

# HOW TO LEVERAGE DATA ANALYTICS

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**HOW TO LEVERAGE  
DATA ANALYTICS**  
across the entire CSP organization

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# The big picture

*The value of data to communications service providers (CSPs) is not in question. What is unclear, however, is whether they are capable of leveraging it across the entire organization. Indeed, operators have been trying to come to grips with big data and data analytics for the last decade, and lack of a cohesive strategy is arguably the biggest obstacle to them becoming digital service providers (DSPs).*

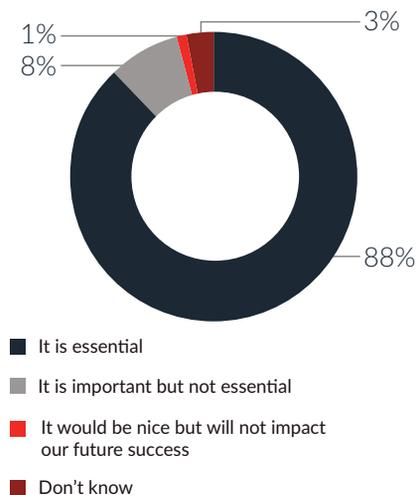
For this report we conducted a tightly focused survey of people working in data analytics roles within CSPs. Perhaps unsurprisingly, 88% of respondents said they consider the effective use of data across the entire organization essential for their businesses (see graphic opposite).

The percentage almost certainly would have been lower had we included different job roles in the survey. Many senior executives, for example, don't know how data is used in their organizations. They may see the *results* of using data in a customer loyalty program or an initiative to reduce operating costs, but they don't necessarily connect results to the collection and analysis of data about customers and network performance.

The reality is that a very small proportion of telco board members have a background in digital technologies or capabilities. As such they may lack insight into how data analytics underpin and shape successful 21st century organizations.

In this report we explore how CSPs are collecting, storing and using data, and we offer guidance to help operators leverage data to improve customer experience and optimize

## How important is using data across the entire CSP organization?



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networks. But first it helps to understand the kinds of data CSPs generate and what they want to do with it.

## What is data?

CSPs use two main types of data in their businesses:



**Data created by customers** – which tends to fall into three categories: traditional customer relationship management

(CRM) data collected from billing records and interactions with contact centers and retail stores; data collected from digital touchpoints including websites, mobile apps, chatbots and posts on social media; and performance data (traditionally the focus here has been on dropped calls and location but increasingly is on throughput, congestion and visibility of the packets flowing across the network)



## Data generated internally by employees and systems

– which includes information in IT systems, which contain lots of different types of data relating to the business and customers, and network data about how the network is performing and customers' usage of the network

CSPs are transitioning from focusing on simple business intelligence to big data analytics. Big data has resulted from an explosion in real-time usage data and deployment of cloud-based systems and technologies. Now operators are working to develop cohesive strategies to leverage it by applying artificial intelligence (AI) and machine learning across all parts of their businesses.

## Part of transformation

The benefits of successfully leveraging data across the entire organization are the same as for digital transformation more broadly:



### Improving customer experience

– without leveraging data from and about their customers, CSPs cannot hope to match the experience that DSPs like Amazon, Facebook and Google deliver. However, telcos are at a significant disadvantage. Whereas the whole customer lifecycle is digital for DSPs, most CSPs interact with their customers through a wide variety of channels including retail shops and contact centers as well as digital interaction. Furthermore, IT systems supporting customer touchpoints are often poorly aligned.



### Improving operational efficiency

– this is a broad category that includes converting all interaction with customers to digital channels in order to reduce the size of call centers, and better managing network alarms and adopting self-healing technologies. CSPs are also looking to reduce costs by improving capacity planning and introducing proactive fault management.



### Increasing revenue from new and existing services

– when it comes to upselling and cross-selling services to customers, the effective use of data plays an extremely important role. Most operators are transitioning to bundled-service strategies (for example, triple-play or quad-play services or bundling over-the-top services like Netflix and Hulu with mobile subscriptions). But their ability to target customers effectively is compromised because of their inability to leverage usage data.

## AI & machine learning

The promise of AI and machine learning is breathing new life and urgency into CSPs' efforts to leverage the vast amounts of data they have. For example, network automation has emerged as a key requirement for 5G and will require the effective use of AI.

AI and machine learning also provide a focus for strategies to effectively leverage data. Operators and industry organizations such as TM Forum are compiling use cases for AI across departments and developing a data model to help operators use data more effectively, which we'll explore in the report.

Read it to understand:

- Which CSP executives are leading data strategies
- The types of data operators collect and generate – and which are most valuable
- Where CSPs store data and how it's accessed
- What data lakes are and why they're challenging to manage
- How effectively CSPs are using data
- What the biggest barriers are to leveraging data
- Why data models are important but challenging
- Why a strategy for data governance is necessary
- How CSPs can leverage network and operations data
- How CSPs can use data to improve customer experience
- How Axiata is aligning its data strategy across operating companies

Section 1

# Types of data and how CSPs use them

While big data and data analytics are in the spotlight because of how hyperscale web companies collect and use data, business intelligence has been an important area of focus for communications service providers (CSPs) for many years. CSPs' challenge is deciding how, when and where to 'supersize' their approaches and adopt data practices used by cloud-native companies.

Big data is characterized by 'three Vs': volume, velocity and variety. Companies like Facebook have based their whole customer experience and product strategies around effective use of the massive amounts of data they collect from and about their customers. For them, the key to success is being able to rapidly process and analyze this data in order to deliver the best possible customer experience and to anonymize the data to sell to advertisers.

The way that CSPs collect, store and use data depends on the type, the volume generated and how quickly it needs to be used. While telcos have used the term 'big data' for the better part of a decade, there is little evidence of its application because in practice separate teams within CSPs leverage data for their own specific requirements: CRM teams use CRM data, network operations teams use network data, and so on.

To succeed with big data strategies, CSPs must:

 Combine data that sits in multiple silos across the businesses, particularly network and customer relationship management (CRM) silos



Develop and deploy a common data model (see [page 10](#))



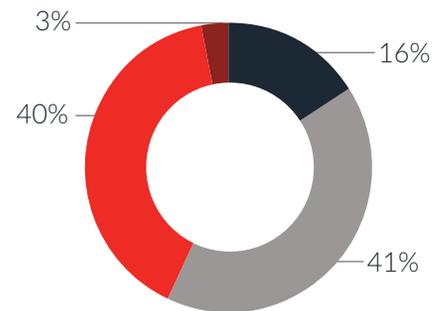
Move data to the cloud and use cloud-based tools such as data lakes (see [page 8](#))

## Who's in charge?

Management of data strategy varies among CSPs. Many operators have chief digital officers or chief transformation officers, and some have chief data officers. In some cases, these roles are senior and sit at or just below board level. Chema Alonso, Telefónica's Chief Data Officer, is perhaps the highest profile digital or data executive in telecoms, with a seat on the main board of directors. But data executives rarely have roles directly managing the teams or individuals whose job it is to execute data analytics strategies.

For this report, TM Forum surveyed 106 people from 46 unique CSPs representing every region of the globe, who are responsible for executing data strategy. All work in a data analytics role or an operations role that relies on access to data. A relatively small percentage of them favor building a centralized IT team under a chief digital officer. This is the approach Axiata is taking (see [page 6](#)).

CSPs' approach to structuring data science teams



- Build a central team (likely in IT) under a chief digital officer
- Take a decentralized approach with data experts in different departments and lines of business, all using a strict set of rules and a common approach to governance
- Take a highly flexible approach with the option of moving experts around and centralizing or decentralizing based on the changing requirements of the business
- Don't know

TM Forum, 2019

## Axiata creates a centralized unit to implement best practices for big data

In 2016 Axiata realized it needed to address a significant gap that had resulted from having separate data analytics teams for each of its operating companies. The teams were made up primarily of staff who had deep technical knowledge but lacked business understanding, and the few data scientists employed in Axiata's operating companies were undertrained and underutilized. At the same time, business leaders were not leveraging data to help with business decisions.

