Special Report | **TM Forum Digital Transformation World 2019**

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Executive brief

TM Forum's *Digital Transformation World 2019* event continues to evolve from its earlier technology-driven roots to take a wider view of the current state of the communications sector, with a more expansive scope suited to addressing the ongoing convergence of networks and IT in the sector as digitalisation momentum builds. The key message put forward by organisers TMF was one of the growing opportunities and need for collaboration between operators and their partners to take full advantage of the transformation that software-defined network and virtualisation are bringing to the industry in parallel with the arrival of 5G. The organisation also showcased the *Open Digital Framework* as a blueprint for ongoing cooperation in development and design of digital services, building on its enthusiasm for *Open APIs*. [pp.**16**-**21**.]

> **EXFO made its presence felt at the event through presentation of two use cases of service assurance solutions in virtualised network environments**, and company executives further advocated the potential for managed automation to address the spiralling complexity that accompanies digital systems. The vendor is taking a DevOps approach to collaboration with Telenor in Denmark on introducing an integrated platform approach to monitoring and analytics as part of a major digital transformation programme. In the UK, the pioneering work by operator Three on deploying virtual infrastructure is being supported using virtualised probes orchestrated as a VNF. **EXFO is also involved in the *Skynet Catalyst* project, which picked up the *Outstanding Catalyst Award*** for its development of a 5G-enabled remote-healthcare solution in a multi-operator orchestrated environment. [pp.**6**-**14**.]

Overall, **more than 30 *Catalyst* projects were presented at *DTW19***, with five major themes emerging, including: adoption of marketplaces; joint catalogues; blockchain; and network slicing. Many projects entailed a combination of these themes, with solutions built on *Open APIs*, and global operators could be seen working together to identify the basis of new commercial opportunities that will come with 5G. [pp.**22**-**24**.]

TMF *Open APIs* are increasingly being relied upon by operators to create new services with the flexibility and speed needed to compete with hyperscale internet companies. The focus of development is also expanding to include more specialist tools for IoT and edge computing applications. Heavyweights including AT&T and Deutsche Telekom have now signed up to the accompanying manifesto, although adoption in the wider operator community is still lagging behind ambitious goals. [pp.**25**-**28**.]

Returning to the theme of collaboration, **operators and potential partners for industrial applications of 5G technology discussed how their relationships need to evolve** to take full advantage of the emerging opportunity. Operators were open to closer cooperation, although the challenges of monetisation and burden of investment are potential stumbling blocks. Virtualisation is again expected to ease the collaborative process, but while customers expect more from operators, operators are calling for major vendors to join the party and deliver the true cloud-native solutions that can flow through to the end-user. [pp.**30**-**37**.]

Telefónica used *DTW19* to highlight its progress on the digital journey, and shared details of how its *AURA* cognitive intelligence platform is bringing together data analytics and AI to improve customer experience. The *AURA* tools are ultimately expected to be replicable in all of the operator's markets, but standardisation is not without its difficulties, as a case study on the deployment of the underpinning *Unified Reference Model* in its Mexico business demonstrated. Meanwhile in Brazil, Telefónica|Vivo's CIO outlined the pace of change needed for IT transformation in a modern operator. [pp.**39**-**42**,**43**-**47**,**57**-**58**.]

Deutsche Telekom was more outward looking in its presentations, with calls for operators to be more friendly towards each other as they strive to protect and grow digital opportunities. Internally, **the Group is doubling-down on the deployment of its harmonised open API layer, which is underpinned by TMF *Open APIs***. Known as *HAL*, the system is supporting a drive to channel most digital interactions in the Europe region through an associated app, with loftier ambitions to expand its uses to include provision of online shopping and OTT TV. [pp.**49**-**50**, **72**-**75**.]

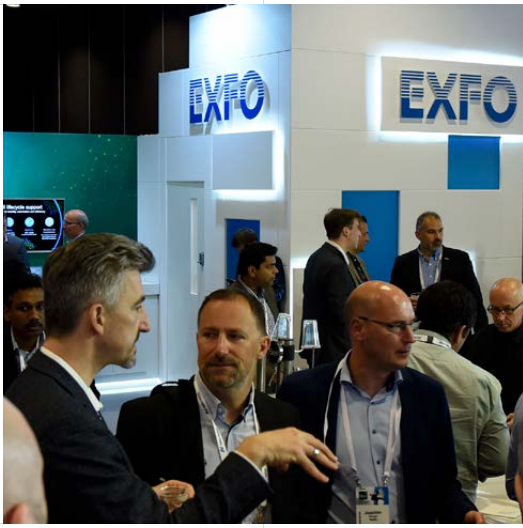
A challenge to traditional infrastructure builders is emerging in the form of Rakuten, which is launching a cloud-native mobile network expected to disrupt traditional models, and which featured in the second major keynote of the event, presented by Tareq Amin, its Chief Technology Officer. [pp.**51**-**53**.]

Reskilling and ongoing training for workforces was emphasised as a crucial element of enabling operators to keep up with the ongoing pace of change in the sector. Wind Tre highlighted the importance of this education as an element of the cultural change needed to ensure telco transformation has solid foundations. [pp.**54**-**56**.]

While operators at the conference pondered how best to counter the dominance of internet giants, **Google made an appearance seeking new alliances**, promising a win-win situation where new services could be bundled into operator offerings, and subscriber engagement can become more digital, drawing on both sides' core strengths. [pp.**60**-**61**.]

BT took the opportunity to trumpet the success of the massive overhaul of its approach to IT with the *Da Vinci* programme, which is bringing agile human-centric design to the telco, and leading the way on essential cultural change that is at the centre of new management's plans for the converged operator. [pp.**63**-**67**.]

Vodafone is also reshaping its IT systems as part of a wider movement towards more openness and collaboration through Zero Touch Partnering. The opening up and automation of systems is a complex process, however, and the operator is looking at robotics on one side to help manage this complexity, while, on the human side, cultural change and training were again emphasised. Meanwhile, Vodafone's German OpCo is ploughing ahead with plans to become cloud-native, and shared its experience in building what it called the *"largest virtualised charging system"* in Europe. [pp.**68**-**71**,**73**-**79**.]



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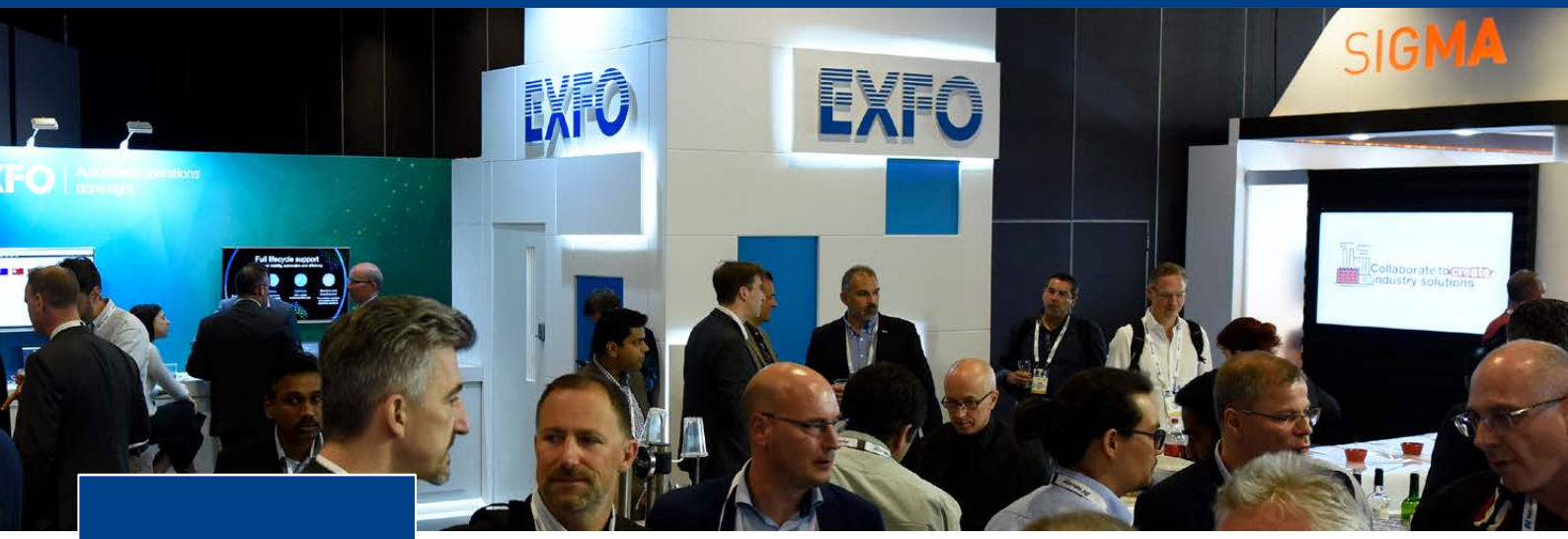


Image: TM Forum

PROFILE

EXFO offers assurance in changing world

- EXFO showcased service assurance and network optimisation capabilities at Digital Transformation World, where the theme was '*Intelligent Operations for a 5G World*'.
- Participation with the award-winning *Skynet Catalyst* provided EXFO with opportunity to respond to operators' evolving strategic priorities, and demonstrate the potential for deploying active and passive monitoring tools in an integrated fashion within a virtualised environment.
- Role of service assurance seen as evolving with 5G, to become a business critical, responsive real-time (or predictive) "*central nervous system*" for intelligent networks.
- EXFO is embracing open-standard development as digital transformation momentum gathers, and customer and industry relationships become increasingly collaborative and consultative.
- Operator use cases illustrated the effectiveness of incremental automation in managing NFV-driven network complexity.

EXFO's presence at TM Forum's *Digital Transformation World 2019* focused on the theme of *'Automated Operations Done Right'* and the role of service assurance in digitally overhauled network infrastructure. With its *'common cause analysis'* and end-to-end network-optimisation propositions, it showcased two major deployments in Europe at Three UK and Telenor Denmark.

EXFO, which is pitching the value of its suite of both active and passive monitoring solutions as it beds in the acquisitions of Astellia and Ontology, is also involved in TMF's *Catalyst* programme. It played an instrumental role in the ongoing *Skynet Catalyst*, which won the *Outstanding Catalyst Award*. EXFO's Director of Test, Monitoring and Analytics Solutions, Ken Gold, highlighted the importance of these projects in both identifying meaningful advances that 5G-driven technology can deliver for the industry, and demonstrating the role that automated virtualised assurance can play in enabling such deployments.

Ahead of the event, Abdelkrim Benamar, Vice-President for the Service Assurance, Systems and Services (SASS) line of business at EXFO, spoke with Market Mettle about the vendor's views on the rapidly evolving communications sector, and his vision for developing EXFO's role in the increasingly open telecoms ecosystem.

Image: EXFO

ABOUT EXFO'S SERVICE ASSURANCE DIVISION

EXFO's Service Assurance Division is focused on supporting service providers with multi-domain monitoring solutions, combined with advanced analytics and automated assurance.

The Service Assurance solution portfolio can be deployed across the breadth of telco infrastructure, covering physical and application layers of networks for both fixed and wireless connectivity, and used under both lab and field conditions. Products include simulators, fibre-monitoring technology, big data analytics, automation, real-time troubleshooting, and active and passive probes.

The division has expanded through the acquisitions of Ontology Systems in early-2017 and French global leader in the performance analysis of mobile networks and subscriber experience Astellia in February 2018. Astellia and Ontology solutions are being integrated with EXFO's technologies into a common monitoring and analytics platform, with a focus on enabling full network visibility for operators in "*hybrid physical-virtual environments*". Benamar flagged the value that the Ontology solution portfolio is delivering through provision of real-time cross-domain topology oversight, and by facilitating service impact, common cause and change impact analyses.

Provision of consulting services for customers is becoming increasingly significant to EXFO, with the ability to engage on specific customer use cases framed as a key differentiator.

Ontology solutions are designed to deliver a complete and accurate view of topology and inventory available, which exposes the relationships between data in service assurance, operations and business systems to enable automation at scale. The Ontology offering can analyse relationships between subscribers, services, and networks across multiple domains, to provide a unified foundation enabling faster detection, analysis, and resolution of faults, as well as enhancing planning and provisioning.

Strategic priorities for an automated future

The transformation of the sector that is expected to accompany 5G will see EXFO focus on what Benamar refers to as "*automated assurance*", which will be needed to manage the increased complexity and expanding capabilities of new networks.

EXFO is approaching this strategic goal by building around three key pillars:

1. Capabilities to correlate data from a diverse range of sources, including varying forms of active and passive monitoring.
2. The ability to apply algorithms to correlated data, to deliver insights for customers and to provide smart diagnoses and predictive analytics.
3. Ongoing incremental automation capabilities.

> *"These three things are the key pillars needed to build a comprehensive, automated assurance portfolio that will become even more important with the advent of 5G, specifically, when you start to add capabilities like network slicing."* — Benamar.

Real-time cross-domain topology, provided through the Ontology portfolio, was flagged as a "*secret ingredient*" in building a compelling automated assurance service.

> *"The fact that you have a complete view of the topology in real time means you can start to isolate where the issue is likely to come from, which makes it extremely powerful because you can reduce the time to repair and troubleshoot the network."* — Benamar.

Human side of AI to support incremental automation

As noted by TMF in its research report, *AI and its pivotal role in transforming operations*, operators are concerned that the complexity of new networks and the proliferation of AI could loosen control over their networks. EXFO believes that this concern can be addressed by the adoption of automation in areas including service assurance.

Benamar considered that the complexity has developed with the layering of generations of network technology on top of each other, up to and including 5G, accompanied by a transition towards virtualised or cloud-based cores. The EXFO executive suggested incremental automation could deliver a means for operators to manage this complexity, while also maintaining a human role in delivering services (at least initially).

> *"People are jumping on automation because there's a market driver for that, as the level of complexity of networks and the co-habitation of various generations of technologies make the life of service providers much more difficult.*
>
> *[Operators] need to introduce some automation, step-by-step. You have to build confidence and the ability to build those algorithms... It's all about humans because you have to change methodology, process and tools. People think about 'closed-loop automation', but it should be 'open-loop automation' that involves human intervention as part of the process at the beginning to build confidence in what we automate. Then, ultimately, part of it would move to closed-loop automation. This is why we say it's incremental, because that's your transformation journey."* — Benamar.

Change as a constant in virtual world

Benamar described the industry as being in a moment of fast and significant change, driven by adoption of NFV, SDN, and 5G technologies.

> *"The key thing is to see that the ecosystem is changing, the market demands are changing, and we have to be prepared for that."* — Benamar.

He noted that boundaries between traditional telco equipment vendors and IT-focused players such as Accenture, HPE, and IBM are blurring, with more opportunities for service providers to work with a wider range of partners on transformation and OSS deals.

> *"We see that ecosystem changing as the boundaries between IT and telecom vanish due to the virtualisation of technology (and also the skillset required). This is pretty visible as an evolution."* — Benamar.

Benamar also highlighted the growing significance of content, and particularly video content, to service provider business models. As this continues to build, quality-of-service for specific applications and services will become a crucial differentiator for network providers. "*This is changing*", said Benamar. "*It has changed significantly in 4G, but is becoming even more important in 5G*".

> *"I would say there are early signs of a significant change of the ecosystem: the players and the requirements on service providers. With 5G, this is much more apparent than with the migration from 3G to 4G, for example. Does it happen today, the change of the business profile of all those players? Not yet; but in one or two years to come? This is what we see."* — Benamar.

Telenor partnership highlights common cause

Following the launch of its automated *common cause analysis* module at the previous, 2018 *Digital Transformation World*, the deployment of real-time cross-domain topology-driven assurance by operator Telenor Denmark was heralded by EXFO at *Mobile World Congress 2019*. Progression of the use case project built on *common cause analysis* was a key feature of the vendor's presence at TMF's 2019 event.

The partners are taking a *DevOps*-approach to the programme, and seeking to improve service operations centre (SOC) efficiency through an enhanced understanding of network topology; feeding through to a clearer view of network performance. This is expected to provide clear customer experience benefits, as detection, diagnosis and resolution of problems can be dramatically accelerated.

With EXFO integrating its test, monitoring and analytics into a single platform, the work represents a key component in the first phase of a major transformation project within Telenor. This entails the EXFO solution being melded with the operator's unified fault and performance management system. The automated element of the EXFO offering is described as vital for enabling rapid response to problems, facilitating troubleshooting processes that would require an unsustainable level of resources were they to be managed manually.

Collectively, EXFO and Telenor are able to identify abnormal behaviours in a network, and, by applying Ontology's real-time cross-domain topology solutions, identify common elements, and home in on potential root causes of the abnormal activity.

Passive potential runs deep

Benamar flagged the value of both **active and passive assurance** for modern telecoms networks, particularly as infrastructure becomes virtualised and understanding network performance becomes more complex.

Active probing is considered important as a means of delivering a snapshot of performance, based on a defined set of key performance indicators (KPIs). To go beyond this, however, Benamar talked-up passive probing, which he said enables operators "*to go deeper*".

Passive service assurance provides a holistic visibility; understanding traffic generated by subscribers and objects, customer experience, service usage, and network performance. This can provide a more complete set of KPIs while also monitoring long-term trends, and opens up the prospect of utilising more advanced algorithms to understand network performance.

The potential for an **integrated active and passive** assurance solution in an SDN environment was demonstrated by EXFO in the *Skynet Catalyst*.

Three UK showcases assurance for virtualised infrastructure

Benamar highlighted EXFO's work with operator Three UK as an illustration of the way in which the market — and telco operating models — are being disrupted by the rise of virtualisation and the advent of 5G.

