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The Imperative of Customer-Centric Operations

An Operational Practice prepared for SCTE/ISBE by

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Table of Contents

List of Figures

List of Tables

Executive Summary

Customer satisfaction drives better performance in the market and increased company value. Unfortunately, as is evident from lagging NPS scores, traditional service providers including MSOs have not performed as well as other industries despite allocating a proportionally much larger share of human resources in customer care. In contrast, web scale providers allocate very limited human resources for customer care, but have much stronger customer intimacy.

To make matters more challenging, customer preferences are evolving rapidly. Access to content is being diversified away from a single static subscription service delivery toward more granular consumption. Consumers and enterprises are demanding a more transactional model for personalized, context aware services that adapt rapidly to changes in need or demand.

To meet these current and evolving challenges, MSOs must transform to a customer centric operations. The paradigm shifts from managing a network to delivering a service that delights the customer. Service customization, user control of their services and automatic adaptation of service delivery are the new requirements for operations. In this model of operations with capability to take autonomous actions, it is critical to define the optimum level of human responsibilities and the insights that they need to perform their functions.

This paper presents four core principles of future operations: customer-centric automation, hyper-scale analytics, an open and programmable architecture, and cognitive awareness.

While MSOs have moved aggressively towards automation of the manual operational functions, **customer centric automation** will enable MSOs to assure and fulfill dynamic services that adapt to changes in network state and customer demand. Deploying **hyper-scale analytics** at the edge and across all business functions helps to predict, minimize and potentially prevent customer impact due to network outages as well as to rapidly isolate root causes.

MSOs have started partnering with each other to deploy services across their footprints. Adopting an **open and programmable architecture** with API exposure to 3rd parties will accelerate deployment and reduce costs for such future services. **Cognitive awareness** and self-learning capabilities in the network enable delivering a personalized service to customers by learning from their past usage of service and their current context (in transit, location, home/business/school, etc.). Autonomous, dynamic actions based on the state of demand and resources will prevent customers from being impacted from network and service issues and address demand surges faster than humanly possible.

This new operating model should either be neutral or reduce operational costs for the MSOs. We expect mean time to restore service and service cycle time will be less than 5 minutes compared to multiple hours or days. Today the goal for network availability is typically 99.999%. With the adoption of this architecture, the goal is to deliver services that are available all the time. From a customer perspective, we should aim to have at least 60% of services be fully customizable, and at least 80% of interactions should be done through self-care. No Faults Found truck rolls will be minimized to less than 5% because analytics will identify root cause before the truck rolls are launched.

These benefits are achievable, but MSOs need to transform and make foundational changes. On the people side, MSO's need higher skilled roles with data sciences and software automation skills. Processes need to be updated so that they drive standardization and enable automation. Data will need to

become available freely across all business silos. Tickets and workflows management will need improved discipline so that correct data is entered consistently and these artifacts can be used across the organizational silos for training cognitive platforms.

1. Introduction

Across all industries, customer satisfaction is a key parameter for achieving success in the market place. **Figure *1*** shows the performance of an actively managed portfolio of companies with the highest ACSI (American Customer Satisfaction Index, n.d.) scores for long positions and lowest ACSI scores for short positions. The financial impact of high customer satisfaction is dramatic.

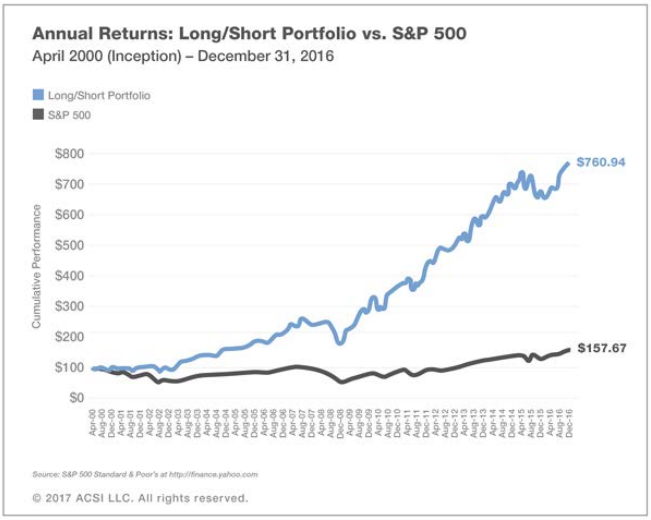

Figure 1 - Impact of Customer Satisfaction on Market Performance

This is a clear indication that customer satisfaction defines success in the market place. Typically, the measure of customer satisfaction has been Net Promoter Scores (NPS). Bell Labs Consulting performed an analysis of several industries comparing NPS with human resources investments in customer care. (Weldon, 2015)

