

Attaining agility

and beating disruptors
at their own game



.....
Author: Tim McElligott, Senior Analyst
Editor: Dawn Bushaus, Managing Editor

TM Forum's research reports are free and can be downloaded by registering on our website

Report Author:

Tim McElligott
Senior Analyst
tmcelligott@tmforum.org

Report Editor:

Dawn Bushaus
Managing Editor
dbushaus@tmforum.org

Chief Analyst:

Mark Newman
mnewman@tmforum.org

Editor, Digital Content:

Arti Mehta
amehta@tmforum.org

Customer Success & Operations Manager:

Ali Groves
agroves@tmforum.org

Commercial Manager, Research & Media:

Tim Edwards
tedwards@tmforum.org

Global Account Director:

Carine Vandeveld
cvandeveld@tmforum.org

Digital Marketing Manager:

Anna Kurmanbaeva
akurmanbaeva@tmforum.org

Report Design:

thePageDesign

Published by:

TM Forum
4 Century Drive,
Parsippany,
NJ 07054
USA

www.tmforum.org
Phone: +1 973-944-5100
Fax: +1 973-944-5110

978-1-945220-81-4

Attaining agility to beat disruptors at their own game

- Page 3** **The big picture**
- Page 6** **Section 1**
Agility is fundamental
- Page 10** **Section 2**
What is the Open Digital Architecture?
- Page 14** **Section 3**
Taking advantage of 'blue ocean' opportunities
- Page 19** **Section 4**
Reimagining IT support systems
- Page 24** **Section 5**
Developing the ODA Reference Implementation
- Page 28** **Section 6**
Make it happen – Strategies for attaining and exploiting agility
- Page 31** **Additional feature**
Designed for Agility: Oracle Digital Experience for Communications
- Page 36** **Additional resources**



We hope you enjoy the report and, most importantly, will find ways to use the ideas, concepts and recommendations detailed within. You can send your feedback to the editorial team at TM Forum via editor@tmforum.org

© 2020. The entire contents of this publication are protected by copyright. All rights reserved. The Forum would like to thank the sponsors and advertisers who have enabled the publication of this fully independently researched report. The views and opinions expressed by individual authors and contributors in this publication are provided in the writers' personal capacities and are their sole responsibility. Their publication does not imply that they represent the views or opinions of TM Forum and must neither be regarded as constituting advice on any matter whatsoever, nor be interpreted as such. The reproduction of advertisements and sponsored features in this publication does not in any way imply endorsement by TM Forum of products or services referred to therein.

The big picture

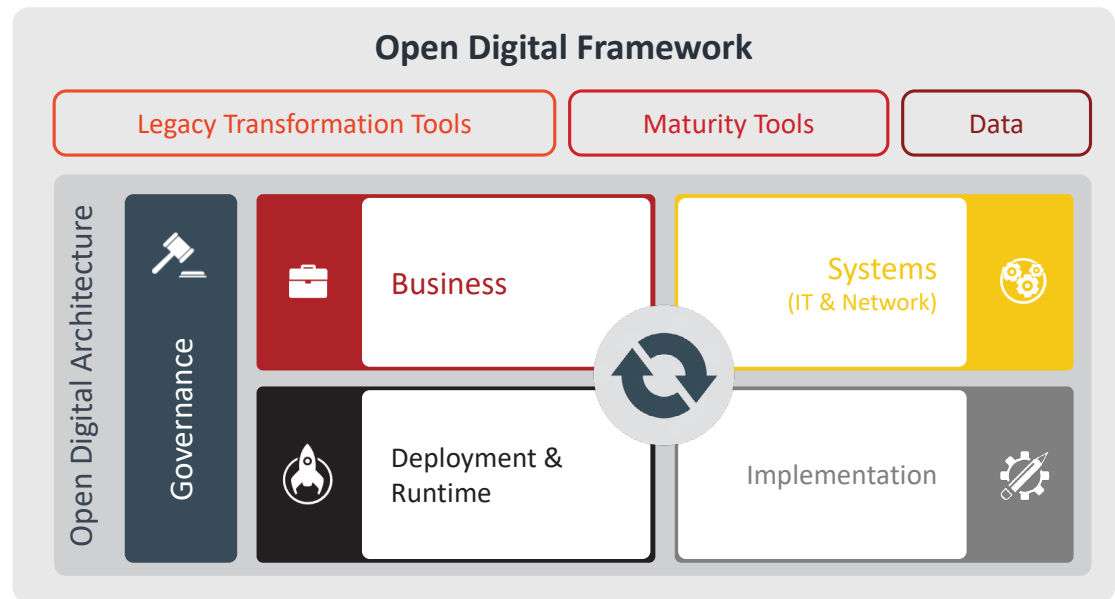
Hyperscale cloud providers, over-the-top content providers and even virtual operators make being agile look easy, because for them it is. They can onboard customers and deliver applications and services on demand because they are concerned only with their own product or service on their own infrastructure, and they have an unwavering focus on it.

Above all, these companies do not bear the cost of implementing and maintaining connectivity networks, nor are they encumbered by decades of legacy systems. And so far they have been subject to limited oversight from regulators. This is in sharp contrast to telcos, which are hindered by these difficulties in their ongoing efforts to become more agile and keep disruptors at bay.

The reimagined communications service provider (CSP) has taken different forms over many years, as operators have grappled with waves of network-altering innovation and competitive stress points. But one overarching goal has remained constant if elusive: to develop an agile business and operations environment to compete and thrive in the digital economy.

This report explores the drivers of and challenges to achieving this goal, and describes the key enablers that make it possible, including the **TM Forum Open Digital Architecture (ODA)** and **Open APIs**. These are critical components of the **Open Digital Framework** (see page 36), which also includes tools and metrics to evaluate digital maturity and tools for managing transformation of legacy systems. CSPs and their partners are working together in the **TM Forum Collaboration Community** and **Catalyst Program** to develop all these enabling assets.

The graphic opposite shows a high-level view of the Open Digital Framework and where the ODA sits within it.



How to increase agility?

To increase agility and become more competitive, CSPs must focus on the following:



End-to-end automation of processes is key to running a streamlined, cost-effective operations environment, but beyond that automation can deliver better responsiveness and proactivity, which are essential. Automation reduces downtime and service degradation in the network, while reducing errors in the fulfillment process, cutting time to market and supporting self-service capabilities and personalization to improve customer centricity.



Smarter, more competitive use of data is needed to provide timely personalized services and put customer experience at the heart of how services are delivered. Data must be applied across all customer touchpoints to ensure a seamless experience, no matter which channel or channels customers opt to use.



Heterogeneous, multi-vendor environments must replace CSPs' use of legacy systems that require significant manual integration, and operators should be able to easily mix and match components from suppliers.



An open software architecture is fundamental to multi-party ecosystems, DevOps practices, and cloud native and microservices-based solutions. Using open APIs allows operators to decouple customer experience from engagement systems, which increases agility and reduces the burden of integration.

Inside the report

This report draws on in-depth interviews with software architects who are collaborating to develop the ODA. We also have included data from recent TM Forum research on customer experience, collection of data and use of AI in operations. The report examines the role of a common data model and why leading CSPs believe many challenges can be addressed in the ODA.

Read it to understand:

- What it means to be agile and why becoming agile requires cultural change
- What the ODA is, and how and why large CSPs like BT, Orange and Vodafone initiated its development
- Why CSPs believe ODA will address the long-standing challenges of interoperability, agility, intelligence and automation
- The power of disruptive platform providers like Amazon Web Services, Google Cloud and Microsoft Azure
- How ODA supports development of platform marketplaces
- What the components are of the ODA

Section 1

Agility is fundamental

The top priority for communications service providers' (CSPs') efforts to transform is to be agile enough to create, deploy, assure and monetize services when (and sometimes before) customers want or need them. Agility is the result of key enablers coming together in an open, interoperable environment. It is the main ingredient to help operators partner with (and compete against) disruptors like hyperscale cloud providers.

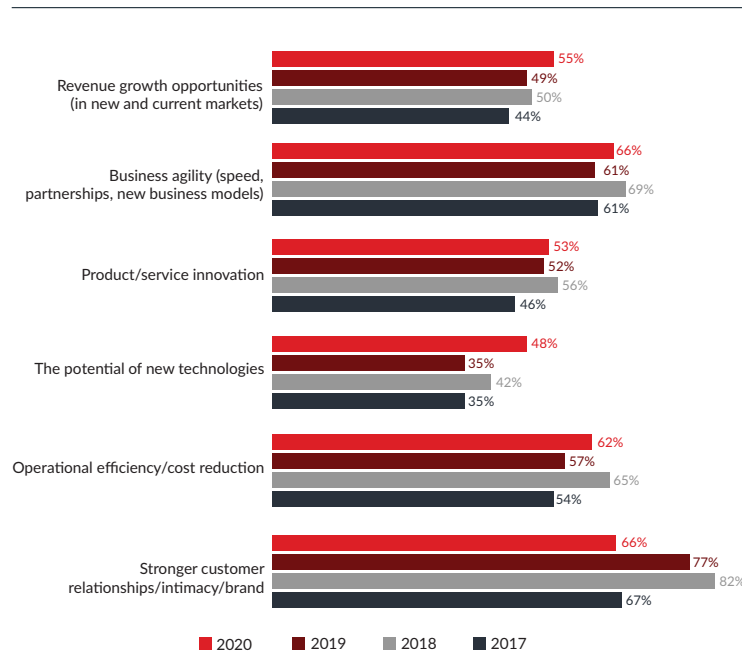
Earlier attempts saw telcos move toward greater agility only to end up with small improvements in time-to-market or fewer errors. Now this crucial shift to **Agile methodologies** and support of the digital economy may be the telecom industry's last chance to unleash the inner competitor and leverage its collective strengths.

