Capgemini

EXECUTING CLOUD TRANSFORMATION

You know why. It's time to focus on how.

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EXECUTIVE SUMMARY

“Cloud transformation” is no longer a hypothetical concept or a marketing buzzword. There is a very real opportunity for organizations to radically improve agility, innovation, cost efficiency, and resilience by moving to a cloud-first, digital operating model.

The vast majority of enterprises have already dipped their toes in the water and achieved positive results by adopting cloud models for various use cases. Additional opportunities now beckon.

Cloud-native development, integrated process automation, AI-augmented analytics, and immersive customer experiences are just a few examples of how organizations are using cloud transformation to create new competitive advantages and enhance their reputations as innovators.

The question is no longer whether cloud transformation should be a top strategic priority. The new question is how to plan and execute cloud transformation for maximum business value and minimal cost, risk, and disruption.

This guide offers business leaders new insights and guidance on every step of the cloud transformation journey—from identifying opportunities to specific recommendations and advice about planning and executing your cloud transformation initiatives. It’s all based on Capgemini’s many years of experience and long track record of success with clients in all industry sectors, across the globe.

Cloud adoption continues to soar

2021 Market Statistics

$1Tr
Global market size by 2030

90%
CAGR across Europe through 2028

92%
of organizations expect cloud use to increase due to COVID

17%
of enterprise workloads to reside in a public cloud within 12 months

55%
of enterprises have a multi-cloud strategy

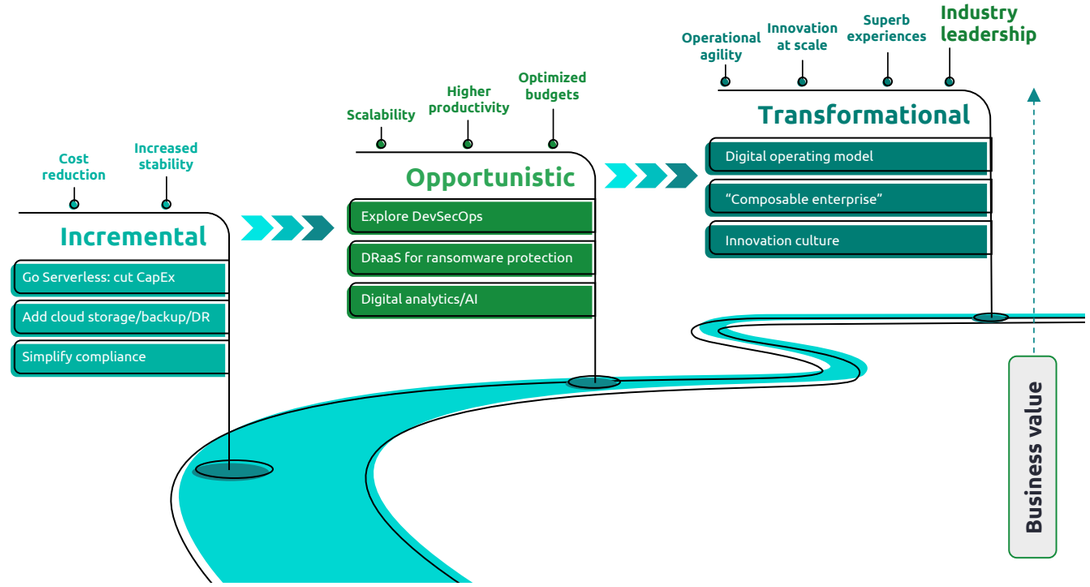
HOW TO EXTRACT MORE VALUE FROM THE CLOUD

Like all disruptive innovations, cloud continues to evolve quickly—and so do the opportunities for cloud transformation. Here are key considerations for identifying the right opportunities for your business, defining your strategy, and specifying the benefits and business outcomes you expect.

Opportunities beyond the obvious

Virtually every enterprise has already moved to a cloud model for certain workloads. And that's part of the problem. The enterprise now has a hodge-podge of cloud deployments, making it difficult to manage existing cloud use cases and easy to lose sight of new opportunities.

However, if you look at cloud transformation as a journey rather than a series of one-off projects, you start to see new opportunities you may otherwise have missed. While the journey itself has many phases and considerations, the opportunities along the way tend to fall into three key categories:



- **Incremental:** Most organizations start with the low-hanging fruit: moving workloads and data to the public cloud to cut CapEx for on-premises infrastructure. Based on positive results, they then consider additional possibilities, such as adding cloud-based storage, backup and disaster recovery capabilities, or using the shared responsibility model of public cloud security to simplify compliance with regulations.
- **Opportunistic:** Success with initial cloud deployments leads to exploration of more substantial use cases, such as implementing a DevSecOps model to expedite development of new product and service innovations, adopting DRaaS (Disaster Recovery as a Service) to ward off ransomware and other security threats, or moving to AI-based digital analytics to facilitate decision-making.
- **Transformational:** Based on positive results from previous use cases, organizations begin considering truly transformative cloud adoption, such as creating a fully digital cloud-based operating model, using cloud-first IT to create a "composable enterprise" that has instant access to the infrastructure needed for any given business scenario, developing an innovation culture that leverages DevSecOps to dramatically accelerate new product development, and more.

The key to success in identifying opportunities for cloud transformation is to look at the big picture, not one-off use cases. Collaborate with all key stakeholders, across departments and business functions, to find common problems that cloud transformation can help address and new capabilities cloud could create. Here are example questions to ask yourself and key stakeholders:

- How can cloud help us launch new products at the speed of need?
- How can cloud help us enter new markets?
- What is the business advantage of moving our applications and app development to the cloud?
- What is the potential impact of cloud transformation on the operating model?
- How can cloud maximize enterprise agility and business value / growth?
- How can we use cloud to improve our reputation as a great place to work?
- How can cloud transform our legacy IT culture into a culture of innovation?
- How would cloud transformation impact organizational processes / ways or working?
- How could better cloud management help us optimize cost, consumption, and capacity?
- What is the connection between better cloud usage and faster time to market?

How cloud transformation will advance strategic objectives

To help answer some of the questions above, consider some of the key business triggers and strategic considerations for cloud transformation.

Why adopt a cloud operating model?

- Cloud is a launching pad—a solid foundation for future growth, scalability, and agility
- Cloud is the future destination of applications, so accelerating the migration is key
- Need to accelerate entry into new markets/ channels
- Anticipated M&A activity
- Financial restructuring
- Disruptions in the industry or competitive landscape
- Reduce the burden on IT and attract top talent
- Need to consolidate data centers across geographies
- Application portfolio rationalization: figure out which apps to migrate and how
- Sustainability goals: cut carbon emissions and conform with corporate objectives

Strategic considerations for cloud transformation:

- Cloud transformation has become a board-level priority because it directly impacts the company's ability to ramp up for growth, innovate with new products and services, differentiate, and attract top talent
- Shareholders are now linking cloud adoption to the organization's modernization journey
- Integrating infra, apps & ops requires cloud transformation
- There are huge opportunity costs to inaction
  - Inability to keep pace with competitors
  - IT can't support new business/IT initiatives
  - Customer experiences become sub-par
  - Damaged reputation to the business, which can impact hiring.

Cloud transformation benefits for IT, employees, and the business

As a baseline, enterprises should expect cloud transformation to deliver the following benefits and advantages.

