

evolving

business support systems

for future
services

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the big picture

Business support system (BSS) transformation has been a theme for the communications service provider (CSP) community for the past 10-15 years. But despite previous attempts at transformation, most CSPs still find themselves wrestling with the same issues around legacy systems, processes and skills that chew up most of their budgets and shrink the time and resources that can be allocated to new initiatives.

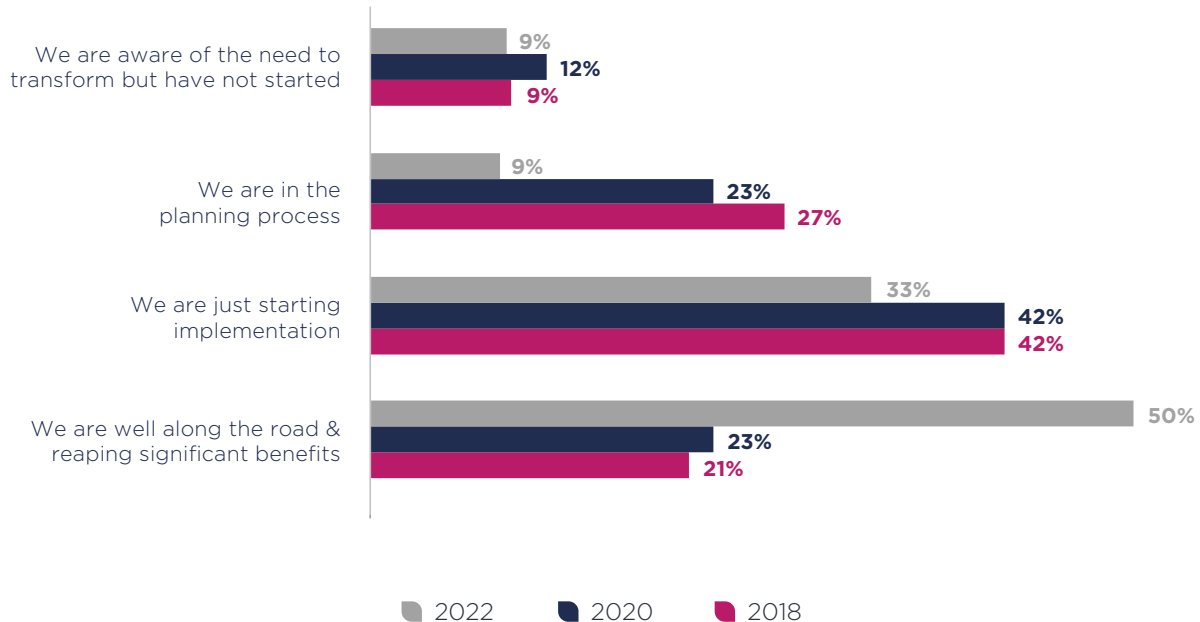
To put a positive spin on where CSPs now find themselves, there is a clear direction in terms of what a transformation path looks like. The end game is cloud-native and automated systems and processes coupled with the delivery of an excellent digital experience for the end user. The question is how to get there, what to prioritize, which suppliers to engage and how to find the right balance between meeting the requirements of the business and adopting a simplified IT estate and architecture.

Our research both for this report and for [Digital Transformation Tracker 6](#) has identified hugely differing levels of maturity when it comes to digital transformation and the journey to cloud native. At one extreme we have operators still at the early stages of taking a lift-and-shift approach to migrating applications to their private clouds. And at the other we have operators which are building cloud-native organizations, have adopted a public cloud-first strategy and are insourcing hundreds or thousands of software engineers.



The end game is cloud-native and automated systems and processes coupled with the delivery of an excellent digital experience for the end user.

status of CSPs' digital transformation programs



TM Forum, 2022 (Digital Transformation Tracker 6)



CSPs recognize that they need to deliver new experiences, capabilities and functionalities to meet customer expectations.

There is another important difference between BSS transformation in 2022 compared with transformation five or ten years ago: telecoms operators are now pivoting to address the B2B opportunity. They are doing so not to sell traditional network services, but to provide a whole range of new ICT solutions. Many operators are focusing on specific

vertical markets, some are targeting large businesses, and for others the main priority is SMEs. Whatever the market segment, CSPs recognize that they need to deliver new experiences, capabilities and functionalities to meet customer expectations.

However, even the most focused and ambitious operators accept that they will need to go through a lengthy period of experimentation before committing to rolling out new products, services and experiences. So, when it comes to evolving their BSS, operators need to be in a position where they can demonstrate their capabilities to customers but without committing to new features and functionalities that stop them from changing course based on customer requirements.

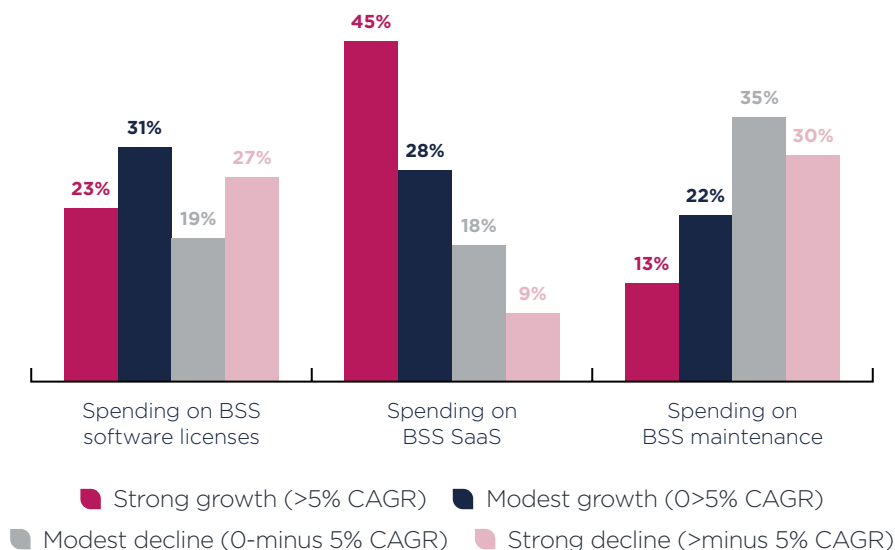
Spending trends

Demand for new B2B BSS functionalities is resulting in a strong uptick in operator spending

on new and improved systems. While operators with mature B2B businesses are investing in new BSS capabilities, those mobile operators which have focused until now on the consumer market are investing in new systems in readiness for the deployment of 5G standalone (5G SA) systems. Investment priority areas include customer relationship management (CRM), product catalog and order management as we detail in section 4.

The overall shape of spending on BSS is also changing. There is a migration from capex to opex as CSPs transition to public cloud and insource technology expertise. Many expect to reduce integration costs as they insource tech experts and transition to modular, API-enabled architectures. But on a global basis these changes will take place slowly, with even the more ambitious European and North American operators having multi-year transition programs.

What is your expectation in terms of spending / investment for your organization between now and 2025?



TM Forum, 2022

The research in this report is based on a global survey of 133 executives working for 79 telecoms operators across the world. Respondents were from Europe (42%), Asia/Asia-Pacific (20%), North America (14%), Latin America (8%), Africa (7%) and the Middle East (9%). We have also spoken to CSPs from a number of large and medium-sized operators and operator groups in the past 12 months. Comments from some of these operators appear in the research.

One of the questions we asked participants was around their expectations in terms of investment in BSS systems between now and 2025. Our respondents expect strongest growth in spending on BSS

software-as-a-service (SaaS), reflecting a move away from spending on software licenses (more on this in section 4). The strongest expected declines are in spending on BSS maintenance, again a function of more modular, API-based integration and architectures and more insourced teams.

Read this report to understand:

- The status of today’s BSS systems
- What’s needed from BSS to monetize future 5G and B2B opportunities
- What the cloud migration options are when it comes to BSS transformation
- Future BSS investment and spending trends.



There is a migration from capex to opex as CSPs transition to public cloud and insource technology expertise.

section 1:

the status of today's business support systems

Communications service providers' (CSPs') business support systems (BSS) worldwide are undergoing deep transformation as a response to a range of internal and external factors. Many of these factors center around how effectively, or not, their current systems are using BSS data.

Among the many drivers of transformation are:

- A desire to provide customers with a better experience, which largely means a better digital experience. Customers have been [relatively reluctant to move their interactions with CSPs online](#) and service providers continue to use a combination of online, call center and retail touchpoints. CSPs have committed to continuing to support multi-channel and omni-channel approaches.
- The need to monetize the deployment of new networks such as 5G. While the main focus of CSPs is building out

5G RAN and Core networks, they need modern IT systems to leverage and deliver the network's ability to provide a large permutation of different network capabilities.

- A realization that CSPs cannot continue along the same path – in terms of evolving the BSS systems they use – because of the accumulation of technical debt.
- A desire to leverage new architectures and technologies that have transformed enterprise IT. This includes cloud – and more specifically cloud-native – data analytics and AI/machine learning.

- A conviction from many CSPs that the traditional telecoms connectivity business is in terminal decline – or at the very least terminal stagnation. They realize that the DNA of their business needs to change to become more agile, flexible, dynamic and that they need to be willing to experiment, innovate and partner to identify and build new sources of revenue.

Identifying the need to transform is one thing, but deciding how to go about doing something about it is something different altogether. Indeed, most transformation projects still fail.



CSPs have acquired systems with overlapping functionality and this restricts their ability to innovate or respond to new market opportunities or challenges.

A reflection of history

The state of CSPs' IT systems tells the story of modern-day (post 1990) telecoms. Operators have, over a period of 20-30 years, launched new products and services, new price plans and bundles. They have acquired (or been acquired by) other telcos, and they have built a whole range of channels to market and ways of interacting with customers. Their approach to technology has been incremental: new systems have been built on top of, and integrated with, old ones.

CSPs have tended to outsource their IT development to third-party vendors and systems integrators and have employed operations teams which, over a period of time, have become expert in the systems delivered by their vendors. Data generated by CSPs' customers has become locked inside these systems and, even when it becomes available, difficult to integrate across applications and functions.

This is reflected in how effectively CSPs think these evolved support systems are able to make use of

what could be valuable customer data. In our survey one out of three respondents gave a score of less than 50 (on a scale of 1-100) when asked how effectively their current systems are using BSS data.

The outsourced approach to IT systems made sense when CSPs' businesses were growing rapidly and the key challenge was keeping pace with the demand for new connections and better connectivity. But over a period of time it has become clear that CSPs have acquired systems with overlapping functionality - which often goes unused - and that this restricts their ability to innovate or respond to new market opportunities or challenges because of the time and cost to customize and integrate new systems.

Technical debt

The term "technical debt" often crops up in conversations about the state of today's BSS/OSS systems. Former Orange CEO Stéphane Richard made reference to the damage that technical debt was causing telecoms operators during his keynote presentation at Digital Transformation World in 2020. "Carriers often struggle to balance quick-fix changes to meet short-term business needs, which only increase their technical debt, with investing in sustainable long-term transformation of the business and the software that runs it," he said.

Technical debt has accumulated across the CSP sector as a result of the approaches they have taken to deploying new applications and capabilities across their IT systems over a number of years. Management consultancy firm McKinsey has conducted an analysis of technical debt at 220 companies spanning six industries - healthcare, insurance, banking, telecoms,

consumer goods, technology and energy/utilities. Across these industries McKinsey found that more than 20% of companies' technical budget, ostensibly dedicated to new products, was diverted to issues relating to technical debt. There were 14 telecoms operators in the survey, of which three ranked among the worst 20% (in terms of the size of their technical debt) and three among the best 20%.

McKinsey has launched a [Tech Debt Score benchmark tool](#) to help CIOs quantify their level of technical debt, to compare it with those of their peers and to address technical debt's likeness to dark matter - namely that "you know it exists, you can infer its impact, but you can't see or measure it".

Stages of transformation

Today's BSS landscape sees telecoms operators at varying stages of transformation. At one extreme we have operators that are on a clearly defined path to migrating all their BSS systems to cloud native. They will have started this transformation five-to-ten years ago, they have a public cloud-first approach and they have taken control of their technology roadmaps. These operators are partnering with multiple software vendors and systems integrators for different BSS functions. Many are committed to adopting TM Forum's [Open Digital Architecture](#), a new approach to building software based on standardized, cloud-native software components.

At the other extreme there are operators whose IT estates are still either on-premises or in private clouds. Their BSS tend to be made up of tens, or hundreds, of closed systems, which means that when a new service, feature

or functionality is introduced into the business, spending on integration and maintenance can exceed the actual cost of the new technology. The time taken to deploy the new capability results in revenue loss from responding too slowly to a new challenge or opportunity. Such operators are deploying cloud-based solutions for new services or, for example, to provision new digital experiences, but are cautious about undertaking deeper transformations of existing systems.

Our survey illustrates the varying levels of maturity across the global CSP sector. When asked about the status of BSS transformation in their businesses on a scale of 1-100 respondents gave an average score of just under 51 (see pie charts).