Operators understand this: The graphic opposite from the latest *Digital Transformation Tracker 4: The Culture Wars of Transformation (DTT 4)* shows that business agility has remained a consistent driver of transformation over the last four years. Other drivers, such as revenue growth in new and current markets and product innovation, require agility.

Making progress

CSPs have increased agility by offering self-service and converged billing, and by consolidating or coordinating resource management systems. But the complexity of networks and the IT operations that support them require convoluted maneuvers millions of times a day just to keep things running. CSPs are not sufficiently agile to meet demands for flexible, automated, personalized, intelligent, real-time services created by open ecosystems.

Drivers of transformation



TM Forum, 2020

CSPs want to increase:



Organizational agility to routinely adapt to market and environmental changes while keeping the organization stable, including proper staffing and skill sets



Business agility to unlock innovation and growth, while reducing costs to stay competitive and supporting new and unforeseen business models



Network agility by leveraging automation, open systems and intelligence to optimize network performance and capacity with a goal of creating a proactive, closed loop network and operations environment that meets and anticipates customers' demands

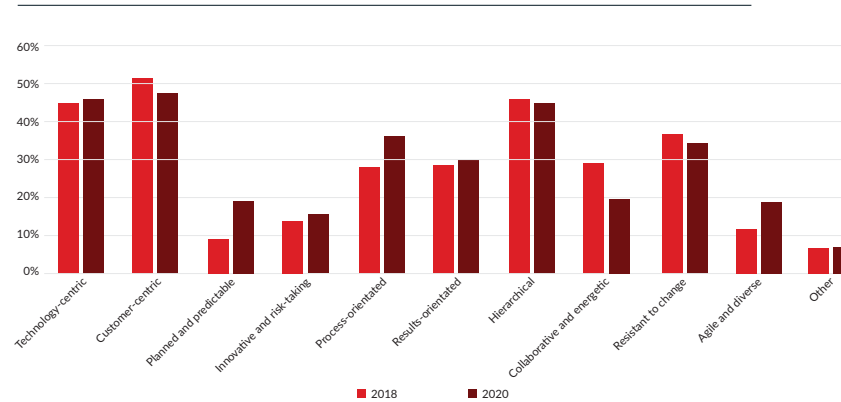


Operational agility, which begins with eliminating the distinctions between operational and business support systems (OSS/BSS); this means a truly open, multi-vendor environment to support cloud operations and technologies like microservices, which is achieved by using open APIs to avoid the cost, time and effort of complex integration



Customer intelligence by incorporating new sources of data into a common data model which is relevant to and can be used by a range of ecosystem partners

How do CSPs describe their culture?



TM Forum, 2020

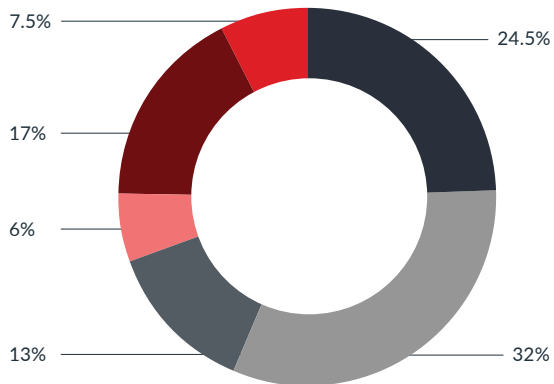
Changing culture

Culture remains a significant obstacle for CSPs, one that is interwoven with customer experience. Fewer than 20% of CSP respondents to the DTT 4 survey described their culture as agile, although that was an improvement over 2018 when only about 12% did.

Use of automation, analytics and open architectures should increase agility, which in turn should improve customer centricity. Indeed, most operators see themselves as being customer centric. Interestingly, fewer surveyed in 2020 claimed to be customer centric than in 2018, although more described themselves as agile. This shows that CSPs understand that it also takes innovative use of technology to improve customer centricity.

The primary driver for operators' customer experience programs, selected by nearly a third of those surveyed for another recent report entitled *Future customer experience: From digital to omnichannel* is to reduce costs and increase operational efficiency.

Most significant drivers for CSPs' CX programs







- Strengthen customer relationships & brand
- Reduce cost & increase operational efficiency
- Grow sales & increase revenue
- Increase product & service innovation
- Improve business agility (speed, partnerships, business models)
- Pursue new growth opportunities (in new and existing markets)

TM Forum, 2020

This is not putting cost savings above customer experience so much as it is recognizing that operational efficiency should result in better customer experience. For example, when customers' service and change requests are handled faster and care is proactive, their experience is better. The same goes for agility, which 17% of CSPs identified as a significant driver because it improves customer experience.

To strengthen relationships with customers, CSPs must transform their businesses, and the biggest barriers to overall digital transformation according to the *DTT 4* report are cultural, namely:

-  Lack of clear, aligned vision and goals
-  Insufficient top management support
-  Organizational issues
-  Deficiencies in skill sets

Beyond culture, the biggest technical barrier to transformation (and therefore to improving customer experience) is inflexible, legacy IT. The rest of this report focuses on the technical challenges and how an open architecture can demolish barriers.

Read these reports to learn more about the relationship between culture and customer experience:



Section 2

What is the Open Digital Architecture?

TM Forum launched the **Open Digital Architecture (ODA)** in February 2018 as an architectural vision for the future of zero-touch, software-defined telecom operations. It aims to be a de facto standard for open digital platforms and was created using decades of evolutionary best practices in the effort to make communications service providers' (CSPs') networks, operations and businesses more agile.

The ODA is a component-based architecture, with the business functions of each component exposed as a set of **Open APIs**. The component functionality is typically implemented as a set of services and microservices. The advantage of using services and microservices is that they can be independently managed on scalable infrastructure using **Agile** development practices.

Drivers for a new architecture

Before we dig into how the ODA can help CSPs embrace cloud, create platforms and increase agility, it helps to look at the drivers for developing a new support system architecture and how the ODA came to be.

BT was a founding member of TM Forum. Underlying frameworks and best practices such as the enhanced telecom operations map (eTOM – now known as **the Business Process Framework**), the shared information model (SID, now **the Information Framework**), and the telecom applications map (TAM, now **the Applications Framework**) became the functional foundation for BT operations.

TM Forum's Chief Technology Officer George Glass was Chief Architect at BT when the company realized that it needed a new architecture to address the problem of multiple software stacks for each line of business and for each service: wireline, wireless, IP, voice and data. Arguably, this is where the Forum's Open APIs and the ODA originated.

"We looked across the business from the consumer space to enterprise and had five product-specific stacks, and we realized that was completely nuts," Glass says. "We had designed systems that could bill for anything from a widget to a complex wireline service, but we couldn't send the customer a single consolidated bill for all of their services."

The start of abstraction

BT began applying abstraction – encapsulating and representing service definitions using standard patterns built into a single functional process – within a single billing system. ODA makes extensive use of abstraction. Back then it allowed BT to provide a single bill, plus new ways of charging and billing. This facilitated new services, too, as a company can only sell what it can bill for.

BT later wanted to apply the concept across other architectural segments, establishing what it called a platform-based architecture. This comprised separate platforms for customer management, service management and billing. Unfortunately, each system exposed its services in a different way, preventing easy interoperability and BT's goal of creating a single functional process beyond billing.

Watch Glass explain BT's use of Open APIs and development of the ODA:



Executives at Orange and Vodafone were also frustrated by the connections that IT teams had built many times over between customer management, service management, and ordering and billing for products and services across several lines of business. To address this, BT, Orange and Vodafone began working together as TM Forum members in 2015 to standardize exposure of services, which led to the creation of Open APIs in 2016 and the genesis of the ODA.

The power of sharing

Two things had to change for this early work to evolve into a useful and usable architecture. First, companies needed to be more open in sharing their work so that the industry as a whole could benefit. Second, the Forum's output needed to go beyond documentation to providing machine-readable code that could be implemented.

In terms of being more open, BT's CIO said to Glass at the time that, "there was no intrinsic value in just connecting things together. The value is in the functionality and capability you have in the components." He allowed Glass to share at an open meeting a 200-page document that had been treated as confidential and "for BT-eyes-only" explaining how BT developed its interfaces. Other operators followed suit, and the drive toward collaborative open systems continues.

To progress beyond documentation, TM Forum changed a bylaw so members could co-develop the Open APIs under standard open source licensing terms ([Apache 2.0](#)). Since then Orange and Vodafone, subsequently joined by Deutsche Telekom, have led the charge to **create software code** that CSPs can use to test ODA concepts.

Originally developed as a prototype of one part of ODA called the Business Operating System (BOS), the scope of this work has expanded to encompass development of a complete ODA Reference Implementation. Now the Forum is launching [tmf.codes](#) as a legal vehicle and infrastructure platform which members can use to co-develop shared software code for the ODA Reference Implementation under Apache 2.0.

