

CLOUD & AUTOMATION:

Changing CSPs' OpEx outlook

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April 2021

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The big picture

Communications service providers (CSPs) have grown comfortable talking to their investors about digital transformation programs, but they have a tough time explaining how transformation will impact their bottom lines. This has made investors cautious about building assumptions into CSPs' future financial performance.

There are three main drivers for telco transformation: delivering a stronger customer experience, generating new revenues and achieving efficiency gains. In this research we are focusing on efficiency gains because they are the easiest way for operators to demonstrate the benefits of transformation.

Importantly, we have chosen to focus on OpEx rather than CapEx. There is already plenty of research available about the evolution of the network, which makes up the majority of CapEx. However, little information is available about telco OpEx trends, even though operators spend close to \$1 billion annually.

OpEx falls into two categories: direct and indirect costs. Direct costs are expenses incurred to provide services, while indirect costs are general expenses to keep the business operating.

When it comes to items such as the cost to acquire subscribers – an essential expenditure if operators are to retain or grow market share – it is extremely difficult to make meaningful cuts. To lower OpEx CSPs are more likely to focus on indirect costs such as network and IT operations or reducing the number of employees and contractors across the organization.

Key telco operating expenses



TM Forum, 2021

In this report, we show the status of current telco OpEx through detailed analysis of publicly available financial results from five CSPs operating in Europe, the Middle East and Africa: BT, MTN South Africa, Ooredoo, Orange and Telenor. We have used the data published by these companies to highlight the most important categories of OpEx and show their expenditure in these areas as a percentage of total revenues and total OpEx.

Our results reveal that there is plenty of scope for OpEx savings, particularly within European CSPs' businesses. Some companies have already made substantial progress reducing OpEx. Telenor and KPN are leading the way, consistently meeting and exceeding ambitious cost-savings targets. This has been achieved through general belt-tightening across the business rather than specific initiatives.

However, it will become increasingly difficult for operators to achieve year-on-year cost savings through generalized, department-by-department budget cuts, particularly companies that have already made large cuts. They will need to embrace new technologies like cloud, automation, machine learning and AI to reduce OpEx further and impress investors.

Read this report to understand:

- Which categories make up telco OpEx
- Why CSPs and their investors use EBITDA (earnings before interest, taxes, depreciation and amortization) margins as a key performance indicator
- How CSPs have been cutting costs up to now, and why new technology will impact costs in the future
- Which CSPs are cost-cutting leaders
- How investors feel about CSPs' efforts to transform, and whether they believe operators can cut costs further
- How BT, MTN South Africa, Ooredoo, Orange and Telenor categorize OpEx, and how their spending compares
- How much CSPs collectively spent on CapEx and OpEx in 2020
- How deployment of cloud, AI and automation will impact OpEx

Section 1

Global trends in telco OpEx

For the first two thirds of its 30-year history as a dynamic, competitive market, the telecommunications sector was firmly focused on revenue growth rather than operational efficiency. However, over the last 10 years revenue growth has proven elusive, forcing communications service providers (CSPs) to focus increasingly on cost management and, more recently, cost cutting.

With customers requiring faster speeds and greater reliability to satisfy their insatiable demand for connectivity, it has never been an option to reduce investment in the network. Furthermore, investors have rewarded operators that have invested early and heavily, be it in deploying fiber or committing to LTE and 5G.

CSPs have focused on reducing OpEx rather than CapEx because a large proportion of CapEx (around 60%-90%, according to our estimates) is on the network. Furthermore, OpEx is two-and-a-half to three times higher than CapEx, so there is more scope to identify cost-cutting opportunities.

EBITDA margins

Comparing trends in OpEx between operators and identifying year-on-year trends can be difficult because expenses include disposals and acquisitions which can end up distorting the overall picture. A better measure of OpEx trends is operators' EBITDA (earnings before interest, tax, depreciation and amortization) margins. The table opposite shows annual revenue and operating expenses for 30 CSPs from 2018 to 2020, calculated by subtracting EBITDA from total revenues.

Comparison of selected CSPs' revenues & OpEx (in US billions)

	2018		2019		2020	
	Revenue	OpEx	Revenue	OpEx	Revenue	OpEx
America Movil	49.2	35.2	48.5	33.4	49	32.8
AT&T	170.8	114.1	181.3	122	171.8	117.4
Axiata Group	5.8	3.8	6	3.2	5.9	3.2
Bell Canada	18.6	11.1	19	11	18.2	10.3
Bharti Airtel	11.5	7.4	11.1	7.5	11.4	5
BT	33.1	22.6	32.7	22.4	32	21.6
Charter Communications	43.6	27.6	45.8	28.9	48.1	28.5
China Mobile	113.5	71	114.9	69.3	117.1	72.8
China Telecom	58.1	42	57.9	39.8	60.6	41.7
China Unicom	44.8	31.7	44.7	30.2	46.5	31.9
Comcast	94.5	64.3	108.9	74.7	103.6	70.8
Deutsche Telekom	90.3	62.5	96.1	61.9	120.6	73.2
KDDI	46.4	32.5	46.8	32.3	48.2	32
Korea Telecom	20.7	16.6	21.5	17.6	21.1	16.7
KPN	6.7	4	6.5	3.8	6.3	3.4
MTN Group	9	5.7	10.1	5.9	12	7
NTT	108.7	81.2	109.4	81.5	109.6	80.8
Orange	49.4	33.9	50.4	35.1	50.5	34.8
Rogers Communications	12	7.2	12	7	11.1	6.2
SK Telecom	14.9	10.9	15.7	11.2	16.4	11.4
Swisscom	12.6	8.1	12.4	7.7	12	7.3
Telefónica	58.1	39.3	57.8	37.5	51.4	34.7
Telekom Indonesia	9.1	4.9	9.4	4.9	9.3	4.5
Telekom Malaysia	2.9	2	2.8	1.9	2.6	1.6
TIM Brasil	3	1.9	3.1	1.9	3.1	1.5
T-Mobile US	43.3	30.9	45	31.6	68.4	41.1
Verizon	130.9	83.5	131.9	84.7	128.3	79.5
Vivo	11.9	7.3	11.2	6.6	8.4	4.9
Vodacom	5.8	3.5	5.8	3.6	6.1	3.4
Vodafone	65	44.5	61	41.2	62.8	42.6
Total	1,344.30	911.1	1,379.70	920.3	1,412.10	922.6

TM Forum, 2021

Expenses amount to between 48% and 79% of the operators' total revenues. Over the last five years, 14 of the 30 companies have seen their EBITDA margin rise by more than five percentage points (and conversely, their expenses fall by more than five percentage points). Eleven of the companies experienced a rise of zero to five percentage points in their EBITDA margins. The EBITDA margin declined for only five companies.

Overall the operators' combined revenue grew by a compound annual growth rate of 2.5% between 2018 and 2020, while OpEx grew by .63% per year. In 2018 the combined OpEx of these companies (\$911 billion) was equivalent to 67.7% of their combined revenues of \$1,344 billion. By 2020 it amounted to 65.3% of their total revenues of \$1,412 billion.

We can conclude that operators are sensibly managing their cost bases. However, breakdowns of direct and indirect costs, which are not publicly available, would provide greater insight. For example, we could understand the extent to which operators have been able to deliver cost savings across their IT estates (mainly indirect costs) or whether there is a downward or upward trend in subscriber acquisition costs (direct costs).

Future OpEx trends

A growing number of CSPs are committing to cutting OpEx overall, and they are confident that new digital technologies and ways of working can drive efficiency gains. They have been less specific about precisely where these costs cuts will occur, however. Further "belt-tightening" measures and eradication of mid-level management roles may offer limited savings, so operators likely will need to depend on successful automation initiatives.

As we'll see in [Section 2](#), investors have learned to treat operators' bold statements about OpEx cuts with a

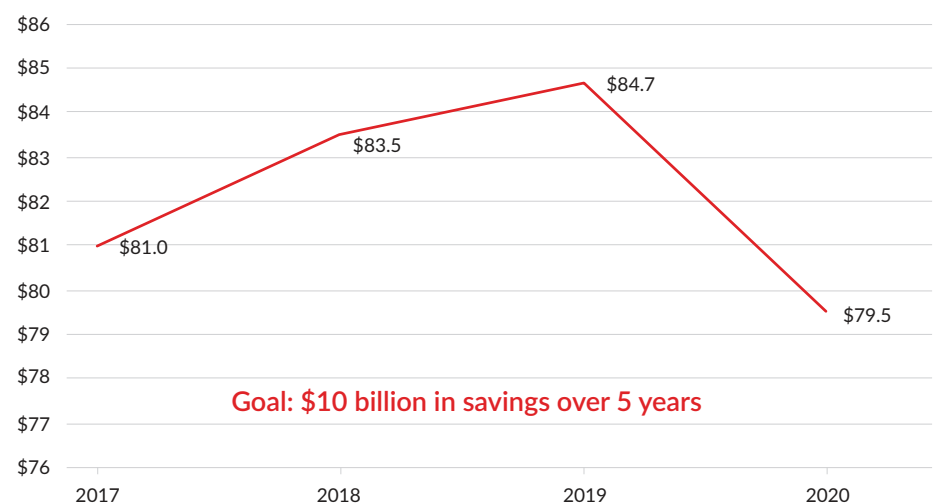
degree of caution. The savings achieved in one part of the business may be wiped out by higher costs in another. This seems to be especially true in IT and network departments, where operators have made reasonable progress in delivering efficiency gains.

For example, speaking at an investors' conference in January 2021, Verizon Consumer CEO Ronan Dunne said the company is on track to meet its five-year goal (announced four years ago)

of cutting \$10 billion in OpEx. While Verizon's financial results show progress, the ride has been bumpy, resulting in overall savings so far that are only a fraction of the goal.

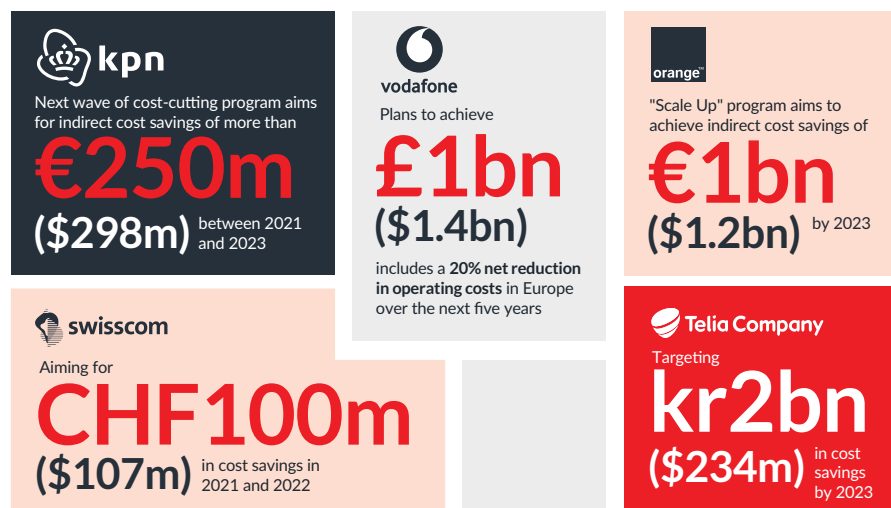
Several European CSPs have committed to OpEx cuts in the period from 2021 to 2023, and executives indicate this will be driven by digitization. We will look more closely at which OpEx categories operators are targeting for these cost-cutting initiatives in [Section 3](#).

Verizon's quest for OpEx savings (in US billions)



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European CSPs' plans to cut OpEx



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New technology

As CSPs transition from hardware-centric to software-centric businesses and migrate IT and network workloads to the cloud, their costs will be impacted. Spending will shift to OpEx with increased use of public cloud services, and automation will reduce staff costs. We'll discuss these changes in detail in [Section 3](#), but it is helpful to

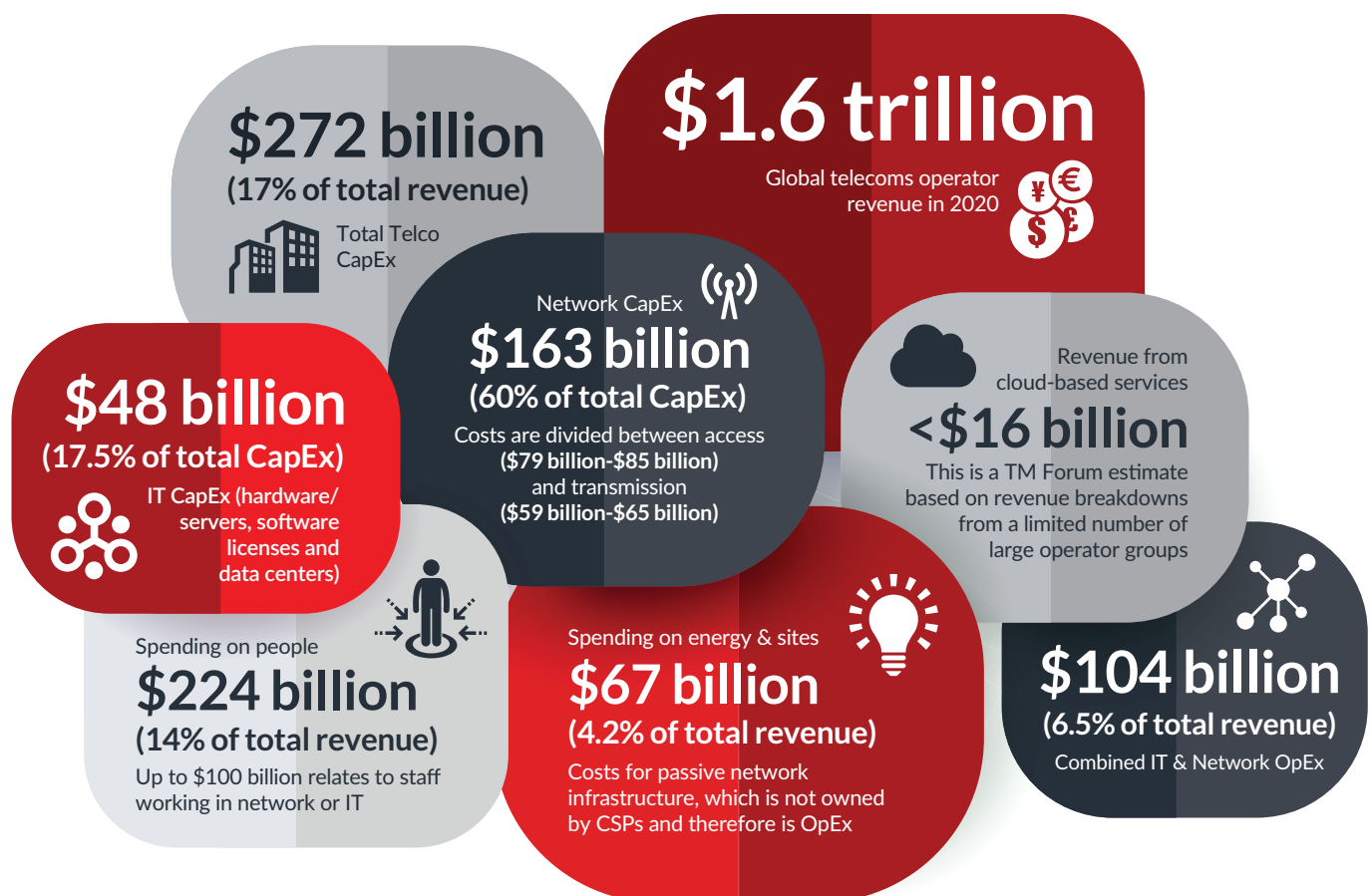
have a snapshot of operators' current spending on CapEx and OpEx to set the stage.