Since 2017, EXFO has provided a complete passive monitoring and analytics solution to the CK Hutchison-owned network provider, which Benamar suggested is ground-breaking in its embrace of software-based services. The vendor is providing its *Nova*, fully-virtualised NFV service assurance solution to the operator. This includes *Neptune vProbe*, a virtualised probe that is monitoring traffic within Three's virtual infrastructure and orchestrated as a virtualised network function. *Nova Analytics* are monitoring end-to-end service quality, to support Three's customer experience management, with the EXFO solution deployed in a public cloud environment to minimise capital expenditure.

> *"We work extensively with Three UK, which is pretty disruptive in its way of approaching the market... We believe the capabilities that we are deploying for Three's use cases are pretty ahead of the market."* — Benamar.

Through EXFO's work with Three, Benamar sees signs of a trend among operators to reconsider the services and functions that are expected to be managed in-house, and where leveraging external expertise and skills can be more effective and efficient.

> *"We see a lot of things happening around what was, in the past, considered by telcos as 'core' to their business becoming 'less core'... Three UK has made a decision to focus [more] on marketing and business aspects, and less on operational issues."* — Benamar.

Image: EXFO

Catalyst contributions provide additional proof

EXFO has featured in several TMF *Catalysts*, which the vendor views as a valuable way of collaborating with leading operators, and getting a feel for the changing priorities and thinking within the industry.

The most recent *Catalyst* in which EXFO has played a key service assurance role is *Skynet*, which is supported by a plethora of major tier-one operators, and led in its current iteration by Orange.

Building on the success of the *Blade Runner Catalyst* showcased in 2018, *Skynet* focuses on 5G-enabled remote-healthcare provision in a multi-operator orchestrated environment, featuring epidemic-management support. The goal is to create a marketplace where a global response to a medical need can be quickly instigated, with a high level of automation.

> *"The idea is, literally, to be able to put up a global network in an hour. We're looking at it from the perspective of being able to test the service once it's been defined, and then put in place and run the initial tests to make sure it's performing as intended. Then, the ongoing monitoring to make sure it continues to operate according to the [service level agreements] that have been defined.*
>
> *It's the automation of this entire service generation, from high-level order-input, filtered all the way down through the necessary elements on the way (including, from our perspective, the end-to-end testing of the service in a fashion that ties back into the orchestration systems in an automated way), so there's no human-intervention."*
> — Ken Gold, Director of Test, Monitoring and Analytics Solutions, EXFO.

Gold was particularly keen to highlight that, while the individual components from EXFO were not created for the *Catalyst*, the work done is especially significant as a proof of the potential for integrated running of both active and passive monitoring systems in a unified way.

> *The work is cutting-edge in the application of our technologies. It's a first live proof-of-concept application of both active and passive monitoring solutions in one network. It's the first time we'll be working with multiple carriers to test, end-to-end, the performance of multiple network slices that have been joined together to make a single service. It's the application of our technologies in a virtual world.* " — Gold.

He stressed the role of *Open APIs* in the development of the *Catalyst*, and the use of TMF's *Open Digital Architecture* as much as possible. As such, the project can be viewed as a demonstration of the potential for orchestrating testing in an open virtualised setting.

Of course, progress does not come without complications. The EXFO executive pointed to the need to ensure communications between protocols and orchestration domains from different idiosyncratic systems, and to work across multiple carrier domains — in a synchronised manner. *"A significant amount of glue",* in the form of professional services, was needed to enable the smooth coordination of these elements, but this was seen as providing a good 'heads-up' for future challenges and solutions that virtualisation and network slicing will present to the industry.

EXFO envisages testing and automated assurance becoming central in the effective development of new services, with Gold suggesting the *Catalyst* provides a compelling illustration of the technology finding a critical role in serving new marketplaces.

> *This is an exciting time, because the role of testing and assurance is changing to become more of the 'nervous system' of the network, so the 'brain' can operate it properly, and it's interesting to see how it's developing.* " — Gold.

Open worlds to open new doors

Benamar underlined EXFO's **enthusiasm for open systems**, as a new ecosystem emerges with operators aiming to become more flexible in building services while avoiding vendor lock-in. It was also noted that major system integrators are beginning to recognise the opportunities around open-source (as well as the threats).

> *If you want to have a powerful and dynamic ecosystem, it has to be as open as possible. When you have a closed world, you have a less dynamic and less rich ecosystem. This is why a lot of people go to Open APIs because they want to have freedom to choose different players, and they want also to foster innovation in an open world. That is something that we see.* " — Benamar.

5G and a more consultative way of doing business for vendors and operators

Complementing participation in *Catalyst* projects, and more widespread industry collaboration in building open tools and applications, EXFO is engaging in a more consultative approach to its business to reflect industry trends and the demands of the more complex network environments. These trends are said to be changing the way network-monitoring is considered in the development process, and reinforcing enthusiasm for automation.

> *The key thing is to understand the critical pain points for the customer. In the past, regarding the SASS domain, most service providers built out network capacity first, and [then], as a second step, thought about how to monitor its performance and quality-of-service. Now, with preparation for complex 5G environments, people are thinking from day-one how they should monitor and troubleshoot performance, and how to make it as close to real time and as automatic as possible.*
>
> *It's more about sitting down with the [service provider] to understand what kind of issues they want to address. Then we can build the best possible solution, created using products that are off-the-shelf, but adding the 'secret sauce' around services to meet service providers' exact needs. Hence, consultative selling is much more important than in the past."* — Benamar.

Benamar observed that 5G use cases are encouraging a change in operators' view of the markets they are targeting, with *Industry 4.0* solutions covering areas such as IoT more to the fore, and network slicing providing a new range of capabilities and opportunities.

Not only does this require more forward-thinking preparation in ensuring that 5G standards and strategies are taking these new technologies into account from the outset, it is moving service providers themselves towards a more consultative sales approach.

> *[Operators] must become much more consultative sellers than in the past, because of the opportunity that's on offer with 5G technology, and performance, especially around latency, will be important for some use cases... It's not about selling boxes, it's all about selling solutions. If you want to sell solutions, you have to do some consultative selling, and now the diversity of use cases is such that you can't have a one-fits-all type of solution."* — Benamar.

Image: TM Forum

Assurance embedded in 5G solutions

Benamar said that with service assurance requirements now embedded "*from day-one*" of network transformation, working with service providers has moved on from a comparatively simple *Request for Proposal* approach (which would have favoured installed systems) and evolution to address any generational upgrades of the network.

Now, with a more collaborative and consultative approach, there is an opportunity to engage with service providers, delivering technical presentations to a more diverse group of stakeholders, with input from operations and marketing as well as traditional procurement teams.

This provides opportunities for vendors to deliver proofs of concept that can be more customised and attuned to the holistic needs of the service provider, which will provide openings for more tailored long-term contracts.

EXFO assurance ambitions

With its expanding 5G-focused portfolio, Benamar said that EXFO expects to build on progress in targeting growth in new regions. Asia-Pacific and North America were particularly referenced as an important opportunity as **5G deployment trailblazers**, providing an opportunity to introduce EXFO solutions as part of the initial wave of 5G investment, ahead of more widespread rollout in Europe.

Digital Transformation World

Image: TM Forum

TM FORUM

DTW19 underlines need for collaboration and speed

The telecoms industry's annual pilgrimage to Nice on the French Riviera is set to take on a somewhat different tone in 2020. France has become inextricably linked with the flagship TM Forum (TMF) event — apart from two forgotten years in Dublin — but, following its rebranding as *Digital Transformation World* in 2018, the event now looks set to transfer to Copenhagen, apparently in order to provide more space.

The event has morphed over time, evolving from a gathering of the very technically-minded into a more-general and wide-ranging conference that tackles head-on the issues that keep chief information officers and their ilk awake at night.

It can still feel like a gathering of the faithful, though, and TMF as part of its efforts to stay relevant in the rapidly-moving digital era has itself innovated in a number of ways that have proved popular among delegates. The *Catalyst* proof-of-concept (PoC) projects, for example, have been widely embraced, and are regarded as an effective way for operators and vendors to collaborate on future-looking technologies. In 2019, the number of *Catalysts* (*see separate report*) increased to 32, and included PoCs on a range of 5G-related topics and more.

Open APIs also represent an area where TMF has been particularly active, with the ambition of ensuring all APIs are exposed in order to create standardised components to support the *Open Digital Framework* (*see separate report*). TMF's over-arching ambition is to create a platform that allows the industry to test interoperability and ensure all players are broadly aligned, with *Catalysts* and *Open APIs* two concrete examples. *DTW* also offers an opportunity for the industry to come together and delve into really thorny issues that at times have threatened, and in some cases continue to threaten, the very nature of the telecoms industry.

The event also provides a welcome, and sometimes rare, opportunity to see high-profile telco executives in action, as they explore and invite feedback on initiatives that they hope will transform their business models. Key highlights in 2019 (*covered elsewhere*) included:

- **Rachel Higham, Managing Director of IT at BT**, providing insights into the *Da Vinci* programme that aims to completely overhaul BT's internal IT department.

- **Shekhar Kulkarni, Head of Digital Architecture for Europe at Deutsche Telekom**, guiding a highly-engaged audience through the Group's *One App* initiative and its platform-based approach to launching services at scale across nine NatCos.

- **José Ramón Gómez Utrilla, Senior Product Manager of the AURA unit at Telefónica**, giving a detailed overview of the Spanish Group's ambition for its *"fourth platform"*, and how *AURA* underpins its objective to become a platform company.

The dominant themes in 2019 were:

- Importance of *Open APIs*.
- Network automation.
- Artificial intelligence (often synonymous with analytics).
- Business assurance (TMF parlance covering service assurance).
- The move to working in ecosystems (heavily underscored by many of the TMF *Catalyst* PoC projects — *see separate report*).
- Working with other sectors.

When formed in 1988 by eight telcos and suppliers that came together to collaborate on common problems, driven by AT&T and BT, the original focus of **TMF** was (and remains) management of services. Historically, this was the domain of the chief information officer, typically represented at enterprise architect-level at TMF. TMF now has more than 800 member organisations, with representatives working in its Collaboration Community on a range of programmes, projects and *Catalyst* PoCs.

Digital Transformation World 2019 had delegates from 625 companies, featured six conference tracks with more than 240 speakers, and hosted 32 *Catalyst* projects. Attendance was apparently up over 10% on 2018, at 2,650, of which around a quarter came from operators, Nearly-10% are said to have procurement responsibilities at vice-president level and above.

One constant in tumultuous times

Collaboration remains at the heart of TMF, as its Chief Executive Nik Willetts trumpeted in his keynote kicking-off the event.

While Willetts acknowledged the ups and downs that the industry has fared over TMF's last 30 years, as it has struggled to reinvent itself and adapt to massive changes, he insisted that one constant throughout has been that collaboration always proves to be the way forward. To frame this, he strove to set an urgent tone regarding the need to accelerate transformation, linked to TMF's purpose.

> *"If the last 30 years have been about building a hyper-connected world with telecoms at its centre, the next 30 will be about creating a hyper-intelligent world. As we move into the 5G era, we stand on the verge of one of the biggest transformations yet, although it's not about 5G or devices or social media. It's about the digitisation of every industry and aspect of society, about taking data to gain new understanding, and fusing human intelligence with AI to address big challenges [such as] population growth and the looming ecological crisis."* — Willetts.

He said that more companies are collaborating through TMF and that change is happening, and the next three years will be the most critical in deciding the industry's future.

The AI programme within TMF has expanded rapidly in the last year, with more than 80 organisations participating, looking at applications from autonomous networks to improving customer experience using machine learning. Willetts noted, though, that *"there is an insane amount of hype, misinformation and miseducation around AI. The reality is, you need to get several foundations right to even be able to go near AI. Hence, the launch of AI Readiness Check, developed by the 80 companies working in that programme and endorsed by 20 companies around the world that have trialled the approach"*.

Foundations for 5G (and maintaining relevance)

Willetts claimed that new competitors are being faced *"every day"*, moving at speeds that outpace traditional telecoms. To embrace the opportunities of 5G, and thus maintain the significance they have today, and play a role beyond connectivity in the future, he said operators must:

- **Slash their cost base**, which is too high. Legacy systems need high levels of integration, which is both slow and expensive. Agility is the key. Elisabetta Romano, Chief Technology Information Officer at TIM, was entertaining on this subject in a panel discussion on *Network transformation for the 5G era*. She said, *"I need a product manager with a mindset who starts every day asking, 'what can I close down today?'"*. TIM is retiring its 3G network and planning to shut more than half of its 700 operations and business support systems (BSS) applications. She added, *"5G is a compelling event for us to build platforms... as a former PTT* [*postal, telegraph, and telephone agency*]*... we had stratified every kind of technologies. You add layers when you buy new stuff so your architecture is all about Italian food, all 'spaghetti and lasagne'. Our technology strategy* [*now*] *is to separate the new and old... or you end up with 'new-old'"*.

- **Improve customer service**, where the telecoms industry lags many other sectors.

- **Fix *concept-to-cash*** cycles, and shorten-time-to-market from 18 months to 18 days — a message heavily promoted around the venue, with TMF's newly-announced *Open Digital Framework* (ODF) pitching the solutions to make this possible.

A living framework

The ODF is designed to build on TMF's heritage, while also reinvigorating it as *"a blueprint for designing, managing and delivering digital services in partner ecosystems... our goal is to revolutionise service providers' operating models from end-to-end"* (*see also below*).

Willetts was at pains to stress that the ODF will be a *"living framework"* to support collaboration between players, such as Zero Touch Partnering and interoperability. Operators including Deutsche Telekom, Orange, and Vodafone are working together to deliver the ODF, writing code and building reference implementations as shown in the *Business Operating System Catalyst* proof-of-concept (*see separate report*).

He also pointed to TMF's new, primary research on procurement (*see separate report*), which found that the telecoms industry wastes, at a conservative estimate, $1bn-a-year, as well as a lot of time *"moving paperwork between companies"*. Willetts said *"we are smarter than that"*, and flagged the importance of companies' culture in their efforts to transform (a constant theme at TMF events in Nice for at least the last three years, and something that has risen up the agenda for many members). He urged that *"we need to change the way we lead, manage, and develop people... to attract talent, but also develop the talent we already have"*.

In addition to Willetts' emphasis on collaboration (including ecosystems and marketplaces), the rising star of AI in telecoms operations and customer experience, business assurance was a big theme at *Digital Transformation World***.** This is evident from the *Catalyst* projects, but also in the hot topic around sunsetting and retiring systems (a subject typically neglected, but which is very pertinent to operators faced with networks getting more complex with the advent of 5G).

Perhaps as a sign of the times, Willetts said that, if delegates only took one thing away from their visit to Nice, it should be the importance of diversity, with everyone asking themselves if they are *'Ready for change?'*.

What is the *Open Digital Framework*?

The ODF is, in part, an attempt by TMF to organise existing and developing assets to make them more accessible, and show members how they can be leveraged in combination. It will be developed through the organisation's *Collaboration* programme and *Catalyst* projects. The ODF will be built round four phases of a project: *Conceive*, *Design*, *Realise* and *Service*.

The crown jewels arguably are the 54 *Open APIs* (*see separate report*), which underpin the platform-based business and operational models that TMF urges telcos to adopt.

The enabling *Open Digital Architecture* (ODA) is described as *"an enterprise architecture blueprint,* [*with*] *common language and key design principles for modular, cloud-based, open digital platforms that can be orchestrated using artificial intelligence"*. The ODA relies on what are now called the foundational libraries (formerly rebranded as *Frameworx*, which never gained traction with members). These have very long roots, and provide '*normalised*' models that provide a common language for business processes (eTOM) and a data or information model (SID). Both are widely used by operators internationally.

The third, more nebulous element of the foundational trio is the *Telecom Applications Map* (TAM), which, according to Andy Tiller, Executive Vice-President for Collaboration and Innovation at TMF, is an extensive functions library that TAM groups together. Tiller said that ecosystems will increasingly change the way telcos' applications are built, becoming more cloud-based and accessed through APIs, leading TAM to become more cloud-native. The role of these foundational libraries is to streamline and standardise the elements they encompass, de-risk and accelerate transformation projects, and avoid wasting time and effort due to replication.

There is also *"an industry-agreed data model"*, with standards intended to exploit data and AI to enhance customer experience and operational efficiency.

Organic evolution

Importantly, and as a relatively new departure first embraced in the *Open APIs* programme, the ODF contains reference implementations (written code) to help assemble and validate the various ODA components in TMF's *Open Digital Lab*. Components can then be used to build services quickly, in a consistent way. The grand plan is to create a services marketplace (*see separate Catalyst report*), in which elements and services can be exposed and swapped because they are built and implemented in a consistent fashion. The *Lab "provides a safe space for inter-company collaborative proof-of-concept generation leveraging open standards and open-source components"*, according to TMF, and is hosted by IBM.

The ODF also provides a constantly updated slew of practical guidance, in the shape of documents and videos showing how the ODF can be used to transform the core business and enable new business growth. It also features education and development services, advisory services, maturity assessments and benchmarking, as well as an online member community.