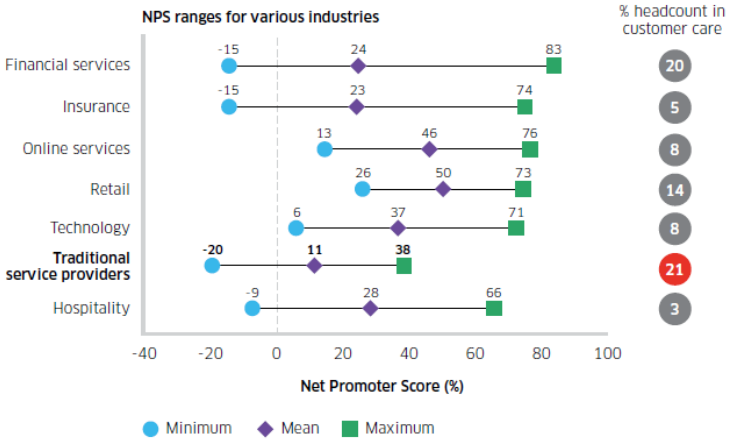

Figure 2 - NPS comparison

Traditional service providers (including MSOs) invest proportionally more in customer care, however their NPS scores lag significantly behind other industries (Figure 2). Compare this with web scale companies who allocate minimal human resources to customer care, but have much stronger relationships with their end customer. Now, we can argue that MSOs have taken a tremendous amount of effort over the past few years to improve customer satisfaction. In addition, with the adoption of new cloud-based services and adoption of DevOps, MSOs have become agile and flexible in deploying new services. However, a linear path of evolution will not deliver the quantum leap in customer satisfaction that we desire. MSOs must transform their operations to meet the following key requirements:

- Offer customizable, dynamic services which can be consumed when and where desired
- Enable partner MSO services rapidly across their footprints
- Give customers increased control to meet their service needs
- Predict changes in network state, impact to service quality and prevent negative customer impact
- Adapt services to customer demand
- Personalize service delivery to customer context

In this paper, we will cover the principles of the future customer centric operations that will meet these requirements and enable achieving the goal of delivering services that delight the customers.

2. Principles of the future customer centric operations

The four principles of the future customer centric operations are:

1. **Customer-centric automation** for fast and frequent adaptation of services to customer needs
2. **Hyper-scale analytics** to predict, isolate and remedy customer-impacting degradations
3. **Open and programmable architecture** for personalization and interoperability of services
4. **Cognitive awareness** for optimization of services within multiple dimensions of context

2.1. Customer-Centric Automation

As networks and services become increasingly complex the ability for humans to efficiently operate them decreases dramatically. Many operations processes can be automated but the most important are the ones that directly impact the customer experience. This "customer-centric" automation of assurance and fulfillment activities ensures customers can get what they want and the quality they expect.

In the future, services from traditional MSOs and telecommunication companies will be expected to adapt dynamically to changing demand and underlying conditions like network state. Web scale companies do this adaptation today to their services. Degradations to service quality or threats to quality will drive preventive actions to optimize and prioritize network and service resources. The adaptation will occur automatically, thus reducing the need for the customer to call in to the provider.

Customers will request additions or changes to their services through omnichannel options, e.g., apps, web sites, text and Twitter messages. Automated fulfillment and service orchestration with zero touch provisioning will reduce that average service cycle time to meet their requests from days to minutes.

Table 1 - Metrics Impact of Customer-Centric Automation

Metric	Today	Future
Service Cycle Time	6-10 days	< 3 minutes
Mean Time to Restore (Sev 1, 2 w/o construction)	1-4 hours	< 1 minute
Average Handle Time	~5 minutes	Replaced by Self Care
Service Quality Indicators	Not consistent	> Business Goals
Self Service Effectiveness	Not measured	> 90%

2.2. Hyper-Scale Analytics

MSOs are starting to deploy use cases for analytics, with focus on getting additional insights from their network or the customer experience. With hyper scale analytics, MSOs will deploy analytic capabilities across the entire edge and core network and spread through the entire operations. The data lake has multiple sources like element management systems (EMS), customer premise equipment logs, network operations tickets, customer care tickets and workflows, billing systems, marketing intelligence and others.

