AWS Whitepaper

AWS Cloud Adoption Framework: Governance Perspective

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AWS Cloud Adoption Framework: Governance Perspective: AWS Whitepaper

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Abstract

As the proliferation of digital technologies continues to disrupt market segments and industries, adopting Amazon Web Services (AWS) can help you transform your organization to meet the changing business conditions and evolving customer needs. As the world's most comprehensive and broadly adopted cloud platform, AWS can help you reduce business risk, improve environmental, social and governance (ESG) performance, increase revenue, and improve operational efficiency.

The AWS Cloud Adoption Framework (AWS CAF) uses AWS experience and best practices to help you digitally transform and accelerate your business outcomes through innovative use of AWS. Use the AWS CAF to identify and prioritize transformation opportunities, evaluate and improve your cloud readiness, and iteratively evolve your transformation roadmap.

AWS CAF groups its guidance in six perspectives: *Business*, *People*, *Governance*, *Platform*, *Security*, and *Operations*. Each perspective is covered in a separate whitepaper. This whitepaper covers the Governance perspective, which focuses on helping you orchestrate your cloud initiatives while maximizing organizational benefits and minimizing transformation-related risks.

Introduction

Millions of AWS customers, including the fastest-growing startups, largest enterprises, and leading government organizations, are using AWS to migrate and modernize legacy workloads, become data-driven, automate and optimize business processes, and reinvent operating and business models. Through cloud-powered digital business transformation, they are able to improve their business outcomes, including reduce business risk, improve environmental, social and governance (ESG) performance, increase revenue, and improve operational efficiency.

Organizational ability to effectively use cloud to digitally transform (organizational cloud readiness) is underpinned by a set of foundational capabilities. A capability is an organizational

ability to use processes to deploy resources (people, technology, and any other tangible or intangible assets) to achieve a particular outcome. The AWS CAF identifies these capabilities and provides prescriptive guidance that thousands of organizations around the world have successfully used to improve their cloud readiness and accelerate their cloud transformation journeys.

AWS CAF groups its capabilities in six perspectives:

- Business
- People
- Governance
- Platform
- Security
- Operations

Each perspective comprises a set of capabilities that functionally related stakeholders own or manage in their cloud transformation journey.

The *Governance* perspective focuses on helping you orchestrate your cloud initiatives while maximizing organizational benefits and minimizing transformation-related risks. It comprises seven capabilities, as shown in the following figure. Common stakeholders include chief transformation officer, chief information officer (CIO), chief technology officer (CTO), chief financial officer (CFO), chief data officer (CDO), and chief risk officer (CRO).

Cloud-powered digital transformation is a continuous endeavor underpinned by numerous cross-functional initiatives that need to be carefully orchestrated, and managed as a cohesive long-term program. At the same time, too much governance, oversight, and Red Tape might slow down, or even bring to a halt complex transformation programs, while a lack of governance might lead to an increase in business and technology risks. An effective governance function helps organizations identify and remove blockers, reach alignment on goals, progress, and achievements, and ultimately accelerate organizational change.

AWS and the AWS Partner Network (APN) provide tools and services that can help you along each step of the way. AWS Professional Services is a global team of experts that provides assistance through a collection of AWS CAF aligned offerings that can help you achieve specific outcomes related to your cloud transformation.

AWS CAF Governance perspective capabilities

Are you Well-Architected?

The AWS Well-Architected Framework helps you understand the pros and cons of the decisions you make when building systems in the cloud. The six pillars of the Framework allow you to learn

architectural best practices for designing and operating reliable, secure, efficient, cost-effective, and sustainable systems. Using the AWS Well-Architected Tool, available at no charge in the AWS Management Console, you can review your workloads against these best practices by answering a set of questions for each pillar.

For more expert guidance and best practices for your cloud architecture—reference architecture deployments, diagrams, and whitepapers—refer to the AWS Architecture Center.

Program and project management

Deliver interdependent cloud initiatives in a flexible and coordinated manner.

Program and project management are critical functions for enterprises that are adopting the cloud. Complex cross-functional cloud transformation initiatives require careful coordination, especially in more traditionally structured organizations. Program management is especially critical since many of these inter-dependencies might only become obvious during delivery.