The need for speed

TMF is also upping its tempo, as Tiller explained, *"We are changing the way we do our collaboration work to make it faster. Traditionally, TM Forum has had two releases a year* [*two updates of various assets*]*... but we're changing the cadence so that it is much easier to publish stuff quicker. It began with the APIs, so we could get them out faster, but we've extended that to everything".*

He added that *"John Gillam has come in* [*as TMF Chief Technology Officer, from BT, where he held the same role for Cloud Services*] *and he's an agile expert who also understands the constraints we're under at TM Forum. We haven't got the luxury of having a 'stand-up' every Monday morning, but instead we're having more face-to-face workshops around the world. Not just APIs spec*[*ification*]*jams, but, for instance, we did an ODA security workshop in Hamburg, we're doing AI work in KL* [*Kuala Lumpur*] *and we're making that face-to-face work a priority... it is the way to shift things".* Wherever possible, such events are hosted by member companies.

Image: TM Forum

CATALYSTS

2019 Catalysts spark pragmatic innovation

- Rundown of key *Catalysts*, joint initiatives.
- More than 30 joint technology projects demoed, with assurance, partnering, and customer experience to fore.
- Operator preoccupations ahead of 5G include profitability and effectiveness of network slicing.
- Drones, emergency services, and healthcare among focus verticals.

Digital Transformation World 2019 saw updates on TM Forum's (TMF) current *Catalyst* projects. The organisation has a proud tradition of delivering proof of concept projects, which are championed by service provider members and work to build prototype solutions to common problems. Companies that opt to join a project typically work as a team for four to six months, in a rare opportunity to collaborate with rivals.

Through live demonstration, *Catalysts* also provide an example of the practical application of TMF's best practices and standards, including how they can co-exist with the work of other standards bodies. *Digital Transformation World 2019* had 32 *Catalyst* project demonstrations. The major themes were:

- Service assurance.
- Resource-sharing through marketplaces.
- Joint catalogues (repositories for information such as inventory, and pricing).
- Blockchain.
- Network slicing.

TMF's *Open APIs* (*see separate report*) were used by all projects. Set out below are the eleven *Catalysts* identified by Market Mettle as the most strategically significant for the operator community.

Table 1 *Digital Transformation World 2019*, standout *Catalyst* developments

Catalyst	Participants (operator in bold)	Developments
5G Optimised Capacity & E2E Experience *— Phase II*	• Amdocs • ARRIS (CommScope) • **BT** • CanGo Networks • MYCOM OSI • Nokia • **Verizon** • Wipro	This *Catalyst* explored the use of a brokerage model to assure guaranteed performance against multiple network slices, while using resource capacity efficiently. *Open APIs* were used between different operators to leverage collective resources efficiently and create buffers in the allocation of resource to prevent any single slice hogging resources that could be used elsewhere. The team used NFV, SDN, and enriched-orchestration with machine-learning to enable predictive, closed-loop assurance of SLA guarantees.
5G Profitable Lifecycle	• Celfinet • Cognizant • Mercato • Software AG • **Telefónica** • Vlocity	*5G Profitable Lifecycle* demonstrated an integrated digital platform that could dynamically configure digital products, services and machines from any industry vertical. It could be used to build a cross-industry, scalable marketplace for operators as a fast way to monetise 5G-related products and services. The platform also tracks profitability, customer experience and empathy, and aims to streamline the lifecycle from lead to order, cash, and retire. The associated marketplace is based on a digital BSS layer and catalogue to orchestrate 5G network slices, and designed to serve a range of specific deployments, including augmented and virtual reality, cloud back-up, drones, IoT, and over-the-top services.
5G Riders on the Storm *— Phase II*	• Accenture • **BT** • Gen-E • Huawei • Incognito • **KDDI** • Netcracker • **Orange** • **Telekom Austria** • **Telecom Italia** • **Telenor** • TEOCO	The second phase of this network slicing *Catalyst* explored the use of the technology for emergency services and public safety during extreme weather conditions. The *Network Slice Type* (NEST) created by the *Catalyst* will be contributed to the GSMA's programme developing templates for network slicing.
AI LEAP	• Arago • **AT&T** • **BT** • Galileo Software • **Orange** • Wavelength Communications	This project explored using AI and machine learning to improve root cause analysis for event, network, and service layers. The partners used an 'Active Inventory' solution to perform abnormal behaviour detection, trend analysis and predictive forecasting. Depending on the cause or type of anomaly detected in the data, the solution automatically investigates and suggests actions to be taken to solve the issue through both supervised and unsupervised machine learning. The project aimed to help the shift from reactive to data-driven predictive operations, to improve users' experience, support more agile service creation, and optimise operating costs.
Blockchain-based Telecom Infrastructure-Markeplace	• Infosys • IOTA • Nokia • **Orange** • r3 • Stanford University • **Vodafone**	Building on the preceding *Blockchain Unleashed Catalyst*, this project looked at the technology's applications in relation to identity management, mobile number portability, roaming, service level agreement monitoring, and stolen mobile devices. The latest phase considered how operators can move towards a more flexible, on-demand way of sourcing and procuring telecom infrastructure and assets in order to minimise capital expenditure. Solutions included 'borrowing' assets, and auction-based on-demand procurement that draws on facilities available for rent.
Business Operating System (*BOS*)	• Globetom • IBM • **Orange** • SigScale • Sigma Systems • **Vodafone**	This implementation of Open Digital Architecture (ODA) Core Commerce Management demonstrated a plug-and-play approach to product catalogues, swapping them in and out to process orders seamlessly. A practical step towards enabling operators to use each other's assets to serve customers beyond their own geographical boundaries, the project won the award for the *Best New Catalyst in Show*. For the first time in a *Catalyst*, the team co-created code for a core commerce system, which ultimately could be contributed to the open-source community.
Cognitive Contact Center *— Phase II*	• Blue Prism • Everis • Nokia • Salesforce • **Telefónica** • Verbio	The latest phase of this *Catalyst* builds on a virtual agent powered by AI and natural language processing demonstrated in 2018. Operator-lead Telefónica is already implementing the tools and practices developed in *Phase 1*, and with *Phase 2* it is considering the potential for AI and bots in the contact centre environment (again something already deployed by the telco in operations in Brazil and Chile — *Telefónicawatch*, #135). The latest demonstration gathered real-time information from the network, as well as from the BSS, in an attempt to anticipate customers' problems and pre-emptively place a virtual agent call to attempt to resolve the emerging issue.
Digital Business Marketplace	• Agile Fractal Grid • BearingPoint • **BT** • **Deutsche Telekom** • Digiglu • Intel • **NTT Group** • **T-Mobile US**	The aim of this project was to explore how companies in traditional industries can be digitally transformed, *"making use of digital techniques to abstract physical products and services, secure the device and create frictionless business to business to x (B2B2x) partner trading ecosystems".* The project won an *Outstanding Catalyst for Innovation* award.

Catalyst	Participants (operator in bold)	Developments
Digital Twins	• **Globe Telecom** • Ericsson • Huawei • Infosys • **KDDI** • Neural Technologies • **Singtel**	This *Catalyst* was set up to explore the potential for 'digital twins' in the telco sector. A digital twin is a representation or visualisation of a real-world entity, which could be an organisation, building, city, product, person or process. It simulates what would happen to that entity in different conditions, to predict the likely behaviour of its physical counterpart. Used to understand the interactions of networks, processes and customers, the team considered issues such as scaling 5G networks, automating the lifecycle management of network slices, and incorporating predictive demand and maintenance. It also modelled customer behaviour trends. A major outcome of the *Catalyst* was highlighting the importance of having a common data model in any digital transformation project. The project won an *Outstanding Catalyst for Innovation* award.
Open AI Business Assurance Marketplace *— Phase II*	• Amdocs • **BT** • **Deutsche Telekom** • Bulb Technologies • FICO • **Hrvatski Telekom** • IBM • **Orange**	This *Catalyst* considers the role of AI and APIs in new approaches to fraud detection and revenue assurance. The aim is both to save money by stemming losses, and to boost revenue through being able to predict and take a proactive approach to prevent churn and revenue leakage. Research focused on: integrated systems for holistic business assurance; applied-AI for data-based assurance decisions; and an API-driven business assurance marketplace to identify partners. The project won a *Outstanding Catalyst for Business Impact* award.
Skynet *(Phase II)*	• Amartus • BearingPoint • **BT** • **Chunghwa Telecom** • **Deutsche Telekom** • **Du** • Ericsson • EXFO • Infosys • **NTT Group** • **Orange** • RIFT.IO • **Telecom Italia** • **Telus** • **Verizon** • **Vodafone**	Building on the success of *BladeRunner*, the first phase of this *Catalyst*, the significance of business assurance to the industry could be demonstrated by the presence of ten operator champions on the project. *Skynet* showcased 5G-enabled remote-healthcare and drone-management in a multi-operator orchestrated environment, including epidemic-management support. The objective was to support a diverse ecosystem of partners, including multiple operators from different geographies, to provide a set of end-to-end hybrid services while also highlighting the importance of business assurance, monetisation, and the technical maturity of 5G-enabled services. The *Catalyst* utilised virtual networking, network slicing, service modelling and blockchain to create a *de facto* global marketplace for remote e-health services based on an unprecedented level of international collaboration. The operational model was based on TMF's ODA and Linux Foundation's ONAP for orchestrating layers, plus APIs from both TMF and MEF. The *Catalyst* also showed that the OASIS TOSCA modelling language could provide a common base for supporting 5G service deployments across diverse operators and locations. The project won the *Outstanding Catalyst depicting Business Assurance awareness* award.
Zero Touch Partnering	• BitX • **BT** • DGIT • Oracle • Sigma Systems • Sinefa • **Vodafone**	This ongoing *Catalyst* demonstrates the use of a partner's registry to onboard a new service, relying only on the catalogue APIs. The first phase won an *Outstanding Catalyst Contribution Award* at *Digital Transformation Asia* event in 2018, and the latest added more service types, with three catalogue-driven software products implementing Zero Touch Partnering. The *Catalyst* created a full suite of *Open APIs*, and work from this *Catalyst* will be fed back into the *Open API Programme* and the ODA.

Source: TMF, Market Mettle.

Image: TM Forum

OPEN API

TM Forum champions APIs as telcos battle web giants

- More big hitters are joining TMF's *Open API* programme, although numbers remain lower than anticipated.
- Ongoing focus on standardisation and consistency saw a pause in API development to ensure strong foundations.
- Adoption of SDN and virtualisation is blurring the remit of traditional standards bodies.

George Glass, Vice-President for Architecture and APIs at TM Forum (TMF), highlighted the growing significance of application programming interfaces (APIs) in enabling global operators to foster the level of flexibility and speed in service provision enjoyed by hyperscale internet companies on their own networks — and TMF's role in enabling them.

Three years on from the launch of TMF's *Open APIs* as a set of tools intended to support the transformation of telco IT systems, Glass was able to discuss the progress made in the programme, and the challenges that have been faced in creating the standardised technology that could be applied across markets and networks.

Developed and applied correctly, *Open APIs* can be used to create services that can run on top of any network, regardless of the underlying technology, network provider and geographic location. This transition towards virtualised infrastructure and software-defined networking is providing telcos with the opportunity to emulate the approach taken by internet-based businesses.

> *"What we're seeing now is that the telcos are realising that with digital transformation, they can catch up or even overtake [the hyperscale companies] as there are many other opportunities out there in the market."* — Glass.

TMF gets API

TMF's *Open APIs* and their development programme are arguably the **most important assets** and workstream in the entity's portfolio. They are also the foundation of its own transformation, enabling it to pivot from being a collaborative member association for traditional telcos (and their suppliers and partners) into an enabler of those telcos becoming digital service providers.

Lester Thomas, Chief IT Systems Architect at Vodafone Group, instigated TMF's *Open API* programme several years ago, with support from George Glass (then Chief Systems Architect at BT) and telcos including Orange and Telefónica, with Deutsche Telekom and Telenor subsequently offering support.

Thomas was able to implement a **crowdsourced model** for API development, with TMF providing a hub for operators sharing internal APIs, and this led to the launch of the *API Manifesto* at TMF's flagship Nice event in 2016, with Axiata, Bharti Airtel, BT, China Mobile, China Unicom, NTT, Orange, Telefónica and Vodafone the founding signatories.

Widespread deployment, but new operators slow to trumpet support

TMF now has 51 signatories to its *Open API Manifesto*, including seven of the world's top-ten operators. However, this is just a fraction of TMF's initial goal of securing 200 signatories by end-2018.

Glass was able to glide over the issue of lower uptake by pointing to the heavyweights that did sign up to coincide with *Digital Transformation World 2019*: AT&T, China Telecom, Deutsche Telekom and Salesforce.

Glass also suggested that other operators may be deploying the APIs without becoming signatories, noting that Deutsche Telekom had more than 17 TMF *Open APIs* installed in its systems before it officially signed up.

TMF estimates that approximately **7,000 software developers** in over 1,200 companies are working with its *Open APIs*, while its *Open API Community* has 24,000 active participants.

Evolving the APIs, and taking a pause to regroup

With APIs continually being deployed and developed, Glass noted that TMF needs to monitor and respond to progress.

The original API submissions were designed for operators' own internal use, and, therefore, TMF collaboration teams need to adjust for standardised application, focused on quality, integrity, consistency and robustness. This has seen the organisation focus on automating the API deployment process, providing a reference implementation alongside standard specifications to ensure consistent use, and testing tools for companies to ensure any development work undertaken keeps in check with fundamental design.

Ensuring this ongoing consistency prompted a three-to-six month pause on producing new APIs within TMF, in order to ensure existing tools were up to scratch. This has reportedly been completed successfully, with new development work back on track, and more specialised APIs in the pipeline.

Filling in the gaps and specialising

The goal of the initial APIs launched by TMF was to cover as much ground as possible, as fast as possible, covering processes and tasks such as ordering, provisioning, billing and faults. These were seen as providing core capabilities that would be essential, but broadly applicable across a range of use cases.

> *"If you're trying to match a customer address or customer identification, that's a standard API; whether you're selling a telco product, or managing water, or street lighting in a smart city (or smart industry), where you are patching through to a customer."* — Glass.

Now, though, more APIs are gradually filling gaps, with members developing specialised APIs for specific Internet of Things applications. Even so, TMF is pushing for these APIs to be designed to be what Glass describes as, *"product and service agnostic, and customer, segment and industry agnostic"*.

Glass highlighted the development of a set of Network-as-a-Service (NaaS) APIs that are expected to support the adoption of edge computing across operators' network architecture. Telstra is leading development here, although several operators are said to be providing support.

As with other APIs, the goal is to abstract network services from physical infrastructure, making service provision independent of network equipment. Through the NaaS programme, TMF is aiming to standardise how those various network services present themselves in the management layer for consumption by third parties. An example might be opening and closing ports to manage a firewall from the operating system software (OSS) layer, without using any proprietary communications.

Evolving relationships as operator needs change

An important part of the API programme's progress is its work with other standards bodies, and Glass noted that the priorities of these entities is evolving as operator strategy shifts towards virtualisation.

Traditionally, operators' dealings with standards bodies tended to focus on networks; the domain of the CTO rather than the CIO. Now, however, as operators strive to disaggregate services from underlying infrastructure, interactions with standards bodies are moving further up the stack into what was traditionally TMF's territory — the management of services, and the associated OSS and business system software.

The Linux Foundation-hosted *Open Network Automation Platform* (ONAP) project was cited as an example, where many operators are working to open up software-enabled services that are expected to come to fruition with 5G deployment. Glass said that ONAP top-level (northbound) interfaces are using TMF *Open APIs* to link into service management. TMF is also now formally involved in ONAP's development.

TMF has a longer history with MEF (formerly the Metro Ethernet Forum), which was originally dedicated to positioning Ethernet as an access network technology. Its remit has now expanded to cover optical, carrier Ethernet, Internet Protocol, software-defined wide-area network, cloud services, and the orchestration services' lifecycles, and it has also adopted TMF *Open APIs* for the exposure of its northbound services.

API to help *Catalysts*

Glass highlighted the role that *Open APIs* are playing in other high-profile TMF projects, namely the ***Catalyst*** programme (*see separate report*).

These fast turnaround proof of concept (PoC) exercises feature TMF members collaborating on innovation exercises, with demos taking place at regular TMF events. The use of APIs is **shortening development** time and easing integration of PoCs with other systems. *"In short, they are doing and demonstrating what they are meant to do [in commercial deployments]"*, said Glass.

Image: TM Forum

COLLABORATION

Operators, other industries struggle for 5G commonality

- 5G expectations have been raised, and now need to be met: lots of talk of potential, but monetisation not clear cut.
- Scepticism over network readiness for advanced, challenging applications, such as in gaming and sport.
- Supplier establishment again chided for dragging feet on harmonisation and cloud-ification; operators stuck in middle between technology and services realms.
- Inner-city pressure over urban service business models; return on capital versus return for communities.

An interweaving theme at *Digital Transformation World 2019* (DTW19) was the importance of collaboration.

Tangible examples of the importance placed on the topic can be seen in areas such as TM Forum's (TMF) *Catalyst* programme, while the end-goal of its *Open API* strategy is to enable operators to collaborate and provide seamless network experience to customers, even where they have no infrastructure (*see separate report*).

This is only part of the story, however. To monetise 5G, operators will have to work closely with partners from other industries and ensure their networks meet customers' varied and exacting demands. Successful collaboration means all parties understanding what the others need, then figuring out the most effective provision.

With this in mind, the opening keynote session brought together representatives from both operators and industry to share perspectives on 5G and discuss the prospects for collaboration. There appeared broad consensus on the need for change, and working together, but beyond shared aspirations and intent, there are clear obstacles to overcome.

Mobile gaming a powerful example of the challenges and opportunities

Vesa Jutila, co-founder and Chief Commercial Officer (COO) of streaming-based subscription gaming company Hatch, said his industry will inevitably follow other entertainment services such as music and film towards embracing over-the-top service delivery. However, the interactivity of gaming means that mechanisms such as buffering are not viable, with low-latency, fast connectivity, and high reliability forming the base line.