The company established Axiata Analytics in 2017 and appointed Pedro Uria-Recio Vice President and Head of the division. The team now employs 180 data professionals who facilitate sharing of best practices in analytics across the operating

companies. Axiata Analytics is cross-functional and includes marketing specialists, consultants, data scientists and engineers, full-stack developers, and designers (140 people are permanently assigned to specific operating companies, while 40 work across the group).

The intent of Axiata Analytics is to implement global best practices for big data analytics in all the operating companies. To do this, Axiata turned to the [TM Forum Big Data Analytics Solutions Suite](#), which includes a data maturity assessment methodology called the Big Data Analytics (BDA) Maturity Model.

Learn more [in this case study](#) on TM Forum Inform.

“

We used this to baseline not only the operating companies, but also Axiata's digital companies, providing a comprehensive cross-business assessment,” Uria-Recio explains. “An additional advantage was that we could understand where we stood against other global CSPs that had previously undertaken the BDA maturity assessment.”

Axiata's Pedro Uria-Recio

Other responses were split between favoring a decentralized approach with data experts spread throughout the business versus a flexible approach based on the changing needs of the business, where data science teams are sometimes allocated to specific departments or they move around the organization to work on different projects.

The role of a data scientist and data science teams is to analyze data for actionable insights. But before they can do this, a huge amount of work is required to import, clean, manipulate and aggregate data to make it usable.

Large CSPs use data from thousands of systems that have been developed by different vendors over many years. Without a common data model, this is a hugely time-consuming process that involves bringing together structured and unstructured data (see panel opposite). Indeed, many data science teams spend more time cleaning up data than they do analyzing it to provide actionable insights. We'll discuss the need for a common data model in the next section.

## Understanding structured and unstructured data

Organizations classify data in two categories:

- **Structured data** is highly organized and formatted so that it is searchable. Within CSPs, this data typically comes from IT systems, for example, charging or billing data or data from network usage.
- **Unstructured data** is not organized in a pre-defined manner. This could include records of conversations between a customer service agent and a customer, or posts by customers on social media platforms such as Twitter or Facebook.

It is much easier for organizations to use structured data.

Which data is most valuable?



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What it's worth

We asked CSPs which types of data are most valuable to their businesses, and it is not surprising that data about customers' preferences and needs tops the list (see graphic above). Indeed, 66% of CSPs said it is extremely valuable to the business. This type of data can come from any customer touchpoint, such as call centers, retail or online stores, mobile apps, email, and so on.

Network and operations data ranked very closely behind customer data, with 65% of CSPs saying it is extremely valuable to the business. We did not ask specifically how CSPs are using the data, but most use cases today are based around improving operational efficiency (see [Section 3](#)).

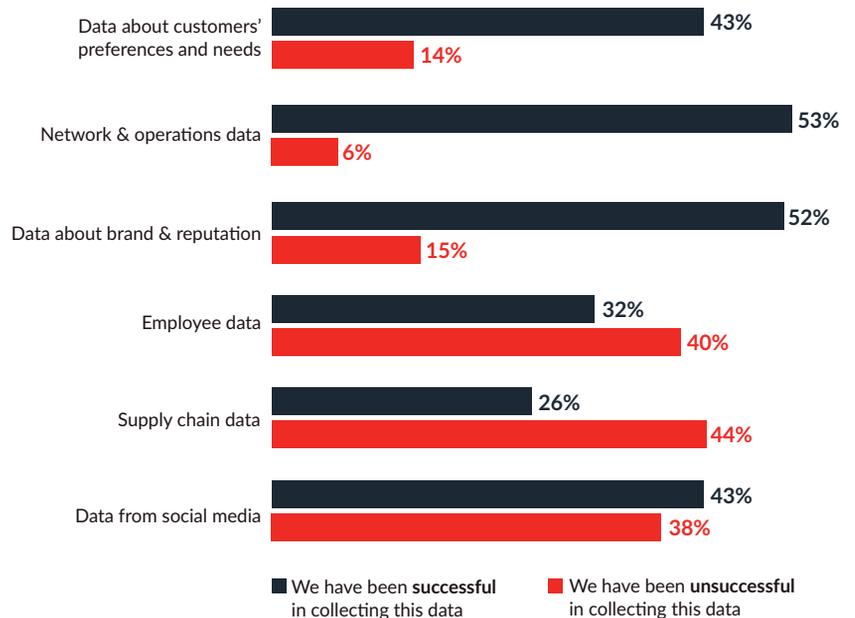
Brand counts

Remarkably, only about half of respondents said that data relating to brand and reputation is extremely valuable. If CSPs are going to make customer centricity the biggest driver of their transformation programs, they certainly need to measure the impact it is having on their brand. Most CSPs use [Net Promoter Score](#) to measure customer satisfaction, but data relating to brand can be even more useful.

In our survey we put data from social media (what customers say about services on social media platforms and direct communication with CSPs via social media) in its own category, and it scored much lower than anticipated, with only about a third of CSPs saying it is extremely valuable data. This is perhaps because we did not explain that it could also include data about customers' preferences and needs.

The two other data sets we included as choices relate to CSPs' supply chains and data about employees' views and needs. When we asked respondents how successful they had been in collecting this data, there was a much higher success rate for supply-chain data than employee data (see graphic below).

CSPs' success in collecting data



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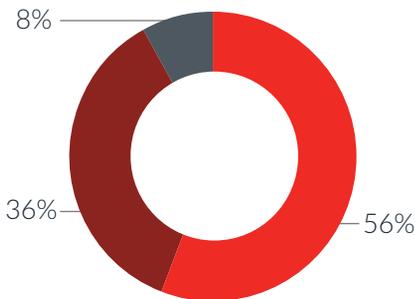
## Where is data stored?

CSPs increasingly are turning to data lakes to store the large amounts of data they generate. *TechTarget provides a good definition* of a data lake:

*“A storage repository that holds a vast amount of raw data in its native format until it is needed. While a hierarchical data warehouse stores data in files or folders, a data lake uses a flat architecture to store data. Each data element in a lake is assigned a unique identifier and tagged with a set of extended metadata tags. When a business question arises, the data lake can be queried for relevant data, and that smaller set of data can then be analyzed to help answer the question.”*

More than half of respondents to our survey said they believe data lakes are a good approach to storing data (see graphic below). About a third said their companies use data lakes but that it’s difficult to extract the data they need in the appropriate format.

How effective are data lakes?



- It is a good approach for ensuring that we leverage data across the entire organization
- We are using a data lake(s), but it is difficult to extract the data we need, in the format we require
- Data lakes are not the best approach for us because of challenges in finding, extracting and formatting the data we need at the right time

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## Data lake difficulties

Some of the people we interviewed expressed frustration with data lakes because they say users can’t access what they need. It is not unusual to hear the term ‘data swamp’ applied to the repositories. Others questioned the usability of data stored in lakes. Says a solutions architect at a large Southeast Asian mobile operator:

“

We have a data lake, but the rate of ingesting data is not quite up to the speed required for us to be proactive.”

CSPs must also decide whether to use a single data lake or multiple lakes.

“

It is better to have not one lake, but a very distributed set of lakes dependent on the different data sets in question,” says an IT transformation architect at a large European operator group.

Governance can also be an issue with data lakes. Disparate teams within CSP organizations often use systems provided by different suppliers and don’t use the same rules for governing use of data. This makes it extremely difficult to reuse data from different data lakes across the organization without cleaning it. We’ll discuss ‘dirty’ data and governance more in the next sections.

## Moving to cloud

Data lakes and data warehouses can reside either on CSPs’ premises or in a public or private cloud. As is the case with many IT systems, migration of data to the cloud is inevitable in the long term, but IT ‘owners’ may not be able to justify making the switch in the short term because there is no quick return on investment.

Our analysis indicates that many large European and North American operator groups are migrating data to the cloud. While none of the CSPs we interviewed have migrated all their data to the cloud, some said they have moved more than half.

We’ll look at additional challenges in the next section and explain why it’s important for CSPs to develop a common data model.