For IT

Agile team culture, with a focus on long-term thinking and continuous improvement.

IT agility: SLAs that match the solution to business needs, ability to conduct more PoCs in a "Fail Fast" approach.

Security & compliance: Highly available, resilient & redundant infrastructure that is fully aligned to standards and regulations, 24 x 7 operations monitoring & management, constant refinement of security and protection mechanisms.

Optimized Application Lifecycle Management (ALM): Tools to aggregate, assess, and analyze the entire application portfolio; end-to-end solution management capabilities; a single source environment to simplify the solution.

Operational savings: reduced cost of IT operations and savings in IT productivity.

Faster innovation: Shorter procurement lead times & resource bottlenecks, rapid delivery of project services, ability to automate & orchestrate provisioning tasks.

For employees

Improved experiences in interactions with HR, payroll, and other business functions because core processes can be streamlined, automated, and accelerated.

Higher productivity because cloud enables faster access to needed resources and better support through online portals, self-help capabilities, and more.

Higher job satisfaction because they get the experiences and support they need, translating to higher loyalty and longer tenure on the job.

For the business

Huge increase in agility, enabling the organization to respond to changing conditions instantly, get to market faster, integrate and manage supply chain operations, and more.

Better experiences for customers, partners, and employees, because developers can focus on the experience rather than the underlying infrastructure.

Cost reduction through replacement of CapEx with OpEx, optimized consumption, ability to scale to meet actual demand and shut down resources when not in use.

Greater control with consistency in authorizations, access, data storage and security, etc.

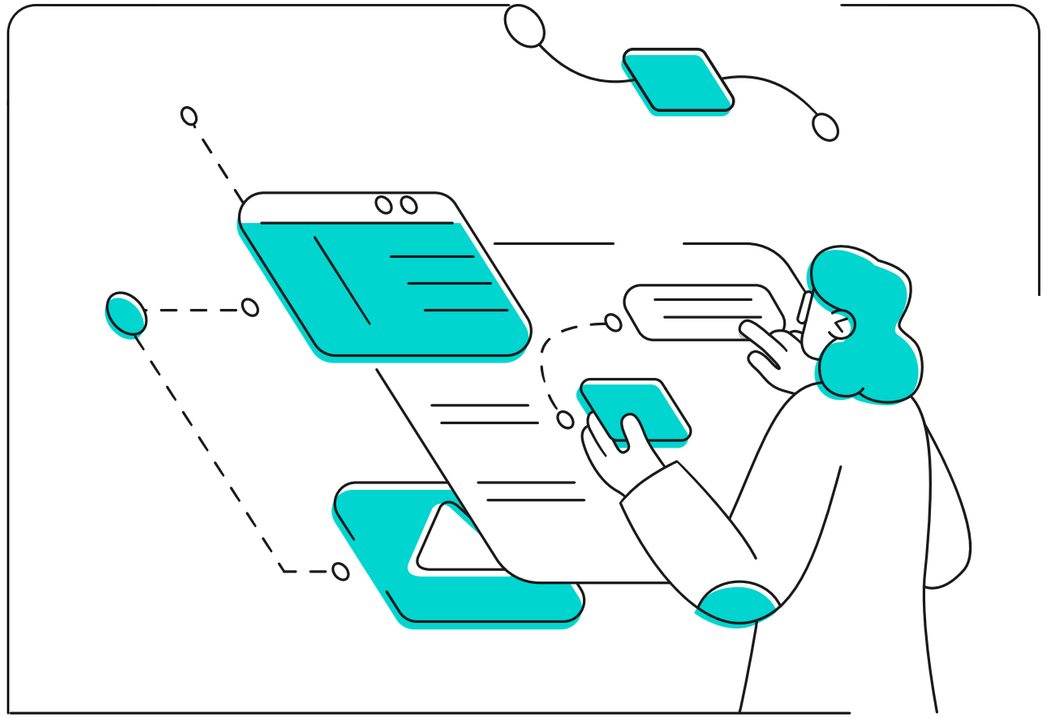
Reliability and privacy gains through reduced downtime and outages, use of encrypted data at-rest & in-transit, best-in-class security and protection, and more.

Speed to value with reduced procurement lead times, fewer resource bottlenecks, and rapid delivery of new innovations.

Obstacles to cloud transformation

Despite the multi-dimensional benefits enabled by cloud transformation, multiple challenges remain on the cloud transformation journey, including:

- **Complexity:** There many cloud services, multiple vendors, many moving parts, and a perception that making the wrong choices could create a spike in business risk.
- **Legacy technology:** Most companies have already made a huge investment in piecemeal or siloed systems, and the associated skills sets within IT can slow down cloud adoption.
- **Operational uncertainty:** As with any change, there is fear of disrupting something that already "works".
- **Skill shortages:** Cloud skills are specialized and hard to find and recruiting/hiring/retaining new talent can be a challenge, but reskilling a workforce can also be difficult.
- **Security:** Strict compliance and industry standard must be met to avoid business risk and penalties, and the shared responsibility model of security with public cloud providers requires continued investment in ever-changing security defenses.
- **Shadow IT:** When multiple business units or departments or geographies implement cloud separately, the result is cross-organizational issues with secure access, compliance, and resource usage; there are also islands of cloud services with multiple contracts/ vendors, adding complexity to unified cloud transformation initiatives.



HOW TO MAKE THE PROMISE OF CLOUD TRANSFORMATION REAL

The momentum around cloud transformation has shifted from explaining "why" to defining "how." This section outlines the mistakes companies often make in launching cloud initiatives, what needs to be in place to avoid the mistakes, and our top recommendations for each of the four key phases of cloud transformation.

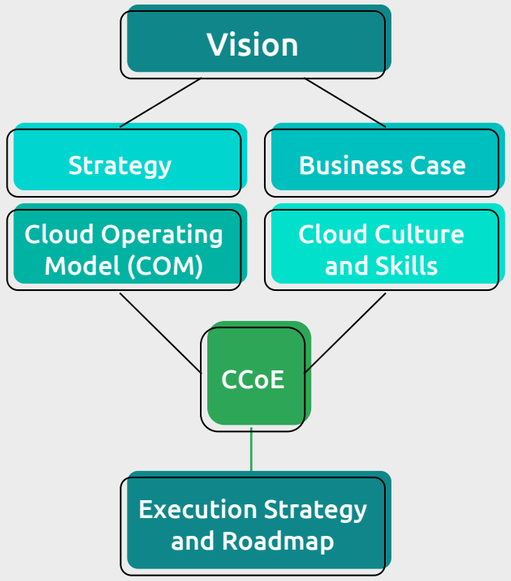
Top 5 mistakes enterprises make

The road to cloud transformation can be filled with potholes if the organization does not prepare adequately. Here are five common errors or misconceptions that can derail the initiative.