Analyzing results by region is interesting to the extent that it demonstrates the perceived need for BSS transformation among executives from CSPs in different countries. However, it is not necessarily a good indicator of the maturity of BSS systems. An operator with a high net promoter score (NPS), which has a relatively unsophisticated portfolio of products and services and with limited appetite for launching new ones, or for expanding into new markets or new value propositions, may believe that it has little need for further transformation.

More closed than open

In our survey we asked a number of detailed questions about today's CSP support systems. Respondents were asked to rate their BSS on a score of one to five (one being low, five high) on a number of different features and functionalities (see chart p.9).

When it comes to "zero-touch end user account management" – managing customer relationships

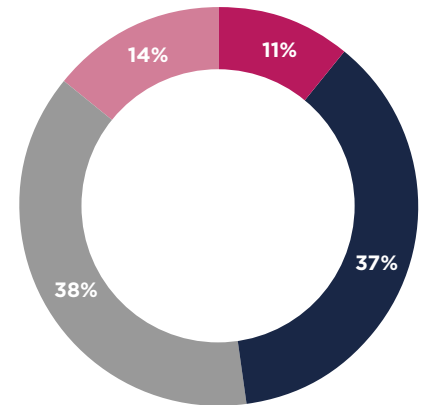
digitally via a website or a mobile app – 44% of respondents gave themselves a score of one or two and 25% marked themselves four or five. While digitization of the customer experience remains an aspiration for most operators, the majority of our CSP respondents believe they are only in the early stages of that journey or that the experiences that they offer currently need to be improved. Indeed, many customers increased the level of digital interactions with their service providers during lockdown, but it is not clear that this trend is being sustained.

"Flexibility and scalability" is another area where there were more scores of one and two (37%) than four and five (26%). As we will explore in chapter 2, CSPs see flexibility and scalability as prerequisites of future BSS systems, particularly in B2B where they are going through a process of experimentation before settling on new strategies and business models. As such, the ability to scale systems up and down is crucial. In legacy BSS systems, when a CSP wants new features or functionality to be added it will likely need to engage with its BSS vendor or systems integrator for a customized solution.

"Real-time revenue management" spans the charging and billing domain. It allows the CSP to identify the usage of one of its services in real time, to apply the relevant charge and to convert that, in real time, to a customer bill or payment. CSPs necessarily deployed real-time revenue management for mobile prepaid services and the question now is whether they need to extend these capabilities across other platforms.

The evidence from our survey is that most CSPs have not invested in this area. Three-quarters of our respondents gave scores of

What is the status of your BSS transformation?

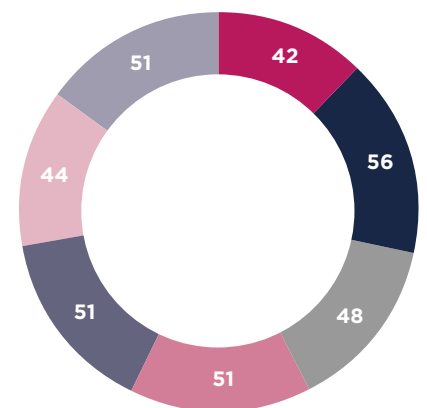


- More than 80
- More than 50
- Less than 50
- Less than 20

1 = start of transformation, 100 = complete

TM Forum 2022

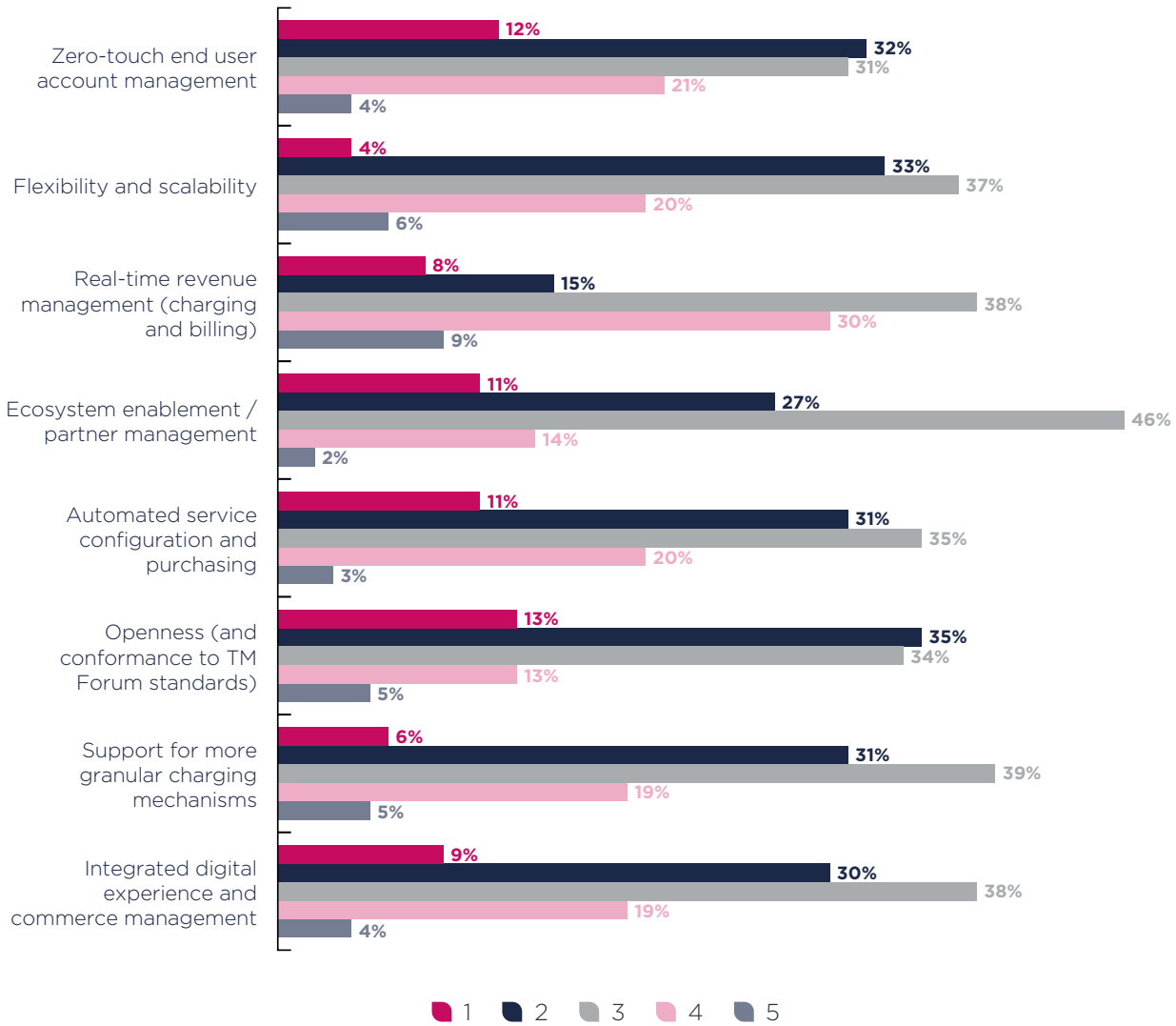
Average score by region



- Africa
- Asia
- Europe
- Latin America
- Middle East
- North America
- Global Average

TM Forum 2022

How do you rate your current BSS in terms of ability to support these requirements?



(1 = does not support this requirement, 5 = fully supports this requirement)

TM Forum, 2022

between three and five in terms of ability to support real-time revenue management in their BSS systems currently, although this does not necessarily tell us if these real-time capabilities only exist in their prepaid mobile billing systems.

“Ecosystem / partner management” has not traditionally been a focus for CSPs but is emerging as a key focus area as

they seek to partner with systems integrators, vertical market specialists, hyperscalers and other sectors to deliver new ICT services. As such, it is unsurprising that only 16% of CSP respondents score themselves four or five.

“Openness (and conformance to TM Forum standards)” is a principle that many CSPs would agree with but which, in practice,

is extremely difficult because of the lack of standardization in BSS systems. Half our respondents scored themselves at one or two for openness, with only 18% giving scores of four or five.

In the next section we look at how CSPs can start to evolve business support systems to monetize the B2B opportunity.

section 2:

evolving BSS to monetize the B2B opportunity

As CSPs globally have pivoted to the B2B market opportunity they have had to review their enterprise BSS stacks. Among the things they have had to consider are what capabilities will be needed to support new customers, new products and services, new approaches to monetization, new partners, and fully digital customer experiences.

However, plotting the right course for enterprise BSS transformation is tricky given that so many of the potential new revenue opportunities – 5G slicing, multi-access edge computing and mobile private networks – are only now emerging. There is considerable uncertainty over the role that CSPs will play in the delivery of these services and how and what they monetize.

In this section we explore the BSS capabilities that will be required based on different monetization opportunities. Our analysis is based on a large number of CSP briefings specific to the B2B opportunity and two surveys – the survey specifically on BSS that was launched for this report, and a survey conducted over the summer of 2022 to feed into our

Benchmark research report [Telco revenue growth: taking it to the next Level](#).

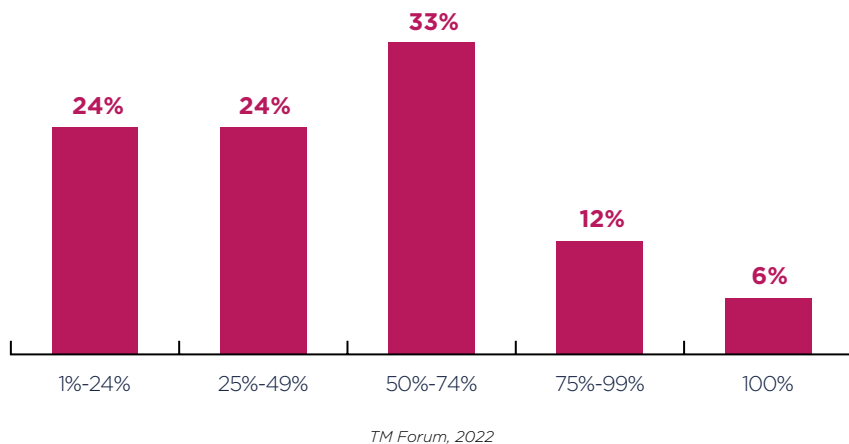
Fit for 5G?

In our survey on revenue growth we asked our operator respondents what percentage of what they planned to sell, in terms of 5G services to enterprises, could be delivered by their BSS stack. One in two respondents said that their current stack would be able to deliver less than 50% of what they plan to sell – in terms of handling charging, billing, digital commerce and so on – an astonishingly high figure given that 5G services are now available in most of Europe and North America and most of the largest markets in Asia and the Middle East.



Plotting the right course for enterprise BSS transformation is tricky given that so many of the potential new revenue opportunities are only now emerging.

What percentage of 5G services to enterprises is your BSS stack capable of handling?



Such a question is necessarily imprecise because it is not clear – for the vast majority of CSPs – what 5G services they will sell. The BSS systems for today’s 5G services are the same as for 4G and operators do not necessarily need new BSS functionality. Operators will only be able to deliver new capabilities with the deployment of [new 5G Core networks](#) and the availability of new features in [upcoming 3GPP Releases 17 and 18](#) – such as supporting new use cases and verticals and enhancements in machine learning and AI.

The key capability that operators are hoping to deliver with 5G standalone (5G SA) systems is the option of delivering differentiated connectivity experiences – by speed/throughput, quality of service, latency and so on – to different customers or groups of customers. This is generally referred to as network slicing. But precisely how many connectivity options CSPs will be able to offer and when – and the extent to which they give their customers the option to change their connectivity settings dynamically and across different networks – is still to be determined. Similarly, the extent to which they build new edge facilities and devolve network

functions and capabilities to the edge, has yet to be decided.

New BSS capabilities

Our survey demonstrated that CSPs have a range of new investment requirements for their BSS systems. Flexibility and scalability are essential in the face of so much uncertainty. Nine out of 10 of our respondents considered it an “extremely important” future requirement, which put it significantly ahead of other requirements (see chart on p.12). There is good reason for this. Despite the enthusiasm for new technologies and concepts such as network slicing, edge computing, connectivity-as-a-service and marketplaces, these are all unproven from a market perspective.

CSPs have had mixed success with new product and service launches and the cost of failure is high. They also have limited capabilities to test a new product or service; the deployment of new IT systems often requires costly IT customization projects; and it can take up to a year from when the market opportunity is first detected to a commercial launch.

For the next two-to-three years, CSPs will need to experiment with

new product concepts, new partner ecosystems and new approaches to monetization before they can commit to full commercial launches. And they will need a flexible, scalable BSS to support such an approach.

Two other future requirements considered to be essential by a large proportion of our respondents are “integrated digital experience and commerce management” and “automated service configuration and purchasing”. Regardless of the new services and business models that CSPs bring to market and adopt, delivering a more compelling digital experience and giving customers real-time access to a range of different services will be central to their success.