Hyper-scale analytics will analyze event streams from multiple sources to detect changes from normal behavior caused either due to state change in the network or fluctuations in customer demand. It identifies potential reasons for the abnormality and suggests possible resolutions. In case of impairments that cannot be recovered automatically, like fiber cuts or incidents at single point of failures, analytics isolates the

root cause and provides an estimate of the customer impact. This will enable MSO operations to prioritize recovery actions.

Implementation of analytics can have a significant impact on MSO operational performance especially on customer impact time. However, to implement network analytics, MSOs need to improve the accuracy of their network state. Table 2 identifies the key metrics that measure the effectiveness of analytics adoption.

Table 2 - Metrics improved by hyperscale analytics

Metric	Today	Future
Customer Impact Time	Not measured	< 3 minutes
Service adaptation latency	Not existent	< 1 minute
Network state accuracy	50-60%	> 99.9 %

2.3. Open and Programmable Architecture

Our networks need to become open and programmable so that our customers and MSO partners can easily provision, deploy and adapt their services without any human intervention. We envision that in the future, MSOs will collaborate heavily to deploy common services across each other's foot prints. This is feasible only by providing a rich and updated framework of network APIs for easy integration and provisioning of services. For consumers and enterprise customers, self-service portals provide similar self-serve functions albeit with an easy user interface of web portals or mobile apps. The open and programmable architecture will also enable partners and customers to update and adapt their services in an automated fashion.

These actions will realize operational cost savings and will be a tremendous asset to improve customer satisfaction. In addition, easy, do-it-yourself capabilities for service chaining will allow customers to develop their personalized bundle of services, often resulting in an upsell of services.

As MSOs move towards programmable networks, the key metrics that should be measured and improved are in the table below.

Table 3 - Metrics for open and programmable architecture

Metric	Today	Future
% Customizable services	Very few	> 60%
Mean time to update 3rd party service	N/A	<2 hours

2.4. Cognitive Awareness

Self-learning capabilities will become increasingly important as network operations become more autonomous. As an example, when faced with a network impairment, the new operational model will first try to autonomously correct the issue or mitigate the impact. If that fails, then the service operations center is presented with the impairment along with the customer impact and prioritized mitigations or resolutions. Once the human decides and acts to successfully resolve the impairment, the self-learning

algorithms update to include the resolution in their repertoire. This concept, called augmented intelligence will allow humans to focus on higher value tasks of continuous improvements and policy management, and machines take care of mundane tasks. The other use examples for cognitive awareness include personalization of service by self-learning of customer context, service usage and dynamic service adaptation based on current and historical data.

The metrics that will be impacted by cognitive awareness are shown in Table 4.

Table 4 - Metrics for Cognitive awareness

Metric	Today	Future
Network and Service availability	99.999%	100%
% incidents self-healed	Not measured	> 99%
Service adaptation rate	N/A	< 30 sec
Contextual Offer acceptance rate	N/A	>30%

3. Future vision of customer centric operations

The future vision of the new operating model aligned with these principles is shown in **Error! Reference source not found.**.