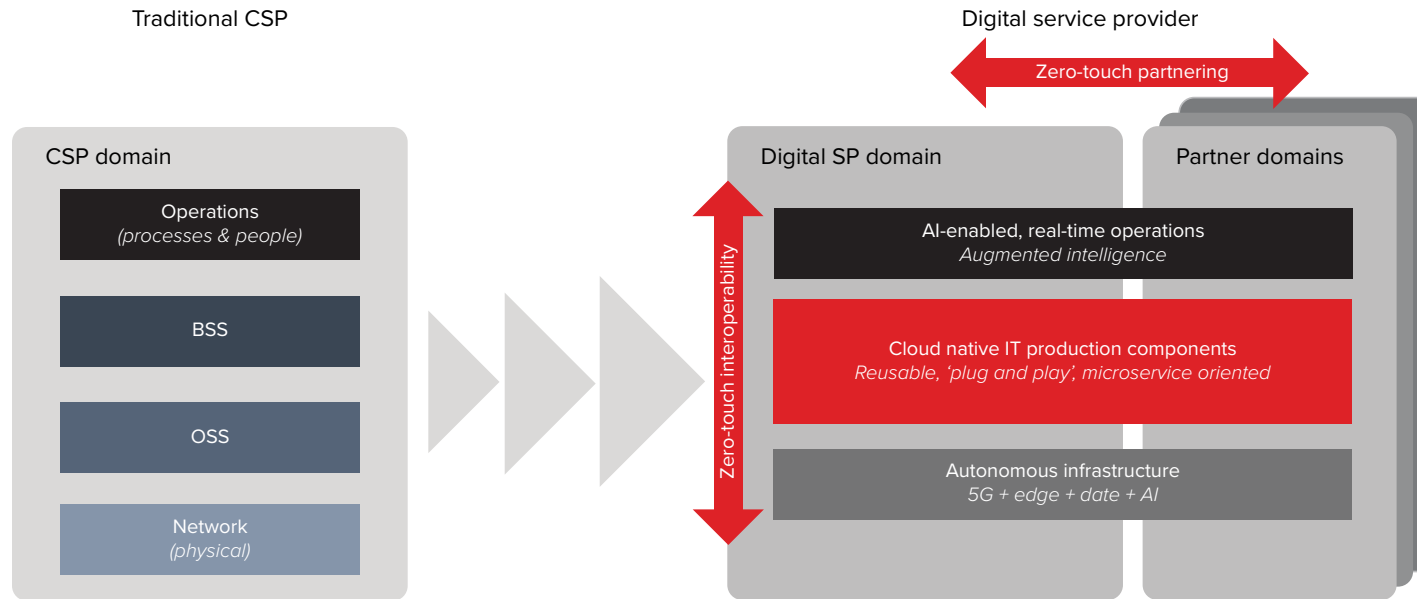
Building consistency

Developing code for publishing APIs gives operators and vendors confidence in the consistency of the interfaces across all users. "Everyone knew the APIs were not written by a couple of guys in their garage but had the thinking of major telcos behind them and would work in their environment," Glass explains.

The API work accelerated in anticipation of supporting network functions virtualization (NFV) in new and scalable ways, rather than as a reaction to the emerging threat of disruptive cloud providers and over-the-top content providers, which had not yet been fully recognized.

When the Open API Project was officially launched in 2016 that threat was clearer. The idea of operators transforming to become digital service providers using platform-based operational and business models had caught on. The Open APIs were extended to the architecture so that operators could begin decoupling components from each other, removing the cumbersome integration between operational and business support systems (OSS/BSS). Only then could the architecture support further decoupling of functional layers, such as separating the customer experience layer from systems of record, and the engagement layer from intelligence management, and so on.

Transforming into a digital service provider



TM Forum, 2020

We'll discuss this decoupling in more detail in Section 4, but the graphic above shows a high-level view of the transformation CSPs are making into digital service providers (DSPs) using the ODA and Open APIs.

In the next section, we'll look at how CSPs can partner (and in some cases compete) with hyperscale cloud providers to develop new business models.

Section 3

Taking advantage of 'blue ocean' opportunities

Hyperscale cloud providers deserve much of the credit for instigating transformation in the telecom industry. Indeed, they are transforming all industries by creating the platform economy. The relationship between communications service providers (CSPs) and cloud providers is complex. On one hand, CSPs are attempting to emulate them and compete with them, but they are also important partners for operators move support applications to the cloud and develop new business models.

A platform strategy can have two key elements:



A platform business model that sets up digital ecosystems or marketplaces connecting consumers with producers of goods and/or services (for example, Amazon Marketplace)



A platform-based IT architecture, which supports an electronic marketplace and facilitates the digital business model (for example, Amazon Web Services – AWS).

The **Open Digital Framework**, in particular the **Open Digital Architecture (ODA)** and **Open APIs**, can help CSPs develop platform business models to compete against and partner with disruptors like Amazon, Google, Microsoft and to some degree Alibaba. The panel on page 16 compares these players and others, highlighting their strengths.

A closer look at hyperscalers

AWS generated \$10 billion in net sales in the first quarter of 2020, up 33% from the same quarter last year, **according to Business Insider**. AWS accounted for an impressive 77% of Amazon’s total operating profit for the quarter. So long as the company can handle increased demand arising from Covid-19, financial analysts expect AWS to continue thriving.

At the same time, Google Cloud generated \$2.8 billion in its latest quarter, up 52% from the same quarter last year, and is on track to make \$10 billion for the year. Alibaba Cloud reached \$1.5 billion in its latest quarter after a 62% year-on-year increase.

Microsoft’s commercial cloud business earned \$13.3 billion in quarterly sales, although this is not a direct comparison because the company does not break out Azure’s revenue. While several large telcos have struck partnership deals with Microsoft, **most notably AT&T**, Microsoft’s recent deals to acquire Affirmed Networks and Metaswitch Networks (see table) should give operators pause because they could position the cloud provider to go after telcos’ enterprise business.

It isn’t only cloud providers’ financial resources or their ability to host applications for everyone from consumers to large enterprises that make them a threat, however.

They often also:

- Are easier to do business with
- Can provide more applications and solutions-as-a-service
- Offer extended ecosystems of interoperable partners
- Can offer scalable services on a pay-for-what-you-use basis
- Understand the new language and technologies of cloud

For analysis of Microsoft’s recent acquisitions, listen to this TM Forum Quick Talk podcast:



- Are more adept at leveraging customers' data
- Have developed telecom-like expertise in multi-cloud infrastructure and service management.

The complex relationship between CSPs and hyperscale cloud providers will continue for the foreseeable future, but it is important to note that while platforms like AWS, Google Cloud and Microsoft Azure partner and compete with operators, some other large cloud providers are focusing squarely on enabling telcos. IBM and Oracle, for example, have cloud infrastructure and offerings that support CSPs' cloud ambitions but do not compete. The graphic opposite compares cloud providers' strategies and shows some recent developments that are significant for CSPs.

“ The TM Forum Open Digital Framework can help CSPs develop platform business models to compete against and partner with disruptors. ”

Cloud providers at a glance

Cloud provider	Strategy
	Alibaba bought a major stake in ZTESoft, including OSS/BSS assets, creating the subsidiary now known as Whale Cloud. Whale Cloud provides cloud, big data and AI-enabled solutions to global telecom operators, governments and enterprises in more than 80 countries and regions.
	AWS closed 2019 with the launch of AWS Wavelength, which gives developers the ability to build applications that serve end users with single-digit millisecond latency over 5G networks. Verizon is conducting a trial in its MEC platform. Add this to AWS' partnerships with Vodafone, KDDI and SK Telekom, and it is clear the company has an aggressive edge strategy.
	Microsoft laid out a telecom strategy in April that heavily favors edge computing. It calls for Azure Edge Zones, which are infrastructure services that extend Azure public cloud beyond its global network to CSP 5G networks and customers' data centers. Microsoft has also announced agreements to acquire Affirmed Networks and Metaswitch Networks, deals that could position the company to compete with telcos in the enterprise market.
	Google Cloud unveiled its strategy for telecom in March including a global MEC strategy for accelerating 5G monetization, new collaboration with AT&T to develop edge solutions, its Anthos platform for managing multi-cloud environments and a partnering strategy with telecom OSS/BSS suppliers to host their solutions on Google Cloud.
	Since acquiring Red Hat, IBM has broadened its reach in cloud computing. Together, the companies aim to move cloud and platform adoption forward, particularly at the intersection of telecom and the enterprise.
	Oracle's Generation 2 Cloud platform features an Autonomous Database which automates patching, upgrades and tuning. Platform services include application development, business analytics, data management, integration, security, AI and blockchain. One of the first apps created for telecom is the cloud native Billing and Revenue Management solution.