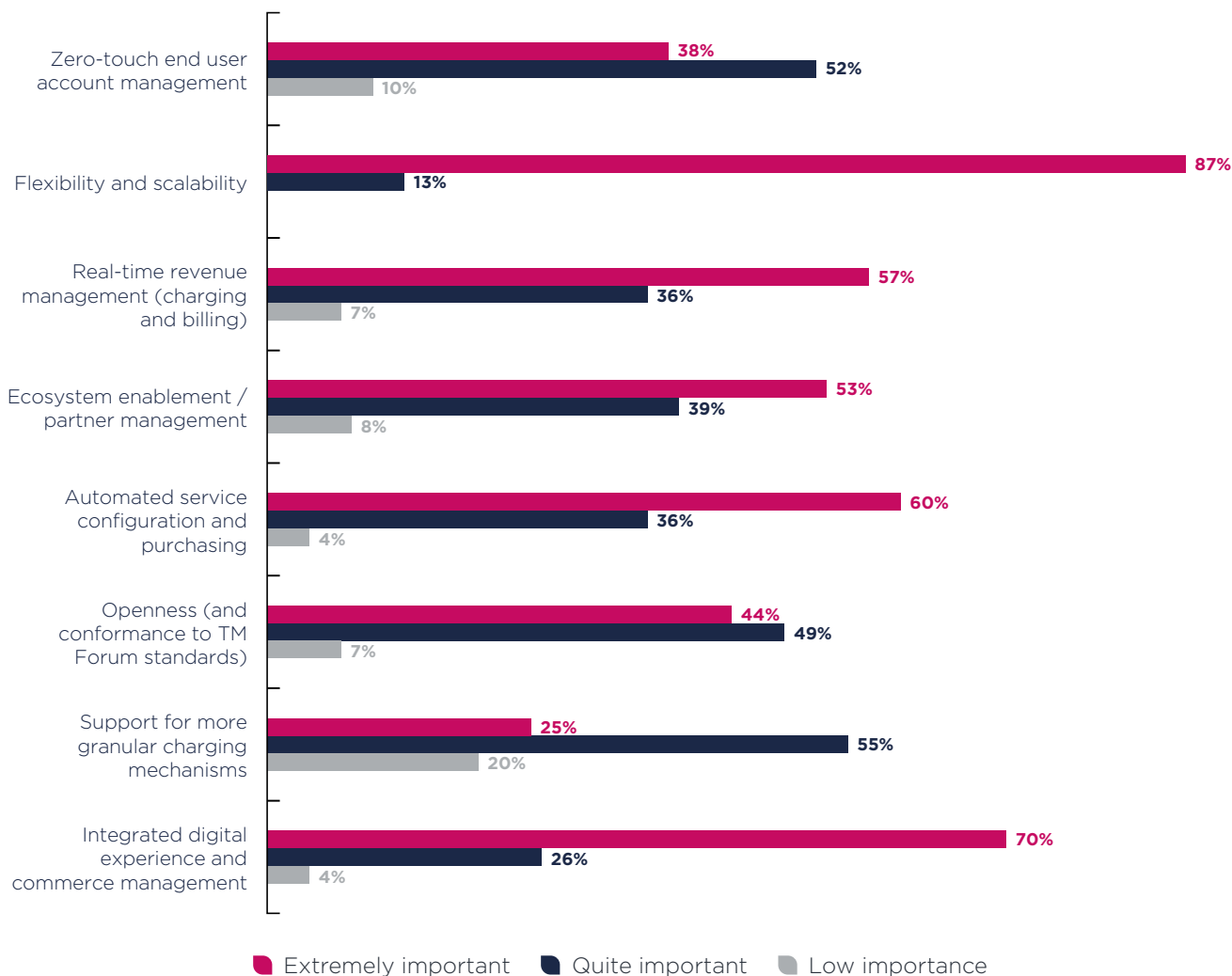
Importance of partners

Building strong partnerships to deliver new connectivity-enabled services is essential for any CSP that wants to explore opportunities for new value propositions and revenue streams. But to what extent do today’s support systems cater for the interests of partners rather than end users? Ecosystem enablement and partner



Nine out of 10 of our respondents considered flexibility and scalability an extremely important future BSS requirement.

What are the most important future requirements for your BSS?



TM Forum, 2022

management are considered “extremely important” by 53% of our respondents and “quite important” by a further 39%.

But who exactly are these partners, how can CSPs deliver a strong experience for them, and what do they need to monetize their ecosystems?

Different products and services will require different partners. In some cases the providers of technology and services will sit across multiple sectors, but in

others there will be vertical market specialists that occupy a number of different roles in the value chain. CSPs have always occupied a horizontal role – connectivity and communications services are crucial for every sector of the economy – and will continue to do so for advanced connectivity solutions that make use of capabilities such as edge computing and connectivity-as-a-service. But many are also looking to expand beyond connectivity in

areas such as application enablement, service orchestration and specialized services such as managed security.

The capabilities that CSPs provide to their partners will vary based on the role they are playing in delivering an overall service or solution. When the role of the telco is confined to connectivity, real-time visibility of the quality of the connection, particularly relating to areas such as QoS or latency, may be valuable.

But as CSPs seek to expose more of their technology assets to their customers – and to aggregators and apps developers – they will need to build support systems around them. Marketplaces are a key growth area for CSPs, and integrating new platforms with legacy BSS will be an important focus if they are going to open up their technologies and services to third parties.

Addressing B2B and B2C

When it comes to BSS transformation, some CSPs are focusing on or prioritizing B2B or B2C while others are carrying them out at the same time. Telefónica Deutschland, Germany's second largest CSP, took the decision to transform both stacks simultaneously as we explored in our report [Next-generation BSS the Telefónica way](#). But this does not mean that both stacks needed to be replicated.

“We decided which parts of the BSS should be common and which ones should not. Some requirements are very different, even when we have the same vendor,” noted Javier Garcia, Telefónica Group’s Head of IT Architecture. For example, when it came to transforming its product catalog there were some specific requirements for B2B which were not needed for the B2C business.

Online charging was a fundamental requirement for Telefónica’s new BSS to help monetize 5G standalone networks. “We could have thousands of products, packages and price plans, all of which need to be frequently updated,” said Fernando Diaz Barroso, Enterprise Architect at Telefónica with specific responsibility for online charging. “As such, the flexibility to implement new business or monetization models and to take them to the market quickly is fundamentally important.”

For this transformation Telefónica has migrated to two catalogs, one for B2B and one for B2C, and one technical catalog. This represents a radical simplification from the previous architecture where there was one catalog per stack and one in each of the charging systems.

Watch a video of Enrique Blanco, Global CTIO, Telefónica Group, explaining how the company is using TM Forum’s Open Digital Architecture (ODA) to transform its IT and network architectures, including BSS, taking a cloud-native approach.



And read our e-book on ODA



Managing B2B diversity

The B2B services market is more diverse and fragmented than the consumer services sector. Future BSS strategies will need to cater for these different customer segments and business models.

B2B market segments are a function of:

- The size of the enterprise – all the way from SoHo and SME to medium and large enterprises, multinational corporations and the public sector.
- The vertical market to which they belong – healthcare, utilities, financial services etc.

- The product or service line – traditional basic and more advanced connectivity and communications services; newer IP-based services such as unified communications-as-a-service (UCaaS) and software-defined wide area networking (SD-WAN); and both legacy and emerging managed, professional and IT services which may or may not be independent from the network. And with the advent of network slicing and connectivity-as-a-service, the number of connectivity permutations is set to expand dramatically.
- The telecoms operator role in the value chain – from connectivity provider to participant within, or orchestrator of, a platform or marketplace, to end-to-end solutions provider.

Many of these new services and capabilities will be aimed at larger enterprises. However, many CSPs also see tremendous potential in bringing new services to smaller businesses which, in many cases, lack new IT and software skills. Deciding whether to use an existing B2C stack – which has been fine-tuned over many years to meet requirements for consumers – for SMEs can be tricky for CSPs trying to find a balance between leveraging existing assets and creating new products, services and value propositions.

Similarly, CSPs may have dedicated BSS stacks for their machine-to-machine/IoT lines of business. They must decide whether to integrate these with other B2B BSS stacks if their expectation is that IoT is just one part of an overall suite of transformation services that can be sold to their customers.

In the next section we explore cloud migration options for CSPs when it comes to evolving their BSS.

section 3:

how to transform – cloud migration options

Most CSPs have been through more than one cycle of BSS transformation. And many still bear the scars of failed, semi-successful or unfinished projects. As such, a priority for this cycle of transformation is to build systems that are futureproof.

This does not mean that they need to cater for new products, services, experiences and business needs that are five or ten years away – CSPs' track record in predicting future trends has not been great. But new systems need to enable them to respond quickly as and when new opportunities and challenges arise; help them to save time and money by configuring rather than customizing new software; let them swap in and

swap out individual components rather than buying multiple systems with overlapping (and unused) functionality; and provide their customers with a positive digital experience.

Building such systems from scratch is one thing, but doing so with a legacy BSS pieced together over 20 or 30 years or more from multiple vendors and systems integrators is completely different. Many CSPs are endeavoring to build a middleware layer that sits between legacy back-end systems and new, front-end customer systems. Vodafone calls this its [Digital Experience Layer](#).

But even this requires a massive simplification and rationalization of existing systems and suppliers. CIOs are driving this simplification, often in the face of resistance from the lines of business which are concerned about losing customers of legacy products.

Where to prioritize

The aim of Vodafone's Digital Experience Layer project – focusing on customer experience and BSS systems – was to allow it to take a cloud-native approach to building out and operating, for example, customer care apps and chatbots, and to connect these into back-end systems using [TM Forum Open APIs](#).

You can read more about Vodafone's strategy in our report [Telco to techco: capex and opex implications](#).



CSPs' track record in predicting future trends has not been great.

As a general rule and principle, CSPs are transforming those systems which are either customer-facing or supporting new product or service initiatives. In both cases CSPs are embracing cloud computing – either private cloud or, increasingly, public cloud.

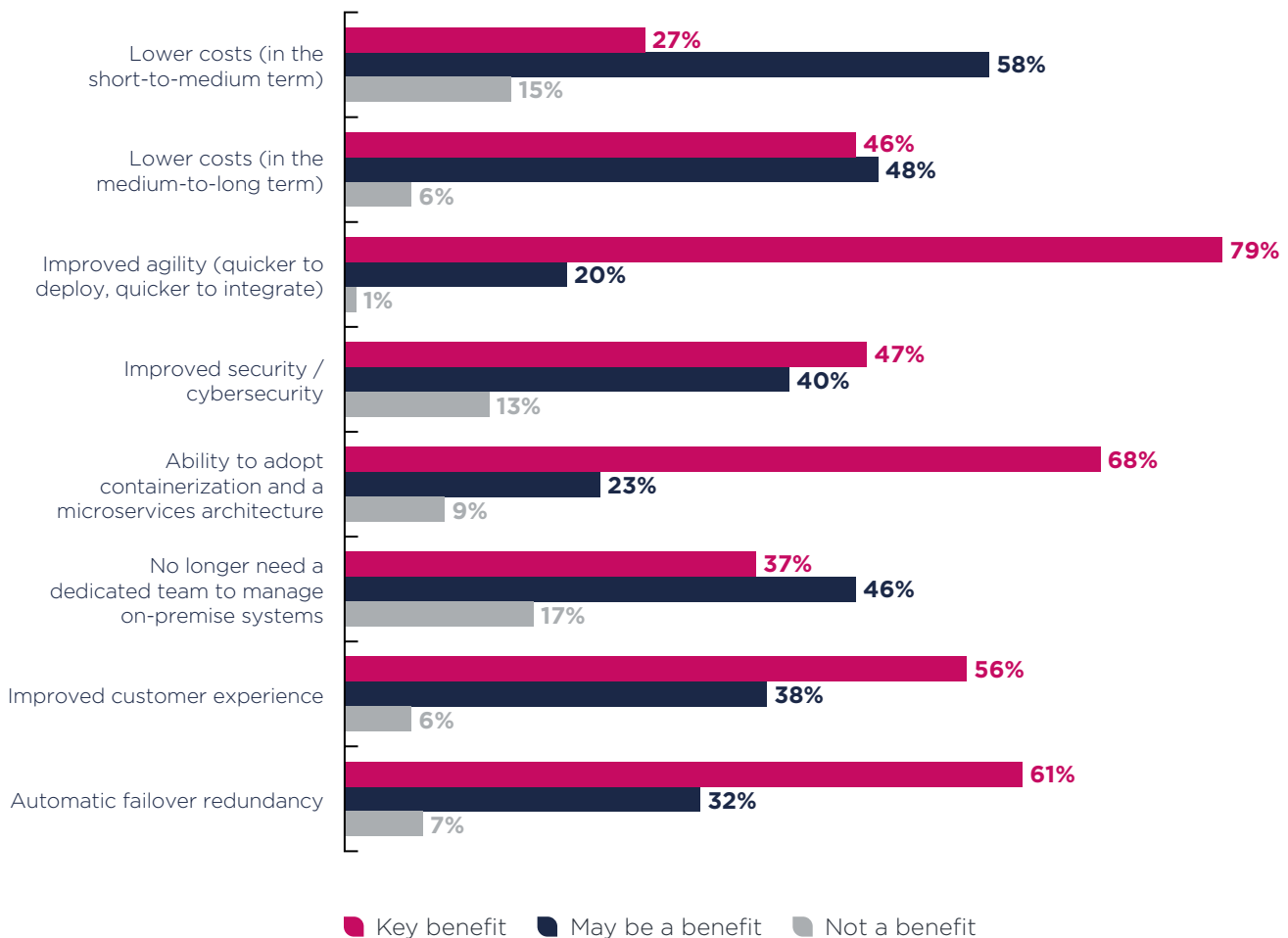
Migrating such functions to the cloud is consistent with the flexibility and scalability associated with cloud more generally. Many of the core BSS functions are predictable in terms of their computing requirements – the legacy telecoms business is stable in terms of revenues, and

even though traffic growth continues to be strong, and particularly in mobile, those growth patterns at least are predictable. The same is not true of new lines of business, such as mobile private networks or managed services, where operators need to scale up and scale down. Unpredictable, or variable, compute requirements may exist in their traditional business – spikes in demand when, for example, a new “hero” device is launched – but they are more likely to be a function of launching new products and new lines of business.