Hatch is, therefore, aiming to build a mass-market gaming service through alliances with operators, and anticipates 5G being *"a massive enabler"* for the success of the company's proposition, with mobile edge computing particularly pertinent for gaming.

The company is also aiming to ensconce itself as a key service accompanying the commercial launch of 5G. To Jutila's mind, it appears that there is the opportunity for a symbiotic relationship here, where the demands of effective streaming could be met by new network technology, with operators finding a new revenue stream and providing a service that will showcase the differential qualities of the new network

To date, Hatch has secured partnerships with operators in Japan (NTT DOCOMO), South Korea, and the UK (Vodafone), to build on existing partnerships with the cloud service providers that currently own and operate the data centres and servers that provide the platform for its streaming services.

> *When gaming becomes a service, you guys [operators] are in the best position to step in because of your existing user base, distribution channels, and billing relationship with customers — so, you could take a massive role in gaming, but you need to go for it...*
>
> *We need very reliable, low latency, last-mile connectivity. And working together, I think there is much more that we could do than just relying on the standard network set-up, and just trying to apply that to gaming — you could optimise a lot."* — Jutila.

However, in pursuing this approach, Jutila suggested that Hatch has found that it faces substantial challenges when dealing with operators too entrenched in their traditional ways of working.

> *The thing that is killing me is the [operator] fragmentation: you all offer billing differently. You offer edge compute differently. It is impossible for a small company to always hear 'we must do it your way'. We need movement from your end, and more flexibility, or we go somewhere else.*
>
> *[Mobile edge computing] really requires a new mindset [in operators], and much faster decision making to be able to capture this 5G dream and opportunity."* — Jutila.

Mark Newman, Chief Analyst at TMF, moderated the session and began by noting that gaming is the **fastest-growing sector** of the entertainment industry, valued at $150bn a year.

Power to the people — or else...

As Chairman of Open & Agile Smart Cities (OASC), Martin Brynskov represents 140 cities in 29 countries. He took a rather more combative tone with operators, and placed an emphasis on the need for substantially greater cooperation and understanding of the requirements of city governments. He warned that telcos that fail to match these expectations would be *"toast"*.

Brynskov said there is *"a huge market opportunity"* around smart cities, and also highlighted the breadth of services that need to be considered by cities looking at technological solutions to meet their obligations. *"If you learn just one thing from what I'm going to say: it's that this is about cities and communities. 'Smart cities' is not a sector, it is all sectors."* — Brynskov.

Should operators get to grips with cities' expectations, Brynskov considers that there is pent-up demand for smart city solutions. He also stressed that openness would be needed, rather than contract and service lock-in, and that his group's members *"would not allow single entities, or a few entities, to own this common ground", nor would they "let you suck the economy, or the power, out of them". He also warned against negotiating individually on a city-by-city basis, describing it as "to go the way of the dodo".*

Brynskov was, however, somewhat light on the details of precisely what he envisages operators and cities doing together, beyond general services supporting the community and provide social benefits.

> *We're moving towards a situation where [operating rules] will come from the demand-side to all of you, and you need to work with us. We need the global dynamics, with you hitting the ground [running]... Those of you who make it into these partnerships, you will be glorious. The rest will be toast.*
>
> *No-one wants 'a 5G network', we want 'better lives', and we're willing to invest in that. So [cities] will pay, but we need to set up ecosystems, and we will pay by results. Cities prioritise family and community... To get started, everyone needs to jump together. If you are fair, there will be money."* — Brynskov.

Broadcasting recognises 5G opportunity, but not at any price

As Chief Operating Officer at BT Sport, Jamie Hindhaugh, works for a content producer and pay-TV service provider within a telco. The business offers twelve media channels, plus over-the-top access platforms featuring access to high profile sport (most notably including exclusive UK live coverage of UEFA's *Champions League* soccer).

Hindhaugh presented 5G as an opportunity to make outside broadcasting more efficient, flexible and accessible for the sports broadcaster. He explained how covering a single live football match can currently involve an on-site crew of around 120, who will typically be there for two days. It also has to bring large generators to power its equipment. Cameras are tethered to transmission cables to attain broadcast quality, which restricts where filming can take place, with some stadia simply unviable for outside-broadcasts due to infrastructure-failings or lack of space.

He said that 5G network slicing with guaranteed low-latency service could transform this set-up, as cameras would no longer be tethered, and more grounds would become suitable for broadcasting. Furthermore, much of the creative work could be executed back at the studio complex in video galleries, where a team could work on several matches at once. He said this would mean fewer people on location, and fewer generator trucks would need to roll. This cost transformation could also make a wider range of live coverage of events financially viable, including concerts and more niche sports.

But Hindhaugh, reflecting his place within a UK incumbent with a dominant fixed-line network as well as strength in mobility, was keen to position 5G as only part of a converged network picture.

> *"Everyone is talking '5G', but we should be talking about 'convergence'. Where is the fibre? Where is 4G? I need one workflow that taps into those converged networks, and we are in danger... of overlaying a new delivery mechanism over one that works already."*
> — Hindhaugh.

Racing to find 5G solutions

While most industry participants reflected on what operators could do for them, Paul Spence, *Chief Technologist* at McLaren Applied Technologies (MAT, a separate business to the motor-racing team which it supports), discussed the potential role of motorsport innovation in helping rapidly evolve 5G technology, and the ways in which the relationship could deliver insights that have far wider applications.

Spence talked-up the value of applying new technology in the demanding environment of motor racing as a form of stress test, which can compress a range of challenges for technology into a brief period of time.

> *"5G technology has to prove itself. It needs to be highly reliable. We've taken systems into motor sport and it stresses them... it's not the speed... or the vibration, or the temperature; it's all those things in one go, and you've only got two days to get it right — then you're onto the next site. It's getting that V2X [vehicle-to-everything] to be reliable."* — Spence.

In the automotive business, MAT provides a safe-stop mechanism, and here Spence explained how connected-vehicles will need to take reliability to a new level to deliver to their potential. For example, MAT ran standard 4G on a race-track and discovered a previously undetected authentication bug which resulted in one in 10,000 handovers (0.01%) failing. While a seemingly low failure rate, it was compared unfavourably to the capabilities of human drivers, where *"on average, human drivers drive 100 million miles before they have a serious accident in the Western world"*.

Nevertheless, the MAT technologist was upbeat on the potential for 5G to improve automotive safety through the intensive turnaround of simulation and testing that his entity provides.

Can operators learn to work well with others?

Edward Tian, founder and Chairman of private equity firm China Broadband Capital Partners, provided another perspective on the opportunity presented by 5G, warning operators that they **risk repeating the errors** of previous generations.

He said telecoms had completely missed the market for 3G and 4G applications, and had not succeeded in transforming in order to reap the benefits of the original cloud movement that started around seven years ago. He said there were two reasons for this. The first is that, by being **prisoners of past success**, telcos are less entrepreneurial, which is compounded by the regulatory environment and shareholder constraints. The second factor is that telcos *"don't know how to work with others, and try to be everything by ourselves"*.

As 5G develops, the industry has no option but to invest in new infrastructure, and, in an effort to capture value, rather than go down the utility path, Tian said operators need to **learn from Silicon Valley**'s venture-capital model, tapping external capital to invest in entrepreneurs and in ecosystems. He suggested that collaboration through projects such as *Open APIs* is a positive step, but more needs to be done to learn how to work with others.

Operators ready to embrace openness...

TMF's Chief Executive Nik Willetts summed up the demands from the various sectors as being, *"high expectations, huge opportunity — and we're ready. Are you?"*. Operators had different takes on how this challenge would be met, but arms were opened towards closer relationships.

Elisabetta Romano, Chief Technology Information Officer at TIM, said she hoped other sectors would help telcos monetise the opportunities around 5G, and suggested that over the past ten years network operators have seen others profit by piggybacking their innovation atop of operators' networks.

To counter this, Romano said TIM will not provide 5G simply as another kind of connectivity, but as a means of providing services on a platform-based model. She said TIM's platform plan is also about exposure and collaboration, describing this ambition as *"a quantum step"* away from traditional telco reticence around openness. She stressed that the challenge is not only about using *Open APIs*, but also being able to expose special capabilities, like drone control and spatial recognition.

Peter Leukert, Deutsche Telekom's Chief Information Officer, also enthusiastically embraced the opportunity of a quantum leap to cross boundaries. He said operators must work differently with other organisations, whether they are smaller (like Hatch) or cross-sector entities (OASC), but regardless of scale identified 'co-creation' as the name of the game, rather than 'design and plan' — with more cooperation, and a focus on faster, agile service development.

> *"Surprising things will happen, left, right and centre... and that perhaps brings us to the hardest collaboration of all: trust between [operators], with people who aren't used to doing that. It's a new game."* — Leukert.

He acknowledged that this change in approach would need to start with operator leadership teams, including his own.

> *"Most boundaries are in our heads and our emotions. The key boundary I need to break is that I am no longer the know-it-all, I am not the guy who gives the orders to be executed. I have to be humble. I have to sit down and listen. Become a servant-leader. I have to start with myself."* — Leukert.

Ruza Sabanovic, *Executive Vice-President and Head of Technologies & Services* for Telenor, struck a similarly conciliatory tone, highlighting the need to work together, and not impose services from the top down.

> *"We need to work together to figure out the best customer experience and how to deliver it, how to fine-tune the network and go-to-market together. It's the only way. It cannot be, 'I own the service and you deliver it'."* — Sabanovic.

... and virtualisation will enable cooperation...

Underpinning the willingness to collaborate on 5G services is the virtualisation of network infrastructure that is enabling operators to provide more flexible services, and exploit the potential of the cloud.

Sabanovic said that her company understands that working more collaboratively necessitates transition to the cloud, and having the capability to scale vertically as well as standardise and scale horizontally — and not just in the countries where Telenor operates, but *"across all countries"*. Currently, 68% of Telenor's data traffic is said to flow through converged and hybrid cloud infrastructure — where boundaries at the network and IT layers are removed — with 110 million subscribers being served from the platform. The goal is raise this to 90% of traffic by 2020.

Romano similarly emphasised that virtualisation is expected to enable TIM to leverage the vast amounts of data it can access to better understand its network, develop new business use cases, and improve customer experience.

Meanwhile Nikos Katinakis, Head of Networks & IT at Telstra, said the Australian operator has progressed with virtualisation to the point where it has 'collapsed' its network and IT functions. The operator is now working with different industry verticals on supporting new virtualised and cloud-focused services. He said that for applications such as smart cities or broadcasting, the network edge could eliminate the IT component for everyone.

... but don't knock connectivity...

While Katinakis joined in the cheerleading for virtualisation and cooperation, he also talked-up traditional telco strengths and declared himself disappointed at what he perceived as operators' willingness to discount the value of connectivity.

Countering arguments that connectivity can be commoditised, he described it as the highest barrier to entry for any networked service, arguing that, while it may be possible to create a new mobile game anywhere in the world, there are a finite number of fibre connections and 5G networks, and it would be a big mistake not to monetise the connectivity they provide. *"It is all about money in an industry that is not very healthy today", he said.*

... and show us the money

Telenor's Sabinovic was also bullish on the value of the work that operators put in to connectivity, and considers that cost and commitment should not be borne by operators alone.

> *[We tend] to underestimate the connectivity, security and analytics [that] operators deliver already, and [the] assumption is we will continue to invest and develop them, but we are investing in use-cases, and we need you [in other industries] to share the pain as well."* — Sabanovic.

In addressing the calls from companies such as Hatch, Katinakis acknowledged the importance and potential of ultra-low latency capabilities, but questioned how operators could justify the investment.

> *Connectivity is 'super important' at the edge. Everyone talks about monetising low latency, but I challenge anyone in the room to tell me how I can technically charge differently for 20 ms latency and 50 ms. Anyone who can tell me how to do that is hired!"* — Katinakis.

Despite the challenge of this, Katanikis does not consider waiting-and-seeing how 5G develops as a viable option, saying *"you have to start early monetising 5G, as, once the train's gone past, you've missed it".*

Vendors take the flak in absentia

While customers called for operators to do more to meet their needs, the operators in turn bemoaned the progress of major vendors in fulfilling their requirements on the path towards virtualisation and realising the full potential of 5G.

There were, however, no vendor representatives on stage, which perhaps left them vulnerable to the position of scapegoat. Romano from TIM appealed to suppliers in the audience to come together to provide the technology that can enable edge computing, and to support cloud-based software.

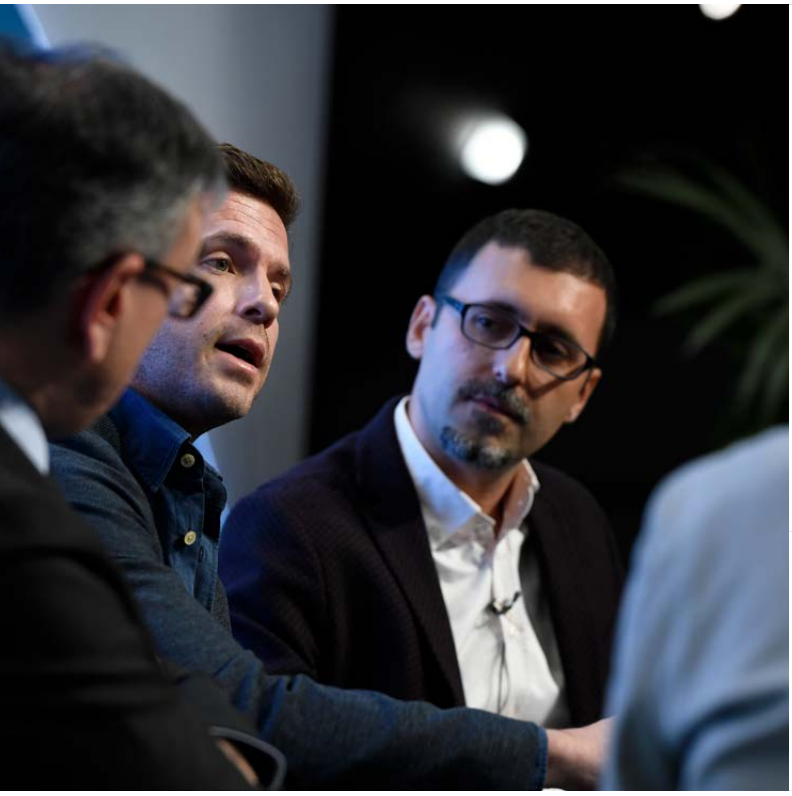
> *We develop some things, but mostly we buy, and here is a call for action. There are so many sectors, but we have some technology challenges. We need to do edge computing, but to do this we need the orchestration. We have plenty of [orchestrators], but not yet the right ones.*
>
> *Vendors are not yet delivering the right cloud-native software for us. We need vendors to step up and enable us to innovate and give [other] industries what they need. "*
> — Romano.

Leukert also expressed concern that the vendor ecosystem could be dominated by traditional giants, while the rest of the industry is attempting to move away from hardware-based services.

> *Yes, we need software engineering and integration capabilities, but we cannot have one or two players dominating the ecosystems. That is a very big shift for this industry. This is a very different game than any of us has ever played in the past. "*
> — Leukert.

Katinakis had his own gripes, and bemoaned the siloing of support for supposedly cloud-native solutions while warning of the risks of business as usual.

> *We talk 'cloud-native', but the question is, 'which cloud?'. You are shown a solution, but it only works with [Amazon Web Services] or [Microsoft] Azure. Yes, you can do it on hybrid cloud, but, if it fails over, it can only fail over from Sydney to Alaska, say.*
>
> *So they [other industries] are stuck with what they're given [by operators], and we're stuck with what we are getting [from vendors], so, if the whole ecosystem doesn't come in and allow interoperability to work properly, we are just going to carry on the same trajectory. "* — Katinakis.



AI & Data

AURA

AURA

Telefónica ramps up AURA

- Telefónica provided insights into its *AURA* strategy, including more market launches.
- Microsoft's position as a partner remains a core element of the project.
- Commitment reiterated to overcoming the challenge of combining local services with a central unified vision.

José Ramón Gómez Utrilla, Senior Product Manager of the *AURA* unit, and Irene Gómez Luque, Digital Product Director within the Chief Data Office at Telefónica, sat down with Market Mettle at *Digital Transformation World 2019* (*DTW19*) to explain how the group is implementing the *AURA* digital assistant at scale by creating a platform that can be adapted to support individual use cases for business units across the Telefónica footprint.

Launched as a commercial offering in Argentina, Brazil, Chile, Germany, Spain, and the United Kingdom in February 2018 (*Telefónicawatch*, #124), *AURA* is now being rolled out in Ecuador, and will be followed by Colombia and Uruguay over the coming months, although a more precise timetable has not been revealed.

Developed in collaboration with partners including Microsoft, *AURA* is a key element of Telefónica's strategy to become a data-driven, platform-based company. Indeed, *AURA* — described by Gómez Utrilla as a *"cognitive product"* — is underpinned by the telco's so-called fourth platform that is designed to make use of *"cognitive power"* in order to gain insights from data (*Telefónicawatch*, #115).

As explained by Gómez Luque, *AURA* is regarded primarily as an enabler with the ultimate objective of improving the relationship — by allowing subscribers to 'talk' to technology using natural language, and gain answers in real-time, thus providing a single point of contact and creating a greater level of personalisation.