The graphic below shows estimates of global telco spending based on TM Forum's analysis of CSPs' 2020 financial results plus IDC's estimate of \$1.6 trillion in total global telecoms operator revenue for 2020. This figure varies from \$1.5 trillion to \$1.7 trillion because

not all CSPs release financials and some numbers are overstated because in some cases sales of devices and reporting of wholesale revenues may represent double counting.

In the next section, we'll look at the role of investors and whether they believe CSPs can successfully make OpEx cuts.

2020 telecoms revenue & spending estimates



Note: Figures are sourced primarily from TM Forum's analysis of CSPs' 2020 financial results but also include IDC's estimate of \$1.6 trillion in total global telecoms operator revenue for 2020. All figures are estimates, and CapEx and OpEx figures are averages of high and low percentages of total spending.

TM Forum, 2021

Section 2

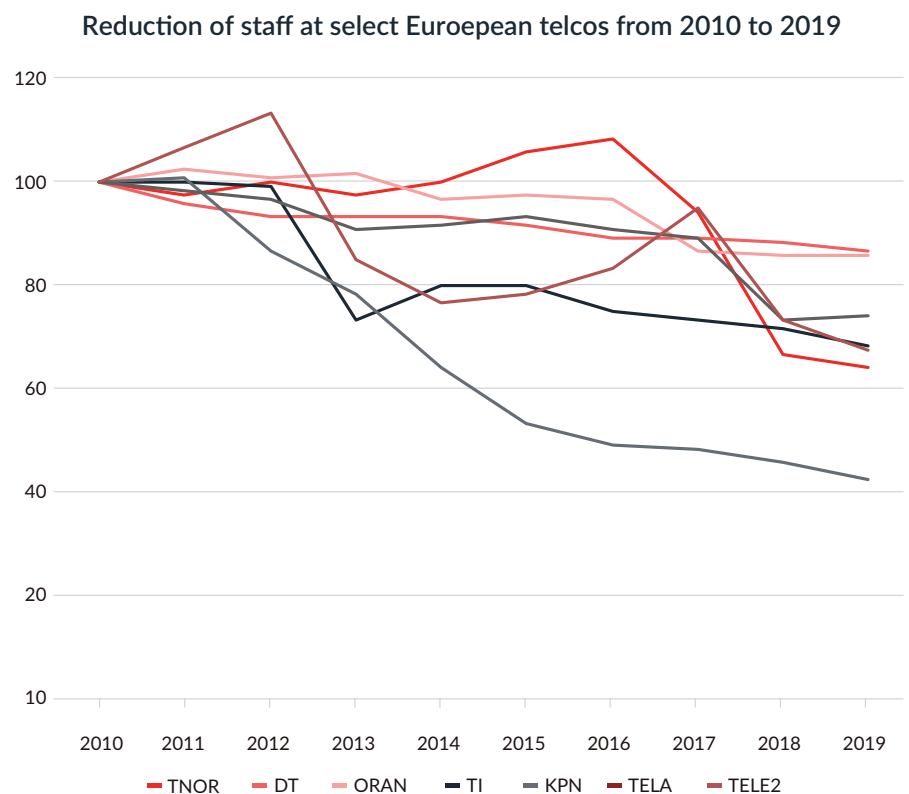
Do investors value telco transformation?

Telecoms investors span public and private capital markets, equity and debt, and different geographies. They use a variety of strategies and hold diverse opinions that tend to fluctuate, with capital markets often extrapolating from recent experience. However, the average view is expressed in share prices and reflects the information and expectations published by communications service providers (CSPs) and their suppliers, as well as forecasts shared between investors and published by journalists and industry analysts.

During recent decades, investors have learned to expect cost reductions, with processes gradually becoming more efficient particularly at telcos that were privatized in the 1990s. For example, Deutsche Telekom had 201,060 employees in its German division when the group was privatized in 1996, but by the end of 2019 the number had fallen to 60,501.

CSPs also have saved by cutting overlapping functions in areas such as sales, marketing, customer care and operations in fixed-mobile convergence deals (initially by the integrated telcos and more recently by cable-mobile deals, led by European investment group Altice). So, the savings generated through digital transformation is really just the latest form of cost cutting in a multi-decade process.

Historically, telco investments have been disappointing, with the sector's performance lagging the rest of the stock market over the last 20 years.



TM Forum, 2021 (Source: Thomson Reuters Datastream)

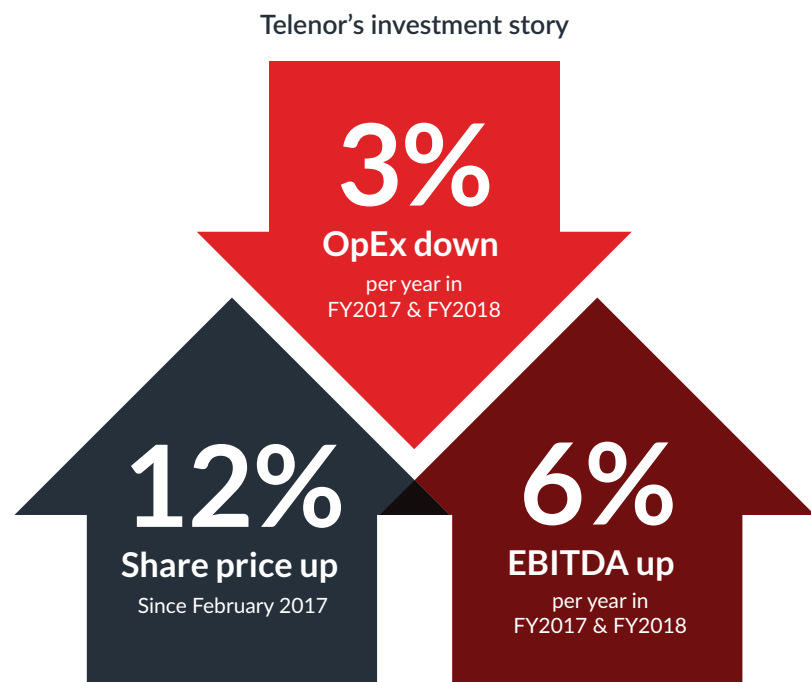
There are exceptional stocks that have bucked this trend – Verizon, for example, has shown steady gains in share price. But overall, cost cutting by CSPs has failed to lead to share price outperformance.

This is partly because cost savings are usually offset by a mix of negative factors including competition, regulatory pressure, rising CapEx and occasional large spectrum costs, leading to disappointing revenue and earnings trends overall. Few telco stocks have managed to offset these headwinds through cost cutting – even the exceptional level of cost cutting at Altice Europe slowed after two years.

Telco investors have learned from experience that cost cutting alone is not usually enough to drive a share price up over the long term. Despite this, investors were positive about digital transformation when it emerged as a new investment theme in 2017.

Malaysian operator group Axiata was one of the first to discuss digital transformation with investors. CEO Tan Sri Jamaludin Ibrahim outlined a plan in late 2016 to cut \$355 million in costs from fiscal year 2017 to 2019, which amounted to 17% of 2016's OpEx base.

Axiata saw two components to transformation: digitization of processes followed by the introduction of new services such as mobile advertising, digital commerce and digital entertainment. However, the company did not publicize many details at the time.



TM Forum, 2021

Telenor leads the way

In February 2017, Norway-based Telenor, which also operates in Asia, highlighted the digital transformation opportunity in a way other telcos had not, with CEO Sigve Brekke presenting a three-year plan at the company's Capital Markets Day. As a result, Telenor became known in the stock market as the leader in transformation – and the benchmark to use for assessing the opportunity for other CSPs.

Unfortunately, Telenor's investment story lost some momentum in 2019, with slower net cost cutting as network costs rose in Asia because of increasing energy prices and network expansion costs. But the stock remains up 12% since February 2017 compared to a 25% decline in European telco stocks overall during the same period. Telenor's transformation plan therefore has been a success from a telco investment point of view, and changed investors' views about the potential for cost cutting to drive share price performance.

Telenor announced a plan to cut OpEx overall by 1% to 3% annually from 2018 to 2020 and to grow revenue organically by low single digits. This guidance may not seem like much, but it was a big deal – few CSPs had managed to grow revenue and shrink costs at the same time over a multi-year period.

So, this guidance suggested a break with the past. Telenor got off to a good start, with OpEx falling a net 3% per year in 2017 and 2018. Underlying revenues were up slightly, and earnings before interest, taxes, depreciation and amortization (EBITDA) was up 6% annually.

At this time, European telcos were known for flat or declining EBITDA. The Telenor share price duly rose 46% over the first year of the company's plan, while the wider telco sector index was flat. This increased the credibility of digital transformation as an investment theme, and analysts and investors in Europe started to ask other CSPs if they had similar plans.

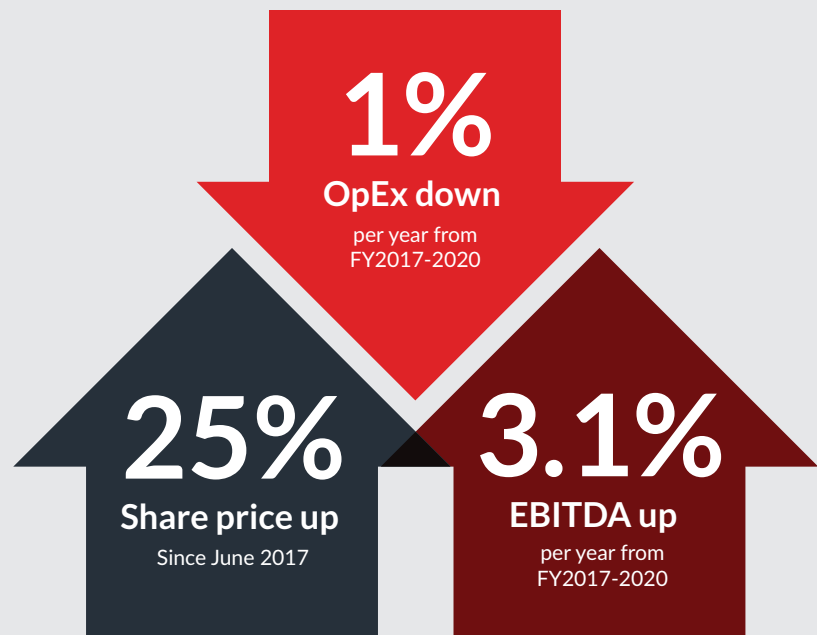
Spark New Zealand's share price climbs

In 2011, Spark New Zealand was spun off as the mobile arm of Telecom New Zealand. Without a fixed-line network to lean on, Spark has been forced to run its operations more efficiently to remain competitive and grow earnings. This pressure led to early digital transformation.

In June 2017 Spark CEO Simon Moutter announced a plan to grow annually compounded revenues by up to 2% from fiscal year 2017 to 2020 and lift EBITDA margins into the low 30% range, from 28% in 2016. The company planned to decrease labor costs rather than continue its recent trend of increases.

Spark broadly met the three-year financial targets: Revenue was flat over the period, and EBITDA grew 3.1% per year. OpEx fell a net 1% annually over the three years, with the number of employees declining

Spark's investment story



TM Forum, 2021

11%. Labor costs were down 2.4% a year, and other indirect OpEx was down 6.9%. Like Telenor, cost savings were greatest in the first year of the

plan and slowed in fiscal year 2020. Spark stock is up 25% since June 2017, a significant achievement for a stock with no top-line growth.

Vodafone finds savings

British multinational operator Vodafone Group has been successful with its digital transformation strategy, but the company's share price has not risen as much as Telenor's or Spark's. In May 2018 Vodafone announced that \$9.5 billion of its annual operating costs were in areas open to savings from digitization. The company followed up in November 2018 with an explicit plan to cut OpEx in Europe by approximately \$1.4 billion a year by fiscal Q3 2021.

Vodafone cut it by about \$475.5 million in Q3 2019 and Q3 2020, with Group EBITDA margins rising 1.5 percentage points as a result and EBITDA remaining flat despite 2% revenue erosion per year. Unfortunately, the

stock performance has been disappointing, down 36% since May 2018, whereas the sector is down 20%.

Vodafone's revenue trends have been disappointing due to price competition in Spain and Italy and more recently the impact of Covid-19. Furthermore, the company's plan was not such a positive surprise to investors as Vodafone had already cut costs significantly from 2016 to 2018. Because investors understood the company's transformation story, some level of continued cost cutting was already priced into Vodafone's share price by May 2018.

Pressure down under

Australian incumbent CSP Telstra announced its transformation plan in June 2018. At the time, the company's

stock price was under significant pressure, halving over the prior two years as the threat from the government broadband network, NBN Co, grew.

Telstra CEO Andrew Penn announced a three-year plan to cut annual OpEx by about \$762 million, aiming to cut two layers of management, reduce staff by 8,000, reduce customer service calls by two thirds and trim product offerings from 1,800 to just 20. This was the most aggressive transformation plan announced to date, reflecting the particularly strong revenue pressure on the Telstra business.

OpEx fell a net 3% per year over the first two years of the plan, and revenues fell a larger 5% annually.

Profits therefore have continued to fall, but at a slower pace than expected by investors prior to June 2018.

Telstra's stock has climbed a creditable 13% since June 2018, despite this considerable revenue pressure.

Investors learned that ultra-aggressive transformation still wasn't enough to drive profits up when revenues were still falling significantly, but it was enough to turn the share price around in this case.

Several more operators have since explained their own digital transformation cost-cutting opportunity to investors – and it has become a component of the investment case for most operators. This is particularly the case with CSPs facing a weak revenue outlook, with cost cutting the only way to grow earnings.

For example, transformation is a core part of the outlook for KPN and Orange, and AT&T has also discussed transformation-led cost cutting in the US. In contrast, CSPs with somewhat faster-growing businesses, such as Comcast, Charter Communications, T-Mobile US and Verizon, are much less vocal about their cost cutting plans.

Little change

Despite all this, the digital transformation process has not had as much impact on investors' views of the telecoms sector overall. While

transformation leads to fundamental change in how telcos are run, their cost bases and relationships with customers, investors have not changed how they view the sector for several reasons.

Firstly, bond yields have continued to fall in recent years, leading investors to favor growth stocks (companies with significant revenue growth) over companies with low growth but higher cashflow like telcos. The good news is this may be about to change, depending on how fast the global economy recovers from the pandemic. As the outlook for economic growth improves, long-term bond yields would rise, with investors then paying less of a premium for growth stocks and relatively more for other stocks like telcos'.

Secondly, the investor experience with CSPs' cost transformations is still quite stock specific. Maybe Telenor was a special case in that transformation allowed the company to move departments to its lower-cost Asia operations. Telstra and Spark are not on the radar for many investors, and Vodafone's stock is down since unveiling its plan.