A new TM Forum report, *Public cloud: Should CSPs venture into the Wild West?*, to be published later in December, will look at operators’ efforts to move operations to the cloud

Section 2

# Challenges to leveraging data and why a common data model is needed

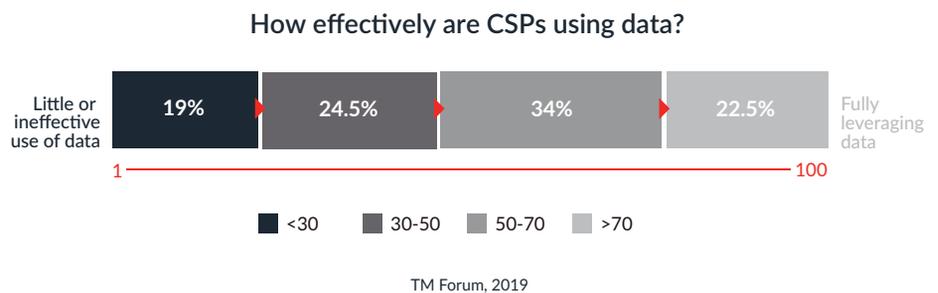
*How to store data isn't the only challenge communications service providers (CSPs) face. They also must acquire analytics skills they lack, determine how best to govern the use of data and analytics across the company, and perhaps most importantly adopt a common data model to make data useful across a wide variety of support systems.*

CSPs are not effectively using all the data they collect. We asked survey respondents to rate their companies' efforts on a scale of 1 to 100, where 1 indicates ineffective use of data and 100 indicates full use of data across the company. The question elicited a huge range of replies, from a low of just 10 to a high of 93, with the average being 54 (see graphic opposite).

But even though half of survey respondents scored their organizations higher than 50, we view these findings negatively. Most respondents are responsible for data strategies within their organizations, so we expected them to be positive and perhaps overly optimistic about their companies' progress leveraging data. The fact that they are not is telling.

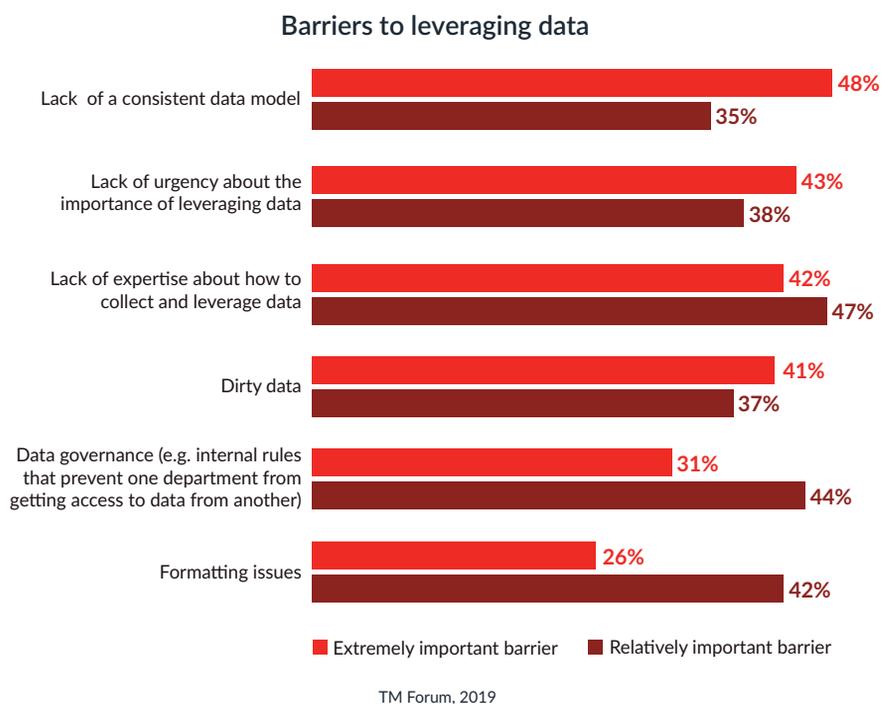
## What are the challenges?

There is no single, easily identifiable reason why so many respondents view their organizations as being largely unsuccessful in leveraging data, but as with other challenges around transformation more broadly, responsibility for success lies with effective leadership, the ability to acquire the right skills and improving relationships with suppliers.



The graphic below shows which challenges respondents find extremely or relatively important. It is worth

noting that two thirds or more of respondents rated all the barriers as at least relatively important.

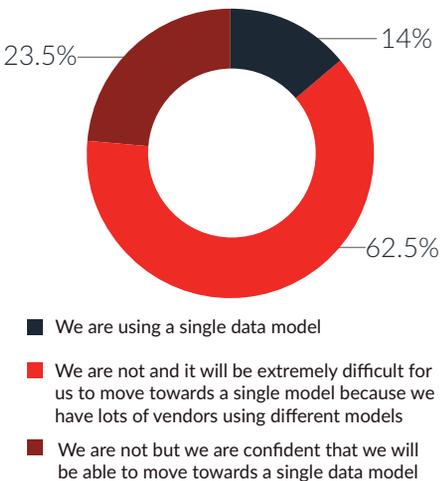


## Data model is No. 1

It's no surprise that nearly half of respondents put lack of a consistent data model at the top of the list of challenges. A data model is a design for how to structure and represent information so that it can be used consistently across disparate systems. The problem is that most CSPs work with tens or hundreds of vendors whose systems generate and/or consume data, all using different data models. It is the job of data science teams within telcos to make the data from these systems reusable and transferable.

Some CSPs are developing a single data model to use across their organizations (see graphic below). But most survey respondents said they are not using a single data model, and they believe it will be difficult to implement one. Even among companies that are using a single data model, not all data adheres to it. For example, one data executive at a global operator group says that only 70% of the data used across the business corresponds to the company's data model.

Are CSPs using a single data model?



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In an ideal world, all CSPs and their suppliers would adopt a common, industry-agreed data model. This would allow CSPs to buy products and services from different vendors knowing that they could re-use data across systems, and it would help them

partner and develop new services more quickly. As part of the TM Forum [Open API](#) (Application Program Interface) and [AI & Data Analytics](#) collaboration projects, CSPs and suppliers are working on a common data model (see below).

## How to streamline data management for AI

TM Forum members are developing a common data model to make it easier for CSPs to ingest, store and use data across the business. Teams working in the Open API project and the AI & Data Analytics projects are extending the Forum's Open API data model and developing the telecoms industry's first API specifications for AI, a Contract Management API Component Suite.

Representatives from many CSPs, such as AT&T, BT, China Mobile, Orange and Verizon, and their suppliers began work on the component suite at [TM Forum Action Week](#) in September. The team is proposing a framework for governing AI systems to allow them to expose APIs to management systems within CSPs' operations. This gives operators the ability to query and control AI systems.

For example, if a management system determines that an AI system is no longer in compliance with business policy, it may command the AI system to stop operating. Key to making this happen is the ability to associate a 'contract' with a deployed AI model. The contract sets dependencies and constraints that must be satisfied for the correct and safe operation

of the AI model and describes actions to be taken when they are no longer satisfied.

Says Aaron Boasman-Patel, TM Forum's VP of AI & Customer experience:

**“Data accessibility is key. AI is only as good as the amount of data available to train the AI systems. You can't have 'dirty' data.”**

He adds: "Some companies are working on their own data models, but it is better to collaborate on a common model to be used across the industry. The model our members are developing is based on TM Forum Open APIs, which are already widely used. The transformation of all data will happen through APIs."

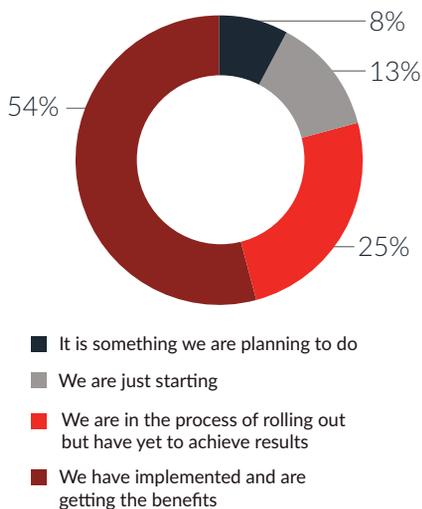
To get involved in TM Forum's collaborative work on data and AI management, contact [Boasman-Patel](#).