We asked our survey respondents about a number of the benefits generally associated with cloud-native adoption and asked them to identify which ones are most important to their business. Two stood out in terms of offering CSPs key benefits.

Four out of five respondents cited improved agility – quicker to deploy, quicker to integrate – and almost two out of three said the ability to adopt containerization and a microservices architecture was a key benefit. This is wholly consistent with other surveys we have conducted over the past

What are the main benefits of migrating to a cloud-native approach to BSS?



TM Forum, 2022

two-to-three years, revealing deep frustration with the time it has taken to introduce new features and capabilities in legacy BSS systems and the desire to take a more modular, microservices-based approach to their BSS architecture to lower the cost of customization.

Attitudes towards the cost of cloud point to continued uncertainty about the impact of cloud migration and adoption. More than half of our respondents said lower costs may be a benefit in the short-to-medium term, with a further 15% saying that it is not a benefit. But just one in four stated that it was definitely a key short-term benefit.

Even in the medium-to-long term, half of our respondents said that it may be a benefit, although only 6% said that it would not be a benefit. This wide range of views about cost implications is a function of the fact that operators are still in the early stages of adopting cloud-native approaches and it will take some time for clarity about cost to emerge.

The chart below shows how one south-east Asian telecoms operator group is evaluating the potential migration of different applications and workloads to the public cloud. It is interesting to note how the appetite for migrating applications to the cloud is a function of both the benefits of adopting flexible and scalable public cloud capabilities and the ease with which applications can be migrated.

The 4 Rs

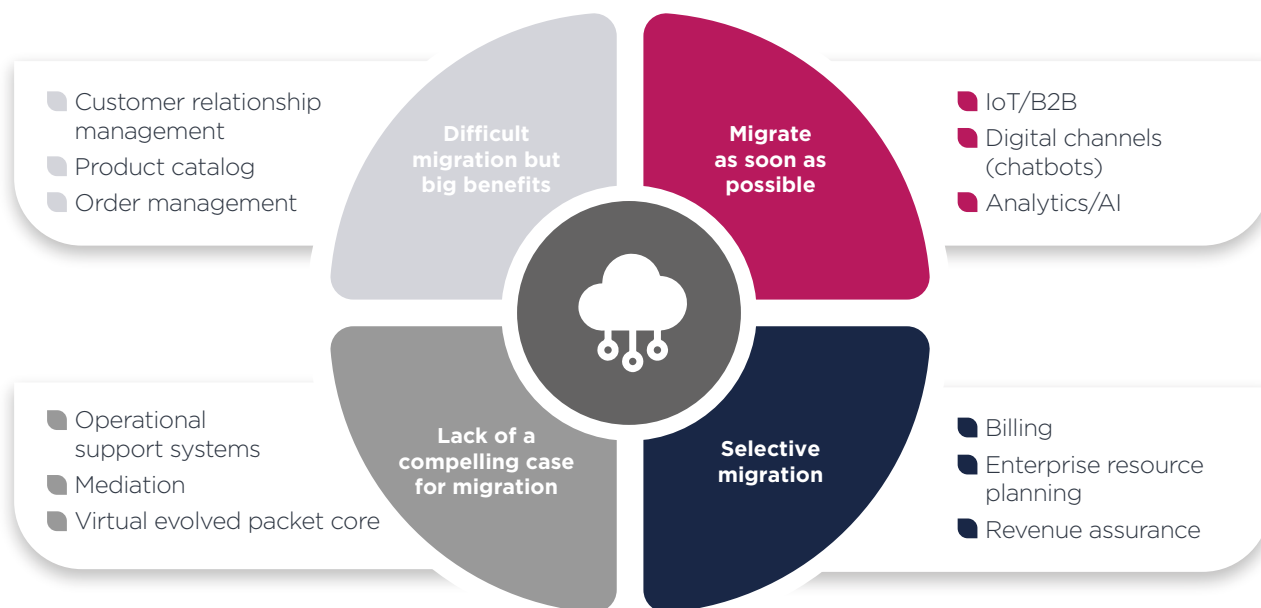
Whether or not to migrate to cloud is not a binary choice. There are four options for operators seeking to deploy applications in the cloud:

- **Rehost.** This is often referred to as “lift and shift”. It merely involves copying the virtual machine and the application that runs it to a cloud provider.
- **Refactor.** This involves modifying the existing software, or a large chunk of the code base, to take advantage of features in the cloud and its inherent elasticity.

- **Replatform.** This sits between rehosting and refactoring and requires some modification of the application in the cloud.
- **Replace (or repurchase)** is where the legacy application is fully replaced by a software-as-a-service (SaaS) solution that contains the same, or similar, functionality.

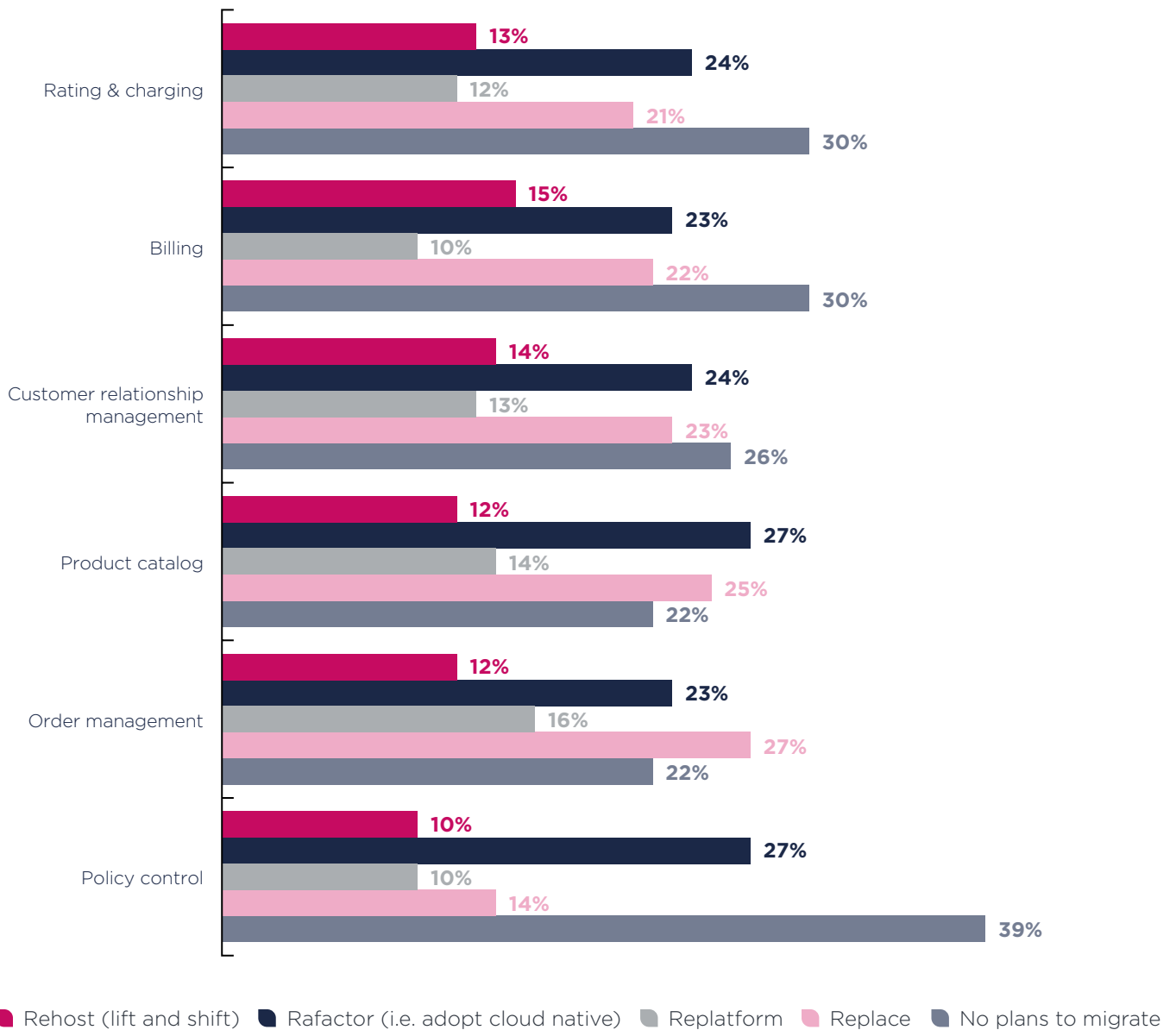
Two other “Rs” – retire and retain – refer to when an application is not migrated to the cloud at all. As part of a cloud transformation program CSPs tend to look to retire a large number of the applications they have accumulated over a 20–30-year period and which support little-used products, services or functionalities. Operators often choose to retain a legacy compute environment for systems that support traditional telecoms products such as PSTN. For example, in our survey for this report 43% of respondents said that they still use mainframes for applications including charging, billing, ordering and inventory.

Evaluating which apps to move to public cloud



TM Forum, 2021

What are your cloud migration plans for different BSS applications?



TM Forum, 2022

We wanted to understand from our survey which approach to cloud migration CSPs were adopting for different BSS applications. Refactoring – adopting a cloud-native approach – was the most popular approach for those CSPs that are seeking to migrate applications to the cloud.

When it comes to rating and charging, billing, customer relationship management (CRM), product catalog, order management and policy control, one in four of our respondents said they were looking to refactor. An intention to fully replace these applications achieved a similar

level of responses in most categories except policy control. Rehosting (lift and shift), however, is a less popular option. There is a clear direction of travel within CSPs to transition to adopt cloud-native approaches, and while lift and shift may have once been seen as part of that journey

it does not always offer clear business benefits. Traditional BSS vendors are, increasingly, transitioning their own products and services to a cloud-native environment. As such, CSPs can more easily make the transition to cloud native using traditional, trusted suppliers.

Bringing skills in-house

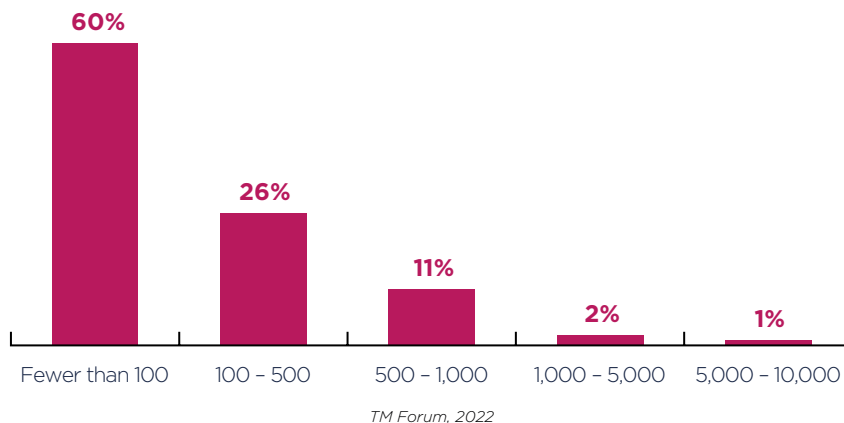
Moving to – and operating – a cloud environment needs new skills. CSPs must either recruit these skills, retrain existing staff or rely on services delivered by their suppliers. Many choose all three.

Vodafone has been one of the most ambitious operators when it comes to insourcing software experts to fulfill the role normally undertaken by vendors. Chief IT Systems Architect Lester Thomas explained how Vodafone started the process of insourcing back in 2015: “We decided not to do it everywhere, but to learn by doing it where we thought it was easiest, which was the digital engagement layer. There are huge amounts of open source technology there and we thought we could do that ourselves without relying too much on vendors. And we went from nothing to insourcing 5,000 people in five years.”



