Assembling your cloud orchestra

A field guide to multicloud management

Executive Report

Cloud

In this report

How multicloud environments are proliferating in surveyed organizations

Benefits of multicloud management

An approach to managing multicloud environments

How can IBM help?

The IBM Cloud provides a faster, more secure journey to the cloud, enabling seamless integration across public, private and hybrid cloud environments. From bare metal servers to serverless computing, IBM Cloud offers resources for any workload. The IBM Cloud is built for your applications, is AI ready and provides industry-leading security capabilities. Optimize your multicloud environment using the IBM Cloud with tools that integrate, broker and give you greater visibility across your vendor clouds and proprietary IT infrastructure to optimize new and existing investments. For more information, please visit **ibm.com**/cloud.

Setting a tempo for multicloud management

Operating in a multicloud environment is a reality for most enterprise functions today, though too often it happens in silos. Whether it's human resources recruiting candidates, manufacturing tracking shipments or marketing enticing customers, business units often circumvent their own IT departments to directly access services on the cloud. Instead of ignoring or attempting to stifle organizational forays onto multiple clouds, IT needs to get better at facilitating, orchestrating and optimizing enterprise multicloud footing. Enterprises that assemble harmonized multicloud platforms now can position themselves for greater competitive advantage and lower costs. But it won't be easy. Here, we provide a field guide outlining challenges, benefits and a clear path to successful multicloud management.

Cloud proliferation

It's no secret that innovative technologies, empowered consumers and digital disruptors are inexorably changing the business landscape, including instigating the proliferation of cloud-based services. Whether it's accessing streaming entertainment or collaboration tools, consumers and businesses alike have been quick to adopt cloud-enabled services, enjoying lower costs, added convenience and enhanced experiences.

Cloud-based services help product developers speed proof-of-concept development, facilitating the creation of new products and revenue streams. And clouds also assist marketers enticing buyers, sales teams managing leads and customer service reps responding to customer inquiries.

Given their benefits, it's no wonder that the use of clouds and cloud services has proliferated across most organizations – sometimes with and sometimes without IT's knowledge or guidance. In 2018, to learn more about the current state and future plans for multicloud management, we surveyed 1,106 executives across 19 industries and 20 countries. (For more details, see "How we conducted our research" near the end of this report.)

98%
of surveyed organizations plan to use multiple hybrid clouds within three years.

Two-thirds
of surveyed organizations say an actively managed multicloud environment is crucial to reduce operating costs.

59%
of organizations report that independent cloud adoption by business units has already created a *de facto* multicloud environment.

Our survey reveals that 85 percent of companies are already operating in multicloud environments. Adding to the complexity, the majority of these environments are comprised of multiple hybrid clouds. Hybrid clouds can connect one or more public, private or hybrid clouds to on-premises systems and can network one or more clouds to other clouds. Seventy-six percent of organizations report they are already using at least two to 15 hybrid clouds and 98 percent forecast they will be using multiple hybrid clouds within three years (see Figure 1).

Figure 1
The upsurge in complex multicloud environments

Today

In 3 years

Percent of companies operating in a multicloud environment today

85%

98%

Percent of companies forecasting using multiple hybrid clouds within three years
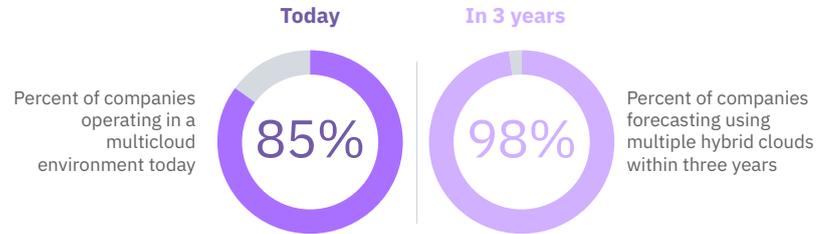
Source: How would you characterize your cloud environment? How many cloud services and platforms are you planning to use across your entire business in the next three years?

Notably, these statistics include only the clouds that executives know about. The proliferation of shadow cloud services throughout most organizations makes the actual number of clouds used by typical enterprises inevitably greater than reported numbers.