- **Seeing cloud transformation as a project, not a journey.** Executing cloud transformation as a series of one-off projects is what leads to incompatible siloes of clouds, vendors, contracts, processes, security gaps, and more.
- **Incomplete strategy and business case.** There are many considerations in defining both the strategy and the business case, and overlooking key factors is all too easy to do.
- **Underestimating the skill requirements and cultural impact.** Cloud skills are scarce, and without a detailed plan to attract, hire, and retain top talent the cloud transformation agenda will slow to a crawl.
- **Lack of understanding of cloud economics.** Deploying applications and infrastructure in the cloud is financially efficient—if you know how to manage the savings levers and take a "design to cost" approach that allows you to optimize consumption, rightsize resources, and manage licensing and contractual obligations to your best advantage.
- **Failure to put the right metrics in place to measure success.** Some business leaders say they'll know success when they see it. This approach does not work well in transitions to cloud operating models. Quantifying success metrics and monitoring them carefully leads to better outcomes.

Keys to success: what needs to be in place

The journey is different for every organization, but there are a few common elements that help ensure successful cloud transformation:



Commitment to a Vision

The transformation journey must start with a clear vision of the objectives and expected outcomes. The vision must have the backing of all stakeholders as well as the funding to proceed through completion. This includes not only the support of senior business leaders such as the **CEO, CIO, CFO, COO, CMO, CHRO,** and **CISO,** but also the board and even shareholders, because cloud transformation has substantial business value and impact on operations.

Strategy: future target state / cloud operating model

A vision without a strategy just an illusion. The strategy must consider a wide range of factors, including the target cloud architecture or foundation; the business operating model, cloud migration scenarios for applications, the expected financial impact, and security and compliance in the cloud.

The cloud operating model defines how the organization will transform traditional infrastructure and operations (I&O) into cloud-based service provisioning. It maps the mix of clouds that will be used to enable various business processes—public, private, hybrid, local, and edge clouds—and specifies how each will contribute to business value and how the cloud mix will be managed.

Defining a target cloud operating model requires going beyond the strict framework of IT department teams and answering questions about the entire IT value chain:

- How to take advantage of the level of automation of the public cloud to respond more quickly to business demands
- How to optimize your service portfolio through the reuse and integration of public cloud services
- How to speed up application production cycles without compromising the quality of service
- How to benefit from public cloud services while maintaining strong security

The future state also defines how the cloud operating model can maximize the business value of cloud transformation. Reference frameworks (e.g. SAFe, IT4IT), combined with the culture of the IT department and the focus on the priority projects of the organization, will provide the necessary inputs to allow for development of the cloud operating model.

In addition, the cloud operating model should provide cloud governance and define how the various cloud teams will organize themselves to meet the organization's strategic and operational objectives. It includes:

- A blueprint that shows how each component within a cloud organization functions
- An integrated view of how cloud services will be provided, along with a description of each cloud function and the underlying processes, roles, governance, interfaces, performance metrics, and tools
- Clear direction on how the cloud operation is configured to execute organization's cloud strategy
- Clarity on the governance arrangements across the IT organization and the business community

In short, the cloud operating model will guide the design and definition of processes that will allow different application teams to follow the same set of processes for application development and deployment. The design criteria should include the following:

- **Customer-centric organization** that is business capability driven
- **High level of IT and digital automation** in processes for resilient operations
- **Increased scalability** with strong design and security safeguards
- **Agile delivery** management and service capabilities
- **Lowest feasible** operational and transactional costs
- **Scalable sourcing approach** to global delivery combining quality, efficiency, talent, and collaboration
- **Microservices, containerized, API-driven** application portfolio

Business case with metrics

The business case quantifies the expected business value, the impact, and the risks of the cloud transformation initiative. It should be tightly coupled to the strategy and should involve the same stakeholders who define the overarching objectives. Success should be measured using a wide range of metrics encompassing incremental revenue from new digital services, user engagement, workforce productivity, cost optimization (including license rationalization), and many more.

More specifically, the business case should include the financial rationale behind cloud transformation, including cost, savings, and quantified growth opportunities. Key business leaders and board members are more likely to engage in the context of growth and new business opportunities.

Over the course of the cloud implementation, the business case should also provide a forecast for return on investment and connect IT charges to business KPIs that ensure ongoing project funding. Savings from cloud adoption and modernization include both hard and soft benefits. Hard savings come from right-sized infrastructure, auto-scaling, and the elasticity of the cloud along with the reduction in software licenses and the pay-as-you-go usage model.

The soft benefits come from reduced time to market for new products and services, agility via automation (DevSecOps and scaling), personnel savings with less manual maintenance, cost and risk reduction via continuous upgrades, increased developer productivity through reuse of standard cloud services, and the indirect costs of simplified procurement.

The business case should include the following elements:

Financial benefit

- Quantify the required investment – IT and non-IT – to implement the cloud transformation initiative
- Establish new cost driver categories as well as savings categories; estimate costs and savings per category and determine the overall resulting bottom line impact
- With the established basis of investments, costs, and savings, determine the impact on cash flow during the cloud transformation as well as post-implementation
- Determine the potential bottom-line impact of digital/cloud-based growth initiatives and factor the results into the overall business case

Business impact

- Provide well-grounded assumptions for the implementation of new digital business models and their returns
- Provide indicators and metrics for improvement in productivity, efficiency, and customer experience, including faster time-to-market for new products and services

Time to scale

- Develop a milestone-based case that shows the accumulation of benefits over time
- Establish a sequential time/progress/benefit matrix to demonstrate achieved vs. expected outcomes periodically
- Self-funding models
- Economies of scale, access to global resource pools, and industry best practices (including delivery models) will all contribute to driving efficiencies in the project spend
- By linking committed future run spend to transformation it is possible to eliminate the usual transformation cost bubble through a combination of commercial levers
- Additional projects enabled by the rightsizing will further contribute to consolidation and rationalization, driving run costs down further

Risk management

- The ability of processes, resources, teams, and partners to align to one cloud vision and adapt to a culture of change management should go hand-in-hand with incremental behavior shifts and minimal risk and resistance
- A detailed plan of action on communication and stakeholder expectation management will ensure better business buy-in

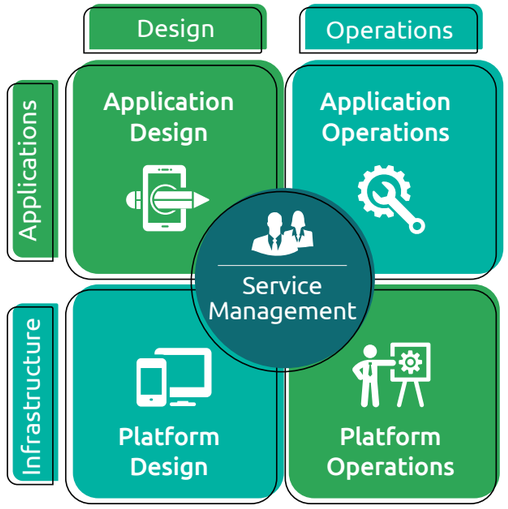
Cloud metrics

Metrics should combine some of the following performance indicators:

- Revenue from new digital services
- Operational improvement
- Customer experience management
- Time to market for new products & services
- Service excellence
- User engagement
- Workforce productivity
- Cost optimization, including license rationalization
- Operating expenses and contributing margin
- Average time to deliver new services
- Percentage of processes automated/self-service
- Sustainability goals – reducing carbon emissions

Cloud Center of Excellence (CCoE)

The creation of a CCoE brings together the skillsets and services required to deliver on the cloud transformation agenda. The CCoE provides a structured environment for delivering a high-frequency product-based organization with cloud-based DevSecOps teams; a clear overarching digital and cloud transformation approach; and the essential building blocks needed to operate digital and cloud use cases.