Global design, local implementation

Certainly, there have been challenges along the way, and here comments from Gómez Utrilla resonated with remarks from his colleague Richard Benjamins when he was recently discussing the role of AI and data analytics in the technology-focused telco (*see Telefónicawatch*, #135).

Gómez Utrilla highlighted the challenge that comes with multiple operations in different countries, with different languages and cultures. Then, there is the matter of ensuring time to market — or how to create a product from the initial vision and deliver it in a sustainable way. Third, Telefónica wants to create a global product in order to maintain a consistent user experience and keep control of the technology and data, while enabling local market deployments.

He said many of these obstacles were overcome by turning *AURA* into a platform that can be used by individual markets as the basis for their own implementations. The concept of the fourth platform offers normalised APIs and data sources across the footprint, supporting a *"build once, deploy on-demand"* strategy.

> *"We have to be sustainable, so we focus on creating the platform with more knowledge capabilities, cognitive modules, connectors with channels and so on, and we deliver that to the countries, and the countries have the ability to design, build, create and deploy their own use cases. The local teams replicate the structure and the skills from the global side, and then with the platform they are able to build on top of that and deploy these different use cases."* — Gómez Utrilla.

Gómez Luque pointed out that although scale is important, *"the global team cannot be sensitive to the problems of* [*for example*] *Argentina. The way that Argentina customers behave with Telefónica is something that is very local"*.

Initially launched as an AI-based digital assistant, *AURA*'s role will be expanded over time as it is incorporated into different applications, customer service channels, and services. A key focus within the individual markets, certainly in the early stages, has been on integrating *AURA* with local customer care applications because of the important role they play in customer support.

Image: TM Forum

AURA progress to date

Argentina: *AURA* is being integrated with the *Mi Movistar* Argentina app, and one specific use case that has emerged here is called 'pay the bill'. *"We never thought about 'pay the bill' in Spain, because it is extracted from the bank account automatically"*, commented Gómez Utrilla, *"but in Argentina and in some other countries in Latin America, it's really useful"*.

Brazil: Gómez Utrilla said the most advanced deployment of *AURA* is currently found in Brazil. *"We call it the omnichannel flagship"*, he said, because *AURA* is integrated with every channel available — including *Meu Vivo* care applications, *Facebook Messenger*, *Google Assistant*, *WhatsApp*, and the Vivo website and contact centres.

Chile: the local team is currently working on integrating *AURA* with the customer care application. As things stand, *AURA* is integrated with *Facebook Messenger*.

Germany: *AURA* is integrated with *Facebook Messenger* and the O2 Germany website for online customer support.

Spain: Telefónica España has focused on integrating *AURA* with the *Movistar Plus* TV application and the *Movistar Home* hub for smart services in the home.

UK: the *My O2* application is gradually being replaced by a new application that will be integrated with *AURA*, starting with the *Android* device operating system and then moving onto Apple's *iOS*. Ultimately, the *AURA*-based application will take on all functions of the current *My O2* app — including billing enquiries — and add new capabilities such as a knowledge base that can, for example, provide information about child safety online.

Microsoft: a key partner...

Gómez Utrilla noted that Telefónica has been working with Microsoft on *AURA* from the beginning, leveraging the US-based supplier's cloud capabilities and *Azure Cognitive Services* to speed time to market. *"On top of that, with our in-house development... we create modules that enhance those cognitive capabilities",* such as building the business logic for every use case, he added.

Although *AURA* is integrated with *Facebook Messenger*, *Google Assistant*, and *WhatsApp*, the same cannot be said for Microsoft's digital assistant, *Cortana*. Neither of the Telefónica executives appeared keen to explain why, although recent reports indicate that Microsoft is repositioning *Cortana* as a skill that can be integrated with *Microsoft 365* and targeted more at business users.

They did expand on the role played by Google and Facebook, which Gómez Utrilla described as *"new entry points for AURA"*. For example, a Telefónica customer in Brazil can tell *Google Assistant* that they want to talk to *AURA*, and are then transferred to the Telefónica service. In effect, *Google zero-Assistant* acts as a bridge: *"we agreed with the Google engineers to protect the business logic from AURA, the API, because it's in our backend"*, added Gómez Utrilla, noting that *Google Assistant* with *AURA* will gradually be rolled out in other markets.

...and a big AURA fan

Rick Lievano, Microsoft's Worldwide Director of Technology Strategy for Telecommunications, who took part in a joint presentation of *AURA* at *DTW19* alongside Gómez Utrilla (or *"Mr AURA"*, according to Lievano), certainly seemed impressed by Telefónica's progress to date, hailing *AURA* as the *"highest profile AI project in the telco sector"*.

He also referred to the announcement made at *Mobile World Congress 2019* that Telefónica and Microsoft are extending their strategic agreement with the intention of bringing *AURA* to all customer relationship channels, including call centres, to improve customer care (*Telefónicawatch*, #133). Furthermore, he reiterated the commitment to use the cognitive technology as a transformational tool within network infrastructure, and not just in the home, *"with the ultimate goal of having autonomous networks"*.

A work in progress

Gómez Utrilla concedes that it is early days for *AURA*, and there is still much to learn about how customers will use the product and how it should be *"reshaped"* in future.

As things stand, *AURA* has two million monthly active users (most of whom appear to be in Brazil — *Telefónicawatch*, #132), generates six million conversations per month (with 30 million to date), supports 1,000 use cases, and is integrated with 20 customer channels. It is available in English, German, Portuguese, and Spanish.

Image: TM Forum

Telefónica embraces short-term pain for data flexibility

- Telefónica Mexico provided insights on building momentum on creating replicable data-driven local systems, with potential for wider deployment.
- Groundwork on establishing principles, and ensuring standardisation, vital to ensuring benefits can flow through to subsequent use cases.
- Real-world implementation of a standardised approach can cause initial localised pain, but is proving an effective way to pursue a central data vision flexible enough to address regional expectations.

Daniel Vaughan, Head of Data Science and Chief Data Officer, Telefónica México, talked about choosing the right data model at a presentation at *Digital Transformation World 2019*. During his talk, which was entitled *What is the right data model for telcos to adopt?,* he considered the choices that Telefónica Group has made on developing a centrally-driven data strategy that can accommodate local market requirements, while ensuring new data services are also replicable across its footprint.

Vaughan acknowledged that the right data model will vary depending on the operator involved, but noted that Telefónica approached the process by considering two key questions: *"what type of data company are we?"* and *"what type of data company do we want to be?"*.

From here, the operator was able to begin the development, and subsequent implementation of its *Unified Data Reference Model* (URM — *Telefónicawatch*, #121, *passim*), a process described as *"very hard, very complicated"*, but which Vaughan considers is now providing valuable benefits.

Design phase considerations — breaking silos in a straitjacket

Vaughan said that the two key questions revealed a set of core values and objectives for Telefónica as a customer-centric telco, which the URM had to complement.

The three core values identified are:

1. **Empowerment** — the data is owned by customers and Telefónica must ensure they have access to it at any time.
2. **Transparency** — being clear with customers about what type of data Telefónica holds about them and how the company uses it.
3. **Security** — assuring customers that their data is safe with Telefónica at all times.

> Telefónica Group was recently listed as the highest performing telco in the ***2019 Corporate Accountability Index*** compiled by non-profit citizens' rights entity Ranking Digital Rights (RDR). However, RDR found that Telefónica and the other leading companies in the *Index* fell short in key areas affecting freedom of expression and privacy, with the Spanish telco achieving 47% and 49% in the two categories, respectively. Although Telefónica was found to have made a number of improvements to its privacy policies, it still fell short on disclosure in a number of areas, particularly around keeping users informed of the way data is shared with third parties (*Telefónicawatch*, #135).

Building on these core values, Vaughan moved on to the company's four major objectives concerning using data as an asset:

1. **Creating value** from the data and making intelligent decisions, based on the right data. This entails building use cases to solve specific business problems using predictive modelling, machine learning and AI.
2. **Producing a data model in a fast, agile way** to get to market as fast as possible to support partners in its ecosystem, including non-telcos.
3. **Sharing data and knowledge** across its operating businesses (OBs). Vaughan noted that Telefónica has found that OBs historically solve the same problems over and over, with valuable knowledge trapped in geographical silos. Vaughan said, *"We wanted to break this and create one knowledge base"*.
4. **Providing structure with flexibility**. Vaughan acknowledged the challenge of hitting this balance, noting that too much flexibility creates trouble in the future, while too little create problems in the present.

> *"Data models are like straitjackets; they restrict what you can do in future. So we have to think about it in two ways in the design phase. It has to be 'forward-compatible', that is able to adapt to changing market circumstances, and to be backward compatible."* — Vaughan.

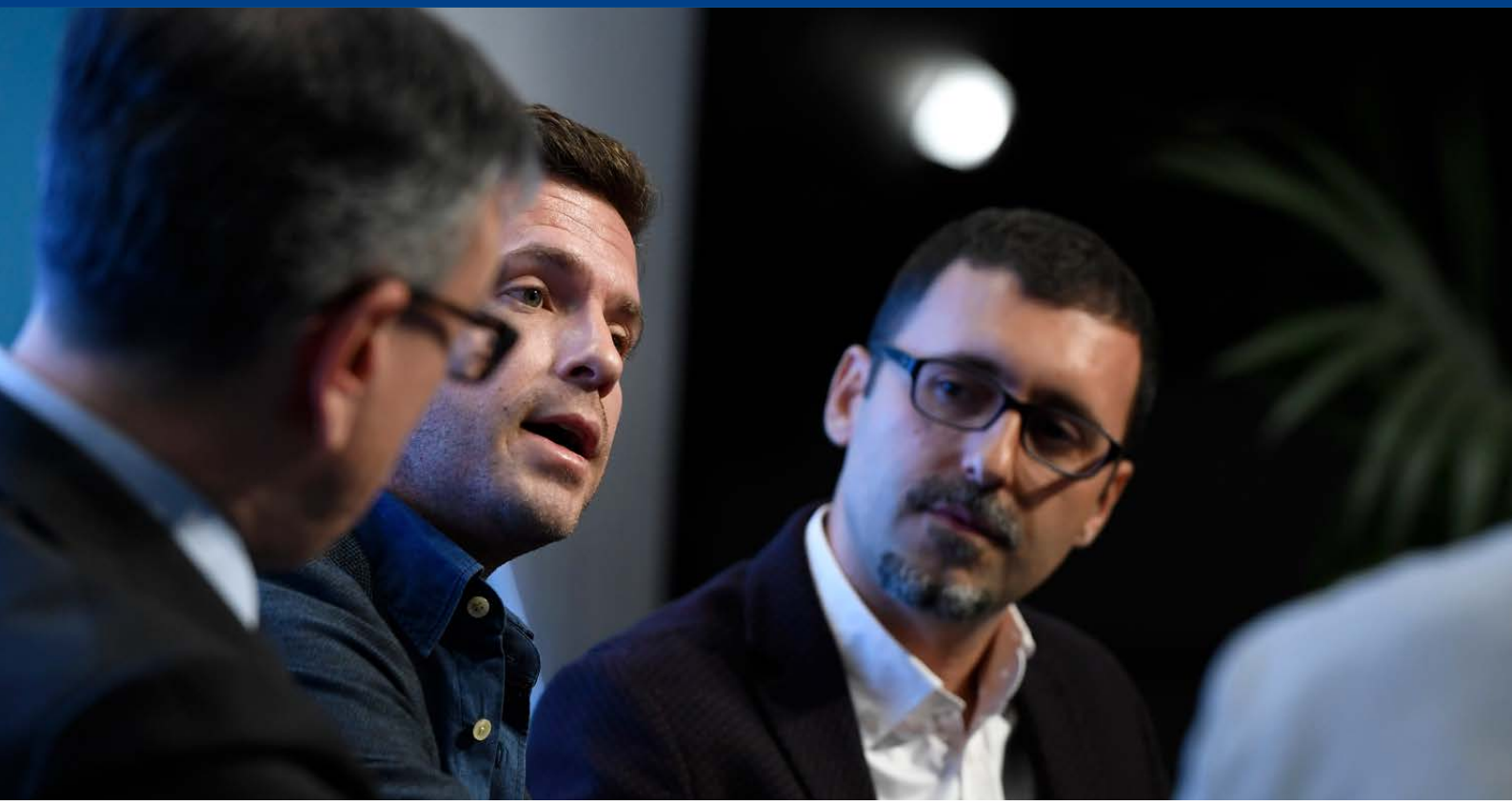


Image: TM Forum

URM enablers

Vaughan talked through three enablers which he said were instrumental in the creation of the URM, based on the data principles identified by the Group.

1. The first enabler was creation of a **common data model** for all OBs. Vaughan stressed that the models used for URM would look familiar to anyone who has worked with other model examples, *"a set of tables or entities, in data jargon, with headings and columns"*. The key distinguishing element is that there is uniformity for these tables across geographies, which he said means the model can be implemented in unique ways to address operational issues, but at the same time be applied by other OBs (*see implementation below*).

2. The second enabler was a **standard set of APIs**. These common tools were said to be vital for ensuring communication across countries regardless of any local systems in place. *"We want to share code, to transfer software and code among us, independent of whatever vendor we have,"* he said.

3. The third enabler was installing a **consistent technology stack** — operating with the same software and same version — across all operating businesses.

> *"That's how we create value in the data economy, doing these three things and sharing code."* — Vaughan.

While Telefónica built the URM internally, Vaughan acknowledged that in doing so it had used some best practices from TMF's long-established data reference model, the ***Information Framework***, usually referred to as the SID (for shared information/data model).

Implementation pains providing lasting lessons

With the theory in place, Vaughan said putting the URM into practice proved very painful — more so for the local teams than the global ones. The early deployments did, though, provide five main lessons that have been applied to the future development of the URM.

- **Finding the right use cases**. Use cases are the fundamental unit for validation of data models, and global data teams need to identify the most effective and valuable local OB models, and convert these to global models to be implemented across all markets.

- **Ensuring data consistency to enable efficient re-use**. Vaughan stressed that the way of preparing data for application in one use case should be normalised to ensure savings are made on future applications. Giving the example of Mexico, he said it took several months of work to ensure consistent data could be loaded into the first URM-based use case, a network optimisation algorithm. However, when the team moved on to the second use case, device recommendation, an estimated 70% of the data had been *"normalised"* as part of the network optimisation process, meaning the cost of deploying the second application was substantially lower than the first.

- **Recycle where possible**. Vaughan said that some OBs had successfully deployed use cases using machine learning, and the Group was looking at whether it is possible to refactor the code and deploy it elsewhere. This remains a challenge, however, where OBs have developed code that may have been built with pre-URM local data models in mind.

- **Move quickly, but do not break things**. Vaughan said the Group's core values mean a note of caution needs to be added to any rush to develop new systems *"because if you put garbage in, you get garbage out...even using the best algorithms in the market is only as good as the data you put in"*. Telefónica is said to run automatic data governance checks on new developments, and also uses an external benchmark to monitor practices within OBs. Nevertheless, the Group is looking at ways to make rapid progress on new solutions, and is currently looking at ways to develop use cases based on *"minimal viable data"* which can minimise the number of fields of data that need to be normalised for any single application.

- **Patience is a virtue**. Vaughan highlighted that existing data models across OBs had their own unique naming conventions. This therefore required occasions where a parallel data model has to be built based on standardised practices to leverage the value of machine learning technology. Some OBs apparently still have two data models in operation. *"This is painful,"* Vaughan acknowledged, *"you have to be patient"*.

Significant gains feeding into a virtuous cycle

Despite the challenges, Vaughan was predictably upbeat on the benefits of the process, and stressed the success of the components built on top of the URM in his home market of Mexico. He also noted that the work in the OB is expected to provide smoother sailing for future solutions across the Group as a whole, as well as within the OB.

> *"In Mexico we found the URM worked well, but it still needed extra data to deploy machine learning solutions, which is what data scientists call predictive variables or predictive models. So we decided to create a feature meta-store, because data scientists [across the Group] are creating the same features or variables over and over again. The feature store has been very helpful, enabling the team in Mexico to build machine learning-based and AI solutions very quickly as a common strategy."*
> — Vaughan.

Vaughan said that now use cases are beginning to be effectively reused across OBs, with local resources creating universal solutions, and a virtuous circle emerging between local development teams and the centralised global office.

This is also said to be ensuring Telefónica's core values are adhered to in all markets, and regulatory standards can be met, while supporting the principal objective of strengthening and deepening customer relationships.

2025 Digital Operator

PLATFORM

Image: TM Forum

PLATFORM

Deutsche Telekom: introvert telcos plan mould-breaking 5G party

- DT plans to step up "*conversations*" with partners in a bid to ensure 5G return-on-investment.
- Execs concede telcos remain "*quite poor*" on enabling collaboration.
- '*Fast telecoms*'-vision mooted, with repeatability across numerous services, but can traditionally closed telcos deliver?
- Hints of increased focus on services long-tail, and beyond flagship tie-ups.

Erik Meijer, Strategy Group Product Manager for Group Innovation at Deutsche Telekom (DT), used TM Forum's *Digital Transformation World 2019* (TMF *DTW19*) event to highlight the importance of improved platform plays by operators to support the partnership-led growth opportunities promised by 5G rollout.

The executive — who joined TMF's *Digital Ecosystems Advisory Board* in August 2018, and is one of the industry organisation's biggest cheerleaders at DT — homed-in on operators' partnering challenges in a *DTW19* session entitled *Building a successful digital service ecosystem*. He highlighted that *"we are now going to deploy 5G, and 5G is extremely expensive"*, noting that on the technology side it will involve *"new spectrum, small-cells, massive MIMO, beamforming, and full-duplex"*.