## Lack of urgency

Lack of urgency within the organization is another key challenge, according to survey respondents. This is not to say that boards of directors do not recognize the importance of becoming data driven. Rather it is more likely that they are unaware how little progress they have made.

In May we conducted a survey of CXOs before TM Forum's CXO Summit which is held annually in conjunction with [Digital Transformation World](#), and about half said their companies have implemented analytics and are benefitting from using them (see graphic below). It is important for CSPs to consider (and measure) the potential benefits of using data across the whole business. Measuring the return on investment in analytics based solely on how much it improves the network may make it difficult to establish a business case, but if using analytics also improves customer experience, it's easier to justify an urgent investment.

CSPs' progress with data analytics



TM Forum, 2019

## Dirty data

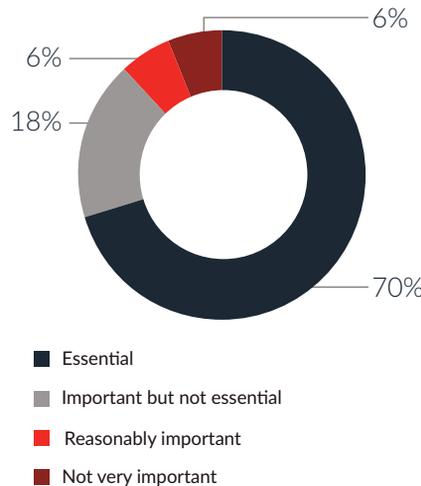
We addressed issues around dirty data and data formatting in Section 1, and again in discussing the need for a common data model. Interestingly, survey respondents ranked these challenges fairly low on the list.

Some of the executives we interviewed said it is possible to gain insights with incomplete or incorrect data, but others believe cleaning and streamlining data is an issue that needs to be addressed urgently, particularly for AI and machine learning to be deployed effectively. Indeed, Boasman-Patel notes that in his work with CSPs, dirty data is often the No. 1 challenge.

## Lack of expertise

A lack of data analytics talent within CSP organizations is another serious barrier. In our CXO survey in May, 70% of respondents said it's essential to hire internal analytics expertise (see graphic below). Similarly, a 2018 survey asking about IT skills found that CSPs are most active in recruiting experts in business intelligence/analytics and big data.

How important is internal expertise in data analytics?



TM Forum, 2019

## Addressing governance

There are two main aspects of data governance that impact a CSP's ability to leverage data:

- Guidelines and rules about how data can be used legally in countries where regulation such as the [EU's General Data Protection Regulation \(GDPR\)](#) imposes large fines on firms that do not respect data privacy
- Rules created within an organization to ensure a consistent approach to

how data is collected, used and shared across all departments and teams

GDPR has changed how departments that collect customer data use it and share it across the organization. Many executives describe serious problems getting data from other departments because of concerns about how it may be used. Perhaps of greater concern is the lack of clarity in the minds of some about what the laws allow them to do.

A lack of rules – or failure to apply them consistently – is one of the biggest challenges CSPs face as they seek to leverage data better. Teams that collect, manage and manipulate data often are scattered across the organization. They work with different vendors (using different data models), and they may use different data lakes.

As a result of Axiata's big data analytics maturity assessment (see [page 6](#)), the company has created a group-wide data governance policy. It is based on the framework from [Data Management Association International – Data Management Body of Knowledge \(DAMA-DMBOK\)](#), which defines standards and processes for 11 areas of data governance, including data security, data quality, data architecture, data modelling and design, and metadata management. Says Pedro Uria-Recio, VP and Head of Axiata Analytics:

“In any maturity assessments of this sort, the participation and support of C-level executives in the organization is critical not only from a sponsorship point of view, but also to highlight the importance of areas like data governance and data ethics within the organization, which are often overlooked at the operational level.”

In the next section, we'll look at how CSPs are leveraging network data.

## Section 3

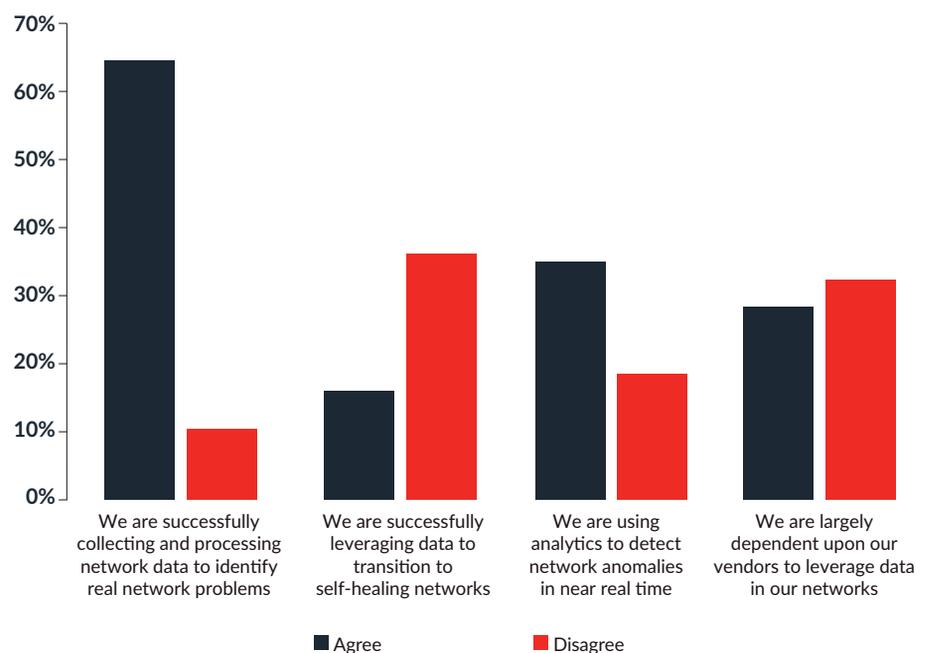
# Leveraging data to improve network operations

Many communications service providers (CSPs) are already successfully using data collected from the network about performance to improve operational efficiency and deliver insights to other parts of the business, but there is huge potential to leverage it more effectively and transition to autonomous, optimized networks.

We asked CSPs about how they are leveraging network data, and nearly two thirds said they are using data to identify network problems (see graphic opposite). Fewer are leveraging data for automation, but the percentage is likely to grow rapidly as 5G is deployed.

“As service providers roll out 5G, network complexity increases as well as the amount of data that is generated and that runs across the network,” says Aaron Boasman-Patel, TM Forum’s VP of AI & Customer Experience. “To handle this volume and complexity, CSPs need to use AI and automation to improve the reliability of networks for customers (through fault prediction, self-healing, etc.), as well as to optimize the capacity of networks to enhance the customer experience. Humans simply cannot perform this task at the scale and within the time frames needed to deliver 5G services and a superior customer experience. Automation and AI will also help to reduce costs, through fewer network outages and faster recovery times.”

CSPs' success in leveraging data to improve the network



TM Forum, 2019

### Addressing alarms

Identification and rectification of problems in the network are triggered by ‘alarms’, which occur for many reasons. A minor alarm may be triggered if a cabinet door is opened on a piece of equipment, for example, while a major alarm would result in the case of a hardware outage impacting services delivered to customers.

CSPs use network data for the following reasons:

-  Prioritizing alarms
-  Predicting when an alarm might occur
-  Predicting when maintenance is required in the network
-  Introducing real-time capabilities
-  Introducing self-healing capabilities
-  Identifying security risks in the network

### Using analytics & AI

Many operators have already introduced some of these capabilities into their networks, and they plan to use analytics and artificial intelligence (AI) to automate them. Indeed, a survey conducted for our 2018 report *AI and its pivotal role in transforming operations*, found that nearly two

thirds of CSP respondents identified predictive maintenance as an area where their companies planned to use analytics.

However, the widespread use of AI for managing the network remains a goal for the future. As a senior solutions architect at a large Asia-Pacific mobile operator explains:

“Using data for network operations so far is still largely done manually in our organization.”

Virtualizing network functions and moving operations to the cloud will increase operators’ ability to automate processes, but the transition to cloud-based networks also will increase network complexity significantly, particularly during the years when CSPs will have to operate hybrid networks made up of physical and virtual components. As such, using data analytics more effectively will become a necessity.