Many businesses we surveyed are employing various cloud services to drive innovation and aid business agility. Forty-nine percent of them are establishing a multicloud architecture to develop new and enhanced products and services. Forty-six percent say they need a multicloud environment to support agile business processes. Fifty-one percent use multiple clouds to cultivate a flexible, modular infrastructure that quickly absorbs and leverages technological advances. Sixty-two percent of surveyed companies require multiple clouds to create innovative business models, 52 percent need them to produce new revenue streams and 66 percent need them to enhance margins. Because of such wide-ranging and valuable potential advantages, multicloud environments are essential to survival and success in today's digital era.

Like a symphony that unites an orchestra's combination of performers and instruments, organizations need harmonized multicloud environments. To do so requires constructing and synthesizing the right portfolio of public, private and hybrid clouds with proprietary IT infrastructures.

Swiss Re saves 250 work days per month with a cloud orchestration solution[1]

To meet business demands, Swiss Re – a global wholesale provider of insurance and insurance-based products based in Zurich, Switzerland, needed to enhance the responsiveness of its IT infrastructure. To eliminate organizational silos and automate manual processes, it adopted a cloud orchestration solution. The orchestration platform executes 45,000 processes per month, reducing the task burden of the IT operations team, saving 250 work days per month.

Gathering storm clouds

Even though the overwhelming majority of enterprises are, in effect, operating multicloud architectures, relatively few grasp how to manage these environments. By 2021, 98 percent of organizations expect to be embracing multicloud architectures. But only 41 percent currently have a multicloud management strategy and just 38 percent have the procedures and tools in place to operate a multicloud environment. For example, only 30 percent of enterprises have a multicloud orchestrator or other multicloud management platform that can choreograph workloads.

Other tools are lacking as well. Fewer than 40 percent of organizations have cloud configuration management tools that provide information about resource configuration and relationships between resources. What's more, only 39 percent have implemented DevOps that supports agile builds and deployments.

The merits of fine-tuned multicloud performance

Fifty-nine percent of organizations report that business unit cloud adoption has already created a *de facto* multicloud environment. The potential benefits of actively orchestrating these multiple clouds are clear across three key business dimensions – strategy, operations and infrastructure – where cost-cutting takes center stage (see Table 1).

Table 1
Benefits of multicloud management

Strategic drivers	
Reduce operating costs	66%
Improve customer experience	62%
Create/support new business models	62%
Operational drivers	
Reduce operating costs	66%
Deliver a self-service customer experience	68%
Provide executives with visibility, governance and control	57%
Infrastructure drivers	
Cut infrastructure costs	65%
Avoid vendor lock-in	59%
Improve latency	59%

Source: Respondents rated the importance of strategic reasons, operational drivers and infrastructure drivers in establishing a multicloud environment. Percentages reflect respondents who consider a driver to be important or very important.

OSRAM embarks on a multicloud strategy to enable transformation[2]

OSRAM, an international lighting manufacturer based in Munich, Germany, provides state-of-the-art solutions for fast-evolving markets such as autonomous driving, facial recognition and entertainment. To nimbly launch new products and enter innovative markets, it adopted a multicloud environment. Moving to multiple clouds has enabled OSRAM to adapt rapidly to changing market conditions by scaling capacity up and down as demand fluctuates. As important, its multicloud environment has freed up IT personnel to focus on continued innovation while yielding a seven-digit annual cost savings.