> *"On the other side, there needs to be the appropriate business model, and that is where we have not been quite excellent in our industry. We have been quite poor. Remember Skype? Remember WhatsApp? Remember Amazon Alexa? These took billions out of our industry. If we're going to enable 5G, and let them take another billion, I don't think that will fit well."* — Meijer.

The main aims of the *Digital Ecosystems Advisory Board* are to help create new operator business models and encourage industry cooperation — including via use of TMF's *Open API* (application programming interface) programme, designed to make internal platforms more accessible and flexible (as DT is doing, via its harmonised API layer, or *HAL, in Europe — see separate report*).

Operators admit they need to be better at making 5G friends

DT has long sought to differentiate itself from rival operators through openness to innovative third-party service providers, including via *Easy-to-Partner* and *Win with Partners* corporate missions, and a multitude of partnering and investment vehicles. Nonetheless, the sense from Meijer's *DTW19* discussion — and the event as a whole — was that efforts now need to be stepped-up.

For example, the show saw highlighting of developing industry plans to use *Open APIs* to support platform business models, and improve appeal as a partner for the 5G era. Operators including Group minority-investment BT Group and key rival Vodafone said they were entering *"phase two"* of TMF's *Zero Touch Partnering Catalyst* project, which aims to establish a suite of tools and working methods to support partnering across a diverse range of service types, and which suit the needs of all service providers. Other participants in the *Catalyst* are BitX, DGIT, Oracle, Sigma, and Sinefa.

Fast telecoms: repeatability and openness

According to Meijer, a primary objective of 5G business model development work will be to ensure that operators create multiple streams of income from each 5G resource, as opposed to *"enabling a slice of very expensive 5G for just one business case"*.

His ideal model is to have a number of brands connected into an operator's platform and selling services to their end-users, thus expanding revenue-generation from multiple sources. As an example, he said McDonald's could enable customers to play a mobile game while eating their burgers, thus *"bringing a slice of 5G"* into fast-food restaurants.

Meijer noted that *"this is a business model that we as the telecoms industry need to get our heads around"*. Nonetheless, he pointed out that efforts are already underway to promote this approach at TMF with the use of *Catalyst* proof-of-concept projects, such as the *Zero Touch Partnering* initiative.

The next step will be to *"have a conversation"* with partners, in order to understand where they see business opportunities in their industries and work collaboratively to help resolve their challenges. *"So, what we will do on the Advisory Board is we will start to facilitate meetings between verticals"*, said Meijer.

He acknowledged that the telecoms industry has not always been easy to do business with, and insists that this has to change. In this context, he pointed to efforts at DT to ensure that it provides a consistent message on networks, customer services, and business-to-business services.

> *"It is very important that we are consistent in our messaging and our delivery."* — Meijer.

Image: TM Forum

Rakuten: first cloud-native MNO (from a non-telco)

- Inside the rebel base: CTO opens up on Rakuten Mobile and Reliance Jio green-field ventures.
- Network and customer experience reimagined for challenge to operator establishment.
- Can telco establishment translate experiences, with legacy encumbrance?

Since its unveiling at *Mobile World Congress 2019*, Rakuten's first-ever cloud-native mobile network has sent shock-waves round the telecoms industry, so it was no surprise that Tareq Amin, Rakuten Mobile's Chief Technology Officer (CTO), was given the honour of delivering the second keynote at *Digital Transformation World 2019* (DTW19), along with Andrew Feinberg, President and Chief Executive of Netcracker (the event's long-term *Diamond* sponsor).

Amin is accustomed to the limelight. Before moving to Japan in June 2018 to join Rakuten, Amin lived in Mumbai, where, as Senior Vice-President of Technology Development & Automation at Reliance Jio, he was part of the team that profoundly changed the Indian market. Amin also presented a session at the DTW's invitation-only *Digital Leadership Summit*.

He opened his remarks by stating, *"we call it the network of the future: a totally cloud-native network"*, continuing, *"Rakuten means 'optimism', and we are not a telecoms company, which is a blessing... we are an internet global innovation company, which means my organisation has access to enormous resources"*.

Rakuten was founded in 1997, and moved about $139bn through its ecosystem last year, which comprises various platforms, including cashback websites (known as *Ebates* in the US), Rakuten Marketing (selling data-driven insights to businesses), *Rakuten Viber* (messaging), and *Rakuten Kobo* (ebooks and audio books). Out of Japan's population of about 128 million, 105 million are said to be Rakuten members. Rakuten's business model is that the more members use its services, the more benefits they are offered across the company's many services — to which mobile connectivity will be added in October 2019.

Rakuten has been allocated **spectrum** in the mmWave band, a 400MHz block in the 28GHz band, and 100MHz block in the 3.7GHz range.

Netcracker, an NEC company, has worked with Rakuten to digitise the customer experience in Rakuten's retail stores (where customer experience optimisation will be amongst the network's innovations and differentiators), and the vendor seized every opportunity at DTW19 to hitch its wagon to Rakuten's star-billing, including giant posters featuring Amin in the foyer and elsewhere at the event.

Complete hardware and software disaggregation in the wild

> *I thought: 'what a dream company that has all the verticals to really disrupt connectivity'. To my knowledge, this is the first time an internet web-scale company [is entering the] connectivity [market] to enrich the value-add.*
>
> *This was a choice not to go the easy-path, which [would have been] in June 2018 to issue an RFP [request for proposal] to deploy a network in the same way it has been done for the last 20 years... Some people say it is easier, because we are green field. My life would have been easier if I'd gone down the traditional route, but that is not good enough. It would not sit well with the ecosystem and culture of what Rakuten is all about."* — Amin.

Amin picked out two key points about the Rakuten cloud platform.

> *The area no-one has dared to enter into, radio access, [is] where 60% of capex goes today in telecoms. I was told by almost everybody that I'm crazy; that radio access could never be virtualised, it's too complex. Come to Japan and you can see it live in production today, running the entire native access on our horizontal, virtual infrastructure.*
>
> *We took every component in the network and made it software. It's not easy, it's not simple, [and] we still have a lot more work to do."* — Amin.

Amin said, *"our choice was to build the network from day [one] for 5G. People cannot understand how we built the network with such low capex. It's very, very simple: we have disaggregated the entire hardware from the software layer".*

Digital customer experience is also a key differentiator

The other challenge he highlighted is the digital transformation for customer experience.

> *I wanted to discover how it is when you go to a retail store and experience the activation of a SIM card. I was in shock: activation time is 2.5 hours, and we think that's wrong. We think you should respect human beings' time, and spend time with your family or what you like to do, not in a physical retail store.*
>
> *Our system allows us to activate the whole experience, not just the network plus the digital stacks we're introducing. The physical format of our stores will be more welcoming, the process of engaging and transaction on- or off-line is different, and we can do it because the culture is right. "* — Amin.

It is worth noting that part of Jio's outstanding success in India — it signed up 50 million subscribers in just 83 days (which it claimed was faster than any technology business has ever grown, including Facebook) — was that it revolutionised the buying and service-activation experience. This was reduced from days, and a hugely-unwieldy process, to customers walking-out of stores with a working phone.

Proving the industry wrong, wrong, wrong

> *I want to highlight [that] every analyst and every traditional equipment manufacturer said it would 'never happen', it is 'impossible'. As human beings, we underestimate our capability: once we put our minds to fix something, we will get it done. We finished everything in eight months.*
>
> *We did not have a data centre. We did not have infrastructure. We did not have our backbone done. We had nothing done. Now, it's live in Japan and anyone who knows Japan knows it is a quality-obsessed country. It is highly-resilient, highly-available, and will deliver on quality that you demand and respect. We want to pass the transformation savings to consumers. It has been a remarkable journey. "* — Amin.

DevOps model needed for telco decision-making

Netcracker's Feinberg was asked by moderator Mark Newman, TMF's Chief Analyst, what commonalities he saw between Rakuten and the many transformation projects his company works on around the world.

> *There are many commonalities, but the differences are important. It's the same cloud-based technology, the same stack, the same objectives. The critical difference is culture. [Rakuten] is an internet company. It's agile and perfectly aligned, and it's not afraid to make mistakes — and fix them quickly... We [telcos] use agile DevOps instead of a [traditional] waterfall in operations now, but decision-making is very fixed. That's the next move is for decision-making to become as agile. "* — Feinberg.

Image: TM Forum

Digital transformation: culture change, reskilling crucial

- Reskilling employees fundamental to Wind Tre's digital transformation strategy.
- Cultural and organisational change critical for digital transformation to be adopted at scale and to succeed.
- Operators must change their corporate identity to attract vital new talent.
- Wind Tre CIO sceptical of vendor marketing of new technologies.

During the *Next steps in transforming into a digital operator by 2025* panel discussion at *Digital Transformation World 2019* (DTW19), executives from operators Wind Tre and Telus, and management consultancy McKinsey, emphasised the importance for operators to reskill their workforce and implement organisational culture change.

Rob Visser, Chief Information Officer (CIO) at Italian operator Wind, underlined that many issues surrounding digital transformation among operators are due to the siloed nature and lack of integration of digital units within the wider organisation, and the need for organisational change in order to be effective.

> *"A separate digital department is, I think, how lots of organisations these days attack digital transformation, by putting somebody in charge [of digital], put them in a cage and say 'OK, I'm ticking the box now; let's wait for digital transformation to happen.' "*
> — Visser.

Visser revealed that Wind approaches digital transformation from three angles (people, processes, and technology), which set the tone for the debate. He described how the operator overhauled its organisational structure and emphasised the need for operators to change their processes (which is a lot harder than adopting new technologies).

> *[Wind Tre] moved into a full agile scrum methodology... Everybody works together within different expertise to drive, across the whole organisation, digital transformation.*
>
> *Hierarchy does not exist anymore. There is no marketing department [for example], there are 'chapters', and they are consisting of... people with unified skills and development that are grouped together, and they are trained to use the same standards, the same principles, and they share best practices with each other. "*
> — Visser.

Harry McIntosh, Vice-President of the Digital division at Canadian operator Telus, shared similar views to Visser, suggesting that digital transformation at Telus runs parallel to the organisation's culture, claiming that *"every technology decision* [*at Telus*] *is coupled with a cultural decision"*. He also stressed that Telus has not embarked on its digital journey to become *"a better telco, but* [*to become*] *a better business"*, adding that performance is not measured by *"'digital KPIs', but 'company KPIs'"*.

Ruben Schaubroeck, Senior Partner at McKinsey Digital, highlighted that, in order to compete with the likes of over-the-top (OTT) players, operators must overcome the barrier of implementing cultural transformation. *"The biggest part of the* [*digital transformation*] *journey is the cultural change, and how you fundamentally change the DNA of a company to become much more digital and data-orientated"*, he stated.

Reskilling and attracting new talent

Visser divulged that a key pillar to Wind's digital transformation strategy is the reskilling of its workforce and investment in fresh talent for the digital era, with new technologies such as AI and machine learning leading to the creation of new jobs in areas such as data science.

> *We have one budget that's unlimited, and that's our training budget. We really incentivise people to become Scrum Masters, to become experts in AI and machine learning, whereas, to be honest, all those things don't exist [on their own]. There is no machine that learns, there is no artificial intelligence, it's human intelligence. It's human people... that do the heavy-lifting across digital.*
>
> *We don't talk about machine learning because machines don't learn, people learn... so we invest in our people. We have so much data... so we need to invest in data scientists. "* — Visser.

The challenge that operators face with recruiting new talent was addressed by McIntosh, who stated that the people Telus was looking to hire *"had no interest in working for a corporate telco environment"*, a prominent issue faced by traditional companies as graduates and the digitally-skilled opt instead to work for the likes of Amazon, Google and Facebook.

In an attempt to attract talent away from internet and OTT players, and to facilitate digital transformation, McIntosh explained how Telus had first to centralise its digital unit within the organisation, and then change its identity to adopt the mindset of a startup. This step was considered crucial in commencing a transformation journey that *"worked in getting the right talent through the door"*.

> *I believe in that future where 'digital' is dispersed across an organisation. It's really a case of whether telco cultures can handle it, otherwise [operators] will get eaten up by the machine of the old school."* — McIntosh.

Echoing comments made by McIntosh, McKinsey's Schaubroeck reaffirmed that operators will lose talent if they do not create the right cultural environment for it. He outlined that, in order to change the culture, operators need to recruit new talent in areas such as software engineering to challenge and bring new perspectives to their organisations. Without such in-house capabilities, it is hard to adapt and adopt new technologies quickly.

However, Schaubroeck said that this alone is not enough, and reiterated the need for operators to have a clear reskilling programme in place for their employees in order to meet future digital needs.

Vendor scepticism

Technology vendors, along with their marketing efforts to promote new digital transformation-associated technologies such as AI, ML and automation, are adding pressure on operators to adopt new technologies to realise their goals, which Visser intimated has increased scepticism towards suppliers.

> *I'm always a little bit sceptical when I hear all the suppliers talk [about digital transformation technologies]. I don't believe that 'digital' is a strategy itself. Digital is not a goal, it is a means. We don't have a digital strategy, we have a strategy to make our customers very happy. We measure value for customers. We measure NPS [Net Promoter Score], we measure how happy people are. Those are real KPIs. All those marketing terms [that vendors use] for us are tools people use to ensure our customers are helped in a better way."* — Visser.

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Image: Netcracker / Twiter

Telefónica/Vivo: opening Pandora's box

- CIO recounts experiences from digital overhaul of Brazilian operator's sprawling IT operation.

André Kriger, Chief Information Officer (CIO) at Telefónica/Vivo, is on a mission to transform the IT operation and improve time-to-market at Brazil's largest operator.

Kriger is a man in a hurry, with much to accomplish in his relatively new role. *"One of the first things I learned when I took over the CIO role [13 months ago] is that CIO stands for 'career is over'"*, he said (*Telefónicawatch, #126*). He was not entirely joking, pointing out that time in IT departments is measured *"at least in months"*, not years.

As you'd expect for someone with too much to do in too little time, Kriger managed to outline pretty much every major IT project that is currently under way at Telefónica/Vivo during his 20-minute session at *Digital Transformation World 2019*.

For now, his three main priorities are IT transformation, acceleration of time-to-market to meet the needs of the business, and achievement of operational excellence.

Kriger said Telefónica/Vivo has one of the **largest IT operations in Brazil**, with a workforce of around 6,500 people, 600 systems in the IT domain (and 600 in the business areas), and 175 partners in 435 contracts.

In order to improve time-to-market, the main strategy has been to reduce the number of projects that are running in parallel, ensuring the more important that will add value to the business can be completed more quickly. Kriger said it previously took over a year on average for an idea to reach the deployment stage. In one recent example, he said he was able to bring about a reduction in the time taken to improve prepaid-charging from three months to four weeks, by ensuring that all parties involved focused solely on this project. That proposition has now launched, and is generating value for the operator.

As for IT transformation, three major projects are currently in progress. The first two, named *Beatrix* and *Luiza*, respectively aim to replace the business-to-consumer (B2C) and business-to-business (B2B) systems with one full stack. In the B2C segment, for example, the migration of mobile and fixed services to one stack would facilitate convergence offers. The full-stack B2B system, based on technology from partners Netcracker and Salesforce, went live in March 2019.

The third transformation project is called *Pandora*, and aims to replace the ten-year old online charging system (OCS) from Ericsson. The project is so named because *"we are opening the OCS box and we don't know what we are going to get out of it"*, said Kriger. The ambition is to move outside the scope of the traditional OCS by adding-in customer care and service offerings, for example.

Kriger also touched on Telefónica/Vivo's efforts to *"extend its core"* for both B2C and B2B services. In the former segment, the operator has thrown in the towel and decided to embrace over-the-top (OTT) providers such as Amazon's *Prime Video* and Netflix. It has also signed contracts with the National Football League (NFL) and the National Basketball Association. After previously moving away from the area because of the high cost of subsidies, Telefónica/Vivo again sees value in selling phones and accessories. In the B2B segment, it intends to focus on expanding its portfolio of services, with a focus on cloud, the Internet of Things, and security (all priorities within the wider Telefónica Group).