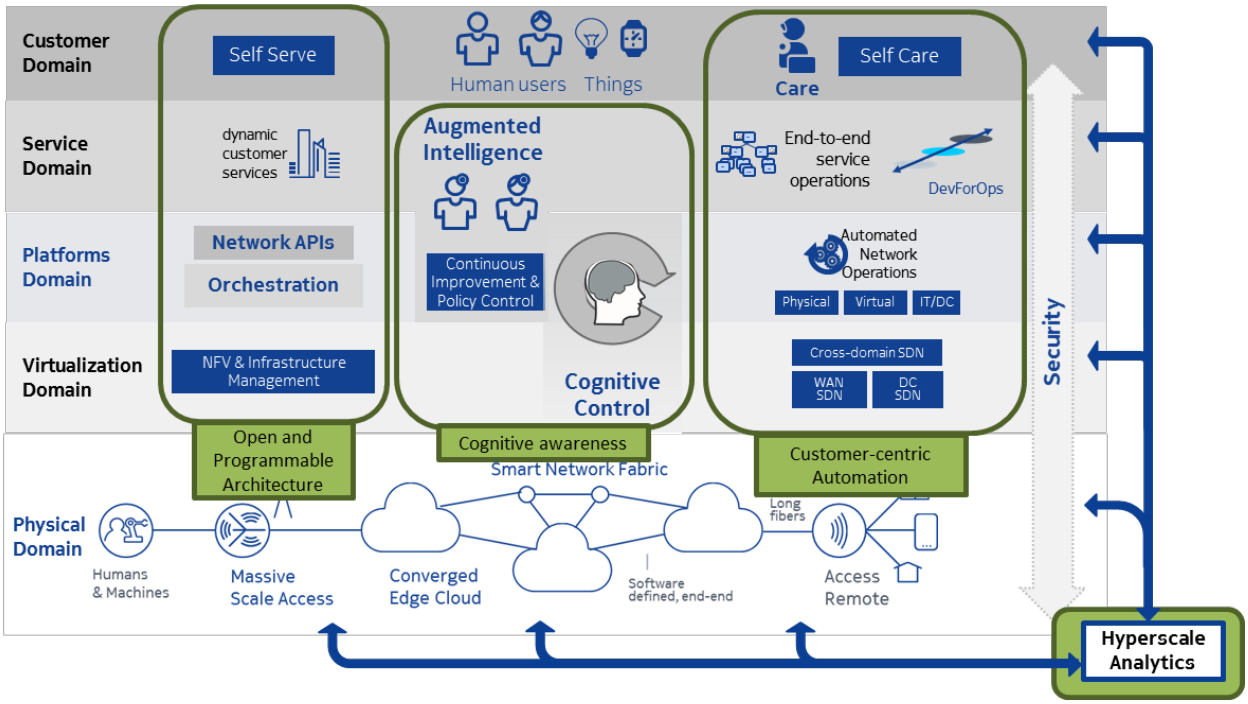

Figure 3 - Future customer centric operating mode

The physical domain incorporates the traditional "network". This is the domain that has traditionally been managed by network operations. The physical domain includes hardware assets for both the physical and virtual network components.

The domain of virtualization includes capabilities that enable cloud based services. This architecture does not differentiate between OpenStack versus integrated solutions and applies equally to both solutions.

The platform domain provides the "programmable" capabilities that are crucial to service adaptation. It includes rapid and dynamic orchestration of resources as well as access to the state of the network. This domain provides API exposure capabilities that can be exploited for deploying customizable services, both by consumers, enterprises as well as partner MSOs.

We have traditionally operated networks by managing individual network elements. However, as we move towards cloud-based dynamic services, it is paramount that we manage end-to-end services to ensure quality of experience to the user. The service domain orchestrates service delivery and assurance using dynamic service models that deterministically measure quality of experience. DevForOps (Weldon, 2015) is the agile methodology used for rapidly deploying customer services in partnership with MSOs vendors.

The customer domain provides increasing levels of self service and self-care to give customers control over their services in an omnichannel environment.

While a lot of the normal events should be handled autonomously without minimal human intervention, the system provides humans augmented intelligence that enables them to manage policies and continuous improvements.

This operating model impacts all facets of operations, some of which are covered in section **Error! Reference source not found.**.

4. Key steps to transform to the future customer centric operations

The adoption of customer-centric operations requires an evolution of the operating model in all 4P's: People, Process, Platforms, and Performance.

Transformation first starts with people. The change is best achieved by staff who embrace innovative disruption and with data science, automation and software skills. The implementation of analytics requires a huge culture shift in operations towards a data driven culture that can trust data available to it and use it as a tool for improvement.

Services will be designed to be inherently flexible in nature. A potential option is to design base services with options that can be programmed either through APIs or customized through service. Designs will need to change to deploy services that look and feel the same to the end user, but are available to them ubiquitously- on and off MSOs foot print, and with local customizations. The service design needs to

adapt dynamically to feedback from the network that indicates any changes in how the services are being delivered or consumed.

Processes must focus on continuity of service management and agile DevForOps delivery. Before the cognitive capabilities are deployed, it is critical that MSOs test operational readiness to prevent unexpected outcomes. Current operational processes like configuration management, inventory management, capacity planning need to be redefined with abstraction of resource, service and product layers and standardized across the MSO.

The top priorities for platforms includes enriched self-service portals, omnichannel workflows and self-learning automated capabilities in every business function. Analytics need to be included as a key requirement in service design, rather than bolted in during subsequent lifecycle stages. Data needs to be universally accessible within the MSOs environment across organizational boundaries and with adherence to high security standards.

In today's operations, we often run into examples where data is either not accurate or not freely available across organizational barriers. Analytics works best when the data provides a full perspective of operations This means that data from marketing, network, customer care and operations needs to be available freely to the analytic use cases. Any organizational silos that prevent this from happening need to be understood and resolved with optimum solutions that adhere to regulatory considerations.