Jumping into the ocean

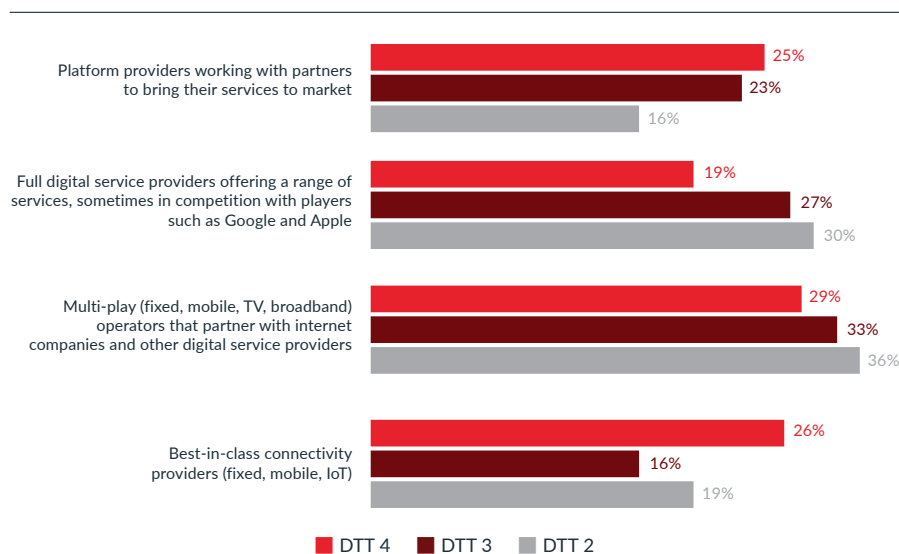
Certainly, future services based on 5G, IoT, Industry 4.0 and multi-access edge computing (MEC) will require partnerships with cloud providers for delivery. To be equals in these relationships, CSPs must be as agile and innovative as their partners. Dr. Lester Thomas, Head of IT Architecture & Innovation, Vodafone, looks at these technologies and sees the chance to take advantage of new “blue ocean” opportunities.

Forbes describes blue ocean strategy like this: “Organizations should not try to compete in existing markets (red oceans) but rather create or find new markets where competition does not yet exist (blue oceans). In other words: it tells companies to be entrepreneurial, to find and create their own opportunities and differentiate themselves from others, rather than to pursue opportunities already taken by others.”

Thomas says that CSPs must change how they operate to form collaborative partnerships with enterprises as well as partner with the developer community, IoT entrepreneurs and cloud providers. “The threat to being able to take advantage of blue ocean opportunities is the expectations on customer experience set by the hyperscale internet companies,” he explains.

One way for CSPs to jump into the blue ocean is by creating and enabling marketplaces. Over the last three years, TM Forum’s **Digital Transformation Tracker** has shown a steady increase in the number of CSPs that aspire to become partner-driven platform providers in order to bring new services to market. However, the same percentage of CSPs prefer to focus on being best-in-class connectivity providers.

What should CSPs aspire to become?



TM Forum, 2020

Building marketplaces

The Open Digital Framework supports creation and operation of all kinds of marketplaces, including:

1. CSPs access capabilities supplied by vendors’ ODA-compliant components via Open APIs
2. CSPs offer their own capabilities for sale in a marketplace for third parties to access via Open APIs

Technically and conceptually these are the same: Company X sources capabilities from Companies Y & Z, and packages them in a service offered to end customers. 5G adds new capabilities like ultra-low latency and massive machine type communication that can be combined with network slicing, edge computing and AI so that CSPs can target enterprises and develop B2B2X services, accessible through platforms and marketplaces.

These concepts are outlined in [a new TM Forum white paper](#) exploring how the Open Digital Framework supports the creation and management of marketplaces. To date, 30 companies, including many of the world's largest CSPs and their suppliers, have signed a manifesto promising to adopt and collaborate on the Open Digital Architecture and Open APIs.

Bain & Company [predicts](#) that the market for “everything-as-a-service” could be worth more than \$400 billion by 2025. For CSPs to capture some of it, they must collaborate with each other, with suppliers and with hyperscale cloud providers.

Read more about developing marketplaces:



An ongoing TM Forum Catalyst proof of concept called [App trading marketplace: a framework for CSP collaboration](#) is demonstrating how CSPs and suppliers can work together to deliver marketplaces. The project will be demonstrated in July as part of [TM Forum's Catalyst Digital Showcase](#).

The [first phase of the project](#) demonstrated partner and product onboarding, configuration in a product catalog, and how end users consume apps. In the second phase, the team is focusing on the B2B opportunity for CSPs by targeting 5G use cases that illustrate how SD-WAN and MEC can be used to facilitate smart video surveillance.

In the next section, we'll look at how CSPs are developing and using the Open Digital Framework to reimagine back-office support systems.

Watch these videos to learn more about the Catalyst:



Section 4

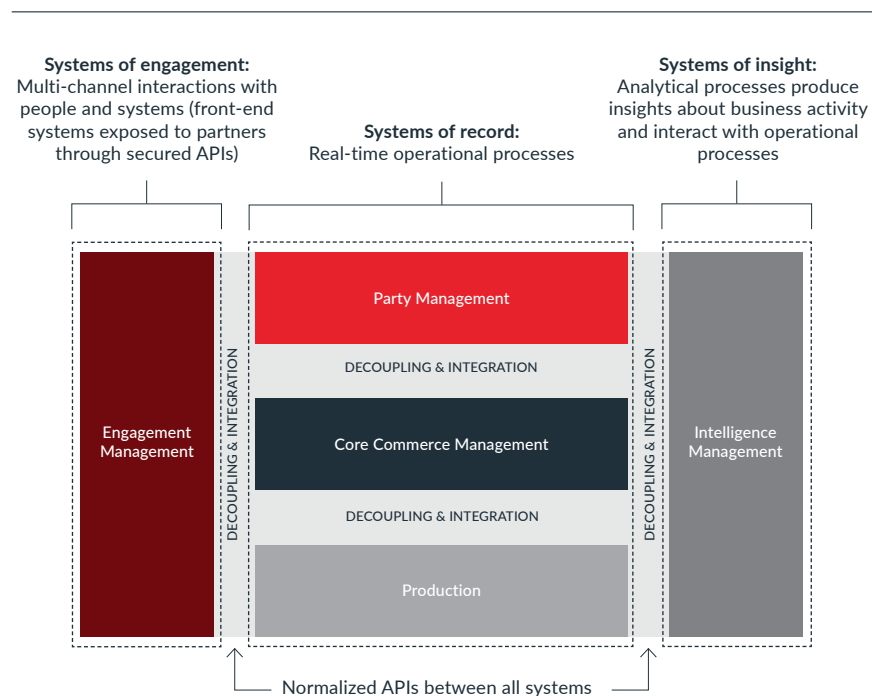
Reimagining IT support systems

TM Forum's **Open Digital Framework**, which members are developing through collaborative efforts such as the **Open Digital Architecture (ODA)**, **Open API** and **Autonomous Networks** projects, can help communications service providers (CSPs) create an evolutionary path toward cloud native, autonomous networks and operations that are software defined. By taking it step by step, operators and their suppliers can realize a return on investment in legacy systems, while at the same time benefiting from new technology.

CSPs and suppliers are co-creating the ODA to help companies reimagine and transform their operational and business support systems (OSS/BSS) and improve data sharing. It is an evolutionary approach that allows for a gradual transition away from legacy support systems. The architecture embraces state-of-the-art IT, including containers and microservices, open source software, virtualization and cloud architectures, as well as embracing new agile ways of working and **DevSecOps** culture.

The graphic opposite shows the high-level functional architecture of ODA, which changes the way operational layers connect and share data. The ODA captures a high-level view of how a CSP operates. The diagram was deliberately kept simple so that people in various job roles within a CSP, not only software architects, can understand and explain it. And while it is being developed primarily by CSPs and their suppliers, it is also useful for other kinds of enterprises that want to transform into digital businesses.

ODA functional architecture



Following is an explanation of what happens in each block of the ODA functional architecture:



Engagement Management deals with multi-channel interactions between people and systems as well as system to system, and includes front-end systems that are exposed to partners and customers through secured APIs.



Party Management handles all interactions and data associated with entities or actors (for example, customers, suppliers and partners) that are involved or likely to be involved in business processes.



Core Commerce Management includes activities that directly or indirectly facilitate the exchange of goods and services; this covers functions such as product catalog, order capture, orchestration of product delivery, rating of charges, and product assurance.



Production abstracts the complexity of infrastructure and is responsible for the delivery and lifecycle management of customer-facing services and resource-facing services, regardless of the type of technology being used. Network service capabilities are exposed in a way that is commonly known as **network-as-a-service (NaaS)** to simplify the consumption and management of network domains by other ODA function blocks. For example, Core Commerce Management uses them to create products and offers, while Engagement Management might use them to allow customers to top up their balance or order a video on demand.



Intelligence Management supports systems of insight, AI, machine learning and cognitive capabilities and includes analytical processes that use operational data along with events fed from operational processes to produce analyses, correlations and aggregations to improve operations. This could include using traffic analysis for revenue assurance or fraud detection, for example.



Decoupling & Integration happens between ODA domains and components through Open APIs, which govern and manage the separation of functional borders based on "families" of closely interrelated services as well as the integration between them. Using APIs ensures that services provided by the ODA can be combined in a flexible way, without restrictions being imposed by processes from adjacent blocks. Unlike traditional architectures in which functional layers are supposed to communicate only with adjacent layers such as OSS/BSS or the network, the decoupling within ODA ensures that the functional architecture by itself doesn't preclude the sharing of data or combination of services.

A maturing model

As noted in Section 1, Vodafone was one of the founding members and contributors to the ODA. When ODA was launched in 2018, Dr. Lester Thomas, Head of IT Architecture & Innovation, Vodafone Group, said, “Concepts like Open APIs, artificial intelligence, platform business models, cloud native microservice architectures and digital ecosystems will help drive agility and innovation, but only if CSPs can successfully evolve away from legacy BSS/OSS architectures. The TM Forum Open Digital Architecture provides a pragmatic way to bring these concepts together and sets the blueprint for the digital transformation essential for CSPs to survive and thrive in a digital world.”