CCoE (Transition)

Ideally, the CoE should serve as the hub of integrated service management, including design, operations, infrastructure, and development as well as risk and finance. This requires active engagement from a wide range of stakeholders, both internal and external, including:

- IT and cloud engineering teams
- Enterprise architecture
- Cloud and information security teams
- Application owners
- Compliance and risk
- DevSecOps
- Cloud and network operations
- HR
- Finance
- Vendor/supplier management
- Partner and cloud service management

Cloud culture and skills management

The cloud requires highly specialized skill sets that your existing teams may or may not have. Therefore the cloud transformation journey must carefully consider culture and skill management issues, addressing questions such as how cloud migration will change the culture, how the needed skills will be obtained and retained, how leaders will indoctrinate change, what the impact will be for customers and partners, and more.

There needs to be a strategy for up-skilling existing teams as well as recruiting hard-to-find skills. Re-badging of employees, as well as potential severance agreements, need to be provisioned as well. Getting to the right resource balance and aligning employees to adapt to the cultural changes will require a continuous series of analysis, assessments, and workshops. Incorporating and acting on stakeholder feedback is essential to build trust and credibility for the proposed new ways of working.

We believe there are five key areas organizations should focus on to solve cloud talent challenges:

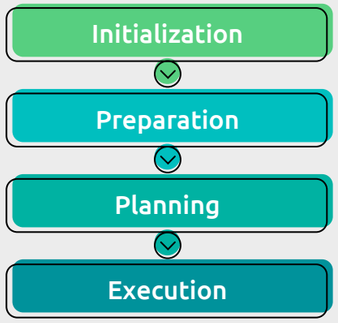
- **Align leadership on a talent strategy.** HR executives and other business leaders need to acknowledge the cloud talent gap and play their part in narrowing it. Leadership will also have to play a greater role in seamlessly integrating new cloud talent into the existing workforce. Dealing with a multi-generational workforce requires greater awareness of employee strengths, their working styles, and their aspirations.
- **Diversify your recruiting approach.** Organizations should think creatively about where to look for talent, as opposed to just focusing on which talent to look for. Focus on establishing offices or recruitment efforts in technology hubs that are more accessible to cloud talent. Organizations can also collaborate with educational institutions to develop the pipeline and recruit new talent and leverage social media, other digital channels, and "gamification" or gaming techniques.
- **Create an environment that prioritizes and rewards learning.** Given that upskilling is a priority for cloud talent, organizations should ensure their people feel supported in their decision to participate in learning and development. Organizations can also consider ways to incentivize learning.
- **Give new talent the power to implement change.** Organizations need to build an acceptance for failure. Cloud talent is unlikely to thrive in an environment that lacks freedom to experiment and fail. Innovation will also suffer if a culture of experimentation does not exist.

Comprehensive execution plan

The success or failure of the cloud transformation initiative ultimately hinges on execution, and that requires cloud teams to carefully consider and prepare for a wide range of factors—from planning and executing application migration to cloud security, quality assurance, testing, governance, automation, sustainability, and more. These considerations, along with Capgemini's specific recommendations, are detailed in the next chapter of this guide.

Recommendations covering the four phases of cloud transformation

There are four key phases of cloud transformation: initialization, preparation, planning, and execution. Here are Capgemini's top-line recommendations for each phase.



Initialization

- Strategy and business case belong together and will form the basis for board approval
- Align early in the process with the organization's overall digital transformation agenda
- Create a business case for cloud transformation leveraging existing digital business initiatives

Preparation

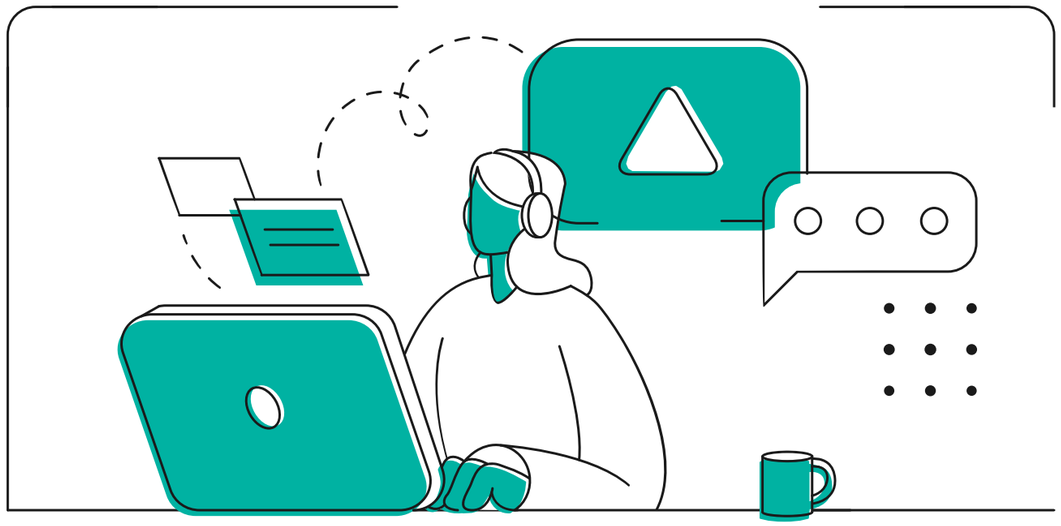
- Take advantage of the resilience inherent in public cloud services
- People management: Involve HR as early as possible to prepare people for the transition to cloud
- Set up governance and controls
- Identify the inventory to migrate (apps, servers, etc.) and define the desired scenarios (Rehost/Lift and Shift, Redeploy, Refactor/Re-architect)
- Evaluate and plan for improving the quality of existing data sources

Planning

- Focus culture and change management to align all resources
- Establish a core team with cross-functional process owners with a clear roadmap for action
- Implement a chargeback mechanism with business units
- Set up a homogeneous chain of DevSecOps tools and practices to automate the deployment of modernized applications; use container orchestration platforms on Kubernetes to bring high-level standardization and industrialization
- Onboard transformation partner(s) with the right set of experience, skills, and resources to help drive change management and technology adoption

Execution

- Maintain business continuity and operations with minimal disruptions
- Communication during cloud transformation is key
- Build a minimum viable cloud product through continuous iterations
- Automated monitoring and orchestration capabilities should have real-time visibility & consistency across environments
- Run testing throughout the delivery process
- Use native cloud services where possible to avoid redeployment of less agile solutions
- The next-gen operating model should allow for extensibility into growing cloud trends



HOW TO EXECUTE ON YOUR STRATEGY: 10 KEY CONSIDERATIONS

It's time to get more specific about the execution phase of cloud transformation. This section highlights 10 key factors that comprise a successful implementation of the cloud vision, strategy, and business case.

1. Planning apps migration and modernization

Moving applications to the cloud is one of the key drivers behind cloud transformation, because it enables a whole new level of agility, efficiency, and cost savings compared to on-premises models. At this point, the objective is to define, in detail, how to get there, taking into account the application portfolio, platform, and operating model.