We all know that if you just look around us we’re facing a retirement cliff in our industry. The great resignation is upon us.”

How many software engineers will you recruit in the next 12 months?



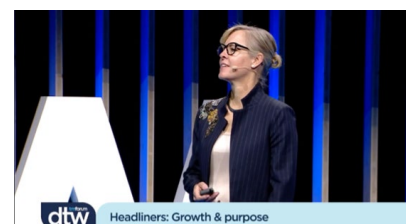
While Vodafone may be an outlier – very few CSPs have such an ambitious insourcing program – many are insourcing new cloud and software expertise. In a survey that we ran in the first quarter of 2022 for our benchmark research report [Telco to techco: capex and opex implications](#), one in four CSP respondents said that their companies were recruiting between 100 and 500 software engineers over the next year (see chart above). But just 1% said they were recruiting 5,000-10,000 and a full 60% said fewer than 100.

But it isn’t just new skills that are a problem. Speaking at TM Forum’s Digital Transformation World (DTW) event in Copenhagen in September, Keri Gilder, CEO of B2B telecoms group Colt, referred to a problem faced by CSPs across the world: the average age of the people employed in the operations departments of telcos. “We all know that if you just look around us we’re facing a retirement cliff in our industry,” she said. “The great resignation is upon us.”

Gilder has worked with TM Forum, Bain & Company and other Forum member companies to develop [a new Diversity and Inclusion](#)

[benchmarking tool](#) to help technology companies create working cultures that will retain and attract key digital skills.

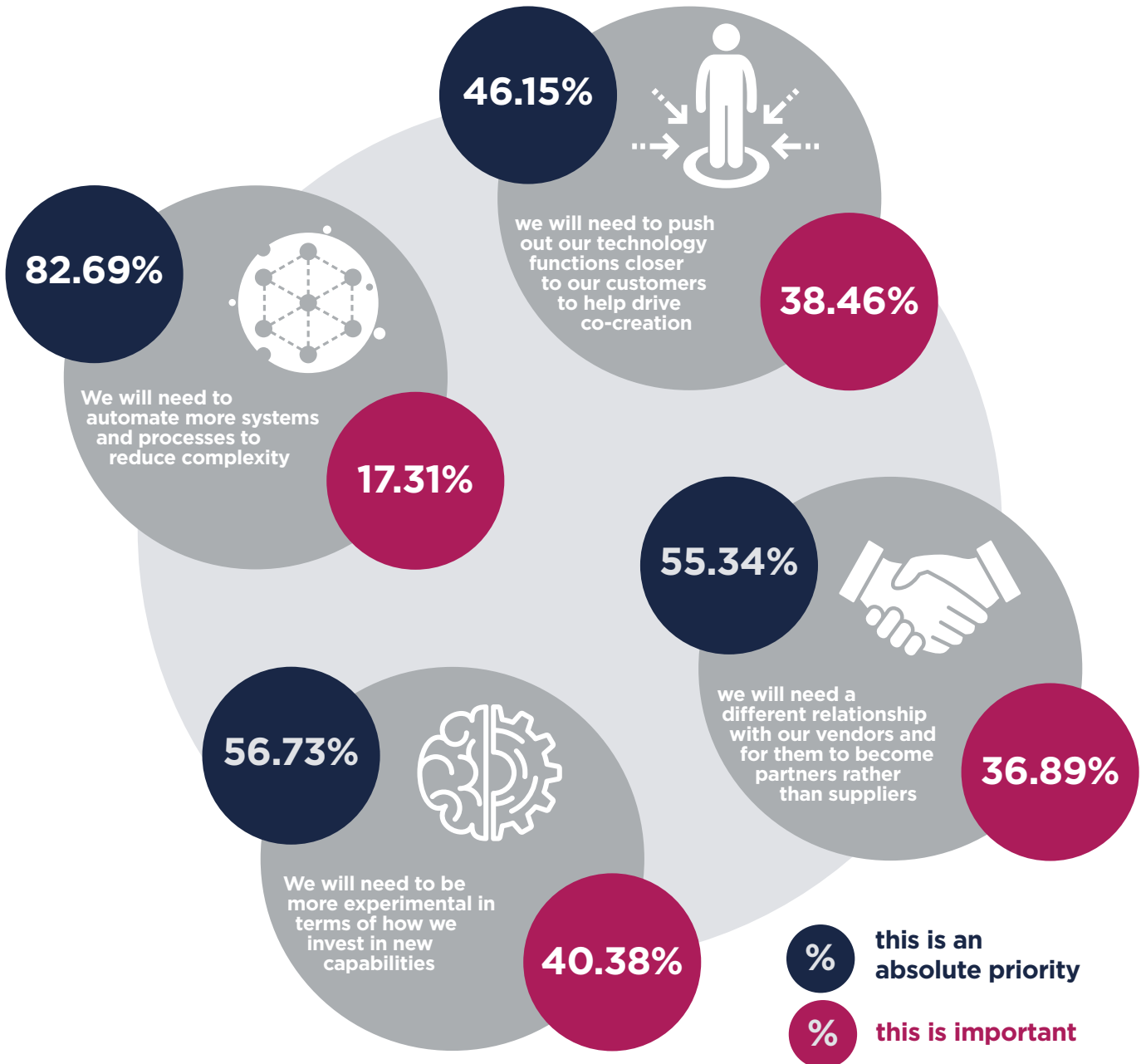
[Watch Gilder’s full DTW presentation.](#)



Another way to circumvent skills shortages, at least in the short-to-medium term, could be to “acquire” expertise by developing stronger partnerships. Operators embarking on cloud transformation projects say they are already trying to build different relationships with their technology suppliers. In our Telco to techco benchmark survey 55% of service provider respondents said that converting CSP-vendor relationships into CSP-partner relationships was an absolute priority (see graphic on p.19). And 38% said they would need to change their (RFP) approach to procurement to achieve this.

In the next section we look at some of the future BSS investment and spending trends.

what are the biggest changes you will need to make to your technology organization to become a tech company (service providers)?



section 4:

future BSS investment and spending trends

When it comes to operator spend on BSS, which segments are likely to see the most and least focus in terms of investment? And how is this spending allocated across operations and IT systems and software, opex and capex, and outsourcing versus insourcing?

Operators do not break out their overall spending on IT systems. Furthermore, spending is divided across internal operations teams, outsourced functions, software delivered as a license or as-a-service and computing resources either in a private or a public cloud. As such, building a complete picture of operator spending is a challenge.

But we can get some sense of the buoyancy of the market for BSS vendors by looking at the financial results and the 2023 guidance of select business and operational support system (BSS/OSS) vendors. For example:

- Amdocs recorded 7.3% revenue growth in the quarter ending September 30, 2022, and is providing guidance of 5%-8% growth in 2023
- Cerillion's revenues grew by 26% in the first half of 2022

- Comarch's revenues in the first half of 2022 were 16.8% higher than in the same period in 2021
- In October 2021, Matrixx said its revenues were growing by 60% per year
- CSG's Q3 2022 revenues were 3.8% higher than in the corresponding period in 2021
- Tecnotree's revenues in the third quarter of 2022 were 9.3% higher than in the corresponding period in 2021
- Nokia's cloud and network services revenues were 7% higher in Q3 2022 compared with the same period a year earlier.

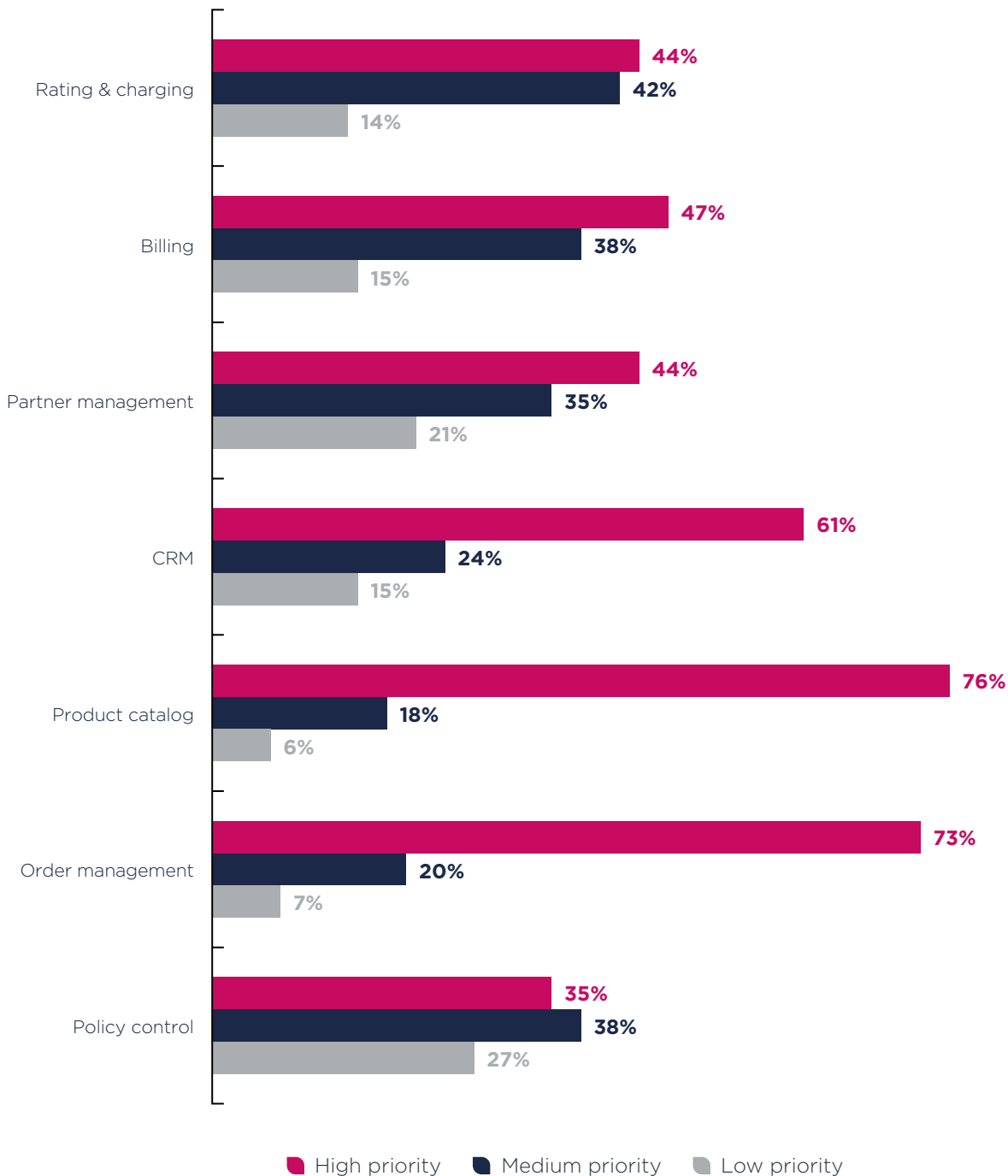
So, to judge from these results the BSS software and services sector overall is currently growing by high single digits. This is not necessarily a proxy for CSPs' spending on BSS systems.

However, given that CSPs are starting to insource more of their BSS requirements, and the fact that these figures do not include spending on public cloud services, we can be reasonably confident in asserting that they are increasing their spend on BSS by a similar amount.

Prioritizing spending

Responses to our survey for this report provide some useful insights into where CSPs are prioritizing their BSS investments. Three product areas stand out: customer relationship management (CRM), product catalog and order management (see chart on p.21). New investment in CRM systems is a function of CSPs seeking to deliver stronger digital experiences to their customers. Investment in mobile apps is a particular focus as they strive to move customer engagement away from call centers.

Which BSS categories are priorities (in terms of new investment) for your organization?



TM Forum, 2022

The strong appetite for investment in order management is a function of CSPs' commitment to delivering improved omnichannel and digital

experiences. As they increase their focus on online sales, order management systems become increasingly important. Customers want to be able to use any

channel to order products, to choose whether to pick them up or have them delivered and, if necessary, to return them.

Product catalog is a key strategic focus for many CSPs' BSS transformations. For example, it was [central to Telefónica Germany's](#) BSS transformation where the BSS has been radically simplified and evolved from one catalog per stack and one in each of the charging systems to two commercial stacks, one for B2B and one for B2C.

Transitioning to SaaS

CSPs' BSS estate is complex in terms of the number of systems and services that are in operation, the different vendors that have supplied them, and the mixture of in-house and out-of-house responsibility for keeping them maintained.

However, the range of products and services that CSPs procure can be divided into two main categories – software and services. Spending on software can itself be divided into two categories – licenses and software-as-a-service (SaaS) on the one hand, and

maintenance on the other. Spending on software licenses currently exceeds spending on SaaS, but many CSPs are starting to try and shift spend more towards the latter.