Today, Thomas acknowledges that ODA has helped Vodafone increase agility: “The combination of Agile sprint teams, cloud native approaches to developing software, adoption of DevOps automation as part of delivery process, and adoption of Open APIs has contributed to a step-change in our agility.”

He adds that the adoption of ODA at Vodafone so far has been mainly in experience management. The next step is to start adopting these approaches for core commerce systems, including service design and creation, particularly for new 5G and IoT services.

A word about design principles

ODA is expected to drive automation, increase agility, support new business models, ease integration with a multi-vendor platform, apply multi-layered intelligence and more. However, not all these capabilities are ready for prime time. Therefore, CSPs must make sure the design choices they make today will support these goals in the future.

The ODA includes a dozen design principles that support the goals while also removing the separation between OSS and BSS, allowing them to be viewed as part of a single architecture. Below is an abbreviated version of them. More detail can be found in a TM Forum publication called *Open Digital Architecture concepts and principles* and *this white paper* focusing on how ODA can help CSPs can build and participate in software marketplaces.

- **Common data architecture** is the foundation needed to create a single view of a customer. It takes a strategic approach to the holistic management of data by reducing the number of systems and simplifying overall architecture. This fulfills the growing business requirement for data generated in one part of the architecture to be available to components in any other part. Initially this can be achieved through a common data repository for each functional block of the architecture, but there are other potential approaches and the ODA team is working to identify best practices.
- **Intent ODA** supports intent-based management using closed control loops, policy management and autonomic computing. These capabilities enable the development of an intuitive network and allow data from the network to be captured and exposed through APIs. This allows iterative learning through machine learning and AI.
- **Componentization and modularity** are key to ODA as they actively promote multiple IT suppliers and systems integrators. Components must operate according to agreed principles, using a common language and collaborative approach to procuring and integrating new capabilities, as the environment will include legacy systems for some time yet. Components need to work together in the way that reusable ones are offered in cloud marketplaces and support microservices.

- **API-based architecture** is fundamental to the concept of componentization and the creation of multivendor environments where components can be integrated through standardized APIs. Ensuring that the same APIs are used for both internal and external integration accelerates partnerships with digital ecosystems. TM Forum offers a suite of **more than 50 REST-based APIs** that are being used by more than 7,000 unique users from nearly 800 companies.
- **Dynamic integration** or orchestration is possible using components that by design enable the necessary dynamic integration or orchestration to chain together the components for each new services or business models as they are introduced.
- **Real time** relies on another design principle, namely that all components should act and report relevant data in whatever represents real time in the current context of the service environment of the time.
- **Separation of design time and run time** are essential as services and products will be designed to rapidly onboard new capabilities and partners. The system is architected so that a new service or product can be designed from existing services (exposed in catalogs), and once complete, placed into the runtime environment automatically.
- **Catalog based** means each component must expose its capabilities through a catalog and provide enough information in the model for another component to interwork with its capabilities, so there is no need for the manual configuration of new service chains.
- **Security by design** is critical as security concerns and measures must be continuously weighed against business opportunities in open architectures that support complex business models. Here organizational boundaries are often ambiguous, and services are composed of distributed, separately maintained and deployed components. Authentication, onboarding and consent management must be considered throughout.
- **Privacy by design** is a legal requirement as part of the **EU's General Data Protection Regulation (GDPR)**. It calls for the inclusion of data protection from the onset of system design, and the hosting and processing of data must be limited to what is strictly necessary. Other key features that must be included are consent management and the right to be forgotten.
- **Agile governance** principles are incorporated into the ODA to manage rapid changes in a complex environment. Systems and operational teams are likely to be distributed geographically, with a mixture of centralized and local products and processes. The governance system should provide the teams with the autonomy they require to be agile in response to their markets, while maintaining consistency through centralized oversight.

In the next section, we'll look at how CSPs are collaborating to develop an ODA Reference Implementation and why a common data model is important to the future of the ODA.

Section 5

Developing the ODA Reference Implementation

The **TM Forum Open Digital Architecture (ODA)** heralds a new type of collaboration in which members co-create code in the form of an ODA Reference Implementation. The first area of focus is on core commerce capabilities, which today consist of many commercial-off-the-shelf software applications that CSPs have developed over time to support order management (for example, product catalogs, quotation tools, rating modules and order orchestration systems). These systems often either have overlapping functionality or present gaps in the end-to-end customer journey that must be addressed through customization, which costs millions of dollars and takes many months. This does not support the business agility needed for the 5G world.

As a co-founding member of the ODA **and signatory of the Open API & ODA Manifesto**, Laurent Leboucher, Orange's Vice President Customer Relations Solutions & Global Architecture, sees the ODA as a cornerstone of his company's strategy to become a digital service provider. The architecture has the potential to support all Orange's emerging initiatives in network slicing, IoT, edge computing, and AI. Above all, it will enable a better user experience for what the company hopes will be a rich, multi-service marketplace.

Leboucher, **said of ODA** that it allows him to make very clear design choices, such as using APIs to decouple front-end and back-end systems, as well as separate party management from offer and product management. Because the processes and reference data are implemented in back-end systems, evolving front-end systems becomes much easier and helps reduce IT transformation costs. The time it takes to configure and launch new services across channels is reduced substantially, which helps put CSPs on par with the cloud providers in terms of agility and customer experience.

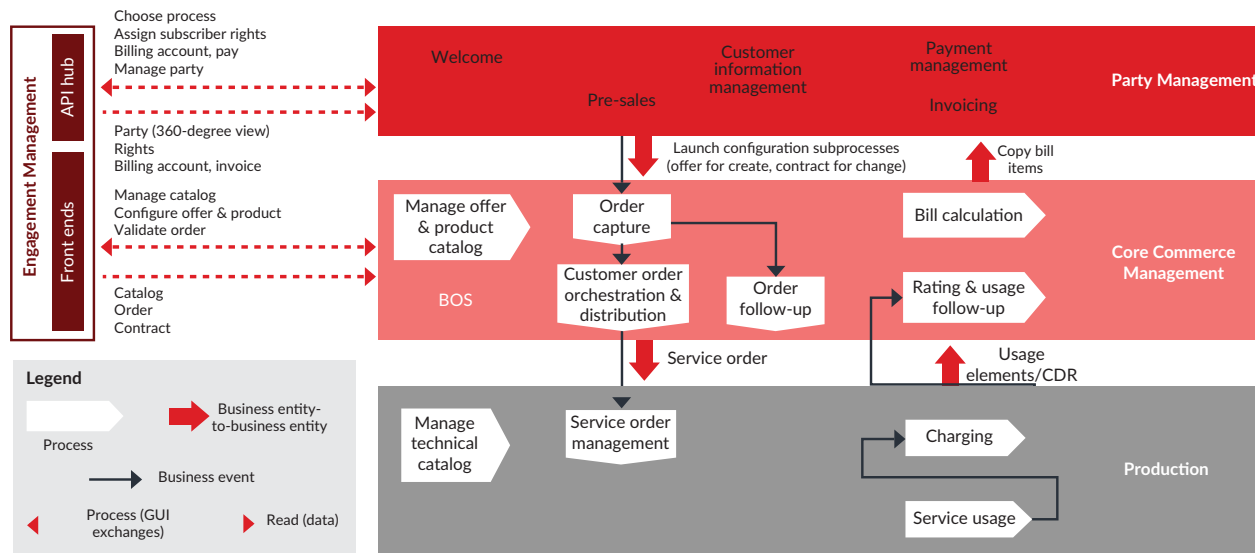
"When we have the opportunity to leverage sound and concrete frameworks such as ODA and Open APIs, we can save a lot of money," Leboucher said.

Proving the concept

Together, Orange and Vodafone championed **a Catalyst proof of concept** to develop the ODA Reference Implementation, which was demonstrated at TM Forum Digital Transformation World in May 2019. The team started by showing how to implement interactions in the Core Commerce Management block of the ODA (see page 21) to order a new offer, select it and then begin configuring it from a product catalog. "We need this reference implementation," Leboucher commented. "We still suffer...a lot of integration burden in our organizations on the IT side and we need to simplify drastically. The only way to do that is to move to a much more plug-and-play architecture. And in order to make it tangible, the only way to create that architecture is to realize it through a reference implementation."

The graphic on page 26 shows the software '**Canvas**', which acts as the backbone of the core commerce system, describing which components are needed and how to assemble them.

ODA Reference implementation



TM Forum, 2020

A new way of working

As part of the Catalyst, Vodafone demonstrated a product catalog that will support future 5G services and edge cloud services.

“We know something like an ecosystem is a fundamental part of our future business model...so it is about how we collaborate at speed,” Dr. Lester Thomas, Head of IT Architecture & Innovation, Vodafone, said at the time. “We need this plug-and-play integration, but how do we build it?”

We need to adopt the approaches to collaboration found in the software world.” Leboucher **said** he believes the ODA Reference Implementation can be used in a practical and easy way to check the compliance of commercial solutions against the APIs.

“We expect in the long run our partners, our vendors, to leverage that reference implementation in their own solutions. So, if we procure some vendor’s solution it will be a guarantee that it will plug easily into the overall ecosystem,” he explained. Thomas went further, saying that he thought Vodafone’s future requests for proposal (RFPs) could include demands for an interoperability test with the ODA Reference Implementation before the company would consider a vendor solution.