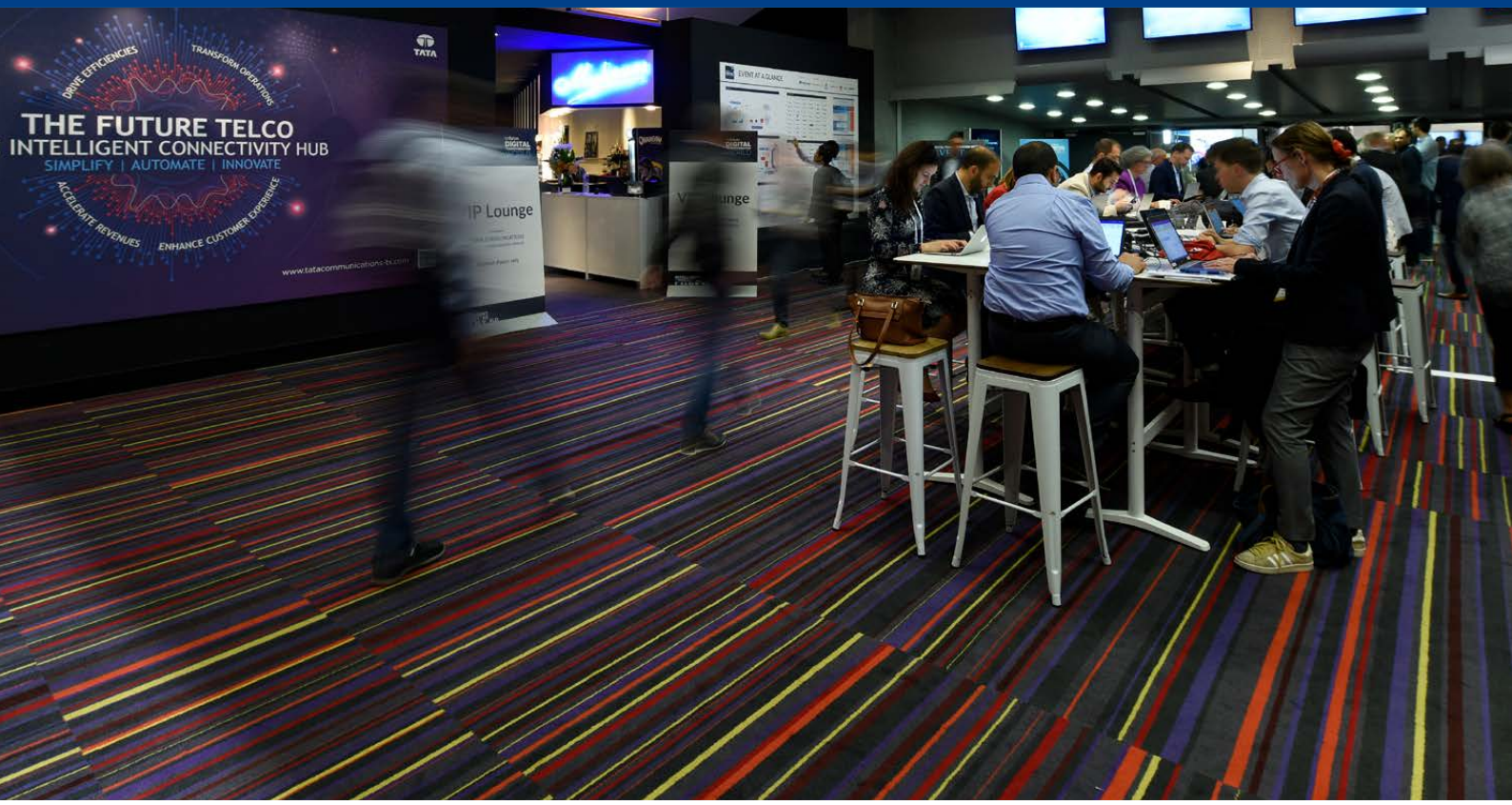


Image: TM Forum

Google and telco: a beautiful budding relationship

- Web services giant gees-up operator audience, stressing their go-to-market strength.
- Opportunities highlighted across network, IT, and services.

Mike Blanche, Head of Telecoms Strategic Relationships for EMEA at Google, took to the stage at *Digital Transformation World 2019* to provide insights into the types of partnerships that the search giant is forming, and would like to do, with telecoms operators.

He pointed out that Google and telecoms operators have an increasingly symbiotic relationship: *"we depend on telecoms operators to reach our users"*. Operators, meanwhile, rely on internet companies like Google to provide the content and services that drive demand for broadband.

Operators might be relieved to hear that Google does not, as Blanche explained, see it as a zero-sum game, where internet companies succeed and telcos fail, or vice-versa. *"We believe it to be a virtuous circle for everyone",* he said.

Blanche outlined three areas where Google thinks it can work together with telcos to grow their businesses, including: access services; the enhancement of technology and operations; and new business areas.

Specific areas of interest include bundling, in order to add additional services to telcos' core offerings; launching new services; *'reimagining'* subscriber engagement to make it more digital; and delivering more efficient networks.

Blanche referenced research carried out by Analysys Mason in 2017, which estimated that, under a scenario where operators and online service providers *"collaborate more directly and intensely"*, telecoms operators could see an annual operating free cash flow (OFCF) **uplift in 2021 of €8bn ($9bn) in Western Europe**, and potentially €15bn across EMEA. The report, *Operators' digital transformation: unlocking EUR15 billion through partnerships with OSPs*, was sponsored by Google.

Examples of Google partnerships with telcos

- **T-Mobile US** is bundling *Google One* with its *Metro* plans, offering cloud storage, member benefits including *Google Play* credits, Google support, and sharing among up to five family members.
- **Vodafone Business** is selling Google's *G Suite* cloud solutions to small businesses, including *Gmail*, *Calendar, Google Drive*, and *Google Vault*.
- **Digi**, the Telenor-owned mobile operator in Malaysia, offers a mobile-management feature for postpaid and prepaid customers on *Android* devices, as part of a wider collaboration between Google and Telenor Group.
- Google also collaborates with telcos on the construction of **subsea cables**. Blanche particularly highlighted the *Faster* cable across the Pacific Ocean, co-owned by China Mobile, China Telecom, KDDI, Global Transit Communications (part of Time DotCom of Malaysia), Google, and Singtel.

Network Transformation

Image: Steffen Roehn / Twitter

TRANSFORMATION

BT scales new peaks with IT transformation expedition

- The *Da Vinci* project is putting human-centric design at the core of BT's IT approach, requiring a fundamental change in outlook for the telco.
- Higham's programme helping BT cut IT costs by nearly 40%, while improving internal perceptions of the Group's IT function through new services.
- *Da Vinci* approach expanding to encompass new digital services beyond traditional IT, and has potential to find a role in new CEO Philip Jansen's transformation plans.

Da Vinci, BT's programme to transform its IT organisation to services-based and customer-centric offerings (*BTwatch*, #294), was the subject of a presentation by Rachel Higham, Managing Director of IT at BT, at *Digital Transformation World 2019* (*DTW19*).

Higham, who has also given herself the alternative job title of *"Chief Sherpa of our transformation expedition"*, provided a review of progress to date with the programme, which aims to fundamentally transform BT's IT organisation over a period spanning around five years. At the beginning of the programme in 2017, the organisation encompassed 13,000 employees serving six vertically integrated technology functions aligned to customer-facing units that manage products, marketing, sales, and customer support. Higham instigated the programme as she assumed her IT MD role, and noted the challenges immediately faced by launching another change programme after a sustained period of cost transformation.

> *"We saw 13,000 people who'd gone through seven years of cost-cutting, and were suffering a huge sense of change fatigue. So we decided to step back, and purposefully design the way we wanted to transform, not just what we were going to transform in the five years ahead. This is far more than just a technology play or adopting a few new tool sets. It really is about moving 13,000 people to being human-centred, thinking about the human being, which is the customer, and then as they do that, thinking of themselves as fundamentally in service of that customer."* — Higham.

A common theme that emerged from initial consultations on the programme, Higham added, was that BT's IT approach needed to fundamentally change to become more fluid and ongoing. *"We could no longer evolve in generational leaps every five, ten or even 30 years. That simply wasn't good enough anymore,"* said Higham.

The project is named ***Da Vinci*** in part to mark the quincentenary of Leonardo Da Vinci's death, but also because of the way the artist and inventor combined art and science *"to take quantum leaps forward"*. According to Higham this was *"something we wanted to emulate by bringing together design thinking and technology together to leap forward many generations"*.

FromHereOn role in rebooting BT IT

FromHereOn, the business design and architecture consultancy that was appointed by BT in 2017 to help get the *Da Vinci* project off the ground, has been fairly blunt about why BT was under pressure to revamp its IT division, and the scale of work that needed to be undertaken.

In a *Da Vinci* case study on its web site, the agency said the six customer-facing units that existed at the time of its involvement *"felt the IT organisation was complex to deal with, unresponsive to change, expensive and slow to deliver"*. Moreover, it referenced wider issues at BT that were adversely affecting how it was perceived both internally and externally.

> *"BT was experiencing some real commercial and cultural turbulence due to a combination of: their merger with another power-house brand with entirely different ways of working [EE]; an accounting scandal which sent the share price plummeting [BT Italia]; and subsequent internal cost transformation initiatives, which fuelled an atmosphere of job uncertainty and a culture of protectionism."* — FromHereOn *Da Vinci* case study.

Mac Lemon, Managing Director of FromHereOn who was on the stage alongside Higham at *DTW19*, admitted that *Da Vinci* has been *"tough"*, noting that although his agency had implemented these kinds of programmes before, they had never been at the scale of BT. *"This was entirely different,"* Lemon said.

The consultancy's role within the programme lasted for 18 months, and involved developing an internal service design function within BT, providing a means for the nascent service design team to interact and engage with customer-facing divisions, and ensure BT had appropriate internal resources to enable the continuation of the programme — and its approach, attitudes and mindset — beyond the consultancy period.

Higham showing the way on cultural change...

To support the reframing of BT's approach to IT delivery, Higham has encouraged the adoption of new ways of working, and a more modern culture built on the *Da Vinci* brand, and an ethos that lends itself to mountaineering analogies.

As *Chief Sherpa*, Higham has overseen the installation of purpose-built *Da Vinci* design rooms across BT sites as a physical demonstration of the way the programme distinguishes itself.

> *[We use expedition allusions] first of all to bring some vocabulary and imagery into play that we could have some fun with, but more importantly to give a sense of a multi-year journey that needed a large diverse team to take us on that journey to summit the [seven] peaks ahead of us...We may know the destination, we may know the view we want to see from that peak, but we're going to have to work together to find the best route to get there, and some of that will be un-navigated.*
>
> *[The Da Vinci brand is] all over our buildings... You walk in there, you hear music, you see plants, nice healthy snacks, we do dress up, and we do play with Lego, and introducing that concept of serious play has been an important way for our teams to believe that this is different, to feel empowered that [they] can experiment, they can fail, and they will be celebrated for doing that."* — Higham.

...human-centred design at the core...

Beyond the aspirational imagery, the programme is based on a model called design thinking, or human-centred design, which essentially adopts certain techniques to solve problems.

The five stages associated with the model are defined as:

1. **Empathise** — learn about the audience for whom you are designing.
2. **Define** — construct a point of view that is based on user needs and insights.
3. **Ideate** — brainstorm and come up with creative solutions.
4. **Prototype** — build a representation of one or more of your ideas to show to others.
5. **Test** — return to your original user group to submit your ideas for feedback.

> *We're adopting DevOps, agile and human-centred design at scale across the whole organisation — every single person in IT will have these three skills within their backpack in the next two years."* — Higham.

… and worlds beyond IT to conquer

Higham also has ambitions to take the *Da Vinci* transformation beyond core IT functions, and the 13,000 staff directly under her, with the aim of giving BT a wider appeal for people with technology skills currently under-represented at the telco.

> *"We're not just reskilling IT. We're reskilling about 25,000 people across the whole of BT in these five core competences: service design, data science, digital, agile, and automation. [People are now] knocking on our door asking to join these programmes."* — Higham.

The impact of *Da Vinci* is also expected to spread beyond BT and into its ecosystem, with Higham referencing the way in which BT is *"fundamentally changing"* its sourcing strategy, and nudging vendor relationships towards becoming more partnership-based in order to *"have them help us accelerate our transformation journey"*.

Tangible benefits beginning to materialise

Higham highlighted through her talk the changes that have been implemented within the IT department as a result of the *Da Vinci* programme, with progress in training service development and cost-savings expected to continue.

- BT now has a new portal for IT called the ***IT Services Marketplace***, which can be accessed both by internal and external customers that wish to commission a service or find help, for example. *"It's like an* [*Amazon Web Services*] *front end for IT, and has been quite revolutionary,"* said Higham.

- A new **IT service catalogue** has also been created. *"We ended up decomposing our IT organisation down into 62 services across architecture, design, build, support, run and evolve,"* said Higham.

- Over the past 18 months, BT has **trained 4,500 people** in service design, 1,200 in agile, and 800 in 'gold-level' DevOps.

- Higham said the division is now **on track to reduce costs by 38%**, or £380m annualised total cost of ownership savings on an ongoing basis. She said just over half of this saving has already been delivered, with the aim to achieve the remainder over the next 18 months.

- **17 services have been launched**, which Higham said have achieved internal net promoter scores (NPS) of between +43 and +81. *"Anything over ten is good,"* she added.

A role to play in Jansen's new BT vision?

Market Mettle notes that the *Da Vinci* focus on dislodging BT's IT culture from traditional approaches and attitudes and developing more agile and fluid processes fits well with new Group Chief Executive Philip Jansen's goals for reforming the telco.

Speaking at the Group FY18-19 results presentation (*BTwatch*, #305), Jansen declared himself *"a bit dismayed"* by the complexity of BT's systems and processes and the constraints on change and decision-making caused by the existing set-up. Jansen, avowedly determined to make system and process change at the heart of his plans to boost profitable growth, may look to emulate the apparent successes of *Da Vinci* in a mission-critical element of the Group across other systems.

BT has been driving towards increased **adoption of agile models** for its IT function for some time and the *Da Vinci* programme forms a core part of this process, according to recent comments by Howard Watson, BT Group Chief Technology and Information Officer (CTIO) (*BTwatch*, #303). Watson, who has referenced the *Da Vinci* project a number of times, said more progress would be made in this area in 2019. He has previously said that the programme is examining end-to-end processes and entailed looking at ways to introduce *"more partnerships with third party suppliers, using more process automation and boosting productivity"*.

Image: TM Forum

ZERO TOUCH

Another Vodafone signal of coming partner platform refit

- Vodafone recognises need for improvement in partner collaboration, to fuel 5G success.
- Chief Systems Architect looking to reshape IT, to help open-up while protecting *"secret sauce"*.
- TM Forum and University of Surrey among collaborators.

Vodafone's Chief Systems Architect Lester Thomas used *Digital Transformation World 2019* (*DTW19*) to expound on how the Group is seeking to open application programming interfaces (API) to support platform business models, and improve appeal as a partner for the 5G era.

In a session on *"zero touch"* partnering within the context of TMF's *Open Digital Architecture* project, Thomas teamed-up with Greg Tilton, Chief Executive of DGIT Systems (a long-time partner of Vodafone on *Open API* development, within TMF's realm — *Vodafonewatch*, #167), to discuss how to achieve *"plug-and-play partner integration"* where you can *"discover, order, and manage any type of service"*.

Tilton described Zero Touch Partnering as a *"key objective if we are going to enable platform business models for telcos, and help 'digital innovators' take new services to market"*. The aim of the initiative is to enable onboarding of new suppliers and services without requiring IT development work, *"so that the incremental cost of adding something new becomes incredibly low"*.

Tilton referenced *"Phase II"* of the *Zero Touch Partnering Catalyst* project (*see separate report*), which aims to establish a suite of TMF *Open APIs* and working methods to support partnering across a diverse range of service types, and which suit the needs of all service providers. The *Catalyst*'s *"champions"* include BT and Vodafone.

Thomas used a restaurant-analogy to explain how platform business models might work. Inside the platform, he said, a telco uses templates to create services from underlying components, like a kitchen uses a recipe to create meals from ingredients. An operator offers services via catalogue-driven APIs, and this gives an abstract view of the template. The restaurant offers meals on their menu, which is an abstraction of the recipe. *"I don't expose my recipe to the customer: that's my secret sauce"*, said Thomas.

Working with robots

Thomas sought to accentuate the importance of a new partnering approach to encourage the creation of 5G services, noting that they will be supported by *"complex ecosystems"*. *"We need to think about these 5G services as actually moving beyond just adding connectivity"*, he said.

As part of this ambition, he said Vodafone has been exploring other services and external industry standards that it should be adopting. One area of interest is robotics services based on the widely-used, open-source *Robot Operating System* (*ROS*).

> *"Instead of selling connectivity to the robot, I want to sell the robot-as-a-service. I want there to be access, so someone can control that robot, and get the video-feed from that robot — and that's the service I'm offering as a telco. Within that, we're managing the connectivity, but we're abstracting the complexity of managing that connectivity from the end-user."* — Thomas.

ROS components include both physical devices, such as sensors and actuators, and pure software components, such as navigation and video-analytics. Thomas said Vodafone is exploring how the software elements can be executed as part of the 5G edge cloud, and offered as part of the service.

Thomas said Vodafone was conducting a trial of 5G/edge services, focused on connected drones based on the *ROS* standard, in collaboration with the UK's 5G-testbed at the University of Surrey's *5G Innovation Centre* (of which Vodafone is a co-founder and funder). He added that applications Vodafone built for the trial formed part of another TMF *Catalyst* project called *Business Operating System* (*see separate report*).

Image: TM Forum

The people side: learning from hyper-scalers on business–IT alignment

Vodafone's effort to open-up to new partnerships is not without challenges, however.

During a session to discuss views held by a panel of chief architects on what will be the major breakthroughs in digital transformation, Thomas echoed a common theme: a shortage of requisite skills at telcos to drive transformation.

> *Skills is one of the critical things which is almost delaying our transformation. Skills is such as scarce resource, and, to my mind, you can't just go and hire these people. They are such new skills; you have to be developing skills. The TM Forum has some great assets: we use TM Forum training for lots of the things we do. We have a model where we take young recruits and graduates and train them up and work with them.*
>
> *We have a culture where we encourage people to do experimentation. With cloud computing platforms, for example, you can experiment very cheaply for most things, so we actively encourage people to try things out, and experiment. And if something is a good idea, we also have mechanisms by which those people can then get their idea 'heard'. We have like an 'internal Dragon's Den', where you can go and get seed-funding... and it can become real. That is something we are actively encouraging now."* — Thomas.

Organisational and cultural challenges were also highlighted, and Thomas returned to his restaurant theme in a yet further session, entitled *Developing a new model for Architecture Governance*.

Illustrated with a slide featuring a photo of abrasive celebrity-chef Gordon Ramsay, he suggested that change was still needed to move away from the one-way, pre-planned operating model under which IT departments have typically been run. Amazon, Netflix, and Uber were among peers he referenced as inspirations for this transformation.