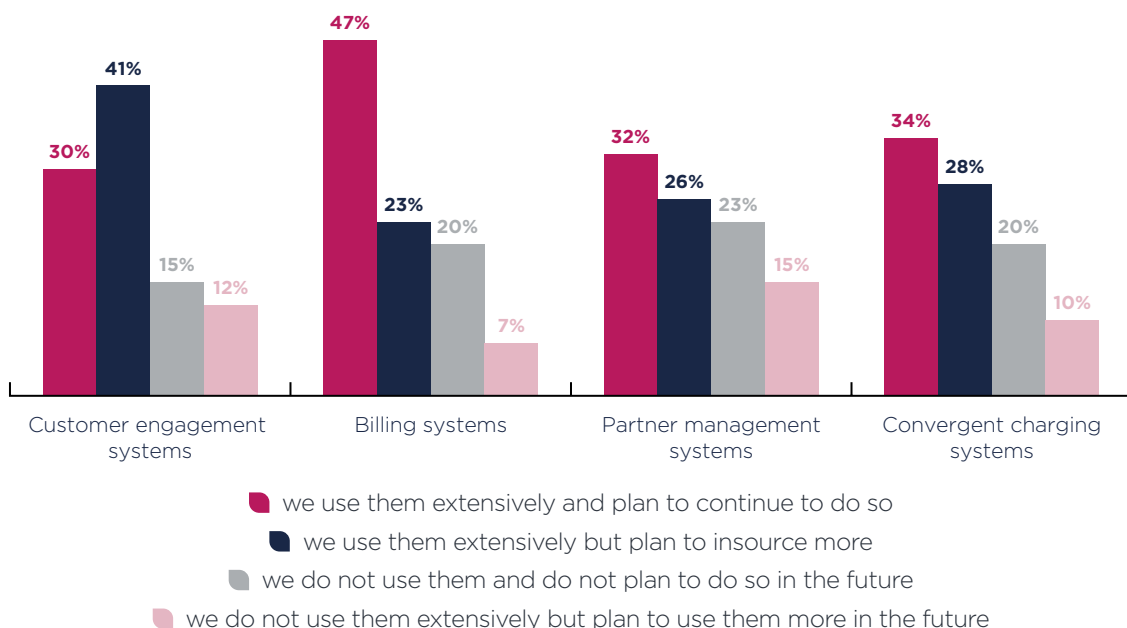
“When we’re procuring software we have a SaaS-first approach,” Lester Thomas, Chief IT Systems Architect at Vodafone, told us. “If we’re going to get something from a partner, I’d much prefer them to deliver and operate it for us because then you’re buying a service based on what they said they would deliver.”

Maintenance, meanwhile, exceeds spending on software licenses and SaaS by some considerable margin.

Services spend comprises integration, managed services and consulting. One of the big drivers for the transition to open, microservices-based architectures and TM Forum’s [Open Digital Architecture](#) is the potential to reduce integration costs through the use of open APIs (see box on page 24).

“
When we’re procuring software we have a SaaS-first approach. I would much prefer a partner to deliver and operate it for us.”

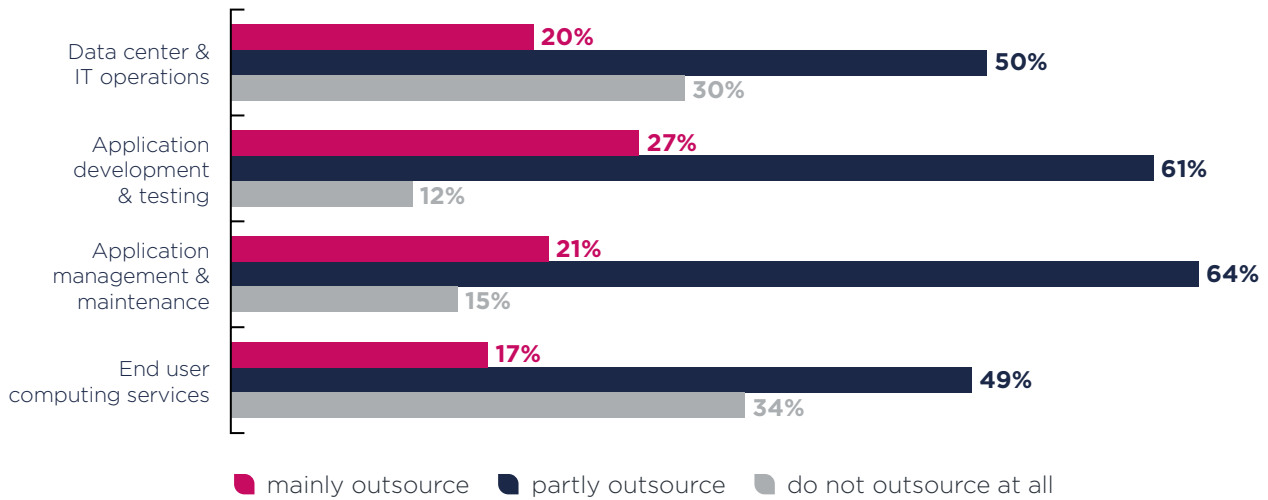
What is your approach towards using professional services and / or outsourcing in the following areas?



Key: does not include "don't know" as a response

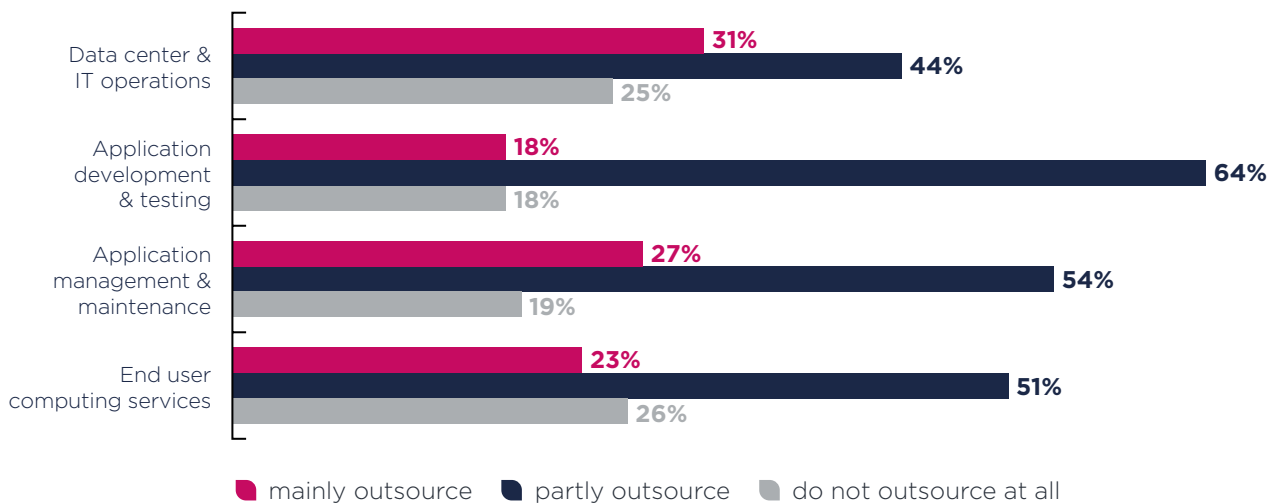
TM Forum, 2022

Which functions do you outsource to third parties today?



TM Forum, 2022

Which functions do you expect to outsource to third parties in 2025?



TM Forum, 2022

To insource or outsource?

Some CSPs are confident that the cost of insourcing software expertise can be directly linked to a reduction in integration costs. We asked our survey respondents about their current approach to insourcing and outsourcing BSS operations and their future plans. Based on our survey there is a

clear intention from CSPs to insource more functions relating to different BSS applications categories (see chart on p.22).

The biggest statement of intent relates to customer engagement systems, with 41% of respondents stating that they planned to insource more. This is because CSPs increasingly see customer

experience as a competitive differentiator where they want to add value beyond what can be delivered through out-of-the-box products.

“The experience I give to my customers is a competitive advantage,” says Shankar Arumugavelu, global CIO at Verizon. “I don’t want to be

at the mercy of somebody, designing a one-size-fits-all for the whole world. I want to differentiate an experience. So I'm going to build these things and that's going to be cloud native."

We also asked our respondents about the extent to which they outsource a number of different generic IT functions. When it comes to data center and IT operations our survey pointed to an increasing adoption of public cloud services, with 31% of respondents saying they expected

to mainly outsource in 2025 compared with 20% today. This is consistent with the trends that we have been seeing in our surveys over the past two-to-three years, namely a slow but inexorable migration from on-premises and private cloud to public cloud.

A similar trend is emerging in application development and testing with a decline in the number of respondents expecting to "mainly outsource" from 27% today to 18% in 2025. This trend is largely confined today to large

CSPs which have the resources to insource technology expertise.

CSPs increasingly are using TM Forum's Open APIs in areas such as cloud migration and application development and testing. The TM Forum Open API program is a global initiative to enable seamless connectivity, interoperability and portability across complex ecosystem services. The box below details some of the assets, including Catalyst proofs of concept, that you can explore to find out more.

Find out more about TM Forum Open APIs

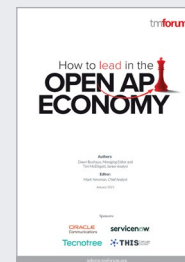
TM Forum's 60+ REST-based Open APIs have been developed collaboratively by TM Forum members working in our [Open API program](#). They are now widely adopted by the industry, with more than 500,000 downloads by 32,000 software developers from 2,300 organizations.

To date 143 companies have publicly committed to developing and using TM Forum Open APIs by signing the [Open API manifesto](#). Of those, 23 CSP

signatories have agreed to position TM Forum Open APIs as a preferred requirement in their IT RFPs. In addition, 120 leading technology partners are committed to using the Open APIs in relevant product applications and to continue to provide feedback and extensions, ensuring continuous growth of the community.

Find out how TM Forum Open APIs are being put into practice by exploring our [Catalyst proofs](#)

[of concept](#). And [read our report](#) to see how Open API adoption can help CSPs innovate as platform providers.



additional features & resources

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Digital Transformation in Times of Economic Uncertainties

How to Prepare for Post-Crisis?

As year-end is coming closer, many companies are in annual planning mode, however, with a potential recession looming, everyone is looking into budgets, and checking opportunities to optimize, while still keeping up activity levels as much as possible.

We spent the last 2,5 years in emergency mode, and there are still uncertainties ahead of us in the immediate future. However, besides all the hardships, the pandemic showed us also how difficulties can fuel positive changes and speed up technological development. There were dramatic changes in the way of working, and also in how consumers purchase products

and services, and how they want to interact with companies, and as a result, the adoption of digital technologies has been accelerated by several years.

Meanwhile, CSPs are still in the process of figuring out what is the best business model for them to become a digital service provider: how they can serve more complex demands, transform the way they work in the B2B segment, and how they can monetize on upcoming new technologies.

Companies are aware of the importance of digital transformation, and most have already started their transformation journey. While scalability and flexibility are already household names, there are also other aspects beyond the

basic technical advantages that need to be considered, like integrated digital experience, process automation, zero-touch account management, and granularity of rating and charging.

In times of cost-rationalization, it's always tempting to go for the bigger figures first. However, companies need to realize that constant IT development is a must, and digital transformation is an investment into their future, to establish a future-proof operation both in terms of technological and human capabilities. Every crisis has an end, and when we finally come out on the other side of this one, businesses must be ready, with full capabilities to grab new opportunities, and monetize emerging demand.

How can Etiya help to manage digital transformation in these critical times?

As we see in various Etiya projects, need-based transformation with a phased approach can provide you with the best of two worlds: you'll improve your capabilities and efficiency gradually, while at the same time you can spread your costs over a longer period.