“It will be a proof point like we have in the networks,” he said. “When we buy network software, it has already been interoperability tested. You don’t have to do a lot of integration work to make it fit into our architecture.”

Indeed, Vodafone has recently announced that its corporate strategy eventually will be to replace the RFP process with one focused on proofs of concept. “Clearly this is very different from our current engagement approach,” Thomas acknowledges. “I would see the approach being trialed for limited engagements as we mature the model.”

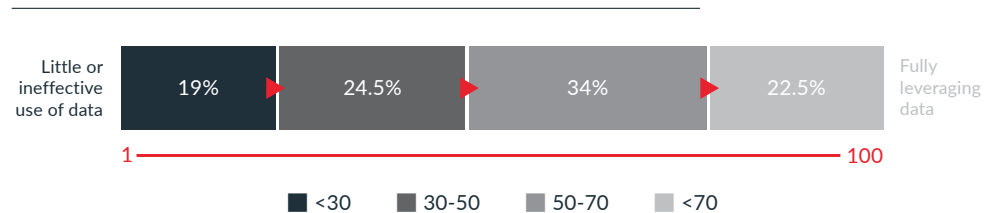
Moving forward with intelligence

As operators progress with transformation and participate in the development and adoption of ODA principles, they will rely increasingly on data. The Intelligence Management portion of the ODA still has some way to go to build a common data platform from which intelligence can be uncovered and shared openly and safely between stakeholders, but this will be necessary.

The challenge of sharing data does not lie with APIs but rather with data management and analysis capabilities. Advanced analytics have come a long way, but the assumption that AI is ready to be leveraged across the business is “magical thinking”, according to Aaron Boasman-Patel, TM Forum’s Vice President of AI & Customer Experience. “Because of the scale of the change required to implement true AI, most operators today have what we call ‘advanced analytics’ in place, in which they are still looking at data in silos and maybe starting to do some cross-functional sharing of data,” he explains. “But really, it is the human still making the decisions and implementing them.”

In a December 2019 TM Forum report called *How to leverage data analytics*, 88% of CSPs surveyed agreed it is essential to use data across the entire organization. However, the survey, which targeted personnel directly responsible for data sharing, showed that only about half of respondents believe their companies are using data effectively.

How effectively are CSPs using data?



TM Forum, 2020

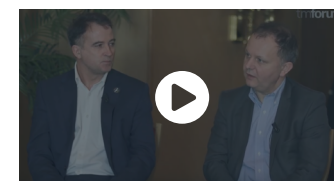
Using a common data model

One way to improve how data is used across the business is through a common data model. “You can’t deploy true 5G...unless you have mass analysis of data,” Boasman-Patel says. “It has to be on a common data model, and there has to be open access to that data that complies with privacy regulations like **GDPR** [the EU’s General Data Protection Regulation].” ODA’s data platform will need to be scalable and make intelligent decisions about how to use data. Boasman-Patel points out that CSPs carried 90% of the data produced in the last two years and that the amount will increase ten-fold in the coming years, yet most is unusable for analysis. He offers these questions to consider when developing an AI-driven common data platform within the ODA:

- What data do we need to look at?
- What problems are we trying to solve?
- Are we asking clear questions?
- Does the value of some data last longer than others?
- How long do we use data, and when do we retire it from the lifecycle?

In the next section, we offer some strategies for increasing and exploiting agility.

Watch Leboucher and Thomas discuss the ODA Reference implementation with TM Forum’s George Glass:



Section 6

Make it happen – Strategies for attaining and exploiting agility

Agility is the primary goal of the **TM Forum Open Digital Architecture (ODA)**. Communications service providers (CSPs) hope to use it to increase innovation, become more competitive and create a more equitable relationship with hyperscale and over-the-top providers. However, each operator's path forward is unique. ODA allows them to set their own pace and direction for transformation. Following are some steps operators can take to achieve these goals.



Persist on the road to agility

Transformation is not only about upgrading systems and software. It is also about changing culture, opening interfaces, automating processes, sharing data, embracing partners, and creating new services and experiences and ways to share them. Developing agility is not easy, but the ends will justify the means as consumers and businesses start to notice the difference. CSPs should look for big and small ways to increase agility and remember that the ODA supports evolutionary change.



Don't just promise – demonstrate

CSPs should start to change procurement processes by relying less on requests for proposal and more on proofs of concept. It's important to make suppliers show that they conform to the desired standard before considering their product's fitness for an architecture. Companies such as Vodafone have already voiced support for this process and are moving in this direction.



Feed innovation

ODA gives new suppliers and innovators a chance to become part of an ecosystem of partners working together to deliver new experiences. The lines between operational support systems and business support systems are being erased, and new solutions, including open source applications and microservices, can more easily communicate through Open APIs and weave their way into the fabric seamlessly.



Drive the standards

Big or small, there are ways for suppliers and service providers to join collaboration teams and participate in proofs of concept, such as **TM Forum Catalysts**, to demonstrate value to operators and contribute to the community. The Open Digital Framework is comprised of groups working on Open APIs, the Open Digital Architecture, AI & Data Analytics, and more. If you'd like to get involved, **contact TM Forum CTO George Glass**.



Listen to data

Almost half of CSPs know they don't make the best use of data in network or customer environments. To change this, operators should start with internal governance around data to ensure that it is shared across the organization and that departments are not hoarding it for their own use. Then they should begin introducing new data sources, paying special attention to compliance, privacy and security. The idea is not necessarily to become data driven, but to leverage data to become customer driven.



Embrace cloud

CSPs will have to partner with and compete with cloud providers for the foreseeable future. Embracing cloud native technology and partnering with cloud providers to move other applications to cloud environments can save CSPs money and improve responsiveness. At the edge, however, CSPs may want to be more cautious. They still hold an advantage with their access networks, so it makes sense to try to own the relationship with enterprises at the edge.

“ Embracing cloud native technology and partnering with cloud providers to move other applications to cloud environments can save CSPs money and improve responsiveness. ”

Designed for Agility: Oracle Digital Experience for Communications



Agility is Job #1 for today's service providers.

Service providers face competitive pressures and disruptive threats from every angle, including over the top providers, cloud hyperscalers, and digitally-minded mobile virtual network operators. The only way to compete in these battlegrounds is to develop the business and IT agility to be flexible, automated, personalized, intelligent and real-time.

Furthermore, the communications industry is at a crossroads as we enter the 5G era. The stakes are high: service providers must embrace solutions and operational models designed for agility, or risk spending heavily on network investments only to be marginalized by disruptors.

Previous eras were primarily driven by clear use case requirements but the paradigm has now shifted. With the wide-open possibilities of 5G, no one yet knows the future killer use cases and so maximizing the ability to quickly explore new opportunities and deliver new services is more important than ever before.

And this must be done against the backdrop of quickly and constantly changing customer expectations, when all underlying systems must have sufficient agility to provide modern, connected digital experiences.

Keys to Success in Attaining Agility

What must service providers consider to maximize agility?

In terms of business agility, frequent constraints are fragmented customer experiences across channels, limited insights into prospective customer preferences, incomplete agent visibility of customer data, explosion of new digital channels.

This requires:

- Modern, adaptive digital experiences across the customer lifecycle
- Connected intelligence through smart use of data and IT

And in terms of IT agility, constraints include multiple incumbent systems, tight coupling of channels to experiences, duplicate and inconsistent and siloed data.

This requires:

- Decoupling systems of engagement from systems of record
- API-driven evolution paths for existing IT infrastructure
- Adaptive data mastering

Oracle Digital Experience for Communications (DX4C)

Today's customers expect personalized interactions from the time they start learning about a company's offers to when they order service to when they need care. They expect to hop seamlessly across channels, from social to app to contact center, while all context is preserved.

DX4C was specifically designed for the communications industry to enable these smarter innovative digital experiences while delivering a solution architecture that maximizes business and IT agility. Based on decades of Oracle's experience of providing full concept-to-cash-to-care solutions for hundreds of service providers, DX4C is a truly revolutionary data-driven solution that enables service providers to innovate, engage and transform.

Designed for Agility: Oracle Digital Experience for Communications

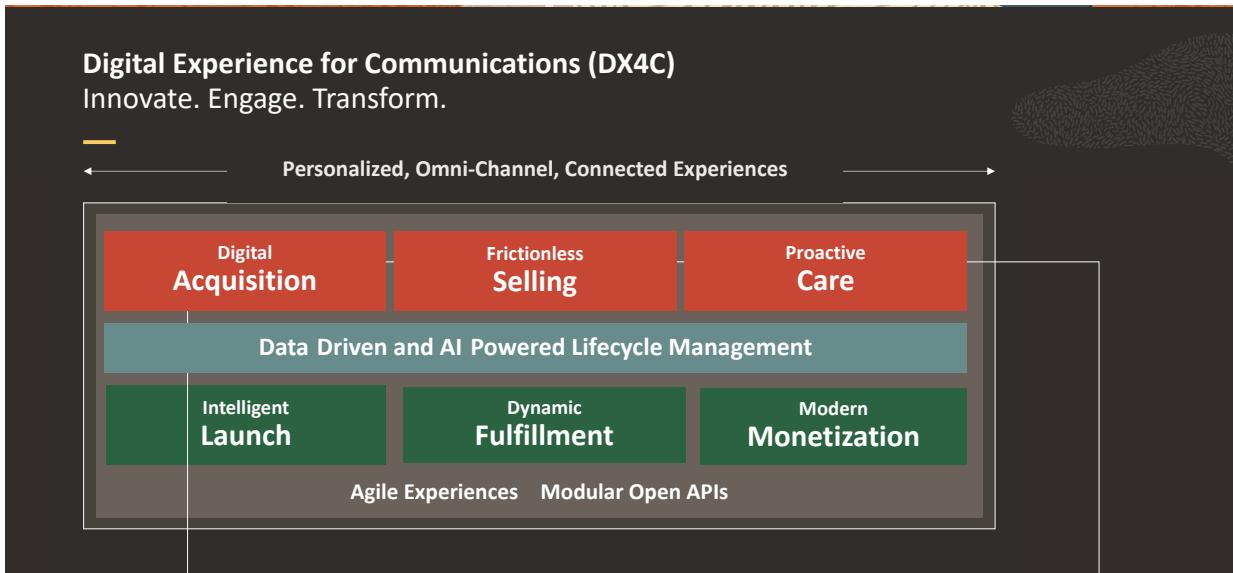


Figure 1: Oracle Digital Experience for Communications provides a complete, data-driven solution for service providers to innovate, engage and transform.