Also, tracking the progress made on cost cutting is not straightforward for investors. As we'll see in the next section, most operators do not break out costs, typically reporting only three or four categories such as direct costs, labor costs and other OpEx.

How costs are allocated between these different buckets is obscure, varies by company and can change. Continued changes in accounting standards have also muddled the water significantly, making analysis of cost trends over the last three years difficult.

This lack of visibility also makes it harder to gauge how much more cost cutting potential remains. Transformation leaders like Telenor have been extending the program three years or so. But it is very difficult for

investors to judge whether the program can last beyond that, which holds them back from buying telco stocks with more enthusiasm and in turn limits the impact of the transformation theme on share prices.

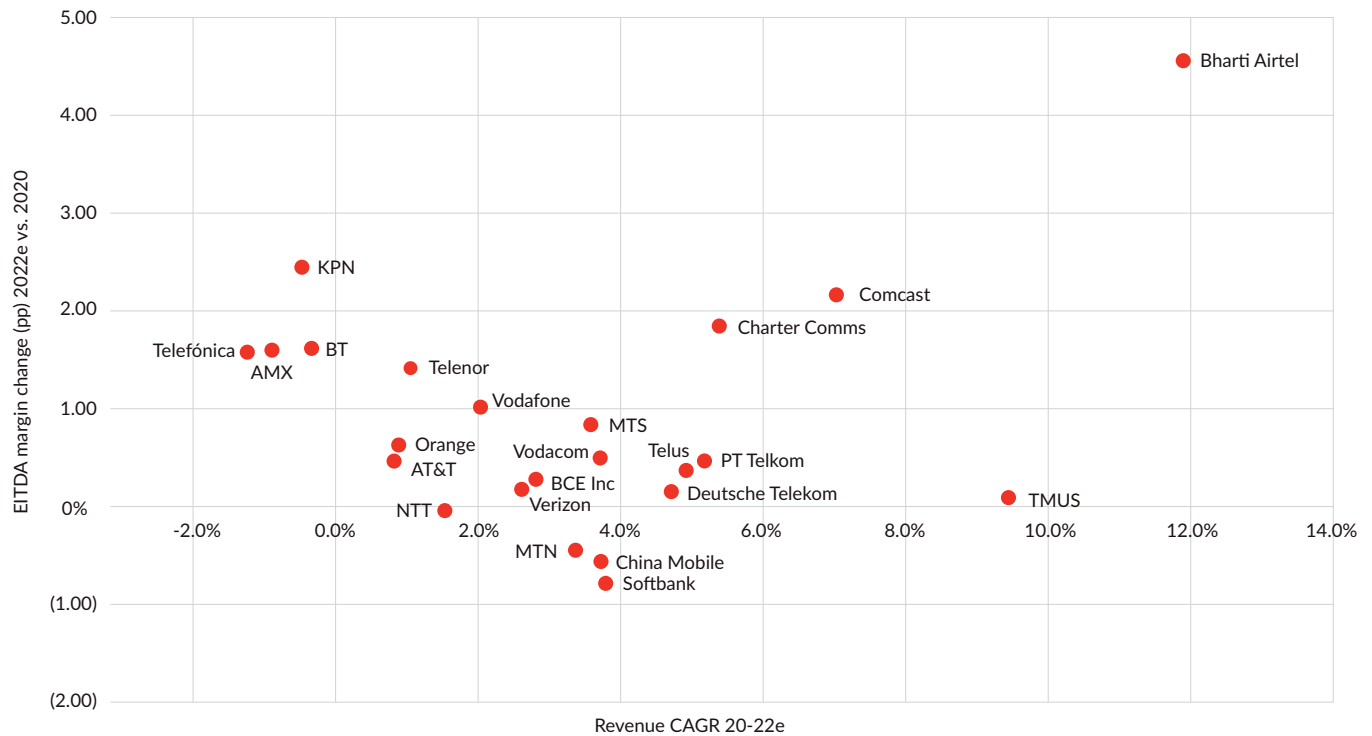
Other factors continue to dominate the outlook for telco earnings, in particular the prospect (or not) of revenue growth. Few operators are growing, and Covid-19 has weakened revenues, meaning that despite many CSPs realizing three years' worth of digitization in just six months as customers work from home, EBITDA didn't surge. The \$81 billion recently spent on 5G spectrum in the US has also reminded investors that years of hard-fought cost cutting benefits can be spent quite quickly elsewhere in the business.

Finally, few CSPs guide an overall net decline in OpEx the way Telenor did. AT&T plans \$2.37 billion run-rate savings by fiscal year 2022 on a gross basis, meaning before other cost factors. BT targets \$1.38 billion gross savings by fiscal year 2023, while DT aims for \$1.78 billion gross saving and Orange for \$1.42 billion net savings in indirect OpEx. The savings described are significant but not quite enough for the companies to guide an overall decline in costs. Hopefully some of these factors will improve as the economy recovers.

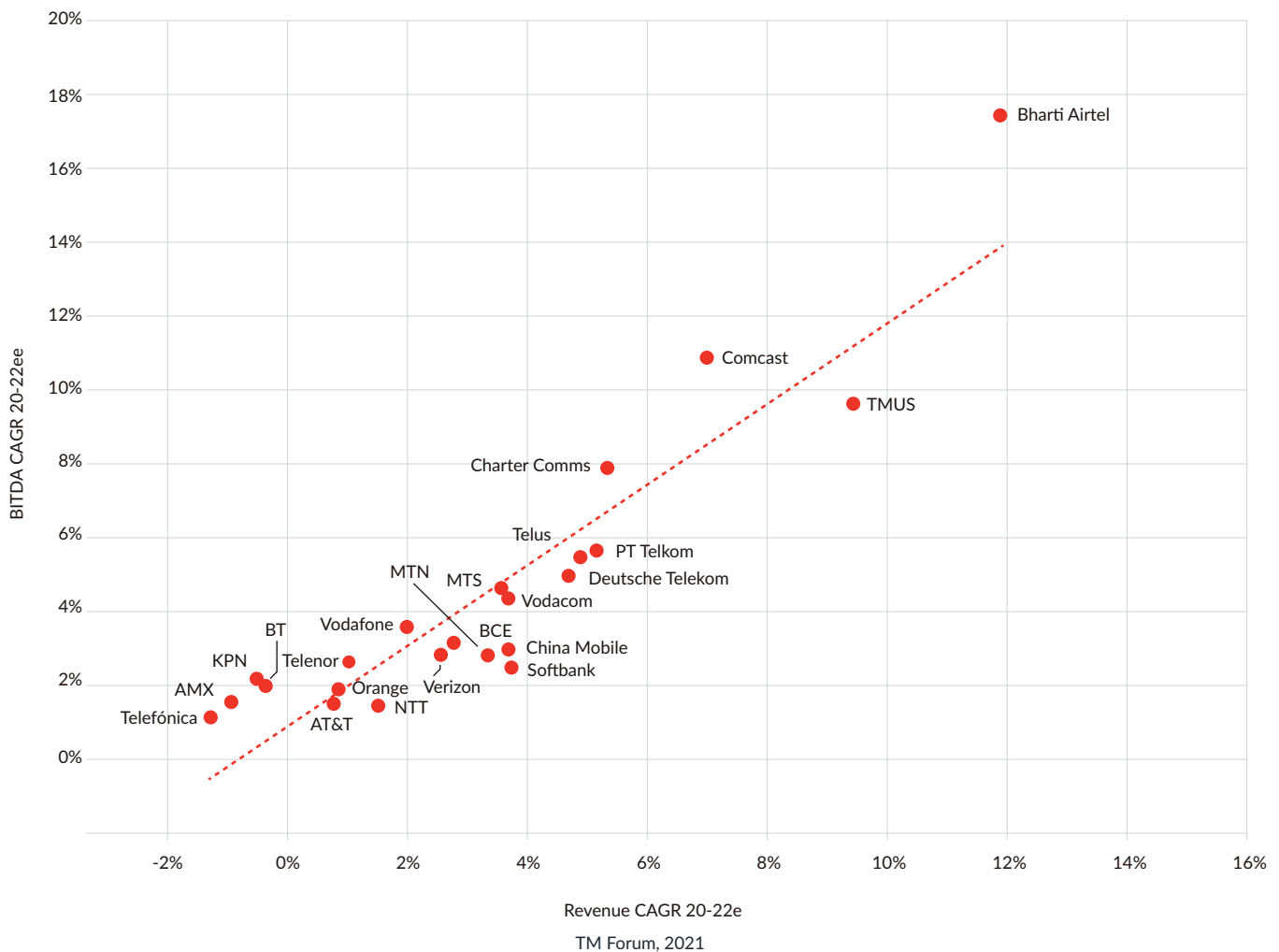
Underestimating potential

Interestingly, the CSPs with the poorest revenue outlook appear to be transforming the most. This is evident in stock market consensus. The graphics on [page 12](#) show consensus forecasts for EBITDA margin expansion for some of the largest quoted telcos globally, compared to forecasts for revenue growth.

Consensus forecasts for EBITDA margin growth vs. revenue growth



Consensus forecasts for EBITDA growth vs. revenue growth 2020-22



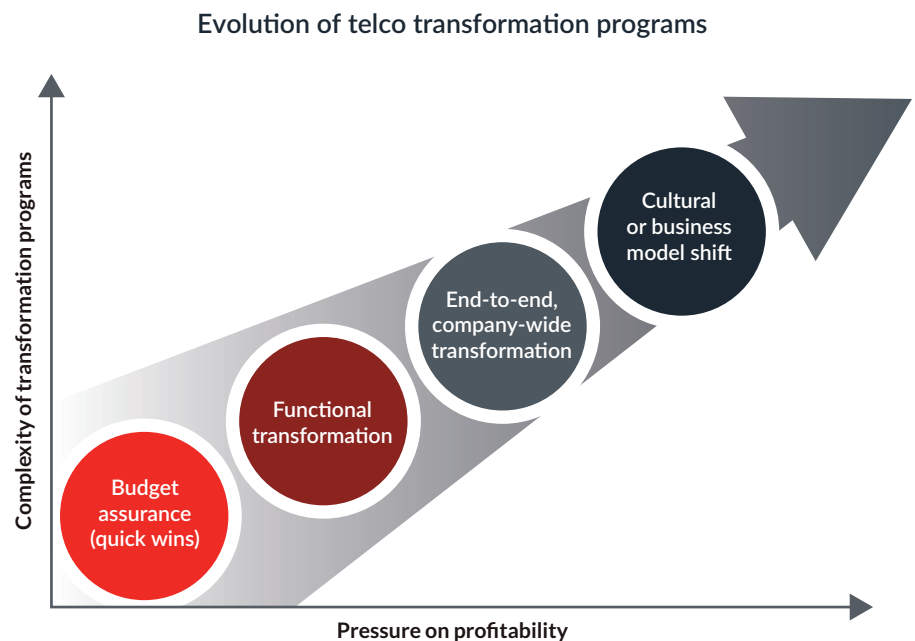
CSP margin growth should naturally correlate with revenue growth, due to the operating leverage of telecom networks – that is, a high mix of fixed costs. Indeed, analysts expect decent margin expansion at the relatively high-growth US cable companies.

However, the operators with the highest expected margin growth are those with the worst growth prospects. These forecasts largely reflect guidance from the companies themselves and show that CSPs' cost transformations are examples of necessity being the mother of invention.

Risks & rewards

As many CSP executives have described, digital transformation is time consuming, painful and risky. Consultancy A.T. Kearney sees transformation as a four-phase process, during which operators gradually become more confident and ambitious with their digital transformation plans. Operators start with projects to meet divisional cost targets and end with a complete change in the way the business is run. Each stage is more challenging and requires a bigger time commitment from the leadership team.

Executives at companies with flat or declining revenues are incentivized to take the risk, but if the business is growing quickly, there is less reason to do so. Ultimately, this is a bullish conclusion, suggesting significant potential for cost cutting for most of



TM Forum, 2021 (source: A.T. Kearney)

the other operators in the sector, once they are ready to commit.

Unfortunately, cost cutting alone likely will not be enough to drive telco share prices up significantly without a recovery in revenue growth. In this way, a transformation project that lifts ARPU and drives sustainable revenue growth is going to be worth more to the stock price than all the work done on cost transformation.

Right now, digitization does not appear to be lifting revenues, leaving CSP executives to focus on costs. But perhaps it is too early for revenue benefits to emerge.

Transformation resets the relationship with the end customer and disintermediates factors that have undermined ARPU in the past, particularly dealer-driven churn, bill shock and very poor customer service.

There is still potential to lift ARPU, for example by upselling customers to unlimited data bundles, for which customers appear willing to pay a premium. If digital transformation helps deliver ARPU growth and changes the telco business, then it will change the telco stock price as well.

In the next section we'll look more closely at the categories that make up CSPs' OpEx costs.

Section 3

Inside the OpEx black box: Comparing expenses

It is difficult to identify and understand all the categories that make up communications service providers' (CSPs') operating costs because very few companies break down OpEx when reporting financial results. And if they do, they often categorize the expenses in different ways. In this section, we analyze OpEx reports from five companies operating in Europe, the Middle East and Africa to highlight key categories and trends.

The graphics on pages 15 and 16 show OpEx categories as a percentage of total revenue for BT, MTN South Africa, Ooredoo, Orange and Telenor. Ooredoo, Orange and Telenor are active in several countries and regions and represent a wide range of developed and emerging markets. MTN Group also operates in many countries, but the financial data analyzed in the report is only for its South African operating company. BT operates only in the UK.

Categorizing OpEx

In addition to looking at the companies' reported OpEx, we wanted to map their spending to the direct and indirect operating costs we identified in our research (see the *Key telco operating expenses* graphic repeated from the report's introduction).