Present ticketing systems and workflow tools work inconsistently across organizational boundaries. There are examples where short cuts are taken such as tickets may not have the right data describing the impairment or may be closed with incorrect resolution codes. In many cases, care metrics have huge, unexplainable discrepancies in Average Handle Time and First Call Resolution. Agents in care, NOC and dispatch organizations need to be trained to be consistent and disciplined in entering information in tickets and using workflows. The metrics and data entered in these systems will be used for training self-learning, cognitive platforms. Hence emphasis should be to have accurate information in these artifacts to prevent "garbage in, garbage out".

We expect that MSOs will need additional investments in the transformation program to a customer centric operating model. However, these investments will quickly realize business value. *The use of automation, self-learning and analytics will reduce time spent by humans in these activities and improve customer satisfaction which is a direct barometer of market value.*

5. Use case - Future SD-WAN service

The Software-defined wide area network (SD-WAN) service is a popular early MSO offering to enterprise customers. From an operational cost, flexibility and customer experience perspective, these services are a huge upgrade over the traditional WAN services. A customer-centric architecture enables more advanced SD-WAN services. The future operations enable these services to become dynamic and rapidly adaptable. An example of this behavior is shown in **Figure *4***.

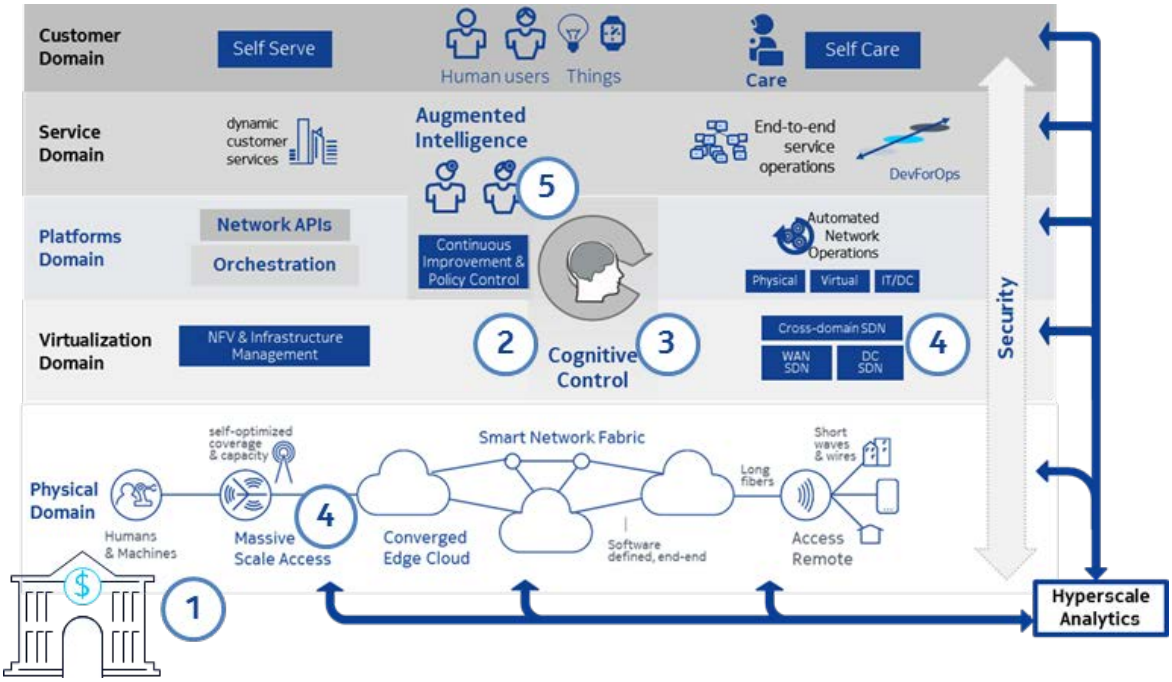

Figure 4 - Dynamic fulfillment of SD WAN

With the principles of customer-centric operations, a peak requirements event can be addressed proactively:

1. **Detect** recurring patterns of higher bandwidth and QoS demands at an enterprise site through analytics
2. **Correlate** increased bandwidth and QoS needs with the underlying enterprise application
3. **Determine** the optimum resource allocation within current SD-WAN service policy to deliver the required bandwidth and QoS
4. **Orchestrate** just-in-time required bandwidth and QoS at target site
5. **Self-learn** from customer behavior to suggest new rule-based policy for SD-WAN service considering customer applications and target sites

The four key principles of the new operating model collaborate to detect changes in customer behavior, automatically deploy needed resources and prevent customer impact.