Multicloud harmonization

As an organization's cloud use expands to multiple cloud providers, developing a multicloud management plan is vital to reducing technology redundancy and promoting business agility. For your multicloud environment to optimally address business needs, first determine which business processes should be in the cloud. Then identify which technical building blocks and management tools best support business objectives, keeping in mind that employing cloud-native standards offers the business flexibility to use assorted cloud vendors.
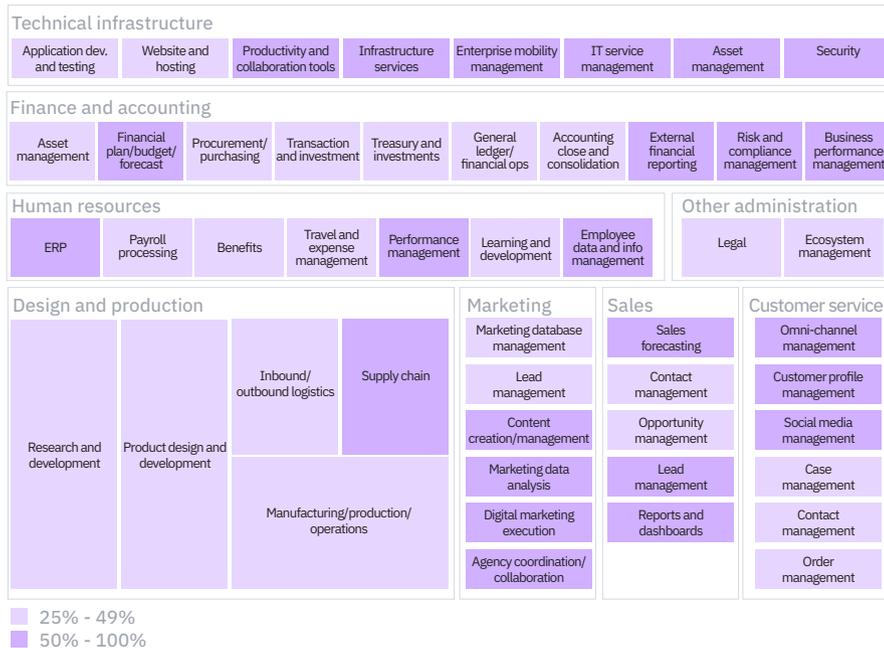
1. Workloads in the cloud multiverse
To help determine which business activities should be considered for a move to the cloud, we developed a value chain "heat map" analysis of our survey results (see Figure 2). This analysis provides a blueprint that shows the degree to which the proficient multicloud maestros expect to use cloud services across their value chains within the next three years.

A successful multicloud environment interplays customer-facing clouds with those that facilitate product and service development, and those that drive operations and support functions to increase front- and back-office business agility. Analysis shows that customer-facing activities, like those in marketing, sales and customer service, are migrating to the cloud.

But so are mission-critical product development activities, manufacturing and operations processes and support tasks in human resources, finance, procurement and IT. As shown on the heat map, within three years, at least a quarter of multicloud maestros expect each function surveyed to be in the cloud.

Who are the "multicloud maestros?"

We have dubbed the most proficient operators of multicloud environments *multicloud maestros*. Making up 20 percent of our global survey sample, our multicloud maestros state that they are already using multiple clouds to smoothly and routinely deliver one or more business functions.

Figure 2

Multicloud maestros planning to use cloud by 2021 for business activities

Technical infrastructure

| Application dev. and testing | Website and hosting | Productivity and collaboration tools | Infrastructure services | Enterprise mobility management | IT service management | Asset management | Security |

Finance and accounting

| Asset management | Financial plan/budget/ forecast | Procurement/ purchasing | Transaction and investment | Treasury and investments | General ledger/ financial ops | Accounting close and consolidation | External financial reporting | Risk and compliance management | Business performance management |

Human resources

| ERP | Payroll processing | Benefits | Travel and expense management | Performance management | Learning and development | Employee data and info management |

Other administration

| Legal | Ecosystem management |

Design and production

| Research and development | Product design and development | Inbound/ outbound logistics | Supply chain |
| | | Manufacturing/production/ operations | |

Marketing

Marketing database management

Lead management

Content creation/management

Marketing data analysis

Digital marketing execution

Agency coordination/ collaboration

Sales

Sales forecasting

Contact management

Opportunity management

Lead management

Reports and dashboards

Customer service

Omni-channel management

Customer profile management

Social media management

Case management

Contact management

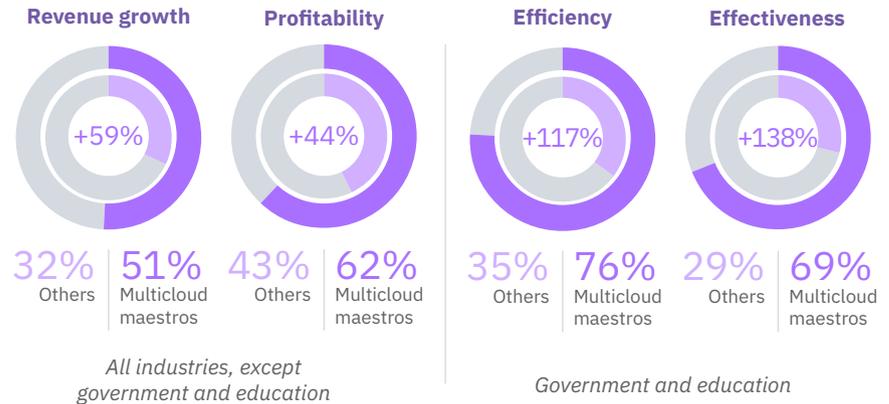Order management

◼ 25% - 49%
◼ 50% - 100%

Source: IBM Institute for Business Value analysis.