The evolution of program and project management should be approached iteratively to address the organizational and process changes required through the transformation. Program managers should elevate their role to oversee cross-functional initiatives. They need to develop processes to manage inter-dependencies identified during delivery, as well as processes for feature requests and backlog management. Program managers should oversee centralized tooling development that enables project and product teams to deliver with reusable assets. Project managers should change their focus based on the new processes to iteratively deliver features.

Start

The program management function should work with portfolio management and the transformation office to prioritize and plan the migration of applications to the cloud. Effective cloud transformations requires new areas of expertise that project managers might need to develop, such as vendor management, security, legal, operations, and risk management in the cloud. To gain success, organizations should focus on the following key elements of program and project management.

- **Project Management Office (PMO)** — The PMO leads organizational-level efforts that require cross-functional management. For example, the PMO promotes new cloud standards and tools for project management. It also sets up communities of practice and training for project managers and other roles involved in the delivery of cloud initiatives.
  - The PMO leads the education of supporting organizations, such as finance, to identify how cloud adoption will affect budgets while moving from project to product funding.
  - The PMO begins to evolve by elevating program managers to oversee these efforts, define new processes, and develop experienced technologists with project management (PM) skills to successfully deliver cloud initiatives.

- **Establish cloud specific governance reviews** — The goal of cloud governance is to enhance data security, manage risk, and enable the smooth operation of cloud systems. It is important for organizations to review their existing governance processes and update them as required.
  - To improve the efficiency and agility, organizations need to review the frequency of any governance reviews and bring them in alignment with their iterative schedule. To achieve their broader business goal, organizations need to establish new agile collaboration among interdependent teams, including architecture, infrastructure, security, finance, and operations.
  - To effectively manage change, it is important to identify and train dedicated project management resources. Organizations can benefit by investing efforts to develop project management skills in the domains of agile, vendor management, security, and risk in the cloud to effectively manage complex digital transformation programs.

- **Iterate rapidly, stay agile** — If not already in place, secure management commitment to move from large waterfall projects to an agile (iterative and incremental) approach.
  - Adopt an agile approach to migrating to the cloud, allowing teams to learn from experience and adapt throughout the transformation journey.
  - Create an empowered team with decision making authority, secure business and technology commitments, create well-prioritized backlogs, and structure work in the form of epics and stories.
  - Develop a roadmap and initial plans, and adopt agile planning methods.
  - Create product vision and roadmap, as well as release, iteration, and daily plans.

Advance

The use of technology to manage projects is expanding as a result of digitization and cloud adoption. Project teams must be cross-functional in order to achieve their project and business goals. Transforming to an agile project organization represents an opportunity to react quickly to new requirements through iterative delivery. Prioritization of business and technology collaboration is essential for faster delivery of a greater number of features compared to traditional waterfall approaches.

- **Enable Business Transformation Office (BTO)** — Organizations that successfully transform generally have a Business Transformation Office (BTO). An effective BTO looks across all business functions within the CEO's authority and actively unblocks projects through regular, action-oriented, fast-paced meetings.

  - A technology-centric PMO often has no ability to address business transformation and hence morphs into a center of excellence for the project teams to live agile values and to secure the teams' decision-making autonomy.
  - The existing PMO can support majority of the project managers to transition to agile based roles and convey the new agile principles and requirements to the teams with the help of training and continuous skillset development.

- **Project teams to standing agile teams** — Project teams are usually time-limited teams formed to complete a particular task. When the team completes its task, it disbands. Transition to standing teams based on business products and supporting applications. These teams require multi-stack developers, knowledge of DevOps, and ability to quickly push incremental changes into production to deliver value. Project management changes from rigid processes and structures to flexible processes and self-responsibility.
- **Enable automation and create value-driven organization** — Increase automation of testing, implement continuous integration and continuous development (CI/CD) and DevSecOps. Create automated portfolio dashboards. Shift from triple constraints of cost, schedule, and quality, to value creation for end user. Enable iterative tracking of realized benefits.