CSPs also are using data analytics to optimize networks. Approaches can include predicting peak-hour traffic for load balancing and optimizing frequency allocations for devices.

### Additional uses

CSPs can use network data in many other ways. Below are some examples (detailed explanations follow the list), and the panel on [page 15](#) explains how TM Forum’s AI & Data Analytics collaboration project is exploring network-related AI use cases.

-  Network planning and investment
-  Agile procurement
-  Adopting a customer-centric view of the network
-  Data monetization
-  Increasing partnerships & development

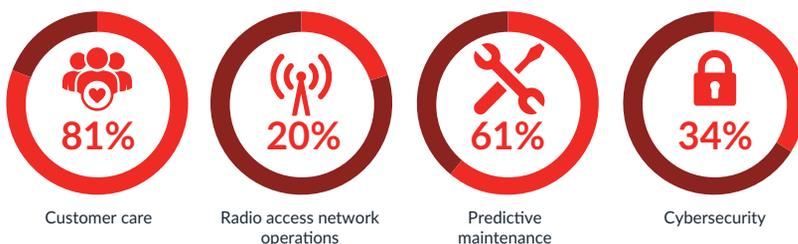
### Network planning

The transition to 5G is placing huge demands on the network, but with revenues stagnating and strict internal limits on capital expenditures (CapEx), CSPs need to make smart decisions about expansion and upgrades. Data captured from network elements such as switches, routers, base stations and microwave towers can be fed into AI algorithms to help predict capacity requirements months or even years ahead.

### Agile procurement

Many CSPs are in the process of transitioning to quarterly CapEx budgeting so that they can respond to market and traffic requirements more quickly. This puts extreme pressure on the procurement process that results from the cycle of planning, deployment and operation. Using data analytics and AI to model the requirements for investing in the network can significantly reduce the time it takes to complete the cycle.

Where will CSPs use analytics?



TM Forum, 2018

## Customer centricity

CSPs can adopt a customer-centric view of the network by making decisions about network operations more customer focused rather than engineering focused. For example, while engineers view network performance in terms of throughput, jitter and packet loss, customers think about it in terms of the quality of audio or video. CSPs also can give customers access to real-time data about network performance.

To address customers' needs, a better flow of data between network management and customer relationship management systems is required, and our survey reveals that improvement is needed here. A quarter of respondents indicated that network data is not being used by front-end systems.

As CSPs adopt a customer-centric approach, they often talk about moving away from a network operations center (NOC) to a service operations center (SOC). This involves translating network data into language that describes the customer experience.

More broadly, the transition involves linking IT systems across the businesses. When Telefónica UK [announced](#) that it was moving to a SOC earlier this year, CTO Brendan O'Reilly said:

“

Going forward the emphasis will be more and more on customer-led decisions, the linking of many systems, the application of new analytical tools, the introduction of new metrics and real-time decisions predicated on how customers 'feel' about the network.”

## Monetizing network data

Data monetization, or the sale of network data to third parties, is a small but profitable business for a growing number of CSPs. The typical organizations that require such data are retailers or any company that wants insights into people's communications behavior.

One example is commercial real estate firm Jones Lang Lasalle which combines data provided by Vodafone with other data to help its clients make better decisions when investing in real estate or probing potential markets. Vodafone provides information on the connectivity

activity of users as they move through streets, shopping centers and office complexes in Madrid, Barcelona and 40 other urban areas, [according to a JLL announcement about the partnership](#).

“This information provides data such as gender and age group of people moving in a certain area, as well as the traffic volume generated at different times, or whether they are locals or tourists, for example,” JLL stated.

Vodafone says it has more than 100 customers buying similar data and services. Other CSPs have set up dedicated business units to resell network data. They include ada (analytics, data, advertising), a subsidiary of Asia-Pacific telecoms group Axiata; Motionlogic, a Deutsche Telekom subsidiary; and Luca, which describes itself as Telefónica's “data division”.

## Partnerships & development

Platform as a service is gaining ground as operators consider how best to monetize their future investments in 5G. Increasingly 5G is being positioned as a platform for innovation – with the innovation not only coming from CSPs, but also from third parties accessing connectivity and other services and capabilities from the network. CSPs will become enablers, offering other service providers wholesale products and services to support their businesses.

As operators seek competitive differentiation, their ability to choose the best content and applications partners will inevitably become a differentiator, and partners will choose preferred CSPs based on price, market reach and additional capabilities like providing data insights from the network. Partners (many of which will be digital service providers) will demand real-time insights into quality of service and other operational data so that they can optimize their own services.

In the next section, we'll look more closely at how CSPs are using data to improve customer experience.

## AI use cases for network operations

CSPs and suppliers are collaborating in TM Forum's [AI & Data Analytics project](#) to develop AI use cases, and 16 of the 25 identified so far are network related. Some examples include network threat detection, zero-touch network service management, autonomous networks (wireless and wireline access, core and transmission), proactive network service quality and troubleshooting network problems.

These use cases represent short- and long-term opportunities for CSPs. For example, many operators are already using analytics and AI to predict future base station requirements. On the other hand, the transition to fully autonomous access or core networks or zero-touch network service management will take much longer to implement.

"It's not surprising that many of the use cases that have been identified for AI are focused on networks and operations," says Aaron Boasman-Patel, TM Forum's VP of AI & Customer Experience. "We will see the majority of AI deployments in this area.

### A new workstream

A recent multi-phased TM Forum Catalyst proof of concept called [AIOps](#), which is championed by seven CSPs, has been exploring many of the AI use cases in an effort to increase efficiency and improve customer experience by optimizing IT processes and operations. The team's work has been so useful that it has resulted

in a new AIOps workstream in the AI & Data Analytics collaboration project.

An important goal of the project is to explore how AI algorithms can analyze collected performance data to drive predictive and corrective actions which minimize truck rolls and identify hidden problems and their causes to enable a quick fix.

Massimo Banzi, Standards Manager at TIM Group, says one of the reasons his company joined the Catalyst is because its focus maps precisely to the future direction of TIM's business:

"It is mandatory to use new technology as much as possible for improving the service that we offer to our customers. We need to be flexible, and we need to anticipate the need of the customer. Hence, artificial intelligence – which comes from the continuous evaluation of data collected from all of the possible sources. This means collecting data from several categories of customer and collecting data from the network to understand when there are performance issues, then tackling them by dynamically redirecting, adding and scaling network resources, etc."

### Watch this video to learn more:



Section 4

# Leveraging data to improve customer experience

The biggest difference between communications service providers (CSPs) and digital service providers (DSPs) like Facebook and Google is the way DSPs use data from their relationships with customers. They have almost exclusively digital relationships with their customers, and every time a customer uses the service, the DSP learns more about them and can be proactive in delivering a good customer experience. CSPs, on the other hand, interact with customers through many channels and as a result must contend with huge amounts of unstructured data.

We asked CSPs about their use of digital channels, and they realize there is room for improvement. Only one in three said their companies are using digital touchpoints effectively to deliver personalized services (see graphic below).

Most CSPs have rolled out mobile apps, but customers are not using them regularly or consistently. They use them primarily to check their bill or data balance. As such, the apps are not generating meaningful and useful data for the CSP. Some operators have attempted to drive usage of the

apps by offering financial incentives to use them or by providing value-added services that can only be accessed via the app. For example, Russian operator group VEON built an entertainment portal into its app.