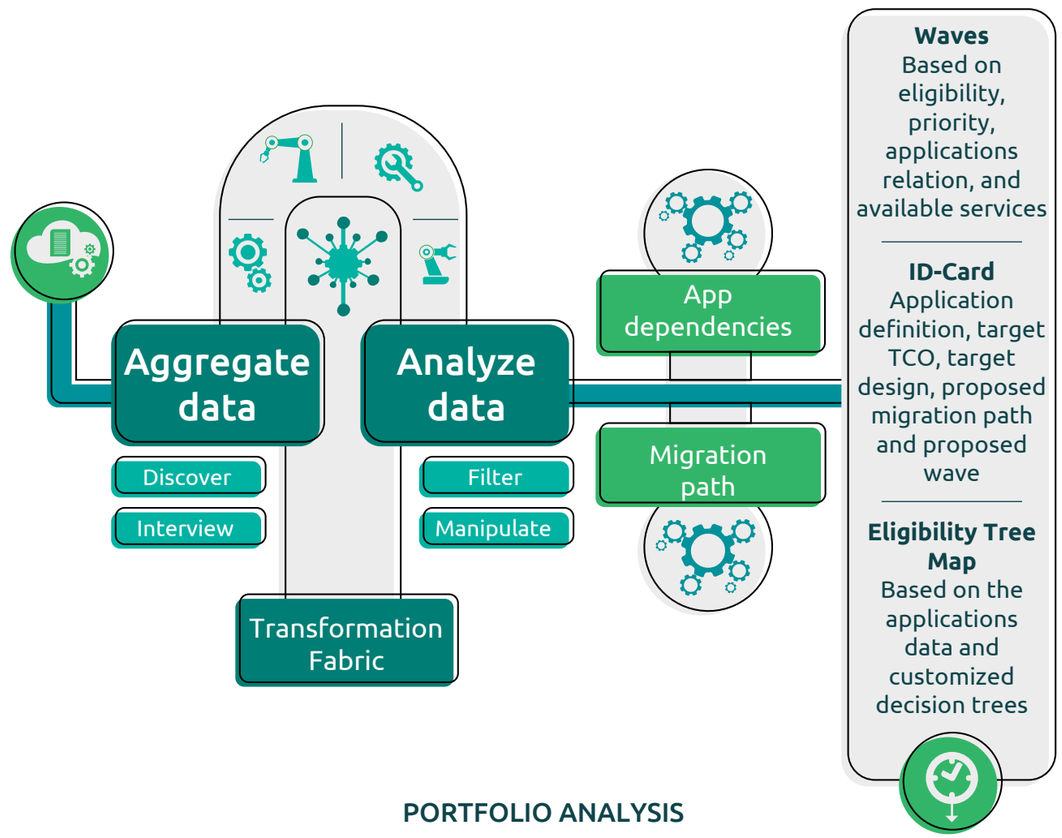
To migrate hundreds, or sometimes thousands, of applications to the cloud, whether public or hybrid, using methods adapted to business objectives, there are two interlinked steps. The first is the assessment of the application portfolio (portfolio cloud analysis) and the second is the actual application transformation (cloud application transformation).

Portfolio cloud analysis

This first process assesses the current situation. The evaluation of the application portfolio leads, for each application, to a recommendation of the best architectural target and the associated migration path.

The evaluation of the platforms that must receive the migrated applications makes it possible to establish platform update recommendations (these platforms often support your critical systems) prior to execution.

Finally, the assessment of the cloud maturity of the organization identifies projects that will make it possible to achieve operational excellence.



PORTFOLIO ANALYSIS

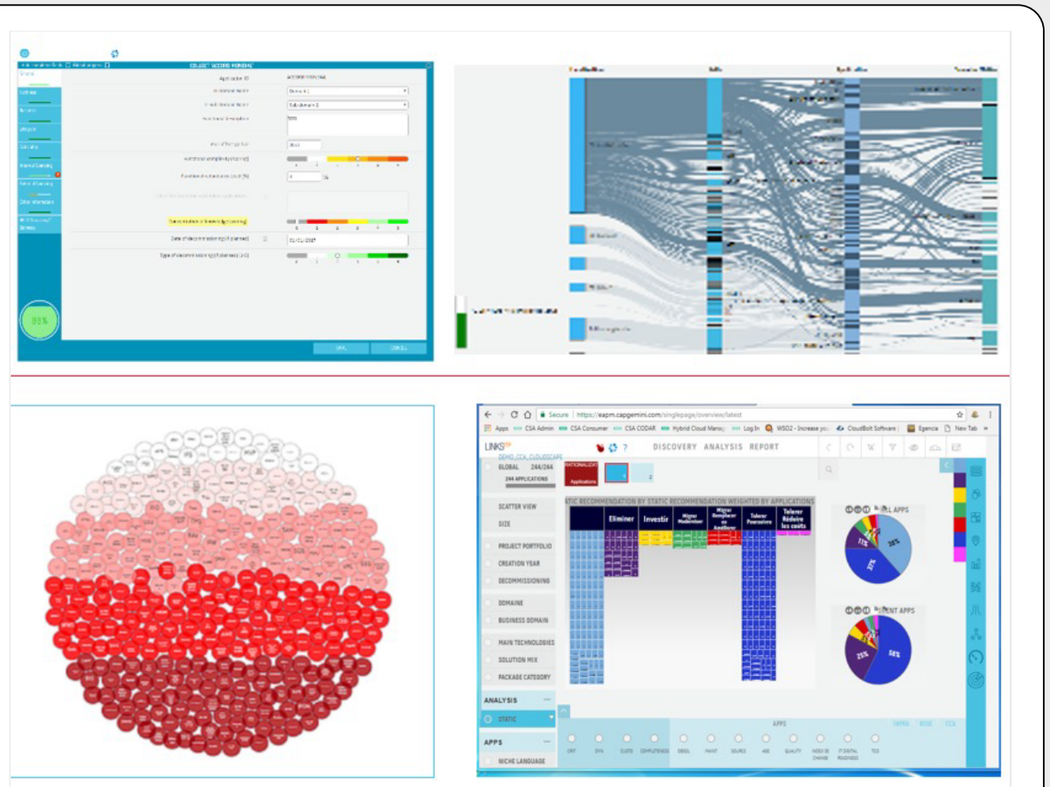
Visualize: model your application portfolio

To recommend a target and a migration path requires a precise view of business, applications, and infrastructure. This is the essential pre-condition for a configurable rules engine to then allow detailed definition of the migration of each application by applying / simulating the rules dictated by technical teams (technological compatibility, regulations in force, etc.) and by strategy (preference for a type of target, for a migration method, for a cloud provider, for a security policy, etc.).

Recommend: establish migration scenarios

For a migration to be optimal and deliver a good return on investment, it is important to identify a scenario, or a set of ideal migration scenarios, aligned with your needs. The analysis process allows us to establish both an overall eligibility matrix but also an identity card for each application where we find its cardinal characteristics associated with the most suitable migration scenario.

Based on this eligibility analysis and with full knowledge of all the elements of the migration (migration model, elements consumed from



Capgemini's eAPM (economic Application Portfolio Management) solution offers a uniquely graphical, granular analysis from which to build a transformation trajectory.

the cloud provider, such as the number of VMs, storage, etc.), the target cost of the migration is known and makes it possible to establish a TCO. The business case, with the potential ROI opportunities, is then built from the cost items.