Key telco operating expenses



TM Forum, 2021



The UK's largest telecoms operator with fixed, mobile and TV businesses; as part of its TV business, the company has acquired extensive sports rights; it is also a strong player in B2B services nationally and internationally via BT Global Services

105,300
employees

30 million
consumer subscribers

1 million
enterprise customers

\$29.9 billion
2020 revenue



Labor	20.9%
Product costs & sales commissions	19.5%
Payments to telecoms operators	7.7%
Property & energy costs	4.4%
Network operating & IT costs	3.9%
TV rights	3.8%
Provision & installation	2.6%
Marketing & sales	1.3%
Other operating costs	2.2%

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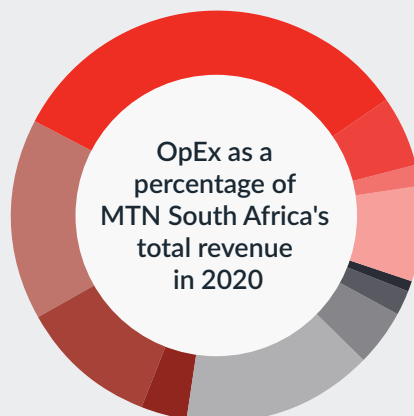


South Africa-based converged telecoms company with operations in 23 countries; largely a mobile operator but recently has expanded into broadband connectivity and mobile money

19,288
employees

273.4 million
subscribers
(32 million in South Africa)

\$11.7 billion
2020 revenue
(\$3.2 billion for South Africa)



Handsets & other accessories	20.0%
Interconnect	3.4%
Roaming	1.0%
Commissions	4.6%
Government & regulatory costs	0.4%
VAS/digital services revenue share	1.3%
Service provider discounts	2.6%
Network & IS maintenance	9.2%
Marketing	2.1%
Staff costs	6.6%
Other OpEx	9.6%

TM Forum, 2021



Middle Eastern & Asian converged telecoms company headquartered in Qatar, with additional operations in Algeria, Indonesia, Iraq, Kuwait, Myanmar, Oman, Singapore & Tunisia; has experienced significant growth over the last six years, transforming from a single market operator in Qatar to an international communications company with a global customer base

15,960
employees

115 million
customers

\$7.9 billion
2020 revenue



Employee salaries & associated costs	11.3%
Marketing costs & sponsorship	2.4%
Commission on cards	2.4%
Legal & professional fees	0.6%
Rental & utilities	0.4%
Allowance for impairment of trade receivables	1.1%
Repairs & maintenance	0.3%
Other expenses	2.2%
Outpayments & interconnect charges	7.6%
Regulatory	8.6%
Rentals and utilities (network)	4.0%
Network operation & maintenance	7.9%
Cost of equipment sold & other services	9.1%
Provision for obsolete & slow-moving inventories	0.1%

TM Forum, 2021

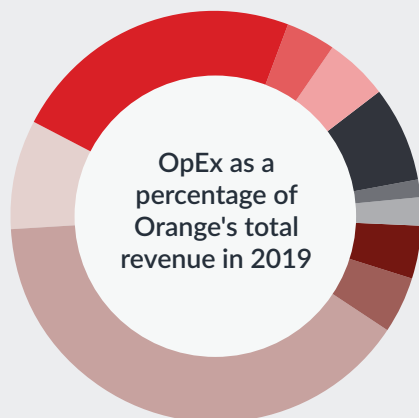


Converged telecoms group headquartered in France with operations in 26 countries; operates fixed and mobile networks in France, Spain, Poland, Romania, Belgium, Slovakia and Moldova; company's African footprint takes in many French-speaking countries in West Africa and North Africa; also a leading providing of global telecoms services to businesses through the Orange Business Services division.

142,150
employees

266 million
subscribers

\$50.5 billion
2019 revenue



Labor	16.1%
G&A	2.6%
Real estate	3.6%
IT&Network	5.1%
CRM	1%
A&P	1.6%
Others	2.9%
Enterprise IT	3.1%
Intercarrier, sales and marketing, content and equipment	27.4%
Africa and Middle East	5.9%

Note: data is a snapshot of operating costs for 2019 presented during a financial results presentation in 2020
TM Forum, 2021



Converged operator headquartered in Norway with additional operations in Bangladesh, Denmark, Finland, Norway, Malaysia, Myanmar, Pakistan, Sweden & Thailand; provides primarily mobile services in Asia and fixed, mobile and TV services to consumers and enterprises in Europe.

20,044
employees

182 million
subscribers

\$14.8 billion
2016 revenue



Staff & personnel	10.1%
Sales & marketing	8.3%
Operation & maintenance	5.3%
Regulatory	4.1%
Other	9.8%

Note: financial data is from 2016 – Telenor does not typically break down OpEx in its financial results but did so in 2016; numbers are likely to have changed because of aggressive cost-cutting particularly reducing staff

TM Forum, 2021

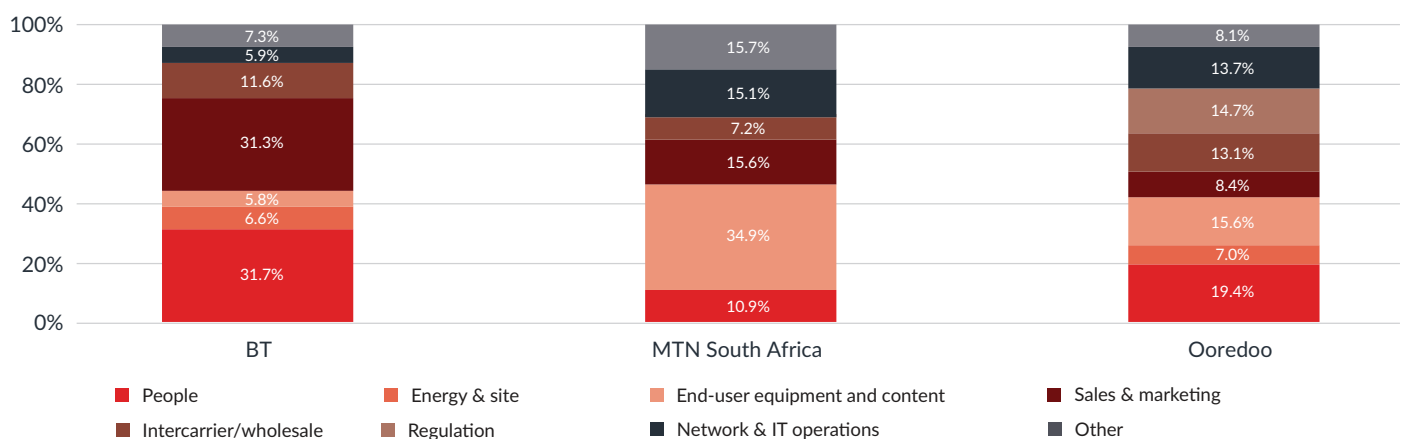
Globally, telecoms operators are becoming increasingly confident about making commitments to future OpEx savings across these categories enabled by digitization programs, restructuring and other initiatives. In some cases, CSPs make specific reference to savings achieved through adoption of cloud-based technologies and automation.

The graphics below show how the three companies that reported 2020 OpEx data compare when it comes to spending in the categories we've defined. We recognize that this data is imprecise because some of the expense categories used by the operators do not correlate with ours.

The first graphic shows expense categories as a proportion of total

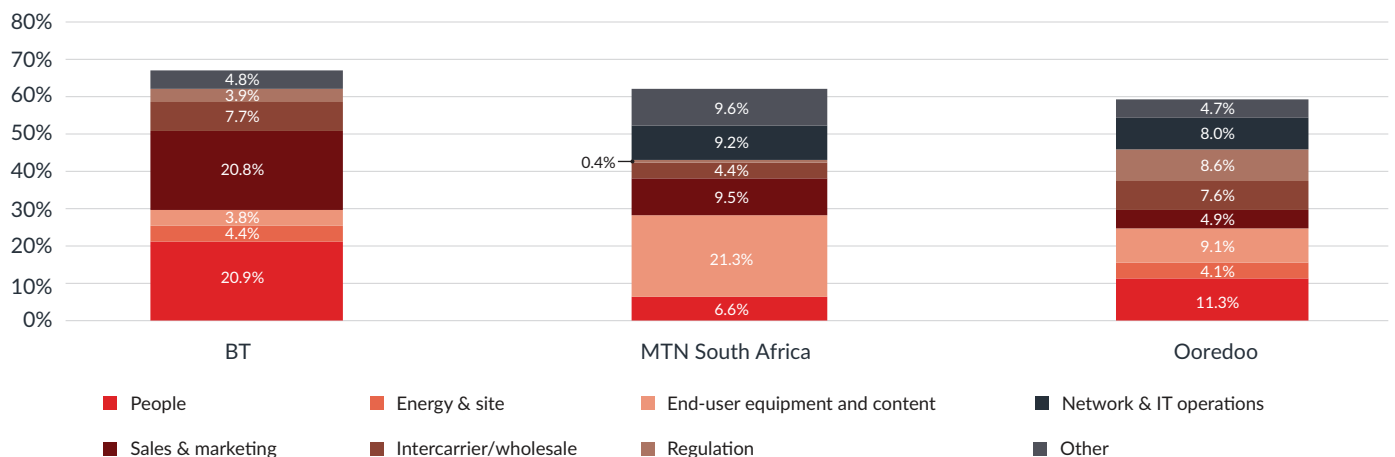
revenues, while the second shows expense categories as a percentage of total OpEx. We have opted to exclude Orange and Telenor from the charts because their data is not current, but we have included individual tables on the next page to show the breakdown of their spending in the designated OpEx categories in 2019 and 2020, respectively.

Comparison of TM Forum-identified OpEx categories as a percentage of total OpEx in 2020



TM Forum 2021

Comparison of TM Forum-identified OpEx categories as a percentage of total revenue in 2020



TM Forum 2021

People

Staff costs vary in the companies analyzed, from 7% at MTN to 21% at BT. It is the biggest single OpEx category for many companies, although in some cases it is second to spending on sales and marketing.

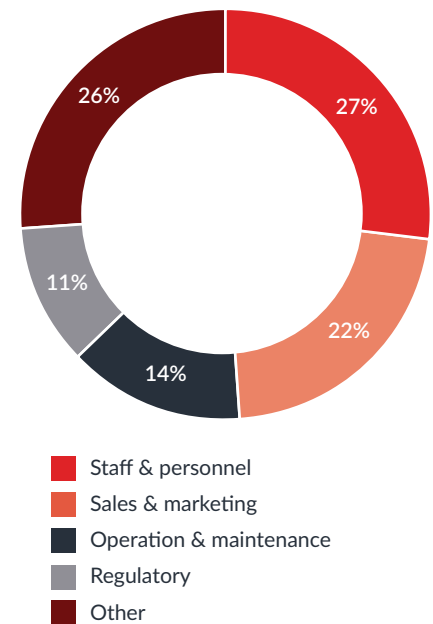
Comparisons among operators are not always accurate because in some cases figures include temporary staff and consultants. Numbers also may vary based on CSPs' retail and distribution strategies. For example, companies operating in developed markets are more likely to have their own shops – and therefore staff – than those in developing markets.

It would be useful for CSPs to show staff costs by department. Indeed, when operators consider how to cut

costs in different areas, the expenses incurred to employ staff are often the most closely scrutinized. However, among the companies we researched, only Telenor disclosed this kind of data.

During its 2017 financial results presentation, Telenor indicated that it spent a total of \$5.2 billion on OpEx. The graphic opposite shows the type of expenses as a percentage of total OpEx. The data, which was difficult to correlate with the company's 2016 published OpEx data, reveals that spending on sales and marketing was nearly 30% of total OpEx compared to just 22% in 2016 when staff costs were separated. Combined network and IT spending comes to 28% of total OpEx in 2017, which is double the cost bases that separates staff costs. This indicates that staff costs represent around 50% of total network and IT costs.

Telenor's spending categories as a percentage of total OpEx in 2016



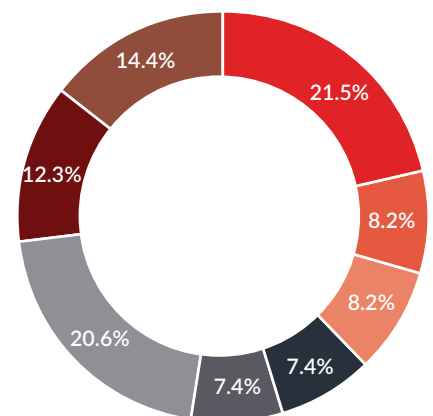
TM Forum, 2021

Orange Group's spending in TM Forum-identified OpEx categories in 2019

	Spending as a percentage of total revenue	Spending as a percentage of total OpEx
People	16.1%	23.2%
Network & IT operations	5.1%	7.3%
Other indirect costs	14.6%	21.1%
Other indirect African & Middle East costs	5.9%	8.5%
Other direct costs	27.4%	39.7%

TM Forum, 2021

Telenor's spending categories as a percentage of total OpEx in 2017



TM Forum, 2021

Telenor's spending in TM Forum-identified OpEx categories in 2016

	Spending as a percentage of total revenue	Spending as a percentage of total OpEx
People	10.1%	27%
Sales & marketing	8.2%	22%
Regulation	4.1%	11%
Network & IT operations	5.2%	14%
Other	9.7%	26%

TM Forum, 2021

Globally, most operators are reducing staff annually unless they have acquired other businesses or are expanding into a new markets such as pay television. As noted in [Section 2](#), 10 of 14 CSPs cut staffing levels in the period from 2011 through 2019. Among the four operators that increased staff, BT and Telefónica Deutschland made significant acquisitions of competing mobile operators during the period.

Sales & marketing

Sales and marketing is the most difficult category to analyze because of the different ways CSPs categorize their costs. Our research shows that spending in this category ranges from about 5% at Ooredoo to more than 20% at BT.

BT's biggest sales and marketing expense in 2020 was "product costs and sales commissions". This likely comprises the cost of subsidizing mobile devices in addition to commissions paid to sales staff. One of the reasons Ooredoo's sales and marketing expenses appear lower is because we chose not to include the company's category "cost of equipment sold and other services". If we had, Ooredoo would have spent about 14% on sales and marketing.

The difference in spending between BT and other CSPs is largely due to the high cost of acquiring subscribers which operators in Europe and North America tolerate in order maintain their share of new subscriptions. Operators in these regions tend to have much higher average revenue per user (ARPU) than operators in southeast Asia or Africa, so customers have a higher lifetime value.

However, high subscriber acquisition costs can effectively wipe out the benefit of higher ARPU levels. Some investors believe that any benefits resulting from digitization and cost cutting brings tend to be lost because operators use the gains to find higher spending on customer acquisition.

Network & IT

CSPs try to capitalize network and IT

costs wherever possible in order to delay recognizing expenses and because investors have traditionally used EBITDA margins as their preferred way of measuring CSPs' success. All hardware and software that is owned by telecoms operators is capitalized. OpEx items in network and IT can include the following:

- Employees (however, as previously discussed most operators report labor costs separately)
- Any IT or network capabilities that operators buy as a service
- Maintenance and repair costs and rental fees, plus the cost of regular software upgrades, patches and bug fixes
- Expenditure on public cloud services
- Research and development
- Energy to power the network (although many operators also report these costs separately – see below)

In our analysis network and IT opex costs represented between 4% and 9% of total revenues. Costs can vary based on whether operators outsource their network and IT capabilities and then buy them back as services, which results in OpEx, or whether they include the costs in other categories such as customer management.

As telecoms operators digitize their businesses and migrate workloads to the cloud, particularly the public cloud, network and IT expenditures will change. Many CSPs are entering into deep relationships with hyperscale cloud platforms such as Amazon Web Services, Microsoft Azure and Google Cloud Platform. The services they buy from the cloud providers are categorized as OpEx, but previously these costs were considered CapEx. We'll explore this more in the next section.

Energy & site

Spending on energy is a growing concern for telecoms operators, partly because of demands stemming from surging traffic and also because of the growing importance and prioritization of carbon reduction. Many companies

are making commitments to switching to renewable energy sources.

In mobile networks, most energy consumption is in the radio access network, but transport and core facilities and data centers require power too. Energy usage and costs have been increasingly modestly worldwide. In many developing countries the ability to deliver energy to cell sites that are off the grid can be a competitive differentiator for mobile operators.