If your organization isn't already thinking holistically about placing most key business processes in a multicloud environment, don't be surprised if you start falling behind competitively. Multicloud maestros outperform on key metrics, including growing revenues, profitability, efficiency and effectiveness in achieving objectives (see Figure 3).

Figure 3
Multicloud maestros outperform their counterparts

Revenue growth

+59%

32%	51%
Others	Multicloud maestros

Profitability

+44%

43%	62%
Others	Multicloud maestros

All industries, except government and education

Efficiency

+117%

35%	76%
Others	Multicloud maestros

Effectiveness

+138%

29%	69%
Others	Multicloud maestros

Government and education

Source: Respondents rated the success of their organizations on multiple metrics compared with competitors over the past three years. Percentages reflect respondents who report somewhat or significantly better performance for a business process.

2. Technical building blocks of multicloud management

As organizations move diverse business activities to multicloud environments, they are adopting an open modular architecture. Not only does this enable workloads to move between on-premises, private and public clouds, it also allows movement across different vendor clouds on an as-needed basis. To operate efficiently in this environment, many organizations have begun employing key technical and management "building blocks." These facilitate work and portability across multiple internal and external clouds (see Figure 4).

Cloud management platforms. Easing the complexities of managing cloud services across multiple providers, a cloud management platform provides management, visibility, automation and orchestration across cloud providers using policy-based tools. Effective platforms present a single, self-service interface that enables configuring, provisioning and deploying of development environments, as well as integration of service management and monitoring, backup and security. Today, almost two-thirds of multicloud maestros report already using cloud management platforms.

Containers. Within three years, 61 percent of multicloud maestros predict that at least 80 percent of new apps will be developed using containers. Docker containers provide optimal portability across cloud and on-premises environments. If they aren't already, not only will your developers be using containers, they will need a container orchestrator, like Kubernetes, that automates deployment, networking, scaling and management of container operations. Today, 50 percent of multicloud maestros are already using Docker containers and 63 percent are using containers-as-a-service. By 2021, 65 percent expect to use container orchestration.

Figure 4
Key multicloud building blocks: Application development example

Source: IBM Institute for Business Value analysis.

Micro-services. Micro-service architectures have emerged as the preferred way to engineer robust, scalable cloud-native solutions. Using the micro-services model for developing cloud apps allows developers to quickly and iteratively redesign, replace and augment customer experience based on dynamic interaction with users in the field. Fifty-six percent of multicloud maestros already use micro-services in their cloud environments.

Virtual machines. Offering enhanced flexibility, virtual machines are runtime environments implemented in software that imitate physical servers. Virtual servers allow provisioning and scaling on demand to meet workload requirements. Within three years, 48 percent of multicloud maestros plan to use virtual machines in their cloud environments.

Serverless cloud services. Serverless platforms let developers quickly and easily build feature-rich apps that respond to events. Instead of provisioning servers, manually configuring clusters, or worrying about networking and software administration, developers focus on writing code. Within three years, over half of multicloud maestros (59 percent) plan to use serverless cloud services in their cloud environments.

Challenges to multicloud adoption and management

Even with key management and technical building blocks in place, implementers of multicloud environments encounter several adoption challenges. Fifty-seven percent of all multicloud managers worry about security and compliance, and the same number report having concerns about governance and control. Fifty-six percent report managing and optimizing cloud costs as an additional hurdle. And then, even after a multicloud environment is adopted, managers cited significant ongoing challenges in managing it (see Table 2).

Because managing multicloud infrastructure is demanding, even multicloud maestros don't go it alone. Multicloud maestros lean on vendors more than companies who are less adept at managing multiple clouds. Fifty-eight percent of multicloud maestros are using cloud vendors today to help manage their multicloud environments compared to 43 percent of other organizations. By 2021, 72 percent of multicloud maestros plan to be using cloud vendors.

Table 2
Most significant challenges to multicloud management success

Multicloud management challenges	
Managing and optimizing cloud costs	**63%**
Meeting desired performance goals	**61%**
Establishing IT governance and control	**55%**
Ensuring security and compliance meets needs	**55%**

Source: How significant are the following challenges your organization faces in managing a multicloud environment? Percentages reflect those indicating changes are significant or very significant.