Excel

The role of project and program management is evolving to move lower in the organization and is no longer operating across multiple areas of the organization. Most of the organization moves to autonomous teams that have minimal dependencies through cloud native applications that are API driven.

- **Shift from a project-focused to a product-focused organization** — Move from project-focused teams to long-lived application or product focused agile teams, adjusting to the fast-paced and customer feedback-oriented world of agile and DevOps.
  - Feature delivery completes the transition from formal projects to iterative delivery managed by the product teams.
  - Budget management transitions from annual project funding to product funding.
  - Teams are stable and work is brought to the teams by product owners through a well-defined, prioritized backlog.

- **Encourage experimentation to drive innovation** — Product teams are knowledgeable about business process and are customer obsessed. They have well-established prioritization criteria and are experimenting in a surrounding that fosters creativity. Product teams have a Minimum Loveable Product (MLP) mindset in terms of making fast changes through real-time and frequent input from end users.

Benefits management

Ensure that the business benefits associated with your cloud investments are realized and sustained.

In the early days of the cloud, discussions about the benefits associated with cloud adoption focused primarily on elasticity and cost effectiveness, including the ability to shift from capital expenses to operational expenses. As early cloud adopters and cloud-native businesses have demonstrated, the flexibility and breadth of services in the cloud enables businesses to accelerate growth and deliver new value propositions. As a result, these discussions have now shifted from the bottom line to business outcomes that drive top-line growth.

Today, organizations are using cloud to accelerate a broad range of business outcomes, including reducing business risk, improving environmental, social and governance (ESG) performance, increasing revenue, and improving operational efficiency. Incrementally realizing desired business outcomes can help strengthen future business cases and accelerate organizational digital transformation journeys.

Benefits management is the structure to define and track business outcomes that is an integral component of the cloud transformation journey. Benefits management helps accelerate value by incorporating business-aligned metrics and key performance indicators (KPIs) into the governance process, thereby facilitating collaboration between technology teams and the business.

This ensures coordinated focus on established business outcomes and delivery of faster and more predictable benefits to the end customer. You use a workstream-tailored scope to identify, document, and track business-driven value streams that might be used to articulate the return on the investment, ultimately creating a mechanism to measure the business impact of cloud transformation.

Start

Take a structured and wholistic approach to defining desired business outcomes. Consider using cloud to:

- **Reduce business risk**. Lower your risk profile through improved reliability and business continuity, increased performance, and enhanced security.
- **Improve environmental, social, and governance (ESG) performance**. Use insights to improve sustainability and corporate transparency.

- **Create new revenue streams**. Create new products and services, reach new customers, and enter new market segments.
- **Increase operational efficiency**. Reduce operating costs, increase productivity, and improve employee and customer experience.

Identifying desired business outcomes might not be straightforward as approaches might vary between each of the four categories. Focus on defining and aligning outcomes with metrics and value KPIs across multiple dimensions and groups (for example, business leadership, program directors, and technology delivery teams). To identify total cost of ownership (TCO) outcomes, compare the cost of running an environment on-premises with running an equivalent environment in the cloud. To help grow revenue, start with your customers and work backwards from their needs to identify the appropriate feature and product initiatives to pursue.

To facilitate the identification and documentation of specific, measurable, achievable, relevant, and time-bound (SMART) business outcomes, consider creating an alignment canvas for each customer persona. The alignment canvas enables customer definition, identification of "moments that matter" to customers, customer solutions, business outcomes from these solutions, and metrics that will measure these business outcomes.

The consolidated list of desired outcomes across the four categories is your benefits catalogue. The portfolio management team or another authorized team should set up a sustainable structure for measuring and tracking business outcome enablers and value realization tracking mechanisms.

Large-scale transformations often require foundational changes to enable new products and features to be effectively introduced to production. A detailed analysis of the development work necessary to support each business outcome is required to accurately align and track the delivery.

Advance

The portfolio management team enables appropriate tools to capture real-time metrics during the delivery process and track the realization of expected quantitative and qualitative outcomes post-delivery. The benefits management tools, such as benefit register, benefit realization roadmap, and benefits breakdown structures help to establish processes to monitor and control progress against the established benefit realization plan.