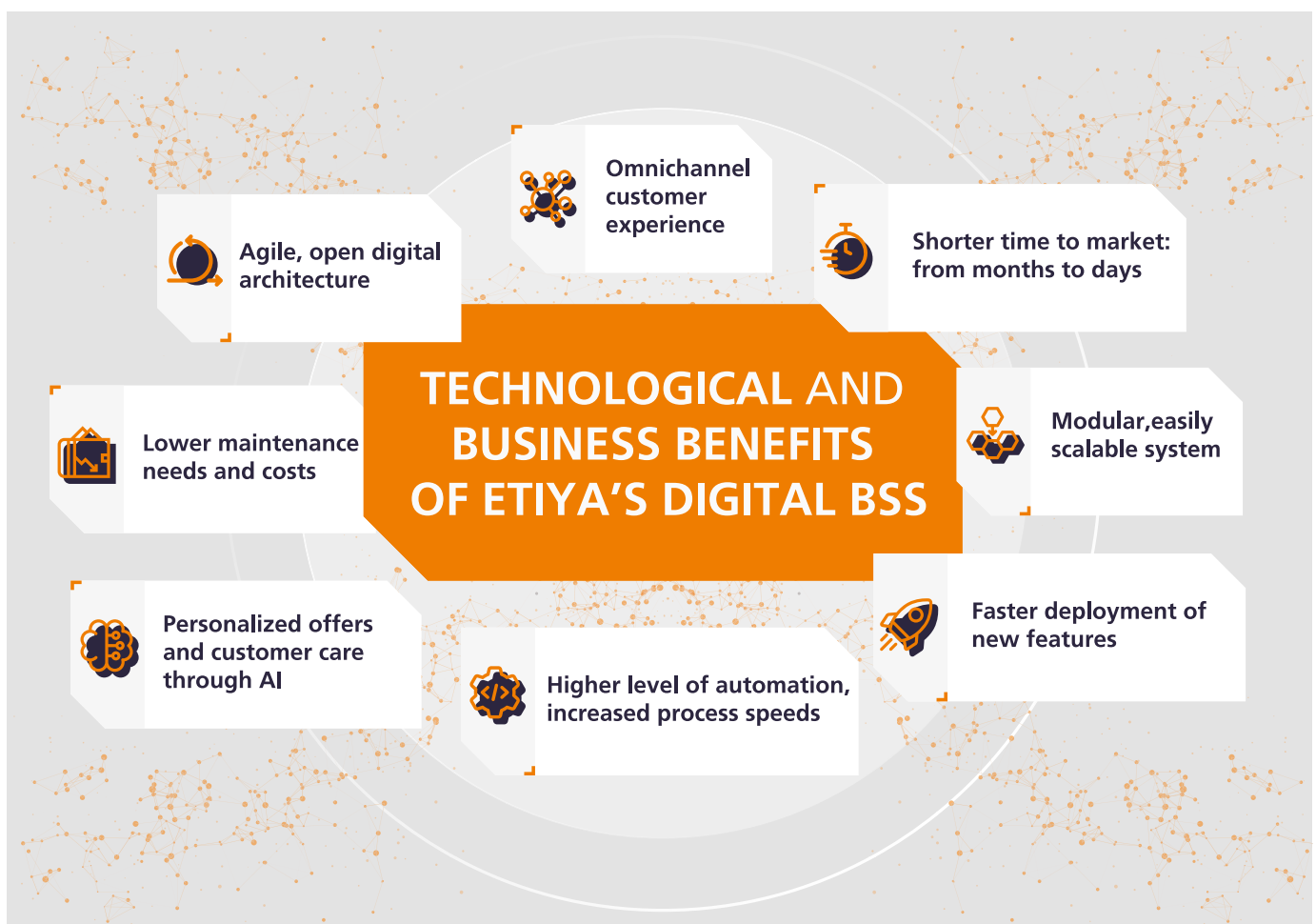
Each company has its individual challenges, but as an overall approach, a thorough analysis is needed first to identify the most important issues your business is facing, together with the long-term goals that you'd like to achieve beyond the crisis. This discovery will serve as a basis for

defining focus areas, required business outcomes and measurements. With the support of Etiya's consultants, and relying on Etiya's scalable, modular digital BSS, you can plan the phases of your digital transformation in line with your specific needs.

1. Short term: focus on cost-saving and efficiency in key pain points;
2. Mid-term: further improvements in efficiency, capabilities and CX as per business/segment priorities, eg. sales enablement, customer engagement/CRM, and a next-level of cost-saving options, eg. low-code development;
3. Longer term: capabilities to monetize new technologies.

Cost reduction has both short- and long-term effects. Legacy systems have high maintenance needs and costs, while Etiya's cloud-native digital BSS will allow you to make immediate savings in both areas already. A cloud migration strategy should form an integral part of your transformation strategy, outlining required business outcomes, and detailing what cloud(s) and business models to use, what applications to move, the steps of the migration process, and an assessment of dependencies and risks associated.

However, besides the most obvious benefits, that is, lower costs and a simplified IT stack, there are also ample business advantages, and that leads us to the topics of **efficiency** and **customer experience**.



New system capabilities from Etiya's Digital BSS will boost sales efficiency and CX in many ways:

- ability to create complex, catalog-based product bundles, with shorter time-to-market;
- better personalization of products and experiences through AI-driven insights and predictions;
- in-context, real-time business insights for quicker and more informed decision making;
- increased speed in CPQ offer creation, customer care queries and purchase flows through powerful automation.

In times of economic uncertainty, when purchasing power is shrinking, consumers will be more price sensitive, and more conscious about their product and brand choices: they want tailored offers, from companies where buying and customer care is easy and flexible. And once the crisis is over, those companies who proved themselves in times of hardship will have a better chance to retain their clients.

Customer experience is the new differentiator, and Etiya's solutions will provide both tailored offerings and the omnichannel experiences that customers are after.

While currently the main drivers of transformation are cost/efficiency and CX, innovation and new technologies will be on the top of the agenda again after the crisis, and CSPs need to be prepared for requirements that are yet unknown. As CSPs slowly but surely transform themselves into DSPs (Digital Service Providers), their offer portfolio will also change: from the typical mobile telco offers they will move

to completely new realms. **New monetization opportunities** will emerge from marketplace and ecosystem capabilities. These will allow them to create offers in a new dimension: bundles with 3rd party suppliers, including non-telco products, and highly tailored packages as per individual customer needs. CSPs cannot realize the true potential of innovations and new technologies without a full digital transformation and a flexible BSS with advanced ecosystem management functionalities, like zero-touch onboarding, new ways of charging and billing, or partner settlements. Etiya's Digital BSS is 5G ready, and works seamlessly with its Network Commerce and Management platform, providing CSPs with 5G ecosystem management capabilities and allowing experimentation with new business models. This is an area where there are still a lot of uncertainties about what will be the "killer application" of this new technology, and what will bring that breakthrough success that everyone is looking for.

Market demand is changing: instead of "simple" products, customers are rather looking for solutions to their problems. When CSPs plan their future operations, this way of thinking must be reflected in their plans as well. Etiya's digital BSS provides them with the agility and capabilities that are essential in our constantly changing market environment to serve highly demanding customers in line with their expectations. Tighter economies and temporary hardships must not be reasons for companies to stop or delay their transformation journeys if they want to stay in the race long term.

About Etiya



Etiya provides customer experience-focused AI-driven Digital Transformation with its own award-winning BSS product portfolio, that also incorporates innovative AI technologies. We offer end-to-end digital transformation, with a scalability to handle millions of orders per day, and we serve over 100 million subscribers worldwide.

We firmly believe that technology solution partners should not only be product suppliers, but also reliable, long-term stakeholders of commercial and technology leaders, who provide consultancy and guidance to navigate in a constantly changing technological environment.

With our products and solutions CSPs worldwide can both offer outstanding customer experiences, and implement operational efficiencies, by enabling personalization and process automation.



Telco scaling strategies: Modernizing business support systems for flexible revenue growth

Consumers and businesses alike are driving huge demand for innovative telecommunications technology that tests the limits of monolithic, traditional business support system (BSS) architecture.

The competition is fierce within the industry, tipping telcos to differentiate their businesses with fresh digital services like low latency mobile apps, ultra fast streaming services, virtual reality, and IoT solutions. The worldwide adoption of 5G is driving the change, bringing with it the need to simplify architectures to accommodate the complexity of modern 5G networks, which require multiple assurances, orchestration, provisioning, and charging functions to aggregate data effectively and manage services.

Alongside the development of headline-grabbing technologies, telecommunications enterprises are also busy building increasingly customer-centric experiences. Fast, reliable communication is essential for all people, from the average consumer who expects flawless performance, to the enterprises that need to run mission-critical business processes over telecommunications networks. These interactions matter immensely for customer loyalty.

Partnering together, Tech Mahindra and MongoDB have ushered telcos through their ongoing BSS modernization journeys by enabling business growth and operational efficiencies with solutions ranging from core network functions

through to product catalog and customer management systems. Today, we see that the biggest hurdles standing in the way of telco innovation are legacy data architectures that eat up developers' time with time-consuming maintenance work.

Building a consolidated view: drilling into customer data

Billing modernization is a big market. The global telecommunications billing and revenue management market size reached \$13 billion in 2019, and is forecast to expand at a compound annual growth rate of 11.6% to more than \$31 billion between 2020 and 2027, according to research prepared by Forrester Research, Inc.

Billing system modernization

Billing is a key example of a BSS function which must be modernized

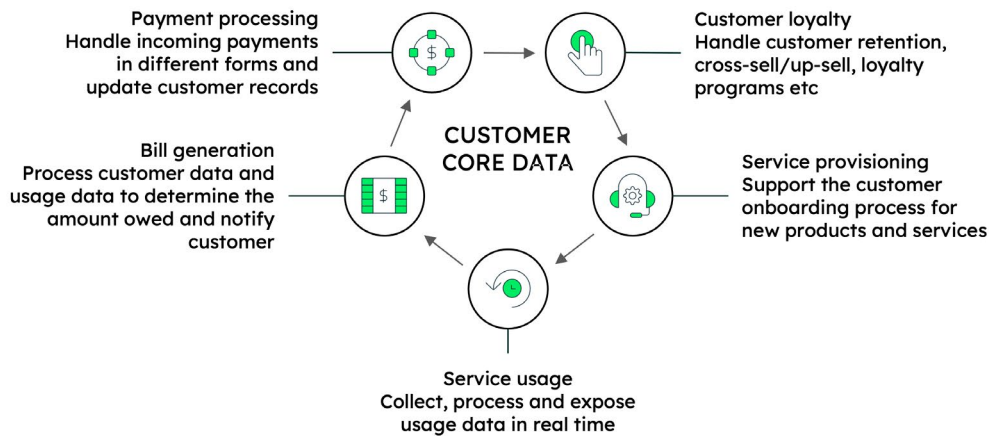


Figure 1: Customer centricity in billing

Core, consolidated customer data act as an enabler for many other related solutions that share the need for a solid, reliable record of customer core data. The common factor for payment processing, customer loyalty programs, service provisioning, service usage, and finally billing generation, is customer core data.

Like many large corporations, CSPs are often made up of siloed application stacks broken out by product area, such as VoIP, mobile, cable, and so on. Since customers use products and services that exist within multiple silos, changes to customer data need to be propagated to multiple systems.

The lack of a single, consolidated view is often a result of historical mergers and acquisitions. Without the ability to analyze data within a single view, opportunities to capitalize on data analytics to uncover cross-selling and up-

selling opportunities are lost. Furthermore, enterprises managing multiple parallel billing implementations and the systems' associated data synchronization infrastructure can incur hefty costs and architectural complexity.

The best way to address these challenges is to modernize core customer data systems to have a single view of customers and their billing-related data. At the heart of these modernization projects is the move to a new platform.

Product catalog simplification and the hybrid cloud approach

Akin to the global-scale retailers with some of the most complex product offerings around, telcos have a complicated array of product offerings that require CPQ processes to be able to combine offerings. Whether a telco is combining handsets, tariffs, warranties, add-ons or

promotions, managing data in a streamlined and scalable infrastructure is a crucial modernization strategy. What's more, telcos must deliver personalized and real-time shopping experiences to customers across web, mobile, phone, and in-store platforms to stay competitive.

The modernization and simplification of a telco's product catalog architecture can quickly turn into a complicated mess when certain existing legacy systems must stay in place. Making one swift rip-and-replace move can be a big risk with costly implications for long-term transformation projects.

Today, more and more successful modernization strategies are achieving omnichannel implementation and multi-play services goals by migrating incrementally. This enables telcos to set the stage for a successful

migration, at the right pace for the company. A key part of a modernization strategy is often a move from a self-managed, on-premise architecture to a cloud-based one. Initially, a hybrid cloud strategy is often more cost-efficient, and acts as an important stepping stone in any enterprise's digital transformation journey.

The limits of existing legacy systems inhibit telcos' ability to scale and grow. As the telecommunications industry reimagines how to apply new technology in the digital-first world, heavier reliance on the public cloud is delivering operational and competitive advantages. But for an industry with complex legacy infrastructure and loads of personal data, moving every workload to the cloud isn't feasible yet.

Through implementation projects with telcos around the world, Tech Mahindra has proven that a central commercial catalog, integrated with the right legacy technical catalogs and BSS stacks, improves time-to-market for launching multiple bundles and offers that are still processed and billed to a single customer.

The benefits of this hybrid approach are immediately apparent:

- Faster time-to-market
- Increase in sales
- Improved customer satisfaction
- Reduced handling time
- Less fallouts, errors, and training time

Through Tech Mahindra's BlueMarble Commerce solution, underpinned by MongoDB, telecommunications enterprises are quickly overhauling their omnichannel strategy without overhauling their business or existing systems. A true end-to-end omnichannel multi-play solution for telcos, BlueMarble automates channel sales, order management, CPQ (product configuration, pricing, and quoting) and fulfillment, including reverse logistics.

Combating the complexity of BSS modernization

By putting the needs of their customers first, telco, cable, and media service providers are building a bridge toward seamless and consistent experiences for both digital and physical user experiences. BlueMarble Commerce was built with this principle in mind.