The solution is available as a complete and integrated suite or plug-and-play modules.

It includes:

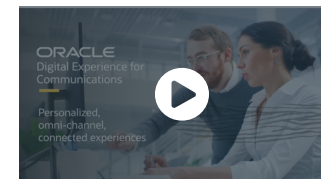
- Acquisition: Leverage digital profiles and behaviors to optimize media buying, personalize content and offers in real time, and win back through digital channels.

- Selling: Deliver a highly personalized, conversational commerce experience using AI-driven recommendations. Increase cross-sell/upsell, improve offer uptake, and reduce cost of acquisition.
- Care: Empower customers through assisted and unassisted channels and encourage digital assistance. Use connected intelligence to surface relevant, contextual customer data. Build loyalty and retention. Blend sales and service to turn care into commerce.

- Launch: Use real-time customer insights to ideate, create and launch offers with a design-time centralized product catalog created for business users. Speed time to market and improve offer uptake.
- Fulfillment: Dynamically fulfill customer orders with fully automated, model-driven orchestration that supports the full order lifecycle at scale. Surface relevant order data into omni-channel care.
- Monetization: Monetize any business model, employ flexible pricing, discounting and account structure, manage payments and collections. Surface relevant billing data into omni-channel care.

Oracle provides unrivaled data management and AI and ML capabilities to power connected intelligence and experiences for both customers and service provider employees.

Watch a video: [Innovate, Engage and Transform](#)



Designed for Agility: Oracle Digital Experience for Communications



DX4C Architecture: Designed for Agility

Oracle designed DX4C to provide the agility to address the key challenges service providers face today. They are losing ground to digital disruptors because they don't use data as well and because their pace of innovation is typically much slower. Every project represents a major change and the funding is not always available to transform IT systems. DX4C is designed to enable transformation at any pace while immediately providing the compelling data-driven digital experiences that customers expect.

The key idea is that service providers want to change both customer and end user experiences frequently but cannot change the systems of record very often. For example, they want to create a new agent desktop window, a new digital assistant skill, or a new recommendation without impacting the underlying systems. This situation constrains agility. DX4C is architected to decouple those two and change experiences at digital speed while taking time to evolve systems of record on a case by case basis. No need to rip and replace: reap the benefits of modern experiences while using existing systems.

How?

1. Let's begin with the importance of experience. DX4C starts from the perspective of experience for business

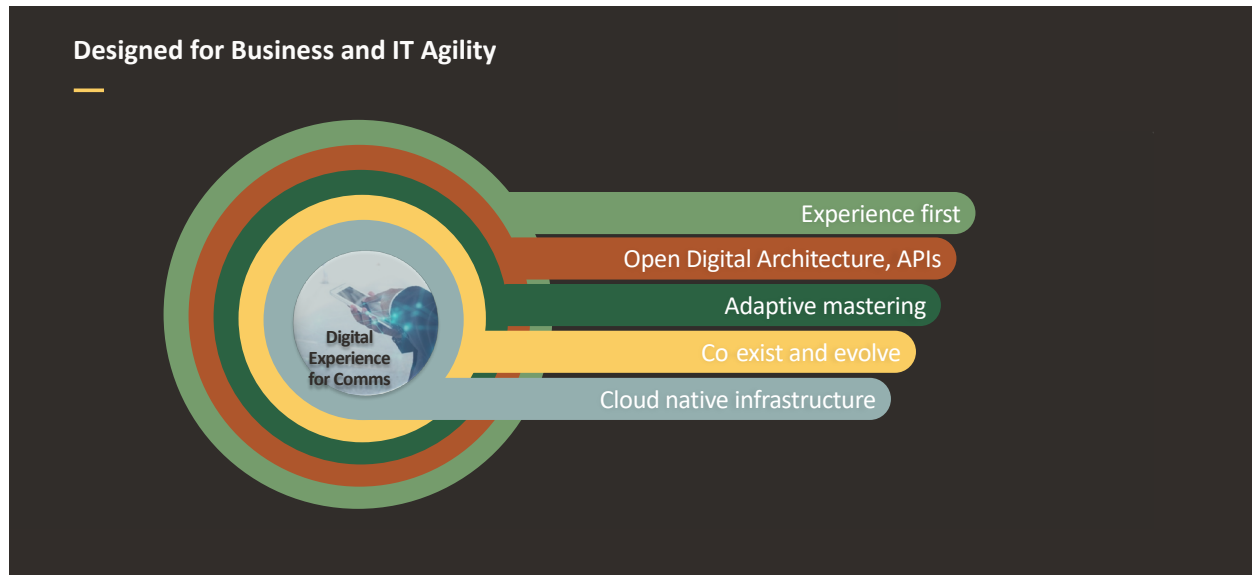


Figure 2: Oracle Digital Experience for Communications' design principles are geared towards helping service providers to maximize business and IT agility so they can quickly deliver innovative user experiences.

users in all aspects of how it is designed. Oracle provides pre-built context-aware experiences based on Oracle's Redwood user experience which uses natural language processing, AI, and other modern paradigms. Customers can extend and modify these experiences or design their own. This encompasses run time for customers and employees, as well as a new design time experience that is specifically built for business rather than technical users.

2. Decoupling this all-important experience layer from the underlying systems of record – which are much slower to change – is critical to attaining agility. Oracle accomplishes that with its Industry Fabric, DX4C's unique architecture that is built in alignment with the TM Forum's Open Digital Architecture. This is critical to providing both IT and business agility and helps applications act more like microservices: pick and choose the underlying components and assemble into

Designed for Agility: Oracle Digital Experience for Communications



an integrated experience. Similarly, DX4C uses TM Forum Open APIs to maximize interoperability. These open APIs are the language of DX4C's Industry Fabric architecture.

3. Data management is very complex when you consider customer data, product data, order data, asset data – across multiple systems. DX4C normalizes data across the enterprise using industry standard data models. There are two aspects to this. The first is data mastering, which DX4C addresses by assigning the role of gatekeeper to receive data, validate updates and broadcast the updates to all apps that have been configured to need that type of data. This ensures that data is both accurate and consistent across all participating apps. Alternatively, customer data can be synchronized to any customer data management adapter conforming to TM Forum Open APIs to maximize interoperability. The second aspect is about applying intelligence to that data. Normalized and validated data is presented to business intelligence platforms to provide executive dashboards as well as to the experience context in real time, where AI and ML can make the experience smarter, more personalized and relevant.

4. Oracle recognizes that most service providers today operate in complex heterogenous IT environments comprised of multiple vendors, software versions and deployment models. DX4C is designed to accommodate such situations by taking an

application- and vendor-agnostic approach to operate successfully in any environment. This enables DX4C to co-exist with current applications, including Siebel, and have an evolution path forward to modify first the experiences and then, at their own pace, the underlying systems of record.

5. DX4C is designed to run on cloud native Oracle Cloud Infrastructure, ensuring the security, availability, resilience and disaster recovery required for a communications-grade, mission critical solution.

This design approach is suited to maximize agility, quickly deliver modern experiences decoupled from systems of record, ensure interoperability and evolution, and master data to provide real-time intelligence.

Oracle and TM Forum: A History and Future of Collaboration

Oracle has a rich history with the TM Forum dating back to its early days in the 1990s when Oracle laid the groundwork for the development of TM Forum's widely adopted information framework (SID) and solution certification (eTOM) and achieved the first-ever TM Forum solution certifications for two solutions spanning business and operations support systems. Oracle sits on the TM Forum board and many subject matter experts participate in working groups, SpecJams and thought leadership activities. Oracle participates in

many Catalyst projects and is currently engaged in *BOS: An implementation of ODA core commerce management – Phase II* and *The Aviator: Enabling multi-vertical innovation through 5G slicing – Phase III*.

As the TM Forum has evolved to the Open Digital Framework, Oracle has continued to align with these standards and contribute to their definition. A signatory to the Open API & Open Digital Architecture Manifesto, Oracle is committed to maximizing agility for service providers by adopting these principles throughout architectural design.

Oracle is working on certification of many Open APIs that expose DX4C capabilities in an open and transparent manner and has recently completed Open API certifications in Service Inventory Management (first company to certify) and Resource Inventory Management for Unified Inventory Management, part of the Oracle Service and Network Orchestration portfolio and foundation to Oracle's 5G Now initiative.