- **Data-driven decision-making** — To be successful, it is also important that business goals and priorities are established and overseen at the executive level. Executives must have access to and be able to track the delivery and realization metrics.

- Split metrics into those that measure business outcome achievements (lagging metrics) and those that indicate progress towards achievements (leading metrics).
- Leading metrics highlight issues in a timely manner to allow course correction; most common example is a sales funnel, where metrics through the funnel give the means to better forecast performance against a target.
- Metrics and realized outcomes should be used to continuously update, improve, and refine the benefit management tools.

Excel

Organizations gain business commitments though transparent communication on the benefit progress report. The benefits management tools and framework should be used as part of demand management for future innovations, experiments, products, and features. The consistent use of the framework will allow the leadership to compare opportunities on common ground and focus commitments on the most important tasks that create the most value and business impact.

Risk management

Use cloud to lower your risk profile.

Any transformation journey includes many different types of risks, including security, compliance, environmental, resiliency, and business. An organization either rejects, accepts and manages, or transfers the risks. The risk management lifecycle is cyclically completed through assessments to identify risks, treatments through the implementation of risk mitigation strategies, and management through continuous monitoring. Efforts and resources to perform risk assessments, treatments, and management can be significantly reduced by moving workloads to the cloud, enabling the business to innovate faster and operate more efficiently.

Start

Develop or identify an industry leading risk management framework. Identify and create an inventory of the high value assets, including but not limited to people, process, technology and data. Organizations must identify, categorize, assess, and quantify:

- Operational risks related to infrastructure availability, reliability, performance, and security
- Business risks related to reputation, business continuity, and the ability to quickly respond to changing market conditions
- Compliance risks for companies obligated to comply with laws, regulations, or rules associated with the industries in which they participate, such as National Institute of Standards and Technology (NIST) 800-53, Payment Card Industry Data Security Standard (PCI DSS), Health Insurance Portability and Accountability Act of 1996 (HIPAA), and others

Develop the risk profile, determine organizational risk appetite based on each identified event's impact to the business and acceptable probability of occurrence. Clearly understand the attributes that are contributing to an elevated risk profile. Determine areas that are ripe to reduce risk. Build an initial backlog of stories and a roadmap for lowering your risk profile on the cloud.

Consider using cloud to reduce risks relating to infrastructure operations and failure. Eliminate the need for large upfront infrastructure expenditures and reduce the risk of purchasing assets that might be no longer needed. Depending on the needs of your users, mitigate procurement schedule risks by using cloud to instantly provision and deprovision resources.

Advance

Maintain a strong risk posture in the cloud, without having to define, build, and maintain hundreds of controls. Remove the burden of defining, enforcing, and evidencing the configurations and controls required to ensure the confidentiality, integrity, and availability of high value assets. Organizations should consider continuous risk assessments to understand and prioritize AWS services in an agile manner. Consider a shift left approach in the secure development to identify and manage risks at early as possible.

Implement AWS services required for risk management and compliance including:

- AWS Control Tower
- AWS Organizations
- Service Catalog
- AWS Config
- AWS Security Hub CSPM
- AWS CloudTrail
- Amazon CloudWatch
- AWS Identity and Access Management (IAM)
- Amazon GuardDuty
- Amazon Inspector
- AWS CodePipeline
- AWS CodeCommit
- AWS Audit Manager, and more.

Continuously monitor, inventory and tag the business's AWS high value assets to the right categories. Include third party risks in the risk management approach.

Excel

Automate and orchestrate to provide means for the risk management processes to enforce controls consistently by using policy as code (PaC) programmatically and at scale. This requires organizations to adopt a Zero Trust approach with least privilege and risk-based access controls through automation of use cases and design patterns using DevSecOps.

Automating processes and workflows minimizes defects due to human error by embedding automated controls and tests into the DevSecOps pipelines. These also avoid bottlenecks and deliver capabilities faster by automating the tasks and approval gates that do not require human intervention. However, for risk automation process to be successful, it is critical to involve the right stakeholders such as business, risks, security, governance and operations teams in the initial, as well as routine, pipeline-related activities.

