimise their networks if they can identify what types of applications their subscribers are using. However, this is not straightforward, as more user plane traffic is becoming encrypted. Heuristic methods have been used in the past for this purpose, and complementing these with ML and AI technologies will enable CSPs to not only do a much better job, but also to prepare for emerging use cases around 5G video/AR/VR and ultra-low latency IoT.

3.3 Operations automation will enhance the customer experience through real-time interactions

CSPs must rethink how their customers purchase, consume and engage with their services when considering how to deliver a superior customer experience. It is in this context that real-time, on-demand interactions will be critical. Network virtualisation will allow CSPs to control digital service lifecycles and customer engagement almost entirely on-demand and in real time. However, to realise this vision, CSPs must rethink the way in which they approach operations, and must move from manual operations to automated operations.

A clear link between virtualised networks and operations is essential if CSPs plan to take advantage of ML-driven real-time and predictive assurance capabilities. ML algorithms can detect and propose resolutions for network issues that affect customer experience, and these resolutions must be implemented back into the network via orchestration and configuration management systems. Automated operations may then close the loop by feeding data relating to the proposed remedy and the results back into the algorithms, thereby further improving their accuracy.

In order to achieve this, the assurance functions must be joined with the network orchestration systems to drive meaningful changes in the network that will improve the customer experience.

3.4 These cornerstones will become more important in the 5G era

The 5G era has begun. Leading CSPs worldwide such as AT&T, EE and Verizon launched 5G services in 2018 and 2019. Advanced 5G networks will depend on emerging networking innovations such as NFV, cloud-native computing (CNC), SDN, service-based architecture (SBA), edge computing and network slicing more than previous network generations did. These innovations will compound the complexity of networks and operations, thereby making the three assurance cornerstones more important in the 5G era.

The adoption of these new innovations early in the 5G deployment schedule gives CSPs the opportunity to revise their approaches to assurance. Traditionally, assurance was considered towards the end of the investment cycle when rolling out new networks and services, meaning that its ability to drive meaningful changes in the network without significant upgrades later was limited. In contrast, for 5G roll-outs, CSPs must plan and design assurance at a much earlier stage to enable automated network and service lifecycle management within the SOC. Assurance functions will be distributed within 5G networks and will use cloud and network resources to dynamically monitor services. They will then be required to use ML techniques extensively to predict network and service quality issues. Assurance-led operations automation will be critical to deliver on-demand real-time experiences to customers in the 5G era.

“More intelligence built in to the 5G system will allow for a shift from managing networks to managing services. Intelligent functions can be customised for each of these services allowing them to operate more resiliently and securely, taking the mobile network to a new level of innovation for the benefit of industry and society.”

Source: Ericsson, 2018⁴

4. Conclusion and recommendations

CSPs must not lose sight of the importance of delivering superior customer experiences as they introduce new networking and cloud technologies such as NFV, SDN and edge computing, and embark on the 5G journey. Currently, CSPs perform at broadly the same levels as utilities providers (in terms of NPS), but they should be aiming to deliver customer experiences that are at least on-par those from web-scale digital service providers.

CSPs must deploy new-age assurance systems and processes to abstract the network and service complexity in the 5G era in order to gain end-to-end visibility of network and service quality, and directly tie it to the customer experience. CSPs must identify and prioritise those network performance and service quality issues that affect the customer experience the most. As part of this strategy, CSPs must make automated assurance a critical component of their customer experience assurance and should focus on three key cornerstones to continue delivering superior customer experiences, even as they execute network transformation and 5G strategies.

In summary, the three key cornerstones to delivering superior customer experiences are the following.

- Evolve the NOC or develop a standalone SOC to gain end-to-end visibility of the service quality and customer experience.
- Apply ML/AI to enable predictive assurance which will ultimately improve the customer experience.
- Link automated assurance functions with orchestration systems to automatically make changes to the network, thereby significantly reducing the time to resolve windows.

⁴ Ericsson (2018), *Artificial intelligence and machine learning in next-generation systems*. Available at <https://www.ericsson.com/en/white-papers/machine-intelligence>.

5. About the author



Anil Rao (Principal Analyst) is the lead analyst for Analysys Mason’s Automated Assurance and Service Design and Orchestration research programmes, covering a broad range of topics on the existing and new-age operational systems that will power operators’ digital transformations. His main areas of focus include service creation, provisioning and service operations in NFV/SDN-based networks, 5G, IoT and edge clouds; the use of analytics, ML and AI to increase operations efficiency and agility; and the broader imperatives around operations automation and zero touch networks. In addition to producing both quantitative and qualitative research for both programmes, Anil also works with clients on a range of consulting engagements such as strategy assessment and advisory, market sizing, competitive analysis and market positioning, and marketing support through thought leadership collateral. Anil is also a frequent speaker and chair at industry events, and holds a BEng in Computer Science from the University of Mysore and an MBA from Lancaster University Management School, UK.

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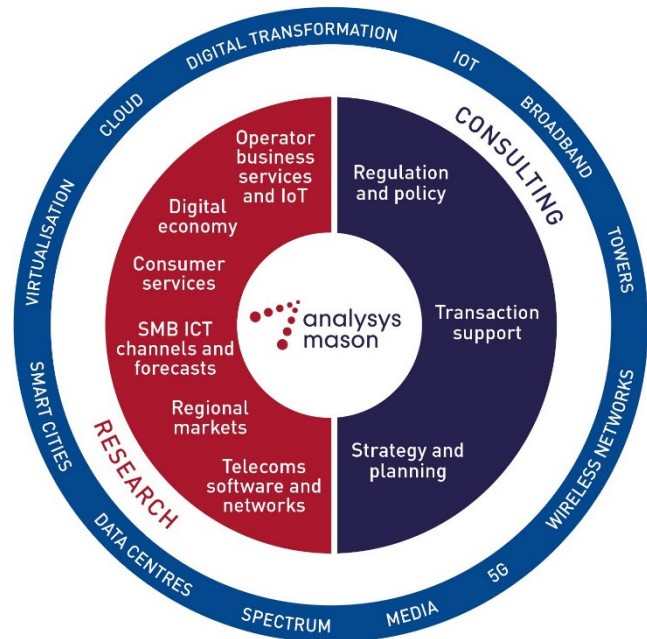
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