A multicloud management roadmap

Figure 5
The path to multicloud management

1. Develop goals and governance

4. Build in the cloud

5. Continually adapt

2. Enlist help

3. Move to the cloud

Source: IBM Institute for Business Value analysis.

Enterprises up to the challenge of managing a harmonized multicloud environment can position themselves to reap significant rewards, including decreased IT infrastructure costs, less downtime, fewer application outages, reduced data loss, increased visibility, governance and control across the entire IT infrastructure, decreased operating costs, improved customer experience, new revenue streams and expansion into new markets. But, pursuing these benefits requires a new approach to managing your multicloud environment (see Figure 5).

1. *Determine goals and governance.* Align goals for your multicloud environment with your strategic plan. Do you need a multicloud environment to enhance customer engagement? Are you seeking enhanced product/service innovation? What kinds of operational improvement are you pursuing? What types of cost reduction are you targeting?

   Once goals are established, set up your cloud governance. Create a multicloud steering committee that includes line of business executives, IT architects, IT operations, application developers and multicloud management subject-matter experts. Use this committee to break down organizational silos and build a seamless multicloud culture.

   Just as an orchestra needs a conductor, an enterprise needs a principal architect to harmonize its multicloud environment. Empower IT with an enterprise-wide multicloud oversight role. Without IT's leadership, organizations run the risk of constraining business advantage while incurring unnecessary costs due to inefficient and duplicative ventures into cloud adoption.

2. *Enlist help.* Determine where additional skills and resources are needed. Obtain them to build and manage your multicloud infrastructure. Bring together an ensemble of complementary cloud providers that meet your goals. Consider partnering with a multicloud vendor to help build and manage your harmonized multicloud environment. Today, 56 percent of multicloud maestros use vendors to help manage multiple clouds. By 2021, surveyed organizations expect that number to soar to 72 percent.

3. *Move the right stuff to the right cloud.* Forty-three percent of multicloud maestros expect that, by 2021, most existing apps will have migrated to the cloud. Identify which workloads go into the cloud now, which go later, and whether any should not migrate to a cloud at all.

   Determine the cloud platform best suited to each workload. This isn't just a "lift and shift" of existing apps into clouds. It involves upgrading applications to add cloud services while migrating them to the cloud and refactoring existing apps to a microservice-based architecture. Be aware of geographic constraints on data location in establishing priorities related to latency and performance.

4. *Build new apps in the cloud.* Fifty-six percent of multicloud maestros expect that, by 2021, most new apps will be built in the cloud. Each time your organization needs a new app, ask if there is a reason not to develop it in the cloud. Default all new app development to the cloud by adopting and evolving the necessary technical building blocks, like containers and micro-services.

5. *Continually adapt.* Monitor and keep evolving your governance and multicloud environment to fit your organizational priorities, competitive environment, emerging technologies and cloud management platforms. Operate your multicloud environment to propel a culture of unceasing improvement.

How will you assemble your cloud orchestra?

Related IBV publications
Kesterson-Townes, Lynn, Arvind Krishna and Sanjay Rishi. "Winning cloud strategies: How leading companies score." IBM Institute for Business Value. November 2017. ibm.biz/winningcloud

Karpovich, Bill, Lynn Kesterson-Townes and Sanjay Rishi. "Beyond agility: How cloud is driving enterprise innovation." IBM Institute for Business Value. April 2017. ibm.biz/beyondagility

Freese, Robert, Anthony Karimi, Julie Schuneman and Meenagi Venkat. "Tailoring hybrid cloud: Designing the right mix for innovation, efficiency and growth." IBM Institute for Business Value. August 2016. ibm.biz/tailoringhybrid

Which benefits will your organization pursue by actively managing your multicloud environment?

How does your organization's planned multicloud management approach compare to that of multicloud maestros? Which of your business processes are behind? Is your organization using key technical building blocks?

What is your action plan for orchestrating a multicloud infrastructure? What steps should your organization take to mitigate barriers and accelerate your multicloud management success? Are there any lessons learned based on how your organization has actively managed (or not managed) multiple clouds to date?

What is the opportunity cost if you don't coordinate your organization's forays into multiple clouds?