[Ericsson estimates](#) that the telecoms industry spends about \$25 billion a year on mobile network energy costs, which is equivalent to approximately 2.5% of total operator revenues. Meanwhile, [McKinsey & Company estimates](#) that energy costs represent 3% to 5% of total revenues.

Only BT and Ooredoo broke out expenditure on sites and energy in their financial reporting, and even though their businesses are very different, both reported OpEx costs around 4% of total revenues. However, the figures do not separate energy costs from site costs, which are primarily rental payments to third parties in exchange for deploying base stations on their property.

Intercarrier payments

Wholesale services have always been a feature of telecoms businesses, although the business model has evolved in recent years from being voice centric to focusing on data. The segment includes payments for national and international roaming.

There is no reason to think that intercarrier payments will change significantly. CSPs will continue to buy services from other operators to ensure interoperability and the delivery of end-to-end services to customers. However, new categories may appear such as intercarrier payments relating to edge computing services.

In the next section, we'll look at the impact of technology, particularly cloud and automation, on telco OpEx.

Section 4

Impact of new technology on telco OpEx

There is no doubt that technology such as cloud computing, automation and AI will impact communications service providers' (CSPs') costs. For example, as operators transition from hardware- to software-based businesses and migrate IT and network workloads to the public cloud, spending will shift from CapEx to OpEx. But it is unclear whether total expenditure will change significantly.

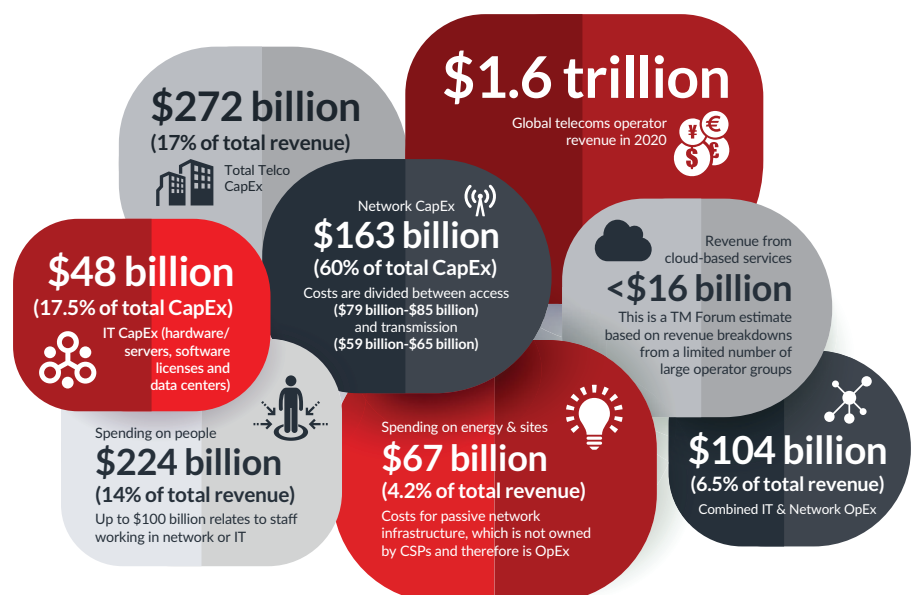
In addition to the shift from CapEx to OpEx, the factors listed below will impact costs, spending and how costs are allocated. However, not all operators will be impacted equally. For example, in markets where people are paid low wages, automation might produce fewer benefits than in countries where the average salary is high. In our analysis in [Section 3](#) of operators' OpEx, labor as a proportion of total revenues was 6.6% at MTN South Africa but 20.9% at BT.

- As automation advances, spending on staff will continue to decline as operators need fewer people to perform manual processes
- The average cost of an employee is likely to rise as CSPs replace low-paid staff (customer service reps doing jobs which will become automated with skilled staff) with software skills or a combination of commercial and technical skills. This could wipe out some of the savings achieved through automation.

- Spending on networks (CapEx) will increase marginally in the short to medium term as operators accelerate fiber and 5G deployment
- Total spending on IT will increase over the next two to three years as operators implement digital transformation programs

The graphic below (repeated from [Section 1](#)) shows a snapshot of CSPs' current combined revenue and spending. Based on this, we can assess which expenditure categories will become a target for cloud spending in the future.

2020 telecoms revenue & spending estimates



Note: Figures are sourced primarily from TM Forum's analysis of CSPs' 2020 financial results but also include IDC's estimate of \$1.6 trillion in total global telecoms operator revenue for 2020. All figures are estimates, and CapEx and OpEx figures are averages of high and low percentages of total spending.

TM Forum, 2021

Network spending

The \$163 billion that operators spend on their networks today is made up of passive and active mobile and fixed infrastructure, such as radio access network (RAN) equipment, switches and routers, cables, and fiber ducts. CapEx also includes money spent on land and buildings, which comprises about 10% of CapEx, and on devices such as set-top boxes, which makes up 9%. Only a small part of CapEx will ever be a target for cloud investment: the computing elements that can be disaggregated and centralized.

Until now operators have been reluctant to consider the public cloud for network expenditure, but as mobile operators roll out 5G core networks and push capabilities to the edge, this could change. Virtualization of network functions has been taking place over several years, and many operators plan to evolve to fully cloud-native core networks. Furthermore, many large CSPs have committed to deploying open RANs which require new centralized computing facilities, most likely at the edge.

IT moves to the cloud

The \$48 billion that CSPs spend on IT CapEx is a prime target for public cloud providers. As operators go through the process of simplifying and transforming IT applications and workloads across the business, many will migrate IT workloads to the public cloud. Similarly, the \$104 billion spent on combined network and IT OpEx is a target.

In our analysis of OpEx breakdowns in [Section 3](#), we separated the costs for IT and network operations, staff, and site and energy. However, these must be figured together when considering the impact of cloud and automation on OpEx levels.

Based on conversations with CSP executives, we estimate that spending on staff working in IT and network departments is similar to the departments' other OpEx, which means that telcos are spending about \$104

billion a year on "people" costs in the IT and network departments. Spending on sites and energy amounts to \$67 million. Based on this data, the total, combined figure for network and IT OpEx is close to \$275 billion or about 17% of revenues.

As applications and workloads migrate to the cloud, operational roles and responsibilities will change and, in some cases, disappear. Plus moving network functions to the cloud will alter energy requirements. Many open RAN protagonists argue that a new open architecture will generate savings because current RAN architecture is inefficient in its use of energy. Savings could also be made on site acquisition and rental if less space is needed for computing functions.

OSS/BSS savings

Overall, the potential for cost savings may be greater in the network than in IT because network spending is so much higher than IT expenditure. However, cost savings in IT may be more tangible and achievable in the short term.

A handful of cloud native software vendors, whose products are only available on the public cloud, are starting to make cost-saving claims for operational and business support systems (OSS/BSS) that are so promising even the most cautious telcos are taking notice.

Mark Collins, Senior VP of Commercial Product Management at ZephyrTel, for

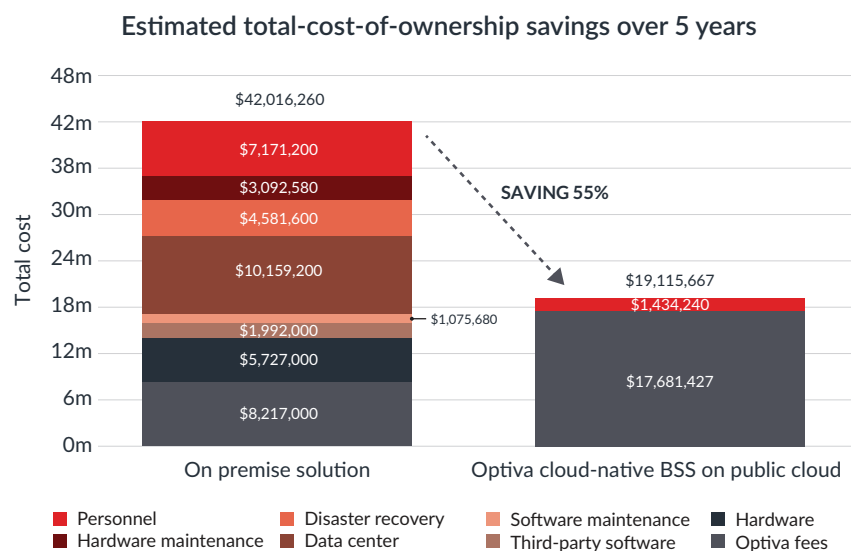
example, says use of the company's cloud native OSS/BSS solutions can reduce CSPs' total cost of ownership by up to 80% over a five-year period. Optiva also promises savings of up to 80%. The company even includes a [handy calculator](#) on its website to help CSPs estimate their potential savings by moving applications to the cloud.

The graphic below, reproduced from an Optiva screenshot, shows the calculation the company produced for a mobile operator in Brazil with more than 20 million customers, two thirds of whom are using prepaid services.

Another CSP technology partner, IT integration specialist Torry Harris Integration Solutions, estimates that CSPs can make 40% cost savings through the avoidance of operational challenges such as frequent hardware upgrades, time spent on manual deployments, prolonged development and release cycles, and frequent production deployment roll-backs.

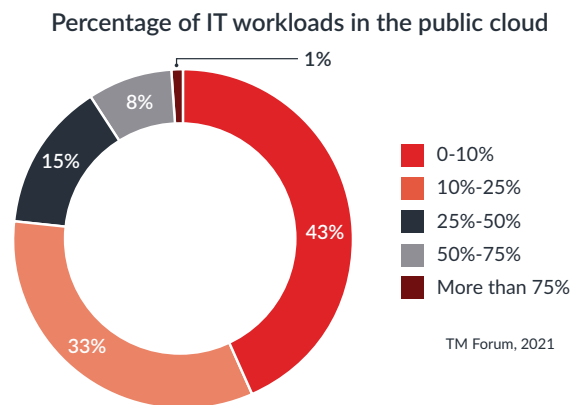
Migration begins

Most CSPs have begun migrating IT (and even some network) workloads to private, public or hybrid clouds. We are not aware of any mobile operators that have completely migrated to the public cloud, although many have business units such as MVNOs which are fully cloud native.



TM Forum, 2021 (source: Optiva)

Our upcoming *Digital Transformation Tracker 5* looks at the state of cloud migration and finds that three quarters of CSPs have moved less than 10% of IT workloads to the cloud. But at the same time, a quarter of operators say that they are absolutely committed to taking a cloud native approach for all their IT workloads, and more than half say they



Assessing network and IT cost savings at Rakuten

Japan's Rakuten Mobile is perhaps the biggest evangelist of cloud native, open networks. The company's Rakuten Cloud Platform (RCP) is a revolutionary cloud native network and support systems environment based on open RAN standards. Now Rakuten is offering RCP as a service to other mobile operators, allowing them to benefit from the company's approach.

Rakuten claims that RCP reduces CapEx by 40% compared to a traditional mobile network and OpEx by 30%. The tables below show a basic allocation of the costs.

It is interesting to consider the impact of the projected savings on the overall

business. On average CSPs' annual spending on CapEx is around 17% of total revenues (although clearly it would be much higher for an operator building a new network from scratch). Expenditure on the network accounts for 70% to 80% with IT accounting for an additional 10%. So, if Rakuten can cut its network CapEx by 40%, this is equivalent to saving around 5% of total revenue. These savings are from significant reductions in hardware and network deployment costs, and from centralization and the use of cloud-based software.

When it comes to OpEx savings, Rakuten is not explicit about which expense items would be impacted. In our analysis we found that IT and

network operations accounted for between 4% and 9% of total revenues. However, a significant proportion of Rakuten's savings relate to the need for fewer people to manage the network, both in the field and in operations centers.

Our analysis indicates that staff accounts for between 7% and 21% of total revenues (the lower figure applies to low-wage economies, the higher figure to high-wage economies). If people costs were not accounted for separately, network and IT operations costs would double. Based on these numbers, the OpEx savings projected by Rakuten would represent somewhere in the range of 3% to 6% of total revenues.

Rakuten's projected CapEx & OpEx savings

40% CapEx reduction				
	Traditional 5G network	RCP	% Change	Rationale for change
Total CapEx	100%	60%	-40%	N/A Less site equipment due to virtualization & pooling of capacity/resources
Software	30%	30%	0%	
Hardware	45%	17.5%	-60%	
Deployment	25%	12.5%	-50%	

30% OpEx reduction				
	Traditional 5G network	RCP	% Change	Rationale for change
Total OpEx	100%	70%	-30%	Less site equipment reduces footprint & power consumption
Rent & electricity	40%	30%	-25%	
Data centers	5%	10%	100%	Increased use of edge locations for low-latency use cases
Transmission	10%	15%	50%	Increased use of edge locations & transmission
Operations center	10%	5%	-50%	Automation & scale of the centralization of resources
Field maintenance	35%	10%	-70%	Less site equipment & automation in maintenance

TM Forum, 2021 (source: Rakuten)

AI & automation

Migration to the cloud does not always result in savings, and the real driver for moving many applications and workloads to the cloud may be agility. However, when cloud technologies are used with other new technologies like AI and machine learning, the potential to drive deeper cost savings can really kick in with automation.

Strategy consulting firm BCG reckons that the use of AI at scale across a CSP's value chain could result in a 10% increase in total revenues and a 20% reduction in costs. A TM Forum survey for an upcoming report about autonomous networks finds that two out of three CSP respondents see cost savings as a key driver for adopting automaton and AI (see below). They see the biggest potential for savings in network operations, network performance and customer care.

TM Forum members are working on automation and AI as part of the [Autonomous Networks](#) and [AI & Data Analytics](#) projects. The Autonomous Networks team has described the levels of automation that CSPs' networks and operations will go through on the way to becoming fully autonomous (see the

graphic on [page 24](#)), while the AI group is working on standards and best practices for AI and AIOps (AI in operations).