A migration schedule can include several phases. Based on the recommendations drawn from the analysis phase, customers then carry out their migration by defining the batches of applications to be migrated at regular intervals (every month or every two months).

Definition and constitution of an application design

A design is created for each application using the migration information collected in the analysis phase. For a redeployment, this design contains all the infrastructure elements to deploy, including:

- Middleware and application packages
- Configuration data
- Data model
- Definition of the environments to be deployed
- Orchestration necessary to deploy each environment

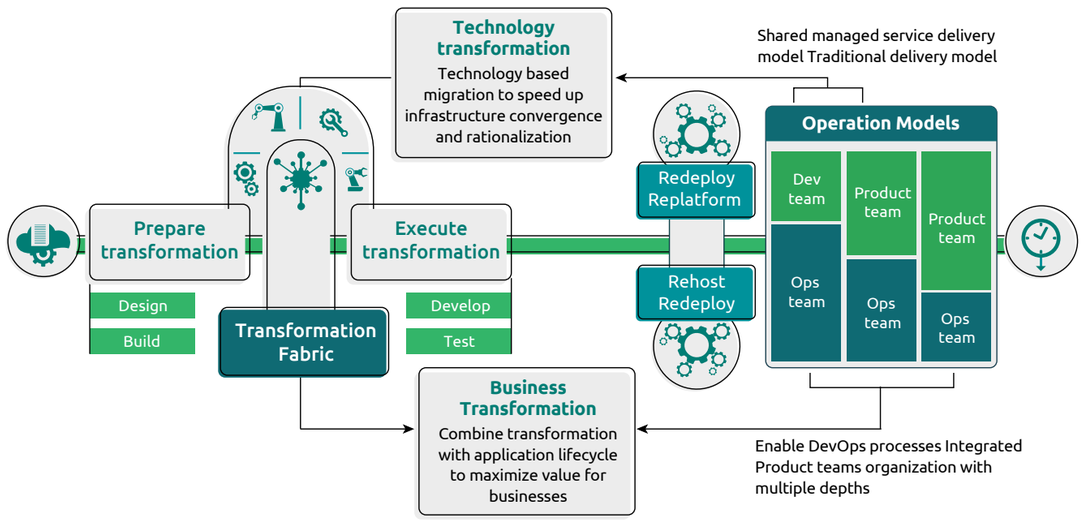
The design considers the relationships between applications as well as the sequencing and integration elements of their deployment. This enables templates and artifacts to be generated that can be used in a chain of continuous deployments. The next step is to perform the redeployment of each environment that is part of the application design.

2. Executing apps migration and modernization

The second interlinked process is the execution of the plan constructed during the Cloud Portfolio Analysis. This process brings together the transformation engine necessary for a successful outcome and an end-to-end automated solution for the migration itself, together with a global community of certified experts to support businesses across the globe.

There are three stages to Application Cloud Transformation: preparation, planning, and transformation.

The previous choice of transformation methodology will influence the time required and the actions to be performed at each stage, but also have an impact on outcomes. For example, by providing the automation artifacts necessary for the deployment of new architectures during the replatforming or redeployment of an application.



APPLICATION CLOUD TRANSFORMATION

Deployment as a chain of continuous deployment operations

The deployment phase is fully automated and launched by a pipeline manager that ensures the execution of the deployment, testing and synchronization steps.

Deployment

The complete deployment is managed by three tools: an orchestration tool, an infrastructure deployment tool, and an infrastructure configuration tool. The set can deploy any application on any target. In the case of a redeployment, this involves the implementation of resources, the installation of middleware, configuration, and binaries with associated dependencies.

Test

There are two stages of testing; an automated infrastructure test and a “user acceptance test” performed by the users of the application. As part of a redeployment, application tests are also added to control the deployment. Automating the application test campaign saves time and minimizes errors.

Synchronization

This final step updates the target application by transferring the last operating data recorded on the source application to minimize service interruption. Finally, once the update is complete, the switch to the new system for all users takes place. This finalizes the migration.

3. Cloud security and compliance

Public cloud models employ shared-responsibility security, so it is important to build security into the application architecture to protect from vulnerabilities and use the cloud to streamline compliance processes.

Security

Organizations must consider the following parameters:

- Plan for cloud protection services for identity and access management, data protection, application security and infrastructure security.
- An identity and access management strategy must be in place to ensure potential organizational IT issues are not replicated in the cloud.
- Identity management, data security, and governance are always the responsibility of the data owner and not shared or outsourced.
- Responsibilities must be clearly defined in the service contract(s) and aligned to the organization’s overarching security assurance model.
- Adhere to cloud security standards and certifications such as ISO/IEC certificates 27001, 27017/18, etc. (per latest market conditions).

Compliance

Compliance requirements need to be implemented jointly with the cloud service provider. These requirements could be regulatory (e.g. GDPR) or certifications (e.g. FIPS) or related frameworks (e.g. PCI). Compliance management should include activities such as technical measures for cloud security and data compliance (e.g. gateway for encryption and tokenization of data before leaving the proprietary network and reaching the cloud), organizational measures for data compliance (e.g. contractual solutions), and so on.

Data protection is an important consideration while moving to cloud. Organizations must implement appropriate access controls and audit mechanisms and have service level agreements with cloud service provider on recovery time and data loss.

4. Quality assurance (QA)

Transformational QA practices need to consider risk exposure, organization culture, and reduction in time to market to drive successful cloud and digital transformation.

- Organizations transforming to cloud need to adopt DevSecOps and continuous testing practices and quality monitoring.
- Automation should be an essential component of the QA methodology. A combination of AI and RPA for test automation and automated reporting and analysis should be increasingly used.
- To benefit from AI, QA experts will need knowledge and training in data science and statistical modeling.
- QA tools should enable UI, pattern, and visual validation & QA COE models, and teams should include both QA experts and business teams.
- Centralize the control and reporting across the QA and test activities.

5. Testing

Testing is the foundation for a strong, agile software-development plan that supports business needs and expectations, and organizations must move from traditional testing to a more modern engineering approach. This will deliver a more effective and efficient testing program that creates a seamless customer experience and better manages risks.

A quality engineering platform should provide holistic customer-experience-focused solutions that enable the organization to transition from traditional testing to modern quality engineering.

Organizations should also consider accelerating their investment in quality engineering skills and continuous testing solutions within their Agile and DevOps teams to ensure that Agile at scale does not fail. To achieve this, they must empower cross-functional Agile teams with sufficient quality engineering expertise and enable the QA culture, QA automation, and test environment provisioning with a flexible quality support team.

Companies need to build test environments that can be spun up, replicated, decommissioned, and managed at scale. This will involve practices included cloud provisioning, service virtualization, and containerization. Effective and efficient management of test environments with structured automation can deliver significant benefits along with substantial cost savings to the organization.