Consider implementing AWS Control Tower, AWS CloudFormation, Terraform, and AWS Lambda functions to perform automated, event-driven actions that automate the security operations. AWS Security Hub CSPM, AWS CloudTrail, AWS CloudWatch, Amazon Detective, Amazon GuardDuty, Amazon Inspector, and AWS Config provide continuous protection from real-time threats and misconfigurations, ultimately ensuring that risk appetite remains within the acceptable range for the organization.

Cloud financial management

Plan, measure, and optimize your cloud spend.

Cloud-enabled transformations require operating model adjustments for builders, as well as finance and business stakeholders. Cloud Financial Management (CFM) is part of the new cloud operating model, and consists of cost management best practices spanning technology, people, and process that drive efficient business outcomes.

CFM best practices include cloud cost planning, billing management and cost control, cost and usage reporting and allocation, as well as optimization that organizations use to implement financial governance over cloud and hybrid technology estates. The use of AWS CFM products and AWS Partner Network (APN) CFM solution offerings helps accelerate cloud value realization, including IT cost reductions, staff productivity, operational resilience, and business agility.

Start

Start with Cloud Economics related upskilling for both technology (builders) and non-technology stakeholders, with a focus on understanding value creation opportunities along your cloud journey. Recommended courses and resources can be found in the AWS Ramp-Up Guide for Cost Management. As part of the new operating model for cloud, clarify financial roles and responsibilities, and ensure that key stakeholders across your finance, business and technology organizations have a shared understanding of cloud costs.

- **Plan** - The cost of migrations or new cloud native workloads are modeled using the AWS Pricing Calculator or information from AWS service-specific product pricing pages. For existing cloud spend, finance teams rely on historical spend and trend-based forecasting to plan and set cloud budgets.
- **Measure** – AWS account structures take into account workload architecture and deployment requirements and the benefits provided by AWS Organizations and consolidated billing (such as simplified billing, volume discounts and commitment discount sharing). Cost allocation models are implemented with account structures and tagging schemas in mind. Cost allocation tags are applied to resources in order to perform showbacks (such as cost reporting incurred by a business unit, product, or team). Cloud stakeholders use AWS Cost Explorer to report on cost and usage or an APN CFM solution offering to accelerate the establishment of cost transparency.
- **Optimize** – AWS spend is optimized using Savings Plans and Reserved Instances that do not require cloud resource modifications and deliver immediate cost savings. Commitment

recommendations provided by AWS Cost Explorer guide these purchasing decision, typically performed by line of business stakeholders.

CFM best practices are implemented in a decentralized manner, with minimal oversight, governance, automation or programmatic management. Aggregate cloud spend is monitored using AWS Budgets and AWS Cost Anomaly Detection in order to identify unexpected cloud budget overages before the monthly cloud bill is delivered. While this decentralization does not impede speed of innovation, cloud cost management might be performed inconsistently and its outcomes are not measured and therefore cannot be improved.

Continuously assess your CFM capabilities to identify opportunities to recognize initiatives that have improved efficiency and created value, as well as opportunities to improve.

Advance

Upskill your technology (builders) and non-technology stakeholders and decision makers on Cloud Economics topics by completing the AWS Cloud Financial Management for Builders and/or AWS Cloud for Finance Professionals curriculums. To learn what good CFM looks like, connect with industry peers and experts at AWS Cloud Financial Management Peer Connect, and read about what distinguishes top CFM performers from their peers.