During an [ongoing Catalyst proof of concept](#), the AIOps team developed eight use cases that cut across customer experience, quality of service, business performance and efficiency:

- Predicting and preventing poor customer experience
- Predicting churn and using proactive techniques to retain customers
- Accurately monitoring service levels
- Identifying potential faults and their root causes in 5G networks before the issues generate impacts or outages
- Preventing customer complaints
- Performing preventive maintenance activities
- Deploying an intelligent operations and maintenance (O&M) framework for home broadband services
- Establishing closed-loop service assurance to continuously improve service quality and O&M efficiency

Quantifying the potential savings AIOps could generate is difficult, and many of the use cases will be hard to deploy. In

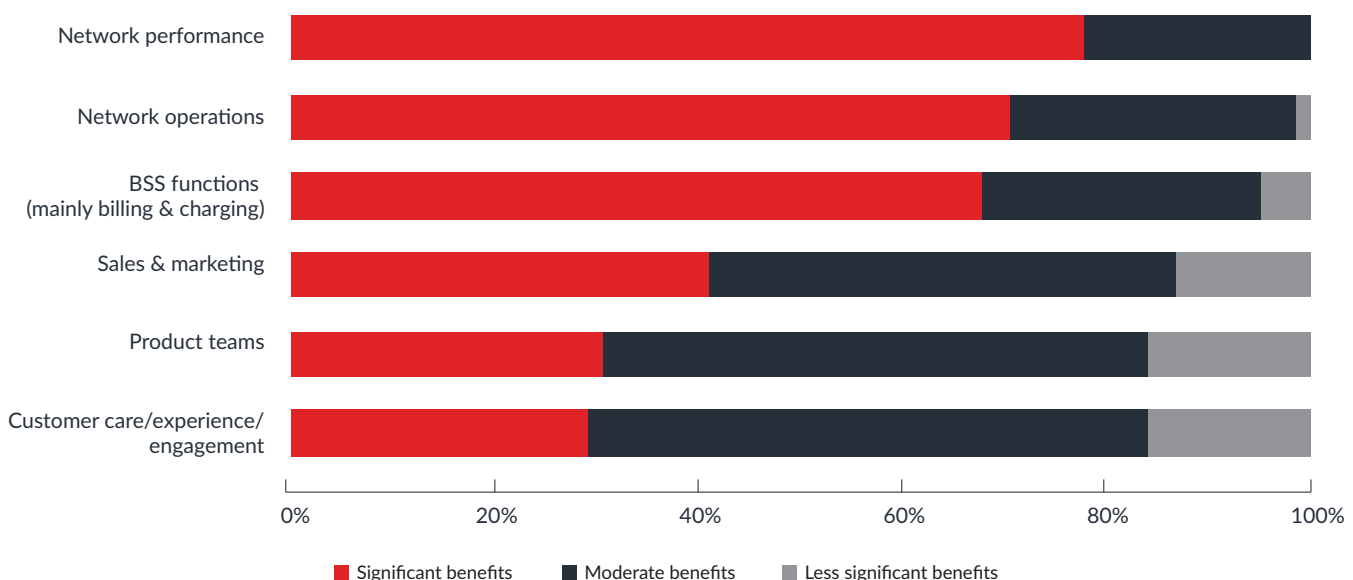
some cases, CSPs will need to be able to expose the right data at the right time. This requires a broad data governance strategy, which TM Forum members also are addressing with development of the [AIOps Service Management Framework](#). In other cases, applications and workloads will have to be moved to the cloud to support the use case.

Nevertheless, there are real examples of operators working with technology suppliers today to deploy new solutions and capabilities that are enabled by automation. [Blue Prism claims](#) that its customers are saving 30% to 40% on OpEx by using intelligent automation in customer contact centers. Other benefits include better customer experience and lower churn.

Similarly, transforming or even eliminating network operations centers (NOCs) leads to OpEx savings. Finnish telco Elisa claims to have an entirely automated NOC, with people intervening only when there is a major problem. To do this, the company has had to automate alarms in the network and program machines to fix the problem.

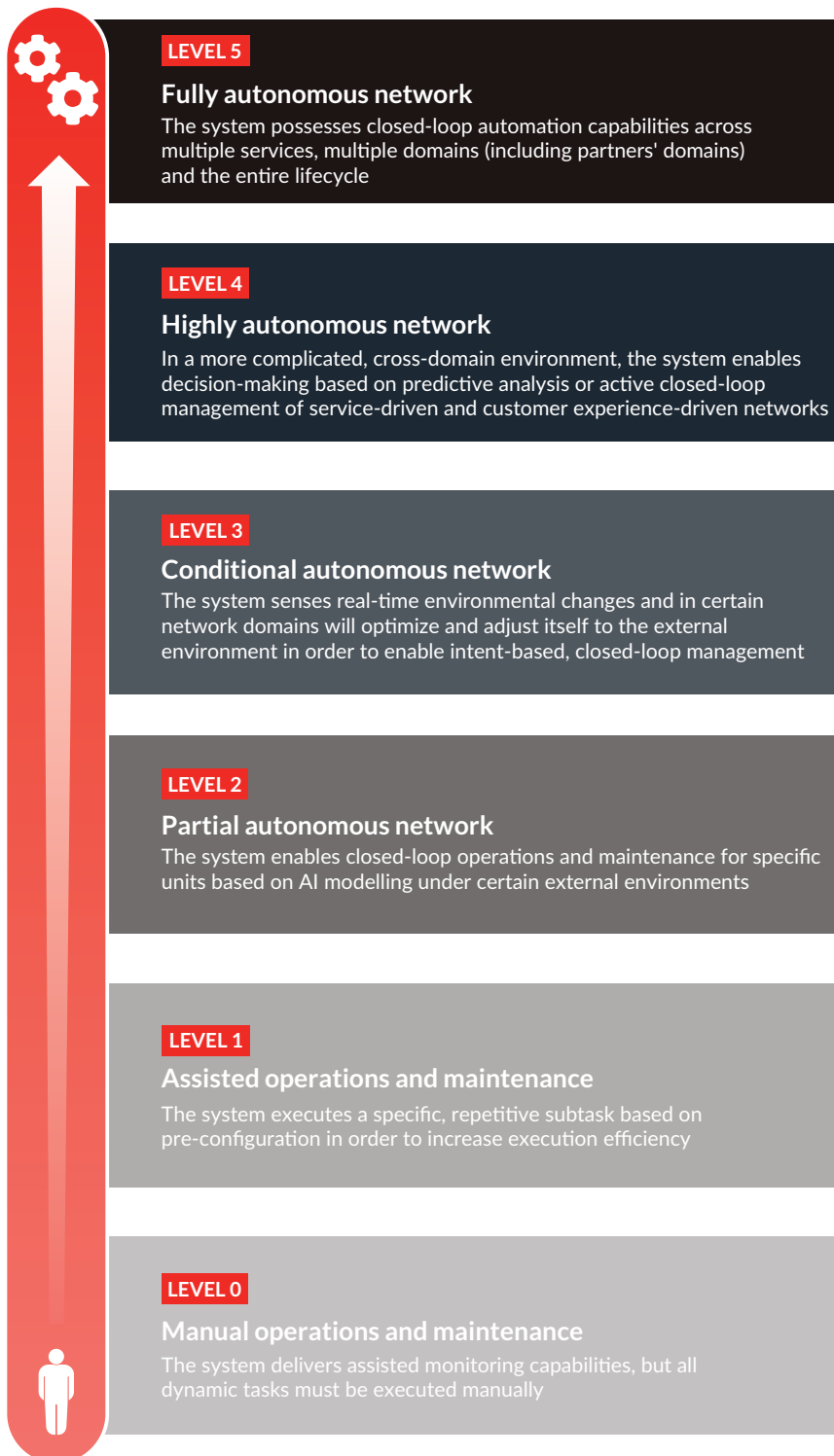
Vodafone Group is also embracing zero-touch operations in its NOCs.

Network & IT capabilities that will benefit from autonomous networks



TM Forum, 2021

Six levels of autonomous networks



TM Forum, 2020

Vodafone UK used to need about 1,500 people to manage its NOCs but this has fallen to the low hundreds, according to CTO Scott Petty.

From CapEx to OpEx

When we interviewed CSP executives in 2019 for [our research on procurement](#), we found some discomfort with the inevitable reallocation of spending on technology from CapEx to OpEx which will result from adoption of public cloud services. Telecoms operators have traditionally viewed CapEx as “good” expenditure. CSPs and their investors want to maintain good EBITDA (earnings before interest, taxes, depreciation and amortization) margins, and these would deteriorate with a significant migration of expenditure from CapEx to OpEx, since EBITDA is calculated by subtracting OpEx from revenues.

All the operators that we have spoken to in our research for this report have categorized expenditure on public cloud services as OpEx rather than CapEx, although many of them are actively engaged in discussions with public cloud providers to find ways of categorizing public cloud expenditure as CapEx. However, this isn't the only issue to consider.

When operators procure new technology, they need to make a case for a return on investment (ROI) on that technology. Purchasing physical data center (or on-premises) hardware tends to take place in three- or five-year cycles, which is why request-for-proposal and request-for-quotation (RFP/RFQ) processes require an ROI over a three-year period. Purchasing public cloud services requires a different way of looking at investment cycles and ROI.

The CSP does not need to invest in physical hardware – this is the job of the public cloud provider. So, logically this means that there is no need to look at a three- or five-year cycle. The question is whether operators are ready to make investment decisions that will bring longer-term benefits.

How costs are allocated and accounted for can affect decisions about whether to move applications to the public cloud. For example, some CSPs use separate departments to manage IT infrastructure and IT software and services. If the owner of IT infrastructure has a powerful role within the organization and can make the case that private data centers are an important part of the overall value of the business, it may be difficult to

make a strong business case for the use of public cloud.

When telcos start to sanction and encourage the use of public cloud services, there is a risk that total, organization-wide expenditure will not be optimized or managed. In a public cloud environment, there is little to stop any part of the organization from developing its own systems and deploying cloud assets as it sees fit.

Without the right controls in place, spending on usage-based public cloud services can surge dramatically. Nathan Bell, Chief Digital Officer at M1, recognizes that operators need to constantly monitor their usage of public cloud in order to manage costs.

“

It requires constant attention as if you're looking after your own garden,” Bell explains. “It's not like hardware where you take the view that if you've got it you'll find a use for it.”

In the final section, we offer guidance CSPs can use to embrace new technology and reduce costs.

Section 5

Make it happen – Strategies for reducing costs

It will become increasingly difficult for communications service providers (CSPs) to reduce costs through departmental budget cuts, especially when many large telcos have already made steep cuts. They must embrace new technologies like cloud, automation, machine learning and AI to reduce OpEx further – and impress existing and potential investors. Following are recommendations to help CSPs reduce costs as part of their efforts to transform digitally:



Think long term

When CSPs plan their investments in new technology, they typically think of a three-year return on investment (ROI). But if they are to benefit from public cloud services, they will need to take a longer-term view. Once operators have migrated applications and workloads to the public cloud, they no longer need to budget for new hardware because it is the public cloud provider that incurs the hardware costs. Cloud native software suppliers generally ask operators to measure five-year ROI rather than three.



Embrace automation

Executives in CSPs' technology organizations are comfortable talking about automation, but it is not well understood within the investor community. For example, there is little understanding about the different levels of automation, the relationships between automation, AI and cloud, and the potential business impact of increasing automation. CSPs need to be able to explain these relationships to investors and why benefits will increase as they progress through the different levels of automation. Operators also must be able to explain why 5G and edge computing require automation.



Change CapEx to OpEx

When operators move network and IT workloads to the cloud, they will necessarily incur OpEx. Many of the CSP executives we interviewed recognize that it can be more difficult to secure budget for costs that are categorized as OpEx rather than CapEx, for which there are well established approaches and principles. This is because CSPs and their investors use EBITDA margins as a preferred key performance indicator. This could dissuade CSPs from using public cloud services, causing them to miss out on key benefits such as flexibility, scalability and the ability to experiment and innovate with more confidence. To overcome such obstacles, CSPs should build compelling, holistic business cases for cloud migration that demonstrate clear savings across combined CapEx and OpEx categories.



Cut costs to lift revenue

To build new lines of revenue, CSPs will need to invest in new systems and platforms to deliver new services, but this is only part of the story. When it comes to delivering IoT connectivity, for example, operators must lower their own costs to enable them to reduce their prices to their customers. IoT ARPU has fallen dramatically in recent years. On average, IoT is generating less than \$0.50 per month in connectivity revenues. If operators want IoT connectivity to be profitable, they use to need new technologies and capabilities such as cloud native components and automation to radically alter their cost base.



Eliminate silos

CSPs have lot of legacy systems and processes. Over many years they have become siloed organizations with different cultures, vendor relationships and varying levels of digital maturity. If operators are to modernize technologies, architectures and working practices they must work across the silos. This means adopting a common culture, finding ways of overcoming technology fragmentation and introducing common targets and goals. This will require the adoption of new governance structures, more cross-departmental roles and teams and a reorientation of the whole organization towards the customer.



Adopt standards

One way to reduce silos and increase automation is to use an open architecture such as the [TM Forum Open Digital Architecture](#), part of the [Open Digital Framework](#) (see [page 39](#)). The ODA is a component-based approach which enables CSPs to evolve to a fully automated, cloud native operations environment that relies on analytics and AI to deliver zero-touch services. It defines standardized, interoperable software components organized into loosely coupled domains. These components expose business services through Open APIs which are built on a common data model. The ODA offers a blueprint for evolving from legacy support systems to applications that are cloud based and cloud native, but widespread agreement, collaboration and contribution among many CSPs and vendors is necessary to advance it. To find out how you can get involved, please contact [Ian Turkington](#).

Additional features & resources

- 29** | [Transform Your Opex Mindset](#)
- 32** | [CSPs Turn to Intelligent Automation, Common Open-Source Platform to Scale](#)
- 35** | [The “How-To” of automation and legacy transformation to impact your bottom line](#)
- 39** | [TM Forum Open Digital Framework](#)
- 40** | [TM Forum research reports](#)
- 41** | [Meet the Research & Media team](#)

Transform Your Opex Mindset

Cloud, Automation, and Beyond

Cloud technologies and related automation offer great promise for improved operational performance. Accelerated by the pandemic and challenges it introduced, embracing cloud technologies is critical for CSPs that want to maintain and improve customer experience and satisfaction. It is especially true given remote work limitations, lack of resource accessibility, and the continued pressure to cut costs across network, IT, and operations.



The areas that can benefit from cloud, automation, and accompanying massive cost reductions are:

■ Care and customer management

The digital era and pandemic have driven customers to adopt digital services while increasing their expectations for instant availability, visibility, and self care.

■ Business processes

Heavy processes with multiple stakeholders across the organization can be transformed into efficient actions that rely on easy configuration through UIs that are

facilitated by standardized cross-system integrations.

■ Operational processes

CSPs can improve and optimize IT and network infrastructure, improve and reduce costs related to software management across the different systems, and automate and optimize network management and inventory.

As CSPs navigate through the cloudification and automation journey, it is recommended they take a holistic approach and maintain the right balance between operational automation benefits, the potential of

overall cost reductions on Opex and Capex, and opportunities afforded through new business and improved customer experience.

Optiva, a leading cloud-native monetization solution provider, has adopted cloud technologies and associated automation capabilities and methodologies as a core capability for its products. These help deliver significant cost savings to customers through its charging engine and BSS stack. The cloud adoption journey provides critical business benefits, including agility, competitive edge, and improved time to revenue.

Optiva's strategy embeds capabilities that drive automation and cost savings across its product, delivery, and operations, including:

1. Fast time to revenue with a centrally managed product framework

A centrally managed strategy is common in public cloud products, and it leverages cloud automation tools and decomposed cloud-native architecture for development and delivery. It ensures that all product instances across Optiva's broad global customer base, either on private, public, or hybrid clouds, are always on the latest product version with a well-defined automated CI/CD pipeline and updated process. It enables a record-breaking launch of a greenfield installation on the cloud within eight weeks with a rich set of OOTB pre-configured features, and thus it allows operators to test fast new services with lower investments and operational costs.

Benefits also include periodic automated rollouts of new functionalities without the need for major upgrades or heavy software

lifecycle management, reducing associated Opex and Capex.

Meanwhile, CSPs are ensured the introduction of new features, the latest OEM and security layer, and the capability to launch new services ahead of their competition with decreased operational burden.

2. Cross-system automated fulfillment and orchestration

Charging is a critical element for new 5G and IoT monetization opportunities. Therefore, Optiva focused on enabling automation beyond its core domain and introduced functional automation innovation to support new services and improve interconnect capabilities across the different CSP ecosystem components.