6. DevSecOps

DevSecOps brings together the Development, Security, and Operations teams and accelerates time-to-market, adopting technologies that enable continuous development of solutions. Our key recommendations for effective execution of cloud-based DevSecOps include:

- Focus on progressive transformation of continuous improvement of the environment of software projects, with incremental components.
- Develop Blueprint and DevSecOps pipelines preconfigured on different platforms.
- Build expertise in customization, installation and integration of CI / CD solutions and tools, quality gates, governance, communication, and orchestration of DevOps environments.
- Deploy accelerators for the optimization of the DevSecOps work environment (RPA, QA dashboards, Cognitive QA, test automation, integration with chatbots, etc.).

There are three major use cases for DevSecOps that require appropriate models:

- **DevSecOps for Quality**
  - Automated delivery pipeline
  - Automated testing
  - Monitoring
  - IaC, self-service

- **DevSecOps for Acceleration**
  - Increase number of releases
  - Reduce time to market
  - Decrease ticket fixing time
  - Agility & flexibility
- **DevSecOps for Innovation**
  - New business models
  - Be the first one
  - Efficiency
  - Ready for scale

7. Cloud economics and FinOps

Understanding the economics of cloud adoption is critical for developing the business

case for cloud transformation—and even more critical for the execution phase. Yet managing costs in the cloud and meeting cost reduction goals is a challenge that many organizations find difficult to achieve.

The reality is that a “cloud economics” approach should be an integral part of all transformation activities. In the execution phase, it must address the following:

- The implementation of FinOps governance
- Measuring the consumption of subscribed services from cloud providers
- Cost analysis and optimization
- Communication of cost trends

FinOps governance

A cost management approach should involve more than having the levers to launch control or optimization actions. It is important to put in place the foundations of FinOps governance including:

- An empowered organization that combines technical profiles and skills to measure consumption in the cloud; and the ability to identify areas for optimization, communicate them, and take decisions to ensure that economic objectives are achieved
- Alignment with business processes to preserve the agility offered by cloud solutions while ensuring consistency in the use of services and their economic impact
- The definition of consumer and budget representatives to ensure user empowerment, with traceability of consumption costs and their breakdown within the organization
- A matrix of responsibility indicating the roles of each area (finance, business functions, applications head, architects, operations, purchasing) in cost management governance in the cloud
- Architectural patterns of subscription models for services consumed, and a matching sourcing strategy
- The definition of budget targets aligned with the cloud transformation strategy, and dashboards making it possible to communicate both on consumption and key indicators of “FinOps” governance

Measure consumption

Once the foundations of the Cloud economics approach have been implemented, it is a question of measuring the consumption of services as closely as possible and analyzing their uses.

This means deploying the right tools. The use of native tools provided by each of the cloud providers makes sense in a mono-cloud environment. In multi-cloud environments, third-party solutions can offer unified analyzes regardless of the cloud providers used. These solutions must be subjected to a detailed needs analysis before subscribing to them.

Whatever the choice of tools, they should make it possible to highlight the breakdown of the costs of using services. Sometimes a labeling strategy (tags) aligned with the organization of the company has been previously implemented. In other cases, it is possible to break down the costs to the application and organizational level. The finer this breakdown, the easier it will be to analyze the use of services and identify areas for optimization.

Analyze and optimize consumption

Once consumption has been measured, it is possible to finely analyze the use of cloud services and identify deviations from best practices.
It is possible to define axes for optimizing consumption, such as:

- Deleting unused instances
- Resizing of certain instances or services
- Change to more economically advantageous subscription models.

Even if, at first glance, these tools provide obvious help in optimizing costs, they only cover a small part of the possible areas of optimization. It is essential to involve a team made up of cloud architects and specialists. This team will be able to work on other axes, for example:

- Reconsider the architectural principles implemented and propose necessary adjustments.
- Identification of serverless services,
- The opportunity to switch to DBaaS services
- Optimizing the data model

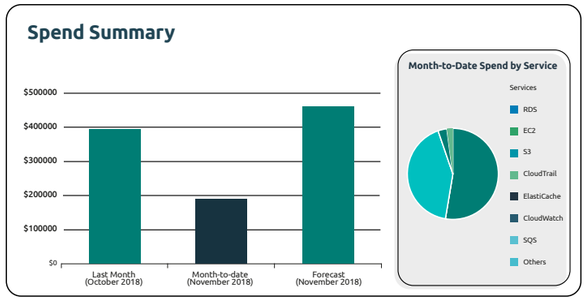
The team of cloud architects and specialists is referred to as the “Design Authority.” They must work in concert with FinOps governance so proposed recommendations are well implemented at all levels of the organization and the impact on costs is measured in all cloud projects.

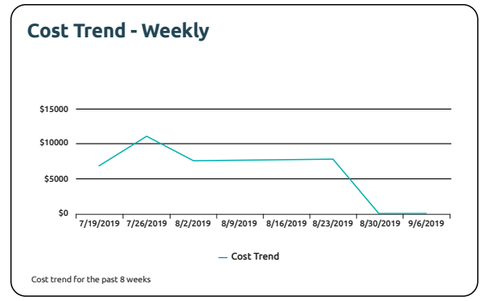
Communicate cost trends

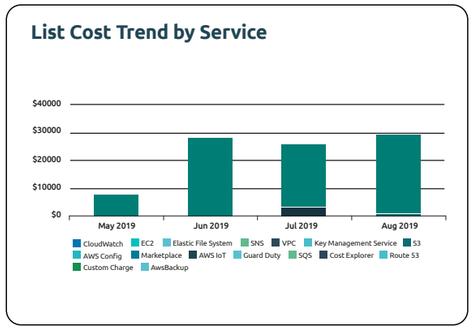
In order to make everyone accountable for the impact of their actions on cloud costs, it is important that FinOps governance communicate proactively and effectively about:

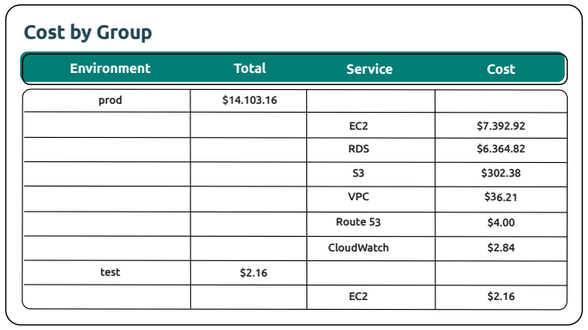
- The state of consumption
- The distribution of costs
- Changes in indicators
- Impact of optimization actions.

FinOps governance will be able to go further in the empowerment of individuals by offering total transparency of the actions of each individual on the economic health of the cloud, or even by launching a gamification process around the FinOps subject.









Environment	Total	Service	Cost
prod	$14.103.16		
		EC2	$7.392.92
		RDS	$6.364.82
		S3	$302.38
		VPC	$36.21
		Route 53	$4.00
		CloudWatch	$2.84
test	$2.16		
		EC2	$2.16

As part of a continuous improvement process, FinOps governance must also operate in conjunction with other contributors such as the Design Authority. It must take place over time and its impact must be measured over time, which is why monitoring dashboards and communication are of critical importance.

8. Governance

The implementation of cloud creates complexity arising out of multi-vendor, multi-services environment, challenges to security and compliance, external factors such as regulatory requirements etc. In order to address these challenges, a well-defined governance model is required.