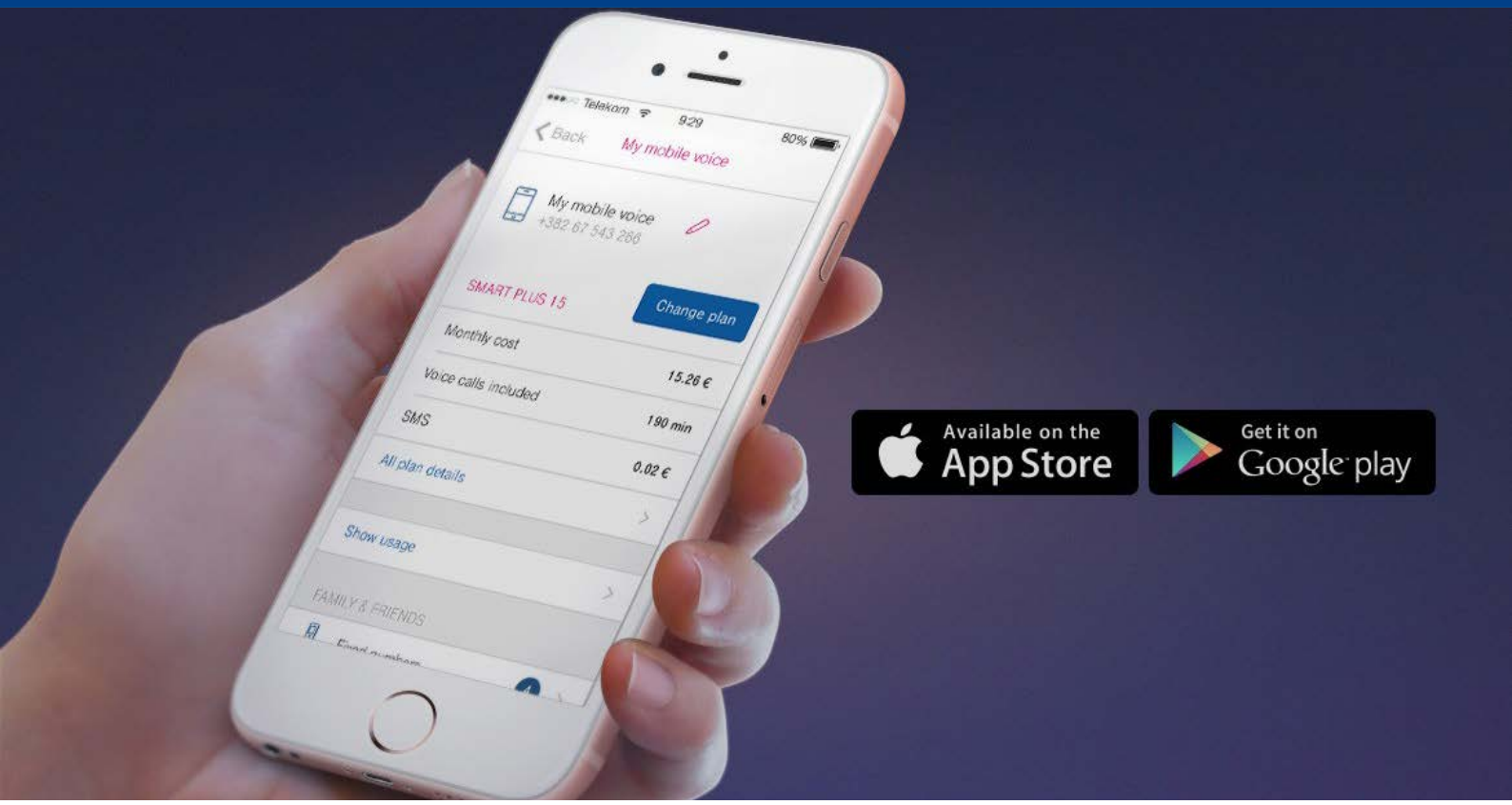
To promote this change, within TMF, Thomas and others have been developing the concept of an *Open Digital Architecture* (*see separate report*) to ready operators for competition in the 5G era, with *"agility, efficiency, and interoperability"* to the forefront. In Vodafone, this has been reflected in a *"Flip IT"* initiative, focused on shifting related functions within Group Technology from being *"order-takers"* to *"recipe-makers"*. To become truly agile, development decisions need to be taken *"as close to the coal face as you can possibly have them"*, he stressed.

> *"We have constant demands from our business-stakeholders for change. We are constantly under pressure to deliver quicker, to deliver at lower-cost. The question is, is this the role for the IT organisation, to be an order-taker in a kitchen? Or is our role more strategic?...*
>
> *If you think about the experience you get with the likes of Amazon or Uber, was someone in their business able to articulate very clearly their requirements and the experience you get when you use those services? I don't think they did. I don't think that was the way it worked. I think the way in which they did it was to establish a minimum-viable-product, they established an agile operating model, to constantly test and experiment with new ways of doing something, and being able to fine-tune that experience. That experience doesn't come from someone being able to perfectly articulate the environment [in advance]. It comes from a completely different operating model. "* — Thomas.

On a personal level, Thomas revealed he *"never talks in IT about cost"*. *"We just talk about efficiency, and efficiency is about having shared-platform resources* [*and*] *elastic, scalable, cloud-native platforms, so you can deliver what you deliver in the most efficient way possible. It's not about cost, per se"*, he emphasised.

Cultural and mindset change was also highlighted as the *"biggest piece"* in improvement efforts outlined by Wibergh, at the *Arch Summit*. *"We have been working a lot with culture... If something goes wrong,* [*we ask*] *'what can we learn?', as opposed to, if something goes wrong, 'who do we fire?'"*, Wibergh said. *"If you don't create a learning-organisation, you don't get things to improve, and I think that has been one of the most important factors to help us increase the pace of change, to improve KPIs without increasing incidents. The learning-path of the organisation has improved significantly"*, he claimed.

Vodafone's involvement in the *Open Digital Architecture* project builds on Group backing for TMF's longer-running ***Open API*** programme (*see separate report*), which offers a crowdsourced model for telecoms API development, with TMF providing a hub for operators sharing internal interfaces (*Vodafonewatch*, #167 and *passim*).



HAL's odyssey: DT grows API framework to drive savings

- Executives claim progress in Europe's digitally-flavoured simplification plan, flagged at DT's last *Capital Markets Day*.
- *OneApp* customer support platform nears full reach across Europe area.
- E-commerce and TV services next.
- Data-analytics layer in pipeline.

At Deutsche Telekom's (DT) *Capital Markets Day* in May 2018, it became clear that the Group was rethinking some of its major transformation projects, having failed to hit key savings targets (*Deutsche Telekomwatch*, #74).

As part of its response, it committed to expanding deployment of applications over open-source platforms and ensuring reuse of its harmonised application programming interface (API) layer (also known as *"HAL"*). The system, in turn, uses *Open APIs* that have been standardised by TM Forum (TMF).

During TMF's *Digital Transformation World 2019* (*DTW19*) *event*, Shekhar Kulkarni, Head of Digital Architecture for Europe at DT, provided an update of how *HAL* is supporting the deployment of one single mobile application, called *"OneApp"* (or *"One App"*), for customer support across NatCos within DT's Europe region.

Initially launched in May 2018, *OneApp* was live in Croatia, Czech Republic, Hungary, Poland, and Slovakia by the end of 2018. The application is now being implemented in Montenegro, North Macedonia, and Romania, and installation in Austria is expected to take place in the third quarter of 2019 (plans for the Europe division's largest market Greece — or Germany and the Netherlands, which sit outside the segment — have not yet been revealed). The goal is to channel more than 50% of the Europe segment's digital service interactions through the application by 2021.

In the first wave of *OneApp*'s deployment, DT employed 15 *Open APIs* from TMF, and created two of its own for onboarding and profiling. By utilising standardised APIs, DT estimated it reduced time-to-deployment by half. Kulkarni said the implementation across the first five NatCos took only seven or eight months, which represented a *"record time"* for implementing such a solution. The application currently has two million users across the Group.

Shiny API people: the moving parts and players

HAL represents DT's framework for APIs that are exposed to front-end systems and based on *Open API* standards, such as *OneApp* (*see separate report*). It forms a standardised layer that sits between the networks and IT back-end of the individual NatCos, and the applications and platforms created to expand their capabilities, such as around self-care (an early target for *HAL*-based innovation), analytics, loyalty, retail, or payments.

OneApp appears the first major output of *HAL,* and, as Europe region Chief Executive Srini Gopalan has put it, is positioned as DT's *"focal point for customer interaction"* for self-service and self-care. Development of *OneApp* was supported by Hungarian provider Mito Digital, which had previously produced open-source applications for Magyar Telekom. Within DT, the *OneApp* initiative was led by Dominik Periškić, Director of IT & OSS Systems Integration at Hrvatski Telekom, and his team of developers.

DT's Europe segment is evidently leading deployment of *HAL*, as part of digital transformation plans referenced by Gopalan at the *Capital Markets Day*. At the event, he highlighted intent to take a much more digitally-led approach to harmonisation of DT's disparate regional businesses — a key Group objective for more than a decade — and highlighted implementation of a '*growth*' mindset, '*lean*' operations, and *"radical simplification"* as key building blocks of the strategy. It was also evident during the *Capital Markets Day* that Gopalan has revamped the central function overseeing Europe area NatCos with this '*platform*' philosophy. In a 2018 interview with *Bloomberg*, he indicated that the segment's corporate operation was being re-thought along the lines of a *"private equity function, which allocates resources and brings those scarce people and skills to the countries"*.

Next steps: HAL goes shopping…

According to Kulkarni, *HAL* represents a cornerstone of DT's strategy to transform itself into an agile, digital service provider. The next step will be to utilise *HAL* as the basis for a *OneShop* platform, designed to create a common online shopping experience for all NatCos. He said DT has been working on this project for six months (suggesting inception in late-2018), but did not indicate when or where it will be released commercially.

Kulkarni looked to suggest that *OneShop*, and other future platforms, will be able to piggyback on resource set up for the *OneApp* deployment. For example, one central team is responsible for specifying APIs for the Group, to drive cost-savings and reduce time-to-market for the NatCos. *HAL* APIs are also re-usable for any front-end solution — a feature that Kulkarni stressed as critical. He noted the importance of *"lightweight, but effective"* governance at Group-level to ensure APIs remain re-usable forever. The aim is to ensure that the application is managed and operated centrally, and based on standardised specifications, while allowing NatCos a certain flexibility to customise the application where required.

… and turns on TV, while tying it all together with experience data

During his presentation, Kulkarni touched on DT's ambition to standardise the integration of cloud services, such as over-the-top television services, with individual NatCo networks. He pointed to work on the creation of a digital integration platform that *"allows us to integrate only once across all ten NatCos… standardising the integration where possible"*, and using *Open APIs* where they are available.

Kulkarni also referenced a *"data-enablement platform"* that aims to collect data from digital channels such as *OneApp* and *OneShop* in real-time and use that data to generate insights that can be exposed to the different channels, and then use this to improve personalisation — *"and drive the whole data-driven decision-making experience"*.

APIs for fibre

Like many operators, DT has a long history with TMF, having adopted blueprints such as the *Business Process Framework* (better known as *"eTOM"*), which emerged in the early-2000s. The operator had a highly visible presence at *DTW19*, and spent much of its time providing insights into how it is deploying *Open APIs* promoted by TMF to enable business transformation.

As well as expounding on how *Open APIs* are being used to support *HAL* and *OneApp*, DT demonstrated their role within the rollout of its fibre-to-the-x (FTTx) infrastructure in Germany — an area where the Group has long shown enthusiasm for technologies that can help it cut costs.

Alexis de Peufeilhoux, Senior Architect at DT, explained how the operator had adopted a holistic approach to the rollout of FTTx services in order to create simplified business processes, IT architecture, and delivery models, and thus support customer experience improvement. DT has now implemented a new green-field business system for FTTx deployments, while also focusing on the modernisation of existing systems and the retirement of legacy applications, where possible. According to de Peufeilhoux, *Open APIs* are involved at all of these levels, although they are particularly useful in greenfield environments with no legacy systems in place. *"They are ready to use and boost the design and development phase,"* he said.

Samir Dorhmi, Lead IT Architect at DT, explained that DT has established a *"Gigabit Digital Hub"* focused on reducing time-to-market, and has now scaled it up so that 15 agile scrum teams are working in parallel in ten locations in four countries.

So far, the process has generated around 200,000 lines of code and 120 fully integrated microservices. Around 50 systems are involved in the entire solution, and 15 of these have so far been modernised with microservices. Dorhmi pointed out that a given *Open API* may be instantiated several times, and listed seven TMF *Open APIs* that were used as building blocks. These comprise *Activation and Configuration; Resource Inventory; Resource Order; Service Catalogue; Service Inventory Management; Service Ordering Management; and Service Qualification.*

> *"Choosing a microservice approach, and leveraging the TM Forum Open APIs, enabled the Gigabit Digital Hub to deliver the first minimum-viable-product within nine months."* — Dorhmi.

An open (API) future

Both Dorhmi and de Peufeilhoux stressed that *Open APIs* and microservices are now at the heart of DT's IT strategy. The Group signed TMF's *Open API Manifesto* at *DTW19*, alongside AT&T, China Telecom, and Salesforce. This represented a commitment to incorporate *Open APIs* in products or require them in request for proposal processes. DT has also created an in-house consulting team to support the use of APIs.

However, the two executives were keen to stress that the *Open APIs* are far from perfect, nor are they the solution. *"Microservices and APIs as technologies are not enough: tackling the agility challenge is mainly a matter of mindset and leadership"*, Dorhmi stated.

Cloud Native IT

DIGITALISATION

Image: TM Forum

DIGITALISATION

Vodafone Germany on charge to cloud payments

- Long-running, Huawei-supported project said to have been met well, with customer experience and efficiencies benefits.
- Some compromises made on legacy and vendor retention.

Martin Wesenaar, Programme Director for Cloud Readiness at Vodafone Germany (VfD), provided some insights into the OpCo's transition to a cloud-native environment, and how it built what it called the *"largest virtualised charging system"* in Europe.

During a session at *Digital Transformation World 2019* (*DTW19*), Wesenaar said VfD plans to become a fully-digital operation by 2021, with aspirations to reach 100% penetration of the *My Vodafone* customer care application, and for all customer campaigns to be targeted and driven purely by data. The ultimate goal is to improve customer satisfaction and reduce business costs. *"We are having a lot more positive feedback from our customers, who are even accepting the offers we are sending out"*, noted Wesenaar.

Big bang refresh

The transition to the cloud started with the charging system, which Wesenaar described as a key pillar of digitalisation. It has been a long process, however, beginning with deployment of bare metal cloud in 2015, and the launch of offers such as the *Red+ Zusatzkarte* multi-SIM card offering and *GigaCube* home broadband services based on 4G.

This was followed by migration to a virtualised environment in the 2015–18 period, and the launch of '*smart-pricing*', which enabled greater autonomy for the customer in selecting tariffs. Smart-pricing, which was developed in collaboration with Huawei, started the virtualisation journey, said Wesenaar. He described what came next as a *"big bang"*, with many things happening simultaneously. For example, a number of systems, such as prepaid and postpaid charging solutions, were moved into the new environment, and several legacy systems were made redundant. *"It was quite successful, because what we have built now is the largest virtualised charging system in Europe"*, said Wesenaar.

He conceded that the final stages of migration were the most difficult, involving the transition of what he described as *"exotic tariffs"* often used by only a handful of subscribers. *"We have now started with the cloud-native part. I cannot say yet how much saving we have made, as we are just at the beginning of that. We are at the start of the orchestration of our virtualised environment"*, he added.

Back to basics

Tariff consolidation is not just something that would be welcomed by many telecoms customers, given the mystifying level of complexity typically associated with selecting the right provider and plan. It is also one of the key elements of the *"radical simplification"* agenda of Vodafone's leadership, as it seeks to cut costs and improve commercial performance.

In the three fiscal years to 31 March 2019, the Group claims to have cut its tariff plans by half, and reduced its product base by *"around 40%"*, although it is not clear whether it is referring purely to mature markets or across all territories. A more high-profile move, within this, is the ongoing rollback of Vodafone UK's Talkmobile offerings — a leftover from a past partnership with retailer Dixons Carphone (*Vodafonewatch*, #158).

Nonetheless, Vodafone still has significant work to do in the tidy-up. The operator admits that OpCos still have *"hundreds, and in some cases thousands"* of legacy plans in usage by customers. Vodafone's management recently reiterated intent to *"move to new simplified pricing models across all of our markets"* and *"proactively phase out complex legacy tariffs"*. Beyond this, Vodafone is seeking to rollout a *"number of 'digital only' products, which require no human interaction"* — as per the low-touch, app-managed *Vodafone Bit* offering released in Spain during late-2018.

Compromises

Wesenaar made no secret of the fact that the entire programme has been a huge challenge, and a costly and time-consuming exercise. For example, in the early stages it was extremely difficult to find the right people to carry out the work. The network architecture is also no less complex than before, with a greater number of vendors in the mix. He pointed out that some legacy systems still have to be maintained to avoid taking too many risks.

Nonetheless, he said the benefits have been significant, and include reductions in both capital and operating expenditure, improved scalability and flexibility, faster time-to-market for services, and the creation of the foundation for a 5G micro-services architecture. *"Are we ready? I think we are"*, said Wesenaar — both on business and cloud-readiness levels.

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