- Automate the E2E flow optimization between the BSS through its embedded policy control and the network by utilizing dynamic, instantaneous rules adoption on quota resources, value-based handling of business products to meet new business needs in 5G, IoT, and optimizing the relevant network inventory.

- Enable automated optimization of processing needs in a distributed environment between central and edge deployment and reduce interconnect operational costs.

3. Seamless and high-quality delivery of new functionalities with Optiva Testing Framework

Optiva framework for automated testing provides complete coverage of scenarios for all of its capabilities and functionalities across the Optiva portfolio. The framework is continuously enhanced with flows based on customer requirements and new features, executed automatically across the entire solution for each change and capability rolled out. The automated testing today includes more than 5,000 test use cases and allows the dramatic decrease of the testing period and manual operational resources required to support them. It ensures that all user journeys and experiences are approved before launching a new service, perfecting the delivery of a seamless and fluid customer experience. Optiva Testing Framework can be extended to CSPs for additional use and allows further savings on the CSP's side.



4. Offering diversification with zero-touch, integration-driven open architecture

A decomposed cloud-native architecture that separates between function, parameters, and databases enables the use of configuration tools and business UI to introduce any new service or offering and integration to other systems instead of heavy customizations activities and actions that previously required heavy business operations. These include:

- Open architecture with open APIs for zero-touch integrations in the ecosystem, facilitating real-time business process optimizations.
- Single point of configuration with a vast range of flexible capabilities in a

business UI and automated propagation of parameters across all the different modules for fast rollout of new services, products, offerings, partners, enterprises, etc., while eliminating heavy customization management and cutting short the required business operations.

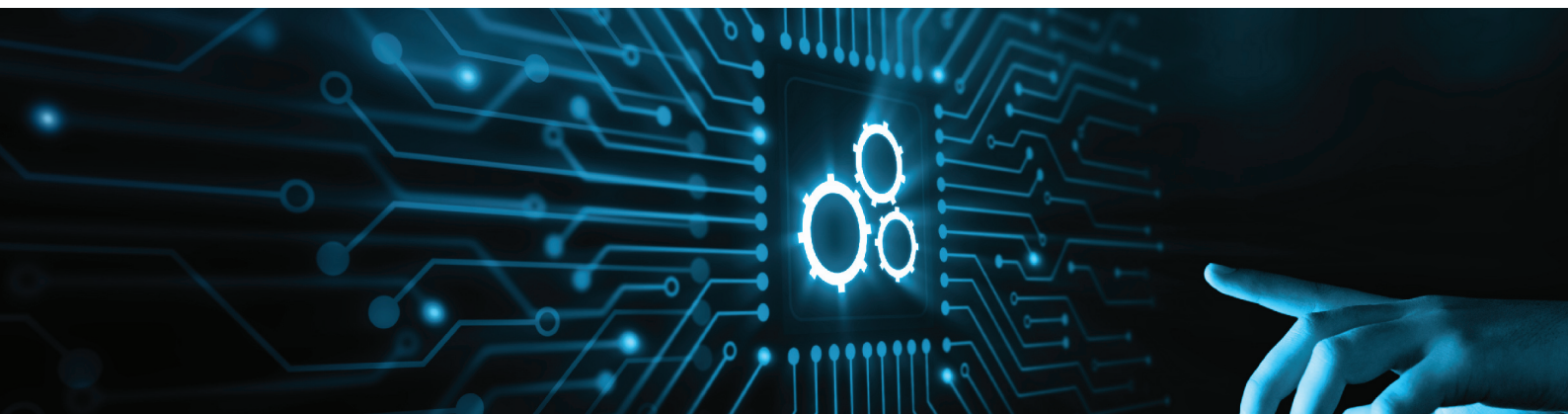
- On the fly offering and charging optimization through AI and machine learning through open data access and closed-loop feedback.

5. 100% business continuity with automated cloud management infrastructure and software tools

Implementing cloud software management tools, such as Kubernetes, drives improved operations and leads to efficiency

while ensuring business continuity and excellent customer experience. These include capabilities, such as:

- Software automated self healing, ensuring service availability for end customers with full automation of the system runtime.
- Automated and zero-touch scalability and elasticity to react fast to capacity needs to improve response time and ensure service availability.
- Cloud-native design optimizes and improves the use of compute processing powers and allows improved compute utilization.



Transform your mindset and your business

Operational cost savings is just one stream of the overall cost savings that cloud technologies and automation can deliver. As the adoption of these technologies increases and the journey towards the cloud accelerates, the benefits of cloud will go well beyond cost savings. Optiva foresees a change to how compute will be consumed leveraging the public cloud, and in turn, this will shift commercial models from traditional licensed-based to SaaS,

subscription-based models. This will drive a change in the overall cost structure as well as operational overhead and shift the balance between Capex to Opex-oriented cost structure while reducing the overall total cost of ownership (TCO). In the case of BSS solutions, based on Optiva TCO evaluation methodology, which has been evaluated in more than 40 cases, this change can reach an average of 60% in cost savings when fully adopting cloud technology and capabilities.

About Optiva

Optiva Inc. is a leading provider of mission-critical, cloud-native revenue management software for the telecommunications industry. Its products are delivered globally on the private and public cloud. Its solutions help service providers maximize digital, 5G, IoT, and emerging market opportunities to achieve business success. Established in 1999, Optiva Inc. is on the Toronto Stock Exchange (TSX:OPT). For more information, visit www.optiva.com.

CSPs Turn to Intelligent Automation, Common Open-Source Platform to Scale

By Volker Tegtmeier, Red Hat

Leading communications service providers (CSPs) worldwide are rapidly beating a path toward greater automation. It is widely recognized that substantial advances must be made to deliver on 5G, internet of things (IoT) services, high performance edge applications, dynamic network slicing, and autonomous networks.

In most cases, CSPs have begun to transform and automate both their networks and IT environments using open source, cloud-native technologies. As networks are increasingly virtualized and BSS and OSS transition to microservices, CSPs need a common, open-source platform that automates and orchestrates container operations. This is necessary to enable the massive on-demand scale, carrier-grade stability, and substantial speed and efficiency gains expected of CSPs' cloud-native transformations.

An industry calling for change

CSP leaders like Orange Group CEO and GSMA Chair Stephane Richard have called publicly for a shift to open, cloud-native technology, open APIs, and interoperability to reduce cost and accelerate innovation. Richard argues that legacy costs must be left behind because carrying legacy systems forward can consume 40% of a CSP's IT budget. He insists CSPs must embrace cloud-native and open-source technologies across both IT and networks that are interoperable and enable CSPs to be more self-sufficient in software development and deployment.

This focus on automation, agility, interoperability, and independence is a massive change. CSPs must now grapple with operating and automating the open-source infrastructure that will underpin their BSS, OSS, and virtualized networks going forward. They will continue, however, to place increasing carrier-grade demands, like massive dynamic scalability, on their technology platforms particularly as complex 5G, IoT and autonomous network services come online.

Container operations and intelligent automation needed

As CSPs adopt open source and cloud native technologies, it is often because they aim to containerize OSS and BSS microservices as well as virtualized network functions. Open-source container orchestration and operation, coupled with intelligent automation, are necessary to address most CSPs' sheer scale and to achieve advantages in speed, efficiency, and developer-friendliness.

In large deployments like telecom IT environments and networks, intelligent automation is needed to sustain the entire container environment.

“

CSPs must now grapple with operating and automating the open-source infrastructure that will underpin their BSS, OSS, and virtualized networks going forward.

Intelligent automation adds value through data-driven analysis and decision making that makes processes, their designers and their users smarter and more productive.

Intelligent automation also helps CSPs at any point in their digital transformation process to streamline operations and lower opex. CSPs are in a transitional period where solutions that combine new and legacy systems span private and public clouds, and on-premises data centers.

Working across hybrid cloud environments, intelligent automation frees operations teams from repetitive, lower value tasks, hands-on lifecycle

A CSP's open source container environment must be:

- Robust enough to underpin BSS, OSS, and virtualized networks
- Easy for developers to use across complex hybrid clouds
- Automated for everything from production rollouts to business processes.

management, and from having to learn multiple different cloud environments to ascertain and access resources. With these types of improvements, intelligent automation avoids costly human errors and accelerates a CSP's pace of development and innovation.

As CSPs expand automation initiatives, they need an open, scalable, common, containerized architecture to support the entire network, service and operations environment. This includes BSS, OSS, virtualized networks, and hybrid clouds. This end to end approach is necessary to achieve the performance and efficiency complex services like network slicing and high performance edge applications demand.

Automation needs to be agnostic to the underlying infrastructure. OSS, BSS, network, or services built on the common container platform should be infrastructure agnostic from bare metal, to private, public, and hybrid cloud, to edge locations including data centers, central offices, cell sites, and 5G edge computing sites.

Developers should see a common set of accessible resources - in whichever cloud or data center they may reside through common tools that allow them to focus on development and innovation. The ability to create, launch, and improve services is enhanced with intelligent automation because the development workforce is freed from manual tasks associated with lifecycle

management, deployment, and other common processes.

CSPs achieve measurable success

Operators that have adopted this automation-based, open source, common container platform approach have found measurable success. Several examples show operators leveraging it for BSS, OSS, and network services to gain substantial cost and time to market benefits.

Virtualizing network services accelerates time to market

Turkcell has used a common container platform as the foundation for its centralized NFVI environment. The platform lets Turkcell balance the benefits of deriving innovation from the open-source community with the carrier-grade stability, reliability, and support it needs to efficiently virtualize resources, organize them into clouds, and manage them.

The common container platform also enabled Turkcell to reduce the time needed to put a new service into production from 6 months to 2 months, a critical goal that both supports new revenue generation and dramatically reduces development cost and effort. "For the last 3 years, we've seen that virtualizing a network service is more financially viable than continuing to invest in legacy infrastructures," said Elif Yenihan Kaya, Director of Network Capabilities at Turkcell.

Replacing bare-metal with a common container platform to reduce cost

Proximus, Belgium's largest telecom provider, replaced its bare metal servers with a common container environment for its NFV network. "We wanted to get free of our dependency on specialist vendors and the high cost of ownership that came with that approach," said Alain Elengesa, Telco Cloud Manager, Proximus Group, "but we needed a platform that could match the performance of our bare-metal environment."

The common container platform reduced hardware costs for Proximus by 20% and saved €30,000 in development costs monthly. It also enabled the ability to scale on-demand that is required for NFV. Most importantly, the common container platform provided a complete orchestration solution to Proximus which it uses to host, operate and sustain its evolving microservices architecture.

Containerization of applications speeds service delivery

Switzerland's Sunrise Communications is heavily focused on digitalization and on continuing to develop many new services quickly. "When we decided to use containers to do that, we knew we would need support to make the most of this new technology," said Luca Broggio, Head of Applications Operations, Sunrise Communications.

Sunrise created a container- and microservices-based infrastructure, gaining the products, tools, and components it needed to containerize applications, develop a microservices-based architecture with modern development methodologies, and reliably transfer data between new and existing applications. Red Hat provided the tools while Red Hat Consulting supported Sunrise in its shift to an iterative, agile development approach. The simplification of the configuration and management process achieved a 75% faster time to market.

An open universal hybrid cloud for cost reduction and revenue growth

Vodafone Idea, which supports nearly 300 million subscribers in India, is creating India's first Open Universal Hybrid Cloud powered by IBM and Red Hat. This initiative aims to deliver a high degree of automation across hybrid clouds that support its OSS, BSS, and network systems, as well B2B customer offerings. To achieve this, Vodafone Idea simplified its IT and telecom network operations using an automated, common container platform. The platform delivers cost benefits because it optimizes capex, opex, skills and automation investments across both the

network and IT application domains. It also bolsters revenue growth because of the speed and efficiency it can enable as result of intelligent automation.

Take a closer look

The shift to open-source and cloud-native technologies continues to accelerate for CSPs everywhere. This places a premium demand on solutions that can operate and automate new open-source container environments across BSS, OSS and virtualized networks at carrier-grade and scale.

Want to learn more about Red Hat's approach to building and automating telco clouds? [Start here](#).



ABOUT RED HAT IN TELECOMMUNICATIONS

As telecommunications service providers race to become more agile to take advantage of the promise of 5G networks, Red Hat and its global partner ecosystem offer a comprehensive open platform that helps service providers innovate faster, bringing new services to market with superior scalability, security, and efficiency. Red Hat is the world's leading provider of commercial open source software solutions, using a community-powered approach to deliver reliable and high-performing Linux, hybrid cloud, container, and Kubernetes technologies. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.

The “How-To” of automation and legacy transformation to impact your bottom line

Legacy is a good word!

The word “Legacy” often has unhappy connotations of being “outdated” and “high maintenance”. While this may be partially true, the business rules & transactions built into your legacy, over many years, are still highly relevant and valid. Your legacy assets, often become your core business differentiators.

A few ways to get more value out of legacy would be to:

- Wire them together in new ways
- Make them more accessible to customers and partners
- Combine them with new capabilities
- Make them more scalable

A cloud native application model offers you building blocks that help you achieve

the above four points and thus transform legacy. The key components of such a model are Containerization, Microservice based Architecture, Automatic Scalability and System Observability.

Typically, legacy applications can be categorized into one of three categories listed below:

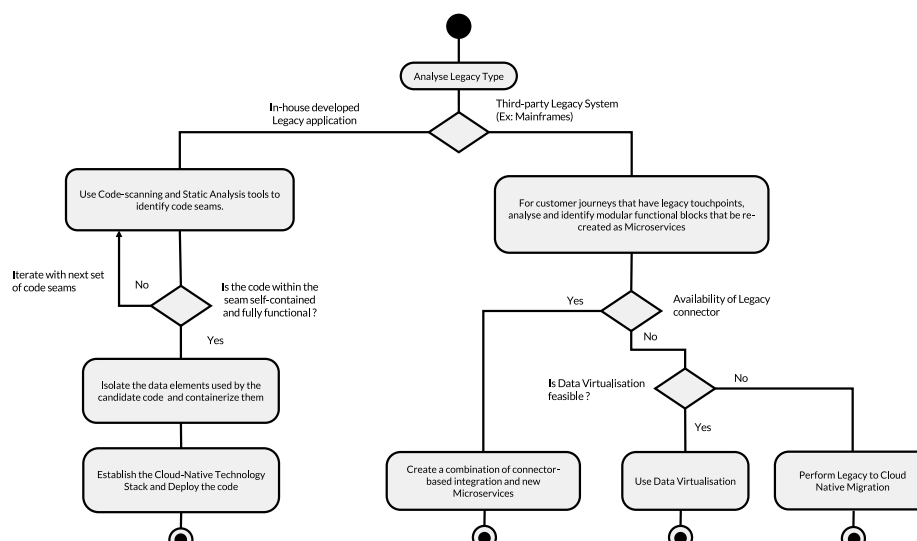
- a) In-house developed applications, built on outdated technology that is expensive to maintain, not scalable, with non-availability of skills for feature evolution. These systems severely impact time to market. In most cases, they are not integration-friendly, as they support outdated interfaces.
- b) Third-party, out-of-the-box business applications, that were typically procured several decades ago. The

vendor might have stopped developing new features and the systems are nearing sunset stage. Such applications are mostly monolithic in nature. They tend to be black boxes, with data and functions not exposed in a granular fashion.