TM Forum CTO George Glass recently commented, "Oracle is further demonstrating the industry value of adopting extensible open APIs to expose and consume a catalog of capabilities to drive innovation and monetization of new products and services. The adoption of these APIs enables companies like Oracle to execute at digital speeds and capitalize on the opportunities presented by an increasingly connected world."

Designed for Agility: Oracle Digital Experience for Communications



DX4C is fundamentally architected to implement the agility of the Open Digital Architecture. The ODA Engagement layer maps to DX4C's experience layer, which manages any channel and customer type. TM Forum Open APIs decouple the systems of engagement from the systems of record in DX4C's Industry Fabric layer and provide interoperability in multi-vendor environments. Intelligence Management is delivered by Oracle's data and AI capabilities, all operated with the scalability, automation and security of Oracle Cloud Infrastructure.

Conclusion

Customers' expectations have been rapidly changing to expect intelligent, personalized, connected digital experiences – further accelerated by COVID-19's push towards digital. In order to meet these expectations and deliver innovative new services and 5G business models, service providers require extreme agility in both their business operations and IT systems. Oracle's DX4C solution, in alignment with the Open Digital Architecture, is designed to maximize agility and enable service providers to innovate, engage and transform their business for the future.

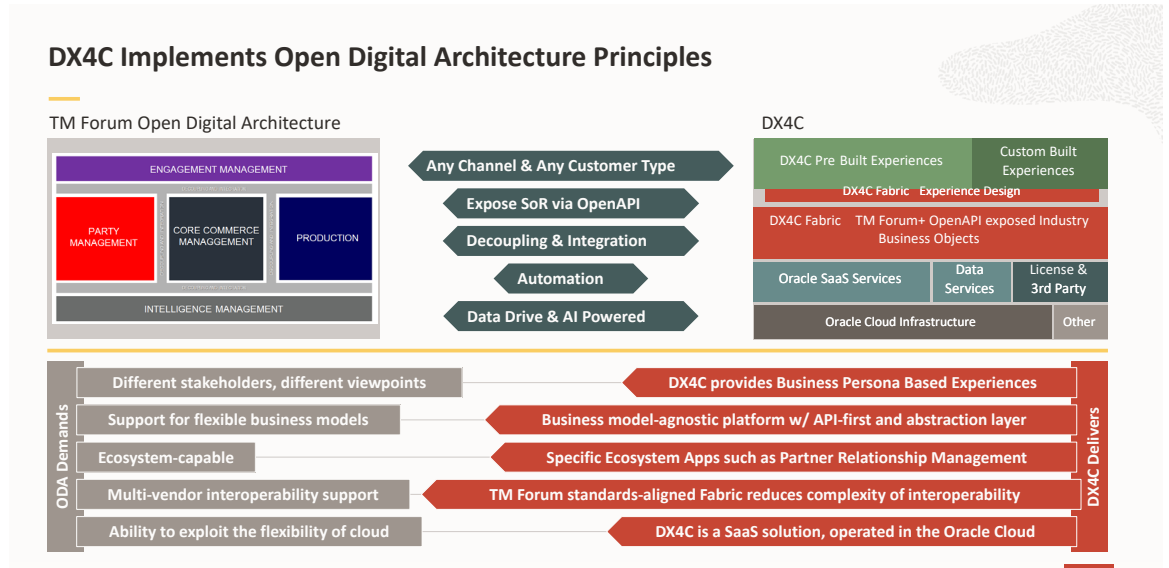


Figure 3: Oracle Digital Experience for Communications is architected to implement the principles of the Open Digital Architecture and the Open APIs.

TM Forum Open Digital Framework

A blueprint for intelligent operations fit for the 5G era

The TM Forum **Open Digital Framework** provides a migration path from legacy IT systems and processes to modular, cloud native software orchestrated using AI. The framework comprises tools, code, knowledge and standards (machine-readable assets, not just documents). It is delivering business value for TM Forum members today, accelerating concept-to-cash, eliminating IT and network costs, and enhancing digital customer experience. Developed by TM Forum members through our **Collaboration Community** and **Catalyst proofs of concept** and building on TM Forum's established standards, the Open Digital Framework is being used by leading service providers and software companies worldwide.

Core elements of the Open Digital Framework

The framework comprises TM Forum's **Open Digital Architecture** (ODA), together with tools, models and data that guide the transformation to ODA from legacy IT systems and operations.

Open Digital Architecture

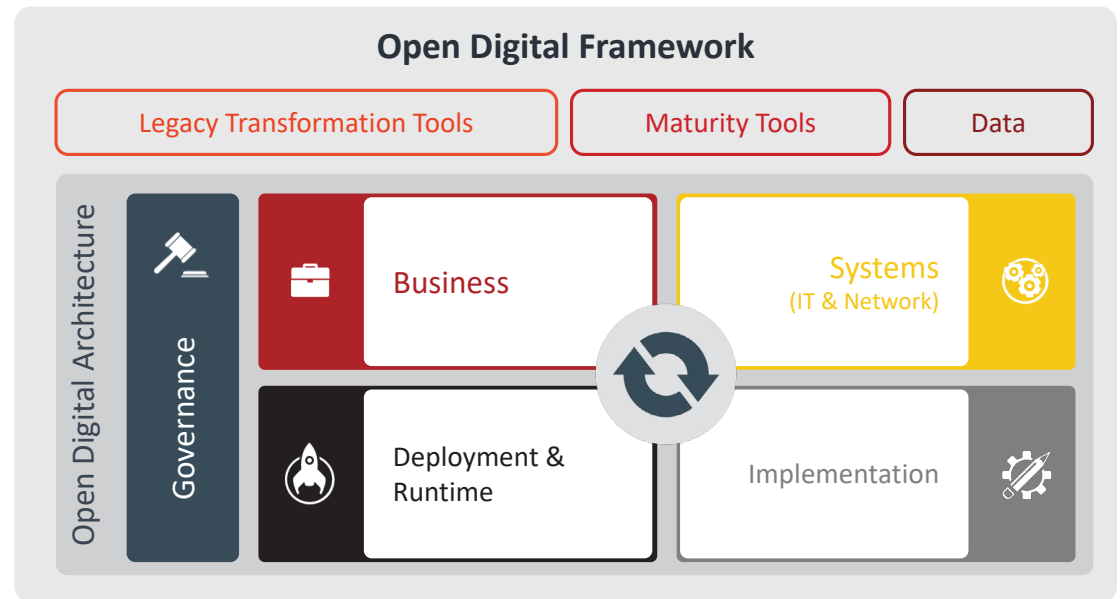
- Architecture framework, common language and design principles
- **Open APIs** exposing business services
- Standardized software components
- Reference implementation and test environment

Transformation tools

- Guides to navigate digital transformation
- Tools to support the migration from legacy architecture to ODA

Maturity tools & data

- Maturity models and readiness checks to baseline digital capabilities
- Data for benchmarking progress and training AI



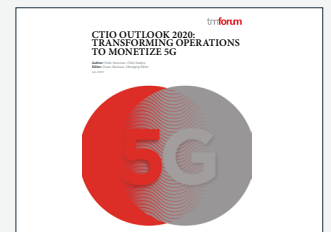
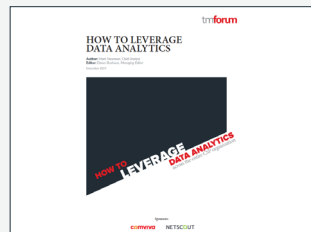
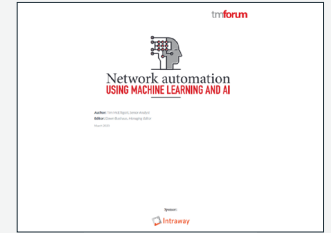
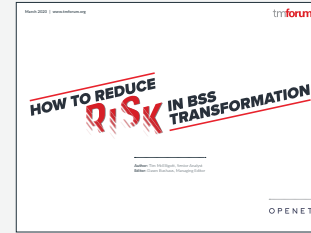
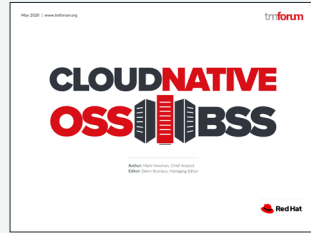
Goals of the Open Digital Framework

The Open Digital Framework aims to transform business agility (accelerating concept-to-cash from **18 months to 18 days**), enable simpler IT solutions that are easier and cheaper to deploy, integrate and upgrade, and to establish a standardized software model and market which benefits all parties (service providers, vendors and systems integrators).

Learn more about collaboration

If you would like to learn more about the project or how to get involved in the TM Forum Collaboration Community, please contact **George Glass**.

TM Forum Research Reports



Meet the Reasearch & Media team



Report Author:
Tim McElligott
Senior Analyst
tmcelligott@tmforum.org



Chief Analyst:
Mark Newman
mnewman@tmforum.org



Editor, Digital Content:
Arti Mehta
amehta@tmforum.or



**Commercial Manager,
Research & Media:**
Tim Edwards
tedwards@tmforum.org



Report Editor:
Dawn Bushaus
Managing Editor
dbushaus@tmforum.org



**Customer Success
& Operations Manager:**
Ali Groves
agroves@tmforum.org



Global Account Director:
Carine Vandeveld
cvandeveld@tmforum.org



Digital Marketing Manager:
Anna Kurmanbaeva
akurmanbaeva@tmforum.org