All these dynamic changes are done autonomously and governed by business policies that are currently in place with the enterprise customer. However, the customer centric operation signals humans that a change of business policies might be needed over time, especially as it learns more about the customer behavior.

6. The future starts now

This paper integrates many capabilities into a cohesive architecture aligned around the four principles. But these capabilities are already being used in many instances either within MSOs or with fixed or wireless service providers. Web-scale companies are clearly far ahead on the road to implementing these capabilities.

It isn't hard to find leading service providers adopting these principles to meet their business challenges and opportunities. Telefonica is combining customer-centric automation of network management with AI capabilities with the goal of averting problems before they impact customers. (Telefonica rolls out AI based network management, 2017). AT&T's Network 3.0 Indigo strategy clearly embraces the evolution to principles of hyper-scale analytics and cognitive awareness. They expect their AI systems to predict when something is about to fail and use self-learning to improve their abilities over time. (AT&T wants to use AI as a crystal-ball, 2016). AT&T envisions building closed communities for data sharing and collaboration using their Network 3.0 Indigo platform. (Data Communities on AT&T Network 3.0 Indigo, 2017) Dialog (Axiata) is exposing core assets via APIs for external consumption to create "friction-free interoperability and partnership (Dialog API case study, 2016).

7. Conclusion

Consumer expectations are changing in this rapidly evolving business environment. Web-scale companies are setting new expectations for customer self-service, rapidly adapting customer experiences, and rate of innovation. MSOs are increasingly competing with these non-traditional providers of high-speed data, video content, and voice services. Operations is a strong influencer of customer satisfaction with a service. To meet customer expectations, MSOs must invest to transform to a new customer-centric paradigm in their fulfillment and assurance operations. *The option of in-action presents higher risk, as current manual operations will not be able to sustain the burden of massive scale and customer expectations, leading to much larger business challenges.*

8. Metrics definitions

Metric	Definition
Service Cycle Time	Average time to complete a work order related to a service
Mean Time to Restore (Sev 1, 2 w/o construction)	Mean time to restore an incident (severity 1 and 2 outages only) without accounting for any construction activities
Average Handle Time	
Service Quality Indicators	Indicators related to Service quality such as voice mean opinions score (MOS) or data throughput
Customer Impact Time	Number of customers impacted multiplied by elapsed event time from detection to restore
Service adaptation latency	Elapsed time for implementing service changes and updates
Network state accuracy	Percentage incidents when errors reported by various controllers (SDN, MANO, inventory systems, etc.) during task execution
% Customizable services	Number of customizable services divided by the number of total offered services
Mean time to update 3rd party service	Mean time to update a 3rd party service
Network and Service availability	Percentage of network/service available time

% incidents self-healed	Percentage of incidents that undergo a fully automated process to restore service/functionality
Service adaptation latency	Elapsed time for implementing service changes and updates
Contextual Offer acceptance rate	Percentage of contextual offers accepted by subscribers per month

9. Abbreviations

AI	Artificial intelligence
API	Application programming interface
ASCI	American Customer Satisfaction Index
DC	Data center
DevForOps	Development for Operations
EMS	Element management system
IT	Information technology
MSO	Multiple system operator
NFV	Network function virtualization
NPS	Net promoter score
QoS	Quality of service
SD-WAN	Software-defined wide area network service
SDN	Software defined networks
WAN	Wide area network

10. Bibliography & References

American Customer Satisfaction Index. (n.d.). Retrieved from https://www.theacsi.org/national-economic-indicator/financial-indicator

AT&T wants to use AI as a crystal-ball. (2016). Retrieved from http://www.computerworld.com/article/3096986/artificial-intelligence/att-wants-to-use-ai-as-a-crystal-ball.html

Data Communities on AT&T Network 3.0 Indigo. (2017). Retrieved from The Policy Forum at AT&T: http://policyforum.att.com/wp-content/uploads/2017/03/Data-Communities-on-ATT-Network-3-Indigo.pdf

Dialog API case study. (2016). Retrieved from https://www.telco2research.com/articles/EB_Dialog-API-case-study

Telefonica rolls out AI based network management. (2017). Retrieved from http://www.computerweekly.com/news/450417040/Telefonica-rolls-out-AI-based-network-management

Weldon, M. K. (2015). *The Future X Network: A Bell Labs Perspective.* CRC Press.