- c) Business critical applications that are fully functional but built on legacy hardware and operating systems such as Mainframes. The challenge with these applications is to make them integration-friendly and scalable through API-enablement.

Factoring in the above scenarios, we formulated a legacy decomposition process to help put a method to the madness, as illustrated in Fig 1: Legacy decomposition flowchart:

Fig 1: Legacy decomposition flowchart



Legacy and cloud-native can and will co-exist

Not all capability from legacy fit into the microservices architectural model. Infact, it isn't even a best practice to move all capability. When we decompose legacy, we identify application components and data that can be containerized. With a deliberate and careful data migration strategy and decomposition, a monolith can be split into a set of microservices. Parts of the monolith that cannot be decomposed is retained until it is re-engineered or replaced with a third-party product or a SaaS application. If the retained part exposes interfaces, it can be API-enabled as-is, using an integration tool. The three models of co-existence and migration are shown in Fig 2: Models for legacy and cloud native to co-exist

OpEx savings – how and why

The automation, agility and optimization elements in a Cloud Native world offer

significant OPEX reduction to CSPs owing to:

- Processes and workflows – Automation & the ability to reuse assets (common services), is built into every stage of the development and deployment lifecycles. The use of automated tests, Continuous Integration/Continuous Delivery (CI/CD) processes etc. is mandated, reducing time-to-market and costs.
- Infrastructure - Cloud Native runtime architecture leverages automation to ensure operational stability through end-to-end monitoring, system observability, chaos-engineering. These aspects align towards the SRE (Site Reliability Engineering) discipline that ensures smooth operations for mission critical systems. The ability to harness “as-a-service” models and containerization, at the application level, greatly optimizes hardware investments
- Business enablement - A fully native, integrated experience to the end-

user is made possible through the speed, agility and scalability offered in a cloud-native model of rendition.

...bringing with it, savings due to:

1. Avoidance of operational challenges with legacy such as frequent hardware upgrades, time consumed in manual deployments, prolonged development and release cycles, frequent production deployment rollbacks, etc. This enables our CSP customers to achieve annual savings of up to 40%.
2. Hardware & Containerization – Legacy systems traditionally are run on legacy hardware, which require constant upgrades and capacity upliftment due to growing Digital consumption and scaling needs. Cloud Native is built on the foundation of scalable and dynamic capacity provisioning, it introduces a new dimension of automation in the traditional capacity management practice leading to cost and time savings of up to 50% annually.

Fig 2: Models for legacy and cloud native to co-exist

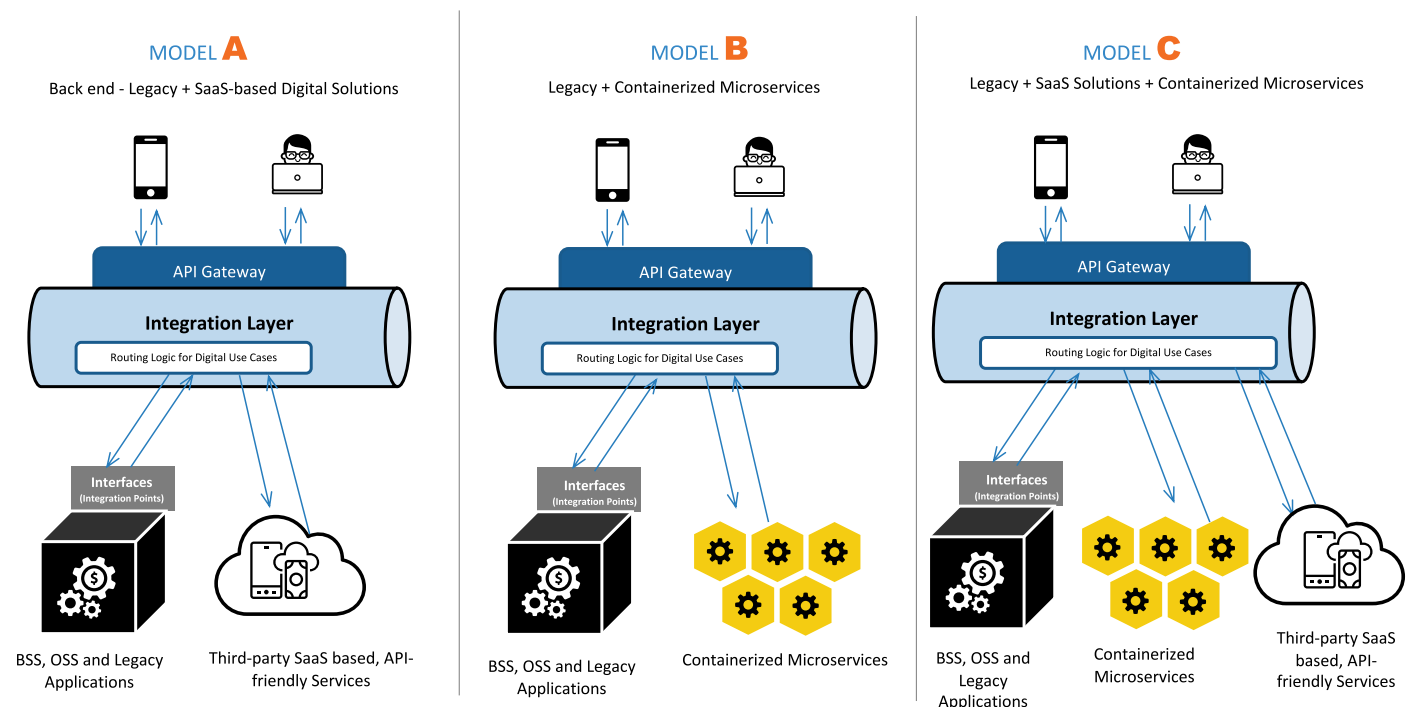
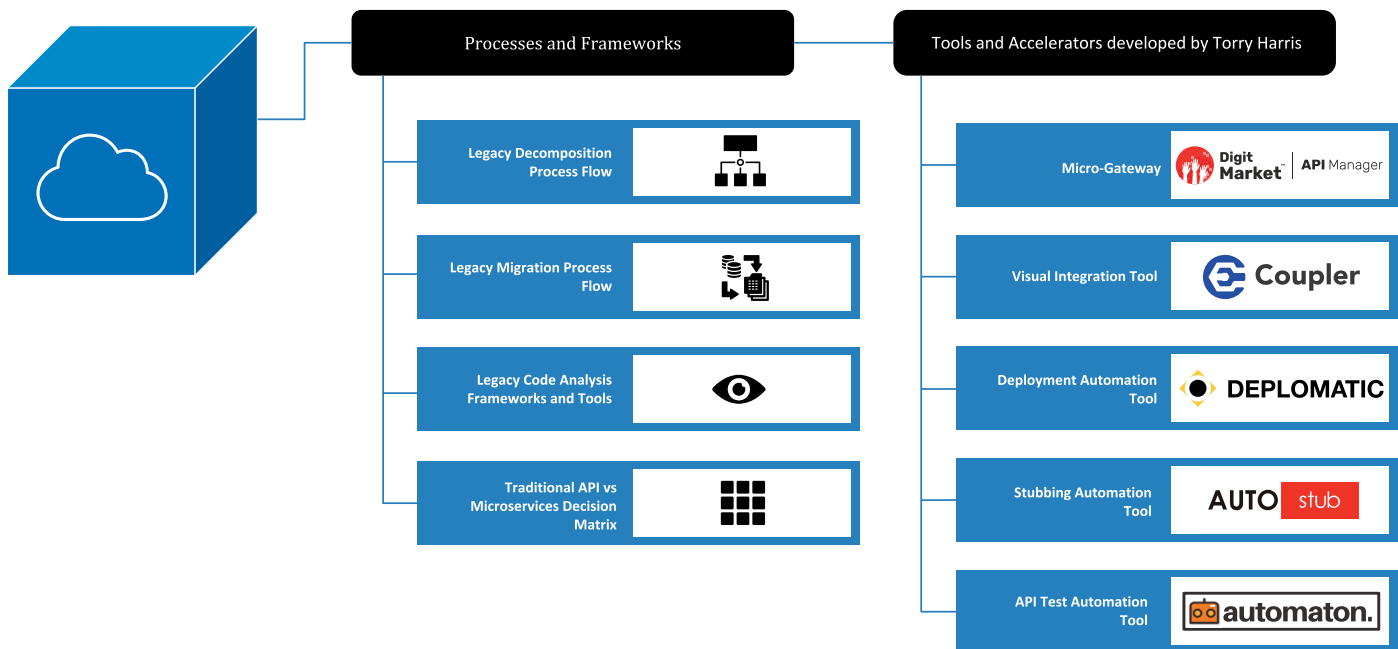


Fig 3: Legacy to cloud native kit – tools and components



Tools to standardize and accelerate migration to cloud native

Torry Harris helps IT leaders analyze, extract and modernize functionality from their legacy estate in a consistent manner for a standardized, accelerated move to a cloud native setup.

The TMForum compliant “legacy to cloud native kit” enables CSPs to leverage ready-to-deploy digital tools, automation frameworks, and services. The kit accelerates reducing OpEx costs, by building scale and efficiency while standardizing cloud native components across group companies.

A micro-gateway: DigitMarket™ API Manager

The DigitMarket™ micro-gateway is deployable as a standalone gateway instance to secure microservices. It has configurable usage policies (throttling, rate limiting, etc.) and

security policies (OAuth, HTTP-Basic, etc.). A token-based authentication model makes it highly secure.

A visual integration tool: Coupler

‘Coupler’ is designed to model flows through configuration (drag-and-drop) and expose them on a micro-gateway. It supports multiple protocols such as SOAP, REST, JDBC, MQTT, JMS, etc. It offers node-based data flow modeling with configurable properties for each node.

A deployment automation tool: Deplomatic

Deplomatic is an advanced deployment automation tool. It is a container-based environment provisioning tool, built on Ansible, to provision a sandbox environment, for approval of workflow-based environment creation and continuous deployment. It can be exposed through APIs for easy integration into DevOps based workflows (continuous deployment).

A stubbing automation tool: AutoStub®

AutoStub® is an automation tool for API mocking. It has automatic data population capabilities configured for different response parameters. Its intelligent mocking capability helps design stateful data, across API invocations. The tool is used to create DevOps lifecycle automation for microservices by stubbing dependencies for each microservice to enable “testability” of each use case.

An API test automation tool: Automaton™

Automaton™ is a test automation tool to test API flows using a visual approach. It is extensible. It can test beyond APIs. Its API-driven approach helps trigger tests from external scripts. It is used to create DevOps lifecycle automation for microservices through test automation for continuous integration. It can be configured to generate reports for each test execution.

Specific savings enabled by Torry Harris automation tools at each stage of the development, deployment and operations of cloud native applications are captured in Table 1: Annual savings - Legacy to cloud native kit

Key benefits of legacy to cloud native kit:

Migrating select legacy systems to a cloud-native setup is an important step in your journey to build digital ecosystems. And cloud-native will propel your operational efficiency.

The legacy to cloud-native kit offers the following advantages:

A standardized approach, TM Forum compliant

CSPs can achieve their legacy application migration goals faster through automation with a TM Forum compliant toolkit-based approach. You have better predictability and standardization in the journey to establish your cloud-native setup.

Easily managed

Legacy to CN kit is designed with flexibility and simplicity in mind to ensure that the migration of your legacy systems is seamless and hitch-free.

Cost effective and reliable migration

The L2CN kit is cost-effective and guarantees high RoI. With this kit, you

can migrate from legacy to cloud-native environments with minimal risks.

High performance and scalable systems

The cloud-native environment achieved through the kit can meet and exceed the high-performance requirements that many enterprises need at the moment. The kit takes into account current and future scaling needs of your enterprise.

Leverages legacy functionality

The kit facilitates retention of what is good about legacy. It helps leverage all your business differentiators built into your legacy systems over the years rather than reinvent the wheel!

Legacy to cloud-native kit

- Lowers total cost of ownership
- Reduces complexity
- Reduces time-to-market
- Eliminates technical debt
- Improves agility and scalability
- Increases responsiveness and flexibility
- Enables real-time insights

Contact us for your legacy modernization, migration, and support initiatives. Accelerate with the “Legacy to cloud native kit”: info@thbs.com

www.torryharris.com

“

Legacy to cloud-native kit is TM-Forum open digital architecture (ODA) compliant, with tools and frameworks to help you progressively transition your legacy applications to a cloud-native architecture”

Watch the video to learn more:



**LEGACY TO
CLOUD NATIVE KIT**

Table 1: Annual savings - Legacy to cloud native kit

No	Torry Harris tool	Area of Automation	Annual Savings
1	Deplomatic	Deployment automation framework that also provides environment governance and workflow capability. It drives cost efficiency through avoidance of over-provisioning of Cloud resources.	Has reduced environment governance cost for customers by 35%
2	Coupler	Microservices development framework through visual flow design approach. Ideal for Integration-centric Microservices.	Reduces development effort up to 40% compared to a code-based approach for implementation.
3	AutoStub	Stubbing Automation tool to automatically generate data-driven API stubs for test automation and facilitate CI/CD	Reduces development time by upto 20%
4	Automaton	Test Automation tool that provides a visual tool to model your APIs and other application test scenarios	Reduces test automation effort by 30%
5	DigitMarket Micro-Gateway	Microgateway to securely expose your Microservices through a de-centralized policy management	Reduces operational cost by 15%

TM Forum Open Digital Framework

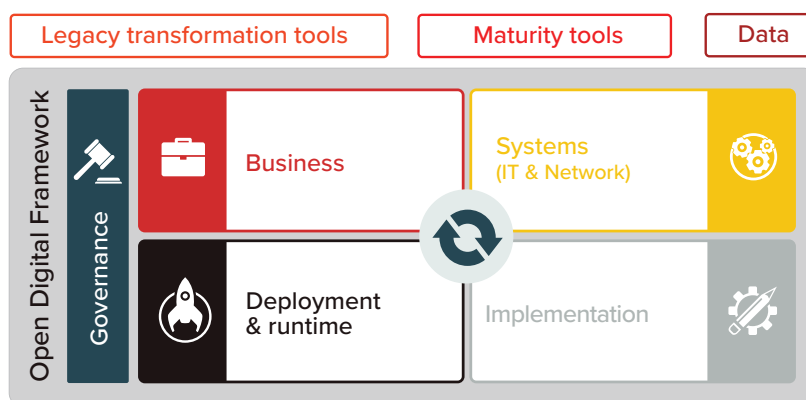
A blueprint for intelligent operations fit for the 5G era

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.

Core elements of the Open Digital Framework



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

Open Digital Architecture

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

Transformation Tools

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

Maturity Tools & Data

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

Goals of the Open Digital Framework

The 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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Published by:
TM Forum
4 Century Drive,
Parsippany,
NJ 07054
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Phone: +1 973-944-5100
Fax: +1 973-944-5110
ISBN: 978-1-945220-97-5

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