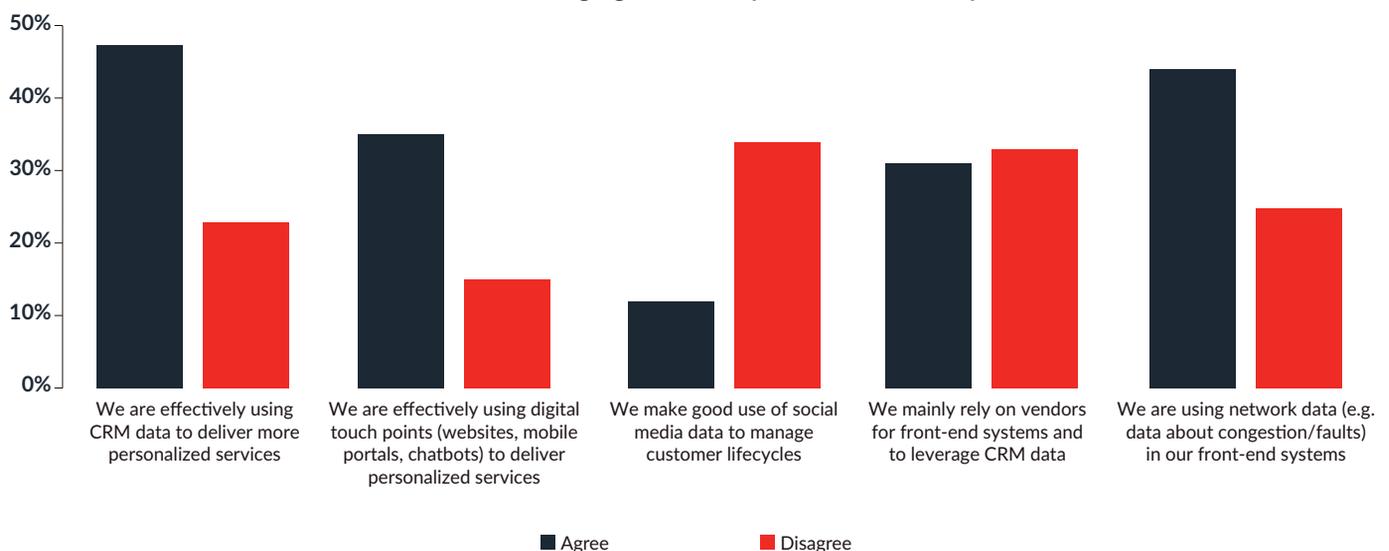
In reality, few customers want or need to communicate with their CSP unless they have a problem (for example, a fault or billing query) or when they want to add to a prepaid plan or are nearing the end of a contract. The onus, therefore, is on CSPs to find other sources of data to build a better picture of their customers, including

the services they use and the quality of their experiences.

## Network data

Using performance data generated in the network and leveraging social media are two approaches CSPs can take to improve relationships with customers. As noted in [Section 3](#), nearly half of respondents said their companies are using network data in their front-end, customer-facing systems, although the additional comments we received and our other research indicate that this is not being done systematically.

CSPs' success in leveraging data to improve customer experience



TM Forum, 2019

## Social media

CSPs recognize that they are making very little use of data from social media to improve customer experience. Only 12% of respondents said their companies are making good use of social media. But a more surprising finding from the survey is that just 35% of respondents believe social media data would be extremely valuable to their businesses.

The most compelling reason for collecting and leveraging data from social media is that this is where customers choose to spend their time (as opposed to interacting with the CSP's app). Furthermore, customers are likely to turn to social media to express their frustration about a network fault, billing grievance or bad customer service experience) or to express delight at receiving a loyalty reward, cost savings from switching or good customer experience. Thorough monitoring and analysis of social media data gives a more rounded and varied set of insights into what customers are thinking than Net Promoter Score, which is how most CSPs measure customer satisfaction.

Data from social media has other measurable benefits as well. It can help CSPs identify customers at risk of churning and those who represent the best upselling or cross-selling opportunities. The data also provides valuable insights into customers' interests, their locations and when they are active.

Partnering with social media outlets such as Twitter, Instagram or Facebook could help CSPs serve their customers via social media channels. For example, an operator could make offers available that are specific to a social media channel.

## Real-time data

Many CSPs consider the adoption of real-time analytics to be an integral

## AI use cases for customer experience

As part of TM Forum's [AI & Data Analytics project](#), CSPs and their suppliers are collaborating to develop AI use cases that focus on analyzing data to improve customer experience. While many of the network-focused AI use cases covered in [Section 3](#) result in better customer experience, customer experience-focused use cases look at how to improve and connect CSPs' front-end systems by applying AI. They include managing the user's experience; social 'listening' with intelligent selling; intelligent marketing and sales; optimizing customer journeys; and analysis of CEM.

An ongoing TM Forum Catalyst proof of concept called [Mind Reader](#) is showing how CSPs can connect commerce systems to back-end systems like CRM, product catalogs, configure-price-quote and order management to help operators deliver customer experience that rivals Amazon.

"Amazon knows what we want before we know it," says Mustafa Oyumi, Vice President of Industry

Solutions at CloudSense (one of the companies taking part in the Catalyst). "The essence of this Catalyst is we want to learn what the customer's intent is to offer next-best action recommendations."

The Catalyst introduces the concept of connected commerce. "Typically in the communications industry, the commerce platform is fragmented," Oyumi explains. "It's separate from all other channels as well as underlying systems like the CRM system."

He adds: "Companies could take this whole stack that we are building, and they would have everything they needed to actually launch this Amazon-like commerce experience to their customers."

### Watch the team discuss the Catalyst project:



part of digital transformation. The benefits of real-time data can be applied to many aspects of a CSP's business, particularly for customer relationship management (CEM) tasks such as service activation and real-time, contextual marketing.

However, it's difficult to introduce real-time capabilities using legacy systems. As the CIO of a central European CSP notes:

"The transition to real-time capabilities is one of the most important things we are currently working on. We are seeking to embrace marketing automation and to

provide real-time responses and real-time feedback to our customers. But we need to be sure that our technology can support this concept. Do they have the capacity and the performance? It may well be that some of our systems simply cannot deliver real-time capabilities."

The panel above explains how CSPs and their suppliers are addressing customer-focused AI use cases in TM Forum's AI & Data Analytics collaboration project. The next section of the report offers conclusions and guidance to help CSPs leverage data across the entire business.

## Section 5

# Make it happen – Strategies for leveraging data across the business

Communications service providers (CSPs) do not need to be reminded about the importance of big data and analytics – they are key areas of focus within operators' technology organizations as well as their business units. However, building and executing a strategy that enables data to flow horizontally across the organization is much more challenging. As with digital transformation more broadly, culture represents a major impediment. Following are recommendations that will help CSPs raise the profile of data analytics teams and remove cross-departmental silos:



### Create a vision

Company leaders need to create a vision for how data will be leveraged throughout the organization. The vision should be owned at main board level, with the next level of managers held accountable for translating it into an action plan.



### Redefine governance

Rather than allowing data governance to be used as a tool for preventing data from flowing across the organization, CSPs should convert it into a framework for ensuring that it serves as a key tool to drive innovation, improve customer centricity and increase operational efficiency. Such a change will require executive sponsorship and building a team that has the credibility and resources to evangelize, educate and troubleshoot across departments and lines of business. Axiata [has taken this approach](#) by centralizing its data analytics team and creating a group-wide data governance policy.



### Solicit ideas

CSP leaders should ask IT and network suppliers for ideas about how a common data model could be applied across telco organizations. While this may seem counter-intuitive for suppliers, they may see merit and competitive advantage in being able to partner with others. CSPs should urge their suppliers to participate in TM Forum's development of an industry-agreed data and AI model. To learn more about the effort, [contact Aaron Boasman-Patel](#).



### Avoid another silo

CSPs should not allow a centralized data analytics team to become another silo within the organization. While it may make sense to have a chief data officer or a chief digital officer as a figurehead, the central data team should be small and flexible. It should be responsible for architecture and governance, and needs to play a crucial role in recruiting the right talent and distributing expertise throughout the organization. But any attempt to make a central team responsible for operations will inevitably slow deployment of analytics solutions, reduce flexibility and take decision-making further away from the customer.



### Track the journey

Once the vision for data management is set, operators should map out on a quarterly and annual basis how they intend to fulfill it and how much progress has been made. Milestones should be communicated across the organization. Successes should be celebrated, and failures must be recognized and understood.



### Consider the edge

CSPs should ensure that analytics and big data are part of the 5G vision and that budget for investment in the required skills is available. Edge computing must be factored into future architectures and roadmaps because it will have major implications for how data is collected and leveraged across the organization. Data analytics needs to shape the thinking around the potential benefits of edge rather than being a secondary consideration.