Authors

Steve Cowley is General Manager of IBM Cloud. He is responsible for worldwide go-to-market activities, including sales, technical sales and solutioning, ecosystem development, client experience, and the success of clients and partners. Steve can be reached at linkedin.com/in/stevencowley, Twitter at @Steven_Cowley and email at scowley@us.ibm.com.

Lynn Kesterson-Townes is Global Cloud Leader at the IBM Institute for Business Value. She has over 20 years of expertise in management consulting, business development, strategic planning, marketing, and mergers and acquisitions. Lynn can be reached at linkedin.com/in/lynnkesterson, Twitter at @LynnKesterson and email at lkt@us.ibm.com.

Arvind Krishna is Senior Vice President for Hybrid Cloud and Director of Research at IBM. He leads the IBM hybrid cloud business, including strategy, product design, offering development, marketing, sales and service. Arvind can be reached at linkedin.com/in/arvindkrishna, Twitter at @ArvindKrishna and email at arvindk@us.ibm.com.

Sangita Singh is General Manager of Global Cloud Consulting Services for IBM Global Business Services. She is responsible for the IBM portfolio of cloud consulting services and leads a global team focused on helping clients harness cloud computing technology to drive business innovation across their value chains. Sangita can be reached at linkedin.com/in/sangita-singh-64ab3927, Twitter at @sangitasingh101 and email at sangsi08@in.ibm.com.

Contributors

Blaine Dolph, IBM Fellow, Vice President, Offering Leader and CTO for Cloud Application Innovation, IBM Global Business Services

Buell Duncan, Vice President Marketing, IBM Hybrid Cloud

How we conducted our research

To investigate the current state and future plans for multicloud management, in 2018, we surveyed 1,016 executives in 19 industries headquartered in 20 countries. Thirteen percent of respondents held the title of CEO or Head of Strategy while 30 percent held the title of CIO, CTO, Head of IT or Head of Technology.
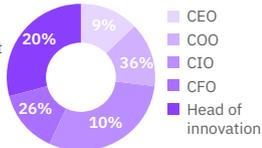
Industry

5%	Automotive
8%	Banking
6%	Chemicals
5%	Petroleum
5%	Electronics
6%	Consumer products
4%	Education
8%	Energy and utilities
5%	Government/public
5%	Healthcare
6%	Industrial Products
6%	Insurance
6%	Life sciences/pharma
5%	Media and entertainment
6%	Retail
6%	Telecom
4%	Transportation
4%	Travel
5%	IT services

Region

20% 9% 36% 26% 10%

- Africa and Middle East
- Asia-Pacific
- Latin America
- Europe
- US and Canada

Role

20% 9% 36% 26% 10%

- CEO
- COO
- CIO
- CFO
- Head of innovation
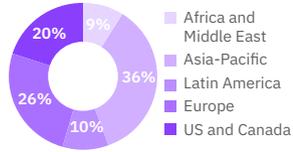
For more information

To learn more about this IBM Institute for Business Value (IBV) study, please contact us at iibv@us.ibm.com. Follow @IBMIBV on Twitter, and for a full catalog of our research or to subscribe to our newsletter, visit: **ibm.com**/iibv.

Access IBM Institute for Business Value executive reports on your mobile device by downloading the free "IBM IBV" apps for phone or tablet from your app store.

The right partner for a changing world

At IBM, we collaborate with our clients, bringing together business insight, advanced research and technology to give them a distinct advantage in today's rapidly changing environment.

IBM Institute for Business Value

The IBM Institute for Business Value, part of IBM Services, develops fact-based, strategic insights for senior business executives on critical public and private sector issues.

Notes and sources

1 IBM and Swiss Reinsurance industry case study. "Swiss Reinsurance Co. Ltd. Accelerating application provisioning and IT operations with an IT service orchestration solution." 2017. https://www.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=KUC12441USEN&dd=yes&

2 Ebner, Dr. Claus, Global Head of IT Infrastructure and Operations, OSRAM and Martin Daigneault, Global Head of IT Processes and Applications, OSRAM. "Working with IBM, OSRAM embarks on a multicloud strategy to enable transformation." https://www.ibm.com/blogs/cloud-computing/2018/05/23/ibm-osram-multicloud-strategy/; IBM and OSRAM case study. "OSRAM lights the way to glittering business transformation." 2018. https://www.ibm.com/case-studies/osram