With its ability to connect with legacy systems using custom-built adaptors and APIs, BlueMarble combines multiple channels in a uniform, seamless manner, helping to simplify telco modernization. MongoDB delivers a multi-cloud database service built for resilience, scale, and the highest levels of data privacy and security. This is critical when building a platform that enables a cohesive, integrated suite of offerings capable of managing modern data requirements for building applications in a microservices framework without sacrificing speed, security, developer

experience, and the ability to scale. These were the primary reasons to choose MongoDB for the BlueMarble platform.

With these features of MongoDB Atlas, BlueMarble acts as a federated, overlay solution that masks the complexity of legacy, and enables the creation of new digital functionalities by integrating new digital architectures with existing legacy, eliminating the need to build new bespoke applications.

In conclusion, as telcos compete with each other to provide the exciting new technologies driving change in the industry, they must not lose sight of the customer, or providing customer value. Tech partners like MongoDB and Tech Mahindra are leading the charge in supplying cloud-native, microservices-based architectures in business support systems.

Learn more about MongoDB Atlas at mongodb.com, and Tech Mahindra's BlueMarble platform at techmahindra.com.



The Future of BSS Depends on a Cloud Transformation Strategy

By Ari Banerjee, Senior Vice President, Strategy, Netcracker Technology

With 5G rollouts continuing, realizing value from the network will require moving BSS to the cloud to take advantage of flexibility, scale and delivering the best experience to customers.

As communications service providers (CSPs) bring 5G networks and services to more and more business and residential customers, it's not enough to just claim the fastest network; rather it's what CSPs do with their upgraded infrastructure that will indicate future success.

In addition, a growing number of CSPs are looking for ways to empower customers with digital-first experiences in order to differentiate themselves and win market share. This approach enables a level of automation that dramatically reduces the operator's customer service costs. It also leverages artificial

intelligence (AI) to anticipate customer needs and behavior, delivering personalized engagement via their channel of choice while proactively driving loyalty.

To achieve this, they need a comprehensive cloud transformation strategy, including for their business support systems (BSS). Migrating BSS to the cloud is critical if CSPs are to thrive in the future. However, many CSPs are lagging in their plans for cloud migration and deploying truly cloud-native BSS. As CSPs approach this critical push from different ways, they need to be mindful that they are not

negatively impacting their digital transformation initiatives, which would put them at a major disadvantage.

Instead, they should consider that the BSS of the future must have a cloud-native architecture to provide unprecedented levels of flexibility and scale due to its modular nature and adaptability. Cloud-native architectures will allow operators to leverage the cloud's multi-tenancy characteristics to build consistency of process across OpCos, scale based on service demands, minimize customization and significantly reduce time and cost for development.

Transformation for Digital Success

Success in the digital economy requires the flexibility and scalability of cloud-native BSS systems to rapidly update their service offerings and pricing, implement service innovation and decrease TCO.

In today's networks, BSS capabilities need to be built for the cloud and should be designed to work seamlessly across both telco and public clouds. True BSS in the cloud gives operators the freedom to select the most appropriate BSS applications, including charging systems and campaign management, which gives operators the flexibility to develop an approach to business operations that best suits customers, the network and economic requirements alike.

This scenario is achievable if CSPs utilize a modular microservices architecture that can be leveraged to design the telco cloud configuration that best matches operational needs. Building this architecture to industry standards and using standardized APIs are essential in order to develop BSS applications that behave consistently across multiple cloud hosts. Cloud-native BSS solutions must employ an industry-leading security framework that applies strict security policies across infrastructure, development lifecycles and operations to protect customer data and guarantee regulatory compliance regardless of location.

Container-ready microservices enable product portfolios to be enhanced and expanded, introducing non-telecom services to provide innovative bundles that can be precisely targeted at different vertical markets. A microservices architecture brings the capability for greater differentiation in terms of loyalty-

centric, real-time and context-driven services through efficient transaction management.

Microservice architectures create a pathway for continuous functionality upgrades to a cloud-based solution, without interruption to existing operations, and also provide scalability to address real-time business needs. This translates into extended business agility and reduced operating expenses, allowing CSPs to vastly accelerate time to market for new service offerings. Breaking a software function into microservices and running them in containers provides significant benefits, including:

- Independent deployment, scaling and upgrading of microservices.
- Faster release of services and upgrades.
- Failure isolation without impacting the rest of the software app.
- DevOps processes with continuous integration, testing and deployment.
- New SaaS commercial models with evergreen upgrades.

Deployment in the cloud allows DevOps practices to be implemented, combining software development and IT operations to increase the quality of software, while reducing development time. Following continuous integration (CI) and continuous delivery (CD) methodologies means that code changes can be more reliable and achieved more rapidly.

Deploying BSS in the cloud also brings benefits in terms of leveraging the power of AI and machine learning (ML). Although legacy BSS systems already perform automated repetitive tasks, any changes to the processes or the data

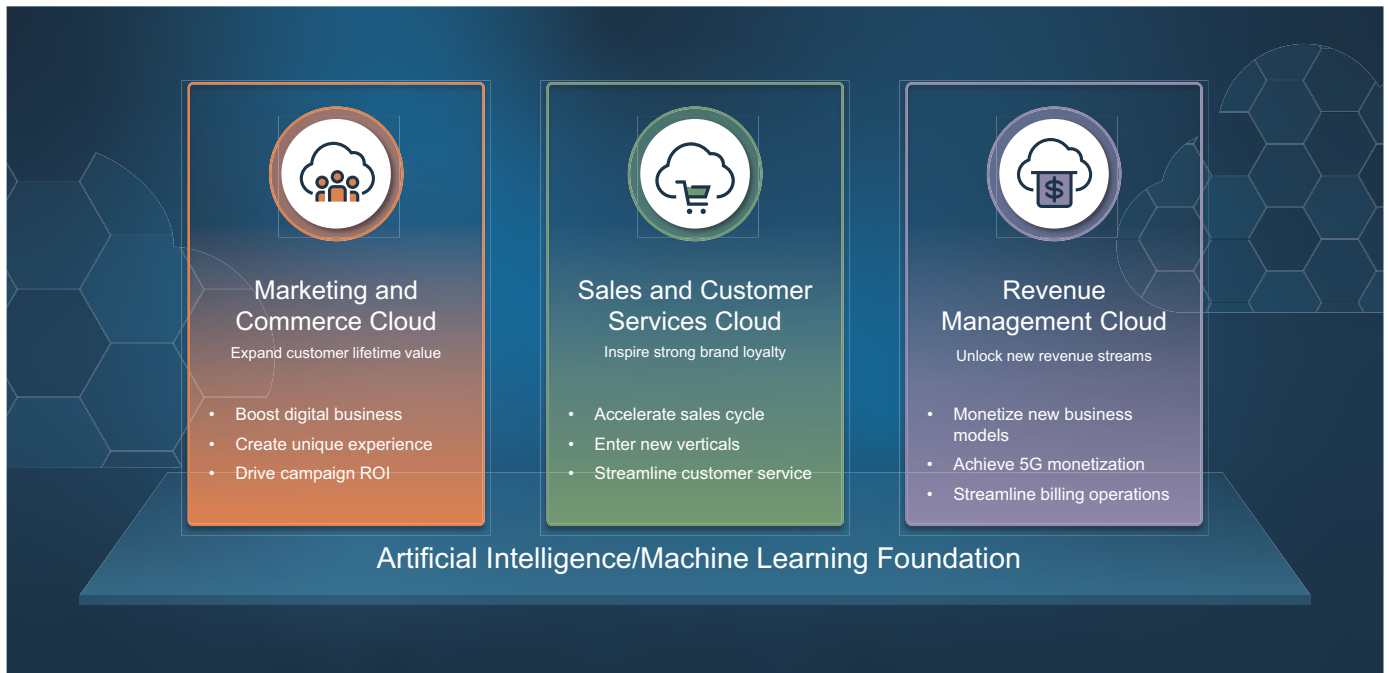
input need to be made with human intervention.

The evolution of BSS in the telco cloud that will enable the application of the intelligence provided by AI and ML to monitor and analyze customer behavior in order to drastically enhance customer experience and increase loyalty.

[Netcracker Cloud BSS](#) is the industry's first SaaS-based, cloud-native solution that runs in the public cloud and helps CSPs create and launch new business cases for the digital economy. Future-proofed functional capabilities, digital operations and lower TCO enable CSPs to become more innovative and disruptive, facilitating access into new markets and guaranteeing carrier-grade quality and compliance with strict security and privacy requirements.

Netcracker Cloud BSS is deployed in a SaaS model including Evergreen support, with Netcracker assuming responsibility for the software and infrastructure. It comprises three cloud-based offerings - Marketing and Commerce Cloud, Sales and Customer Service Cloud and Revenue Management Cloud - that support end-to-end, lead-to-cash business processes for operators. This approach enables them to control their spending and streamline their most critical business domains.

Marketing and Commerce Cloud increases customer lifetime value by providing one-stop shopping for telco, retail and partner products to support customers on their unique digital journey. It offers customers a connected omnichannel experience and uses AI to analyze customer behavior during their digital journey to create personalized content and offerings. Marketing and Commerce Cloud implements



real-time campaign visualization and ML-driven analysis to eliminate the uncertainty and frustration of blind marketing campaigns and drive ROI.

Sales and Customer Service Cloud inspires strong brand loyalty with a guided process from lead creation to contract generation and an intuitive quotation interface across every sales channel for rapid B2C rollouts and simplified B2B scenarios. Its increased automation streamlines and enhances lead conversion to create an enormous base of paying customers. It enables CSPs to expand into new verticals with rapid TTM for traditional, IoT and cloud products. Intelligent customer service builds strong brand loyalty through a customer-centric approach. Netcracker Sales and Customer Service Cloud

increases the level of automation to dramatically reduce operator costs for customer support.

Revenue Management Cloud unlocks new revenue streams with support for multi-partner business models, complex multi-partner B2B2X settlements and cost-effective IoT billing. It provides real-time charging for any service, partner or business model and flexible rating and discounting for B2B and B2C services. It implements dynamic network slicing as a service (SLaaS) to optimize usage of network resources and create new monetization scenarios. Revenue Management Cloud streamlines operations with E2E configurations, automated execution and real-time monitoring and troubleshooting.

About Netcracker



Netcracker Technology, a wholly-owned subsidiary of NEC corporation, offers mission-critical digital transformation solutions to service providers around the globe. Our comprehensive portfolio of software solutions and professional services enables large-scale digital transformations, unlocking the opportunities of the cloud, virtualization and the changing mobile ecosystem. With an unbroken service delivery track record of more than 25 years, our unique combination of technology, people and expertise helps companies transform their networks and enable better experiences for their customers.

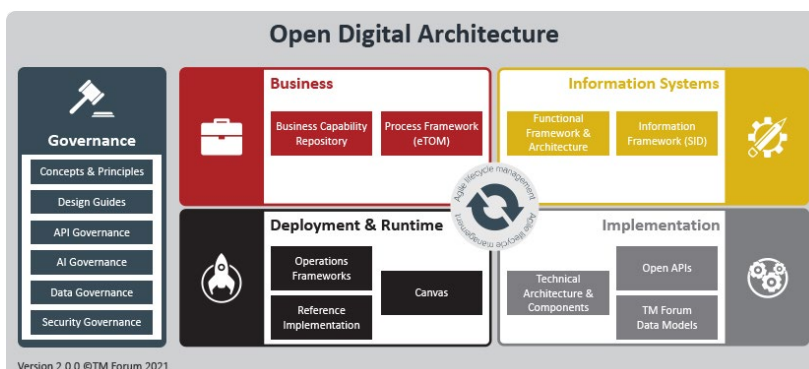
tm forum open digital framework

A blueprint for intelligent operations fit for the 5G era

The [TM Forum Open Digital Framework \(ODF\)](#) provides a migration path from legacy IT systems and processes to modular, cloud native software orchestrated using AI.

The framework comprises tools, code, knowledge and standards (machine-readable assets, not just documents). It is delivering business value for TM Forum members today, accelerating concept-to-cash, eliminating IT & network costs, and enhancing digital customer experience.

Developed by TM Forum member organizations through our [Collaboration Community](#) and [Catalyst proofs of concept](#), building on TM Forum's established standards, the Open Digital Framework is being used by leading service providers and software companies worldwide.



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

Open Digital Architecture

- Architecture framework, common language and design principles
- [Open APIs](#) exposing business services
- Standardized software components
- Reference implementation and test environment

Transformation Tools

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

Maturity Tools & Data

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

Goals of the Open Digital Framework

The aim is to transform business agility (accelerating concept-to-cash from [18 months to 18 days](#)), enable simpler IT solutions that are easier and cheaper to deploy, integrate and upgrade, and to establish a standardized software model and market which benefits all parties (service providers, their suppliers and systems integrators).

Learn more about member collaboration

If you would like to learn more about the Open Digital Framework, or how to get involved in the TM Forum Collaboration Community, please contact [George Glass](#).



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