### Move to the cloud

CSPs should engage with public cloud providers such as AWS, Alibaba, Google IBM and Microsoft to understand how they can help with leveraging data. The \$2 billion deal that AT&T and Microsoft struck in July to move AT&T's non-network applications to the Azure cloud and to collaborate on 5G and AI represents a major vote of confidence in public cloud and could pave the way for other such deals.

## Additional features and resources

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# How (or) Does AI Simplify the CXM Game?

*Penning blogs on customer experience management (CXM) can get tricky after a while. The bottom-line of each piece is simple—a sound CXM strategy can make or break a business.*

Here's the interesting bit, though. Equally important factors in the CXM game are the tools of the trade one opts for. There are, without a doubt, a plethora of options to choose from. But which strikes (or is likely to strike) the right note?

Permit me to point out, though, CXM isn't a "one size fits all" solution. What may work for one customer may not apply universally. In the context of this blog, though, let's focus on artificial intelligence (AI) and how it ensures customer experience monetization.

Permit me to start by restating—AI is not a generic solution. One simply cannot just implement AI—there are larger implications. While there is, indeed, a large amount of hoopla around AI, let's not forget, there's no field tested and proven solution for AI. Every solution, every use case that's been built so far can only be improved, not replicated. If one chooses the latter over the former, well, they've merely limited the possibilities. Therein lies the nub of the argument—the field is yours to prove and implement.

## AI and CXM: A Multi-Faceted Equation

There may be a million ways to address this point (and why not, don't forget, all data provides some outcome!). A very straightforward approach would be thus—AI enables companies to ensure real-time decisioning. How? Well, the data is on hand. Customers haven't really changed their patterns, except every decision is usually made "in the moment". And apart from the fact, of course, that the sheer number of decisions has increased dramatically.

So, AI, in a nutshell, enables companies to inject predictability with a fair degree of accuracy whilst

dealing with customers. The idea is to see if the likely short term future outcomes of a customer's actions come to the fore.

## AI-Based Use Cases That May Turn the Tide for Operators

As I mentioned before, countless use cases for AI (and indeed, any technology) exist. And are only becoming more intelligent, with the domain shifting constantly. Within the scope of the CXM domain, though, two primary use cases must be focused on, if one is serious about retaining customers, of course.



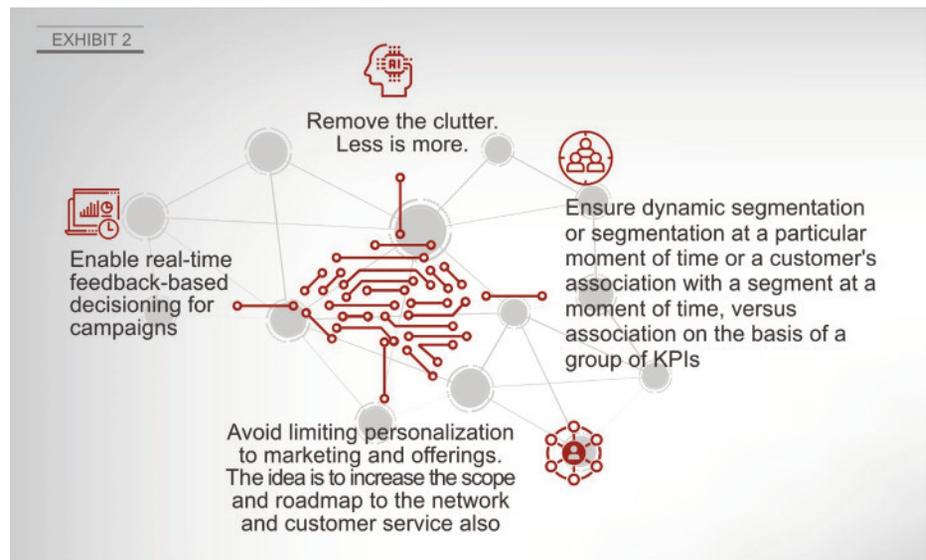
## Leveraging AI Intelligently

This is, to be honest, a bit misleading. Here's how-the very idea of introducing AI in the CXM domain is to enable operators to compliment the customer's expectations. To be where the customer is. And so on, of course.

Now, that a clear set of priorities has been defined, the next step is to create a roadmap of how to intelligently leverage AI. Perhaps something on these lines..?

What's crucial to remember is that AI is directional. Don't mistake it for "artificial execution"-it can only do so much. It cannot address a challenge. It may offer a leaner, meaner structure for problem solving but one's still got to execute the same, for best results!

On a parting note, permit me to put it simply, yet succinctly. Focus on breaking the clutter. Focus on customer retention and making the brand. Focus on AI as a tool in your arsenal, not the arsenal itself. For, isn't the bottom-line providing an unforgettable customer experience?



# Smart Data for Assurance and Smarter Analytics

*With the digitization of network and evolution to 5G and associated virtualization and automation, having visibility and smart data to understand what is happening in the network with insights into device behavior and service experience has never been more important.*

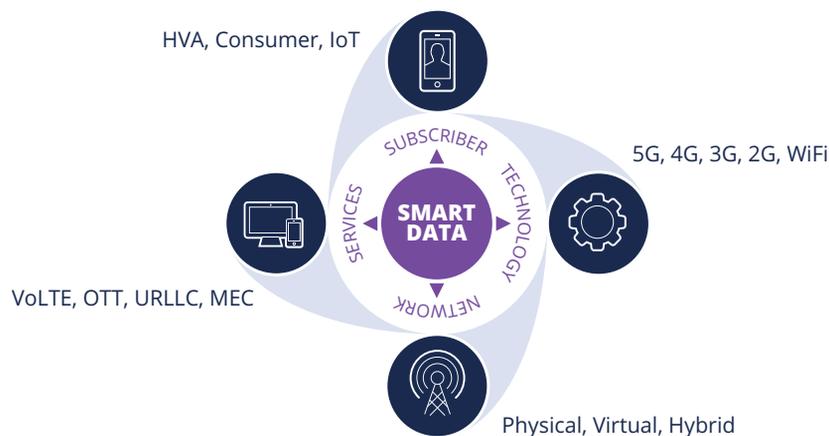
Simply said visibility comes from seeing the data in the network. And communications service providers (CSPs) have no shortage of data from which to derive visibility. There is machine-based data from servers, telemetry, log files, and flow data. While this data may be accessible it suffers from having variable fidelity, vendor dependence, and it is infrastructure focused. In contrast, meta data from IP traffic has high fidelity, vendor independence, and is service focused. Every transaction leaves its footprint on the network and turning that into smart data allows carriers to answer the questions of: Who? What? Where? and When?

## What is Smart Data?

Smart Data is derived from the ultimate source of truth, IP packets that is refined for actionable intelligence that powers analytics applications in agile, real-time, carrier-scale environments. Smart Data gives CSPs complete visibility with holistic, end-to-end coverage of control and user plane traffic over the multiple dimensions of their network, services, technologies and subscribers in real-time. Smart Data is imbued with user experience covering all devices, network infrastructure and applications consumed.

Smart Data is contextual, timely, relevant, structured, and compact. It

## Smart Visibility – Ultra HD



provides value to CSPs by helping to identify problems before they impact service. Smart Data enables service assurance that delivers proactive alerting, rapid problem isolation, and situation analysis. It drives lifecycle automation in which the network auto configures without human intervention, enables service agility for the introduction of new services (such as on-demand delivery of edge computing and network slicing) and end-to-end service layer analytics, and helps accelerate the delivery of new IoT services by providing an understanding of device and application behavior.

Smart Data offers independence and agility as it provides a unified data model that supports any service

(VoLTE, URLLC, eMBB, IoT), any vendor (Ericsson, Cisco, Huawei, Nokia), any network (physical, virtual, 5G/4G, WIFI), any cloud (private or public, VM or container-based) and any use case (service assurance, system performance, security, customer experience, data monetization and more).

It is also cost effective and scalable because Smart Data is a cloud native software solution that offers an optimized footprint that scales up and down with traffic levels and virtualized infrastructure. As Smart Data is constructed at the point of capture it is available for use sooner for more effective analytics and designed for elastic disaggregated network architectures.