Yet all too often, governance is implemented too late during a cloud transformation or migration program. The absence of governance can generate additional consumption costs and deviations from good cloud management practices, requiring tedious and costly corrective actions. Therefore we offer the following recommendations:

- Governance must focus on all aspects of the cloud journey: implementing new roles and responsibilities; rightsizing the IT organization; enabling enhanced sourcing and partner management; focusing on IT innovation; software delivery; platform and DevSecOps capabilities; reducing legacy IT systems; adapting processes, security and compliance, etc.
- The governance model should include all stakeholders to ensure executive support for cloud adoption.
- The governance mechanism should outline the evaluation and control mechanism that will help track execution and monitoring conformance.
- The governance model should focus on measuring effectiveness and business value add; it should also define processes to measure the cloud benefits as outlined in the business case.

9. Automated IT operations

Cloud-enabled, product-based, fully automated IT operations is the desired future state of IT that can support organizations to further their digital journey. The product-centric model is more outcomes focused, with KPIs tied to business results.

Capgemini recommends that a single team of cross-skilled people – a product team – should work closely together across all aspects of development to ensure optimal outcomes, from provisioning to running the SCRUM team to product development, CI/CD pipeline, and product release. It is a "you-build-it-you-own-it" model in which everyone shares responsibility to maximize speed and agility. This model includes:

- **Digital Operations Organization**
  - Establish a product-based organization structure rather than a functional structure.
  - Define a team structure in which team members specialize in their cloud products and are responsible for further development.
- **DevSecOps and Automation**
  - Automated DevSecOps processes covering API & integration, serverless, containerization.
  - Manage infrastructure as code.
- **Cloud-Native Managed Services**
  - Include operational cloud-native solutions in the service catalogue containing the essential building blocks needed to deliver and operate digital and cloud use cases.
  - Leverage cloud-native managed service provider capabilities and expertise to support the end-to-end lifecycle management of this ecosystem, which includes code pipeline management, container registries, container platform maintenance, and orchestration.

10. Sustainability

Being socially responsible towards climate change and the reduction of carbon emissions is another board-level priority, and sustainability should be a key consideration in the execution of your cloud transformation initiative.

The sustainable IT agenda should be planned well in advance and in consultation with the cloud service partner, and the following activities should be kept in mind at various stages of the program:

- Appoint a person to assume overall responsibility for energy management. This function will continuously challenge the planning of all operational units, instilling a mind-set of monitoring energy consumption and attempting to optimize. This spans internal as well as external energy consumption for all parts of the overall IT setup and target state.
- Measure and monitor application energy consumption within the organization.
- Assess the IT department's environmental footprint, based on:
  - Data collection from the client (devices, utilization: data flow, energy consumption)
  - Life-Cycle Assessment (LCA) databases
- Get insights on CO2 emission reduction via transformation strategies such as consolidation, migration to cloud, and/or decommissioning of applications.
- Right-size the application and enable scalability.
- Choose more green hosting locations of hyperscalers.
- Implement sustainable digital transformation with organization IT and functional owners:
  - Streamlined use of ICT equipment, data architecture and application portfolio
  - Eco-design applications
  - Replacement of carbon-intensive habits with the help of technology
  - Optimization of existing models and systems with more responsible solutions
  - Creation of new solutions to support sustainable development.

HOW TO IDENTIFY THE RIGHT CLOUD TRANSFORMATION PARTNERS

Very few enterprises have the cloud-specific expertise, skillsets, and resources to embark on a cloud transformation journey on their own. Yet the cloud market is expanding so rapidly it is difficult to sift through the myriad options for cloud services and transformation assistance. Here are a few pointers in selecting two of the most importance contributors to cloud success: hyperscalers and transformation partners.

Choosing the right hyperscalers

Hyperscalers such as Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform, Alibaba and others are enjoying spectacular growth as cloud initiatives mature and expand. The latest research underscores the upward spiral in demand for hyperscaler services:

- **36** percent of enterprises spend more than **$12** million per year on public clouds
- **55** percent of enterprise workloads are expected to be in a public cloud within twelve months
- **90** percent of respondents who answered a question about COVID-19 expect public cloud use to exceed plans due to the pandemic

For enterprises engaging in cloud transformation, selecting the right hyperscaler(s) is a critical decision—and the relationship must be viewed as a long-term, strategic partnership rather than a typical client/supplier relationship.

The starting point is communication—being clear and transparent about your vision, your strategy, your target cloud operating model, and your expectations in terms of business value and outcomes. Based on initial discussions on these topics, you can begin to gauge which hyperscalers are the best match in terms of their ability to:

- Deliver the optimal combination of resources, at scale, at the right price
- Meet specific niche or geographical requirements to meet the demands of your use cases
- Contribute adequately to your governance, security, and compliance requirements
- Coordinate or support other hyperscalers as required by your cloud operating model
- Provide financial incentives to support your levels of consumption
- Assist with your sustainability strategy by providing green options
- Work with you continuously and proactively to ensure full value both as a supplier and as a business partner

Finding the ideal partner for the transformation journey

Cloud transformation is an urgent yet complex and multi-dimensional strategic initiative, and finding the optimal partner to assist you on every step of the journey is perhaps the single most critical decision you'll make.

Look for a partner who can deliver not only expert advice based on years of successful engagements with other clients but also access to new ideas, fresh insights and guidance, advanced solutions and capabilities, and a true partnership approach that prioritizes business outcomes above all else.

More specifically, look for the following core capabilities that enable your enterprise to maximize the business value of the cloud:

- **A comprehensive approach** to cloud transformation that encompasses the entire journey—from planning to strategy to execution. Make sure the prospective partner can integrate every element of the digital foundation—physical or virtual—and add value with intelligent solutions harnessing automation, analytics, artificial intelligence, containers, and more, empowering your enterprise to create new competitive advantages and business value.
- **A collaborative approach** that fosters cooperation and communication among C-suite executives, IT leaders, business units, and outside advisors and experts to create and execute cloud strategy.

- **A reliable source of advice** combined with a full spectrum of cloud services, including the ability to customize a road map for the entire cloud transformation journey, and expert assistance every step of the way.
- **Sector-specific expertise,** with deep experience and satisfied clients in all industry sectors, including financial services, healthcare, retail, energy, manufacturing, food, travel, entertainment, and more.
- **Security embedded** in all aspects of the cloud environment, during and after transformation.
- **Richly skilled, full-stack engineers** who have expertise in cloud transformation and skills using the latest, most advanced cloud technologies and management tools.
- **Social consciousness:** To be the trusted advisor you require, partners must demonstrate sensitivity to your sustainability initiatives and an ability to facilitate those effort every step of the way.
- **Vendor-neutrality:** Your partner should enable you to maintain freedom of choice among multiple cloud service providers and hyperscalers. There must be no cobbling together of piecemeal solutions that don't work together.
- **Global scale:** Your partner should be able to serve you everywhere your development teams, networks, devices, and users are, worldwide, and scale on demand whenever, wherever you want.
- **Satisfied clients:** Check the references of prospective partners in your specific industry sector, geography, and business type.
- **Consistent leadership in analyst rankings:** Look at all recent evaluations of your prospective partners from leading research and analyst firms such as Gartner, NelsonHall, IDC, Forrester, and more.

ABOUT CAPGEMINI

Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of 270,000 team members in nearly 50 countries.

With its strong 50-year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2020 global revenues of €16 billion.

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