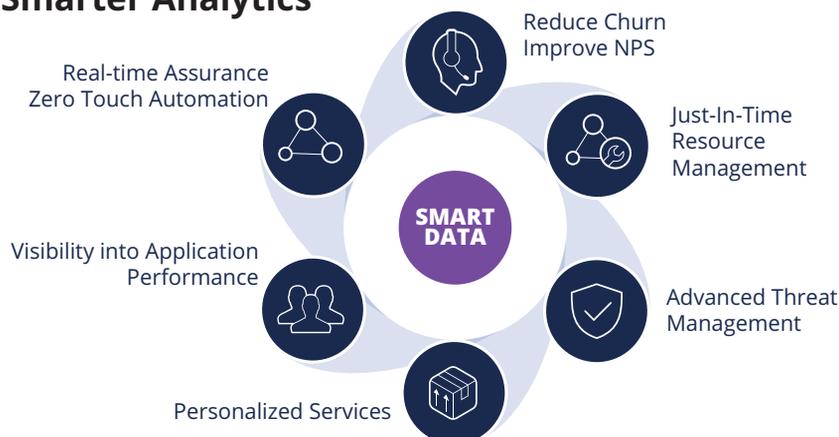
## Smarter Analytics

Smart Data is the fuel for Smarter Analytics that addresses business needs across the carrier organization from providing real-time assurance visibility for Network Operations, to performing churn analysis and helping to improve net promoter score (NPS) for Customer Care, to just-in-time resource management for Network Planning, to advanced threat management for Security Operations and aiding the development of personalized services for Product Teams. Having a unified data model further helps to accelerate the digital transformation of the organization by breaking down the information silos that exist.

## Finding Happy Customers with CEI

Creating a composite Customer Experience Indicator (CEI) from Smart Data helps mobile operators better understand the experience of their customers and the services they consume. Each user is measured for KPIs related to Accessibility, Retainability, Mobility, and QoE for this "Happiness" indicator. With this CEI indicator it is possible to visualize the experience for groups of users in different dimensions such as by device type, location, service and more. When CEI scores fall below the desired levels, Network Operations can drill down to the details of what caused the degradation. Understanding what causes poor experience for a given service or device is key to reducing customer churn.

## Smarter Analytics



## Improving NPS and Increasing Customer Care Effectiveness

All mobile operators want to improve subscriber experience and reduce the impact of trouble tickets on their Customer Care Department. Smart analytics can be used to identify which aspects of network performance and handsets/devices drive NPS and churn. Subscriber experience can be visualized by time, type, tariff, location, application and handset to identify correlations between service plans and subscriber behavior.

## Early Warning Detection and Mitigation

Securing the infrastructure against advanced persistent threats with the expanded attack surface of virtualized infrastructure cannot be an afterthought for the 5G network. What is needed is a scalable, real-time analytics solution that provides early warning of anomalous behavior detection to prevent service disruptions as well as threat mitigation with on demand cloud resources.

## Unprecedented Challenges with 5G

5G increases the complexity challenge for any cloud, any network, any workload across physical and hybrid ecosystems. The disaggregated network functions of 5G with Cloud RAN, Control and User Plane Separation (CUPS), Network Slicing, new 5G disaggregated core, Edge Cloud, NFV, SDN, containers, micro services and more mean increased complexity that comes with security vulnerabilities and visibility challenges.

## Visibility and Assurance Imperatives for 5G

Pervasive Visibility in a distributed multi-cloud network environment requires lightweight monitoring across both Edge and Core deployments. What is needed is flexible instrumentation options across both physical and virtual environments. This instrumentation must be cost effective so that it can be deployed pervasively in the hybrid network environment.

## Real-time Assurance and Automation for 5G

To deliver on elastic deployment of virtual infrastructure a timely, well informed policy and automation engine is critical for delivering a high-quality user experience in a dynamic and agile NFV deployment. What is needed is real-time service layer KPIs delivered to assurance and automation platforms. This means enabling a closed loop automation fed by Smart Data.

For communications service providers evolving their networks and operations to support digitalization with 5G, edge computing and virtualization technologies, visibility must be designed in at the start. You cannot assure and secure what you cannot see!

## About NETSCOUT

At NETSCOUT, our solution for the 5G network evolution is Visibility without Borders. Service providers can implement NETSCOUT solutions across multi-generations of network technologies—mobile, cloud and hybrid—to gain actionable insights into, performance reliability and latency for 5G networks and services. From RAN planning and design with geo spatial propagation modelling calibration, to proactive service assurance, to network automation and optimization, and everything in between, NETSCOUT helps service providers overcome the challenges of multi-generational networks as they march toward a 5G future.

By Bruce Kelley, SVP/CTO, NETSCOUT

# TM Forum Open Digital Framework

## Delivering the tools to go from concept to cash in just 18 days

The [TM Forum Open Digital Framework](#) is an interactive, continuously evolving collection of tools, knowledge and standards that give communications service providers (CSPs) an end-to-end migration path from legacy systems to modular, cloud-native IT components. Simply put, it is a blueprint for service providers to deliver intelligent operations fit for the 5G era.

A prototype version of the framework is [available now](#) for TM Forum members to explore. It is being developed through the [TM Forum Collaboration Program](#) and [Catalyst Program](#), and builds on the success of the Forum's established [Open APIs](#) and the [Frameworkx](#) suite of standards. Specifically, it includes:

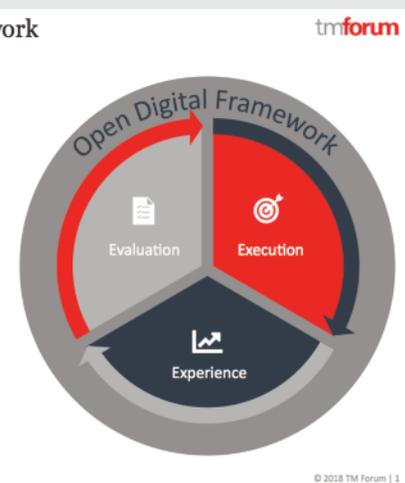
- **Open Digital Architecture (ODA)** – an enterprise architecture blueprint, common language and key design principles for modular, cloud-based, open digital platforms that can be orchestrated using AI
- **Open APIs** – 50+ standardized REST-based APIs to facilitate zero-touch integration and zero-touch partnering
- **Data & AI standards** – an industry-agreed data model,

### Components of the Open Digital Framework



together with standards maximizing the potential of AI to enhance customer experience and increase operational efficiency

- **Reference implementations** – a framework for assembling and validating ODA components in the Forum's [Open Digital Lab](#), fostering the creation of a services marketplace
- **Practical guidance** – guides and videos showing how the Open Digital Framework can be used to transform the core business and enable new business growth
- **Foundational libraries** – normalized models providing a common language for business processes and information that

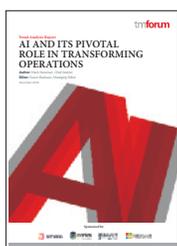
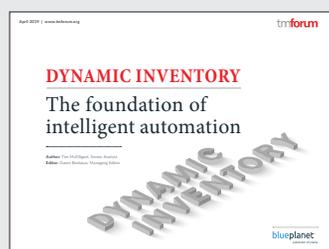
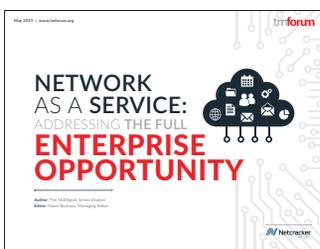
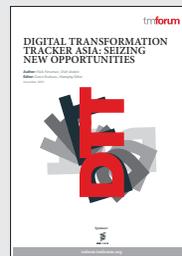


simplifies and de-risks transformation projects

The goal of the Open Digital Framework is to help service providers increase agility and drastically reduce the development cycle for products and services from 18 months to 18 days. Much of the collaborative work that is part of the framework is already available, but it helps to organize it and make it more accessible. The framework is a work in progress and will improve through crowdsourcing.

If you would like to learn more about the project or how to get involved in the TM Forum Collaboration Community, please contact [Andy Tiller](#).

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