- **Plan** – Organizations engage with the AWS Migration Evaluator team, AWS Professional Services, or an AWS Migration and Modernization Competency partner to build a business case to quantify the cost reductions associated with moving to AWS. In some cases, organizations engage with the AWS Cloud Economics team to build business cases that quantify the creation of business value above and beyond cost savings. Finance stakeholders responsible for budgeting engage with their technology counterparts to review existing spend and cloud budgets, and solicit inputs that inform more dynamic technology forecasts and budgets.
- **Measure** – A formal tagging schema is published with inputs from technology, finance, business and security stakeholders, requiring user-defined tags to be applied to cloud resources. AWS Cost Categories and AWS Billing Conductor are used to perform showback-based cost allocations. Stakeholders with more nuanced cost reporting needs query the AWS Cost and Usage Reports (CUR) using Amazon Athena. They also deploy and customize Quick dashboards, including the Cost Intelligence Dashboard.
- **Optimize** – AWS spend optimization takes place through individual teams that use recommendations provided by AWS Cost Explorer (such as rightsizing recommendations), AWS

Compute Optimizer, AWS Trusted Advisor, and Amazon S3 Analytics to audit, identify, and suspend/delete unused resources; for example, unattached Amazon Elastic Block Store (Amazon EBS) volumes. Engineering teams implement resource-level optimizations before commitments are purchased using a centralized purchasing model for the entire organization, increasing purchase accuracy and effectiveness.

Individual teams monitor their own spend through one or more AWS Budgets and AWS Cost Anomaly Detection monitors at the appropriate level of granularity for their needs (total spend by account, or service component). A centralized function owns the implementation of financial governance and outcome-based reporting (for example, cost savings, increased cloud efficiency, improved productivity) of CFM activities. These improve the consistency with which cloud cost is governed.

Excel

- **Plan** – Workload migration scoping includes quantifying both expected cloud costs and expected value creation (such as improvements to staff productivity, operational resilience, and business agility). Value is quantified using third party benchmark data, or through an engagement with the AWS Cloud Economics team. New born-in-the cloud initiatives undergo cost modeling inclusive of licensing to inform business profit and loss (P&L) statement. Cloud planning is part of the organization's overall (cloud and hybrid) technology financial planning process and cloud-service delivery model. Finance and technology stakeholders maintain an ongoing business partnership responsible for developing driver-based technology forecasts with high accuracy, and establishing budgets.
- **Measure** – AWS account lifecycles are governed using AWS Organizations APIs and AWS Control Tower. A tagging policy ensures user-defined tags are applied to cloud resources, and governance ensures non-compliant resources are remediated (for example, tagged, shutdown, or ended). Cost allocation models define how commitment purchases, shared resources (for example, containers, AWS Support, or other shared resources charges) and untaggable spend is handled.

  Finance team members, P&L owners and the organization's auditors agree on a specific chargeback model for the attribution of cloud spend, which is incorporated into an overall technology cost allocation model inclusive of hybrid technology-related spend (such as infrastructure, labor, and licenses). Cloud stakeholders with cost reporting needs define and track unit metrics to measure cloud efficiency—for example, cost per Amazon Elastic Compute Cloud (Amazon EC2) hour, and cost per business transaction—as cloud usage continues to grow.

Teams monitor spend using AWS Budgets or AWS Cost Anomaly Detection monitors, and ensure all variances and/or anomalies are actioned through a standard operating procedure including root cause identification, and remediation.

- **Optimize** – Cloud workloads are Well-Architected and operated in the most cost-effective manner. Cost optimization takes place throughout the cloud development lifecycle, including upfront (during design and architecture stages), and during operation (using an audit-based approach). Cost is traded off against other requirements, and cost-aware architectures are built using Amazon EC2 Spot instances for fault-tolerant applications, AWS Auto Scaling for dynamic workloads, and storage tiering for workloads with heterogenous storage needs.

  Workload deployments take into consideration network related costs, and optimize license usage. Commitment lifecycles are managed using a centralized portfolio approach to maximize savings for the entire organization. Once products are running on the cloud, individual teams are responsible for identifying and remediating cloud waste associated with their workloads using recommendations or information provided by AWS Cost Explorer (such as rightsizing recommendations), AWS Compute Optimizer (to optimize Amazon EC2, Amazon EBS, and AWS Lambda usage), AWS Trusted Advisor, and Amazon S3 Analytics. Lifted-and-shifted workloads are modernized using containers, serverless, managed databases, managed analytics, or new cloud resources such as AWS Graviton.

  There exists a programmatic approach for CFM, consisting of centralized responsibilities managed by a single threaded owner (for example, an individual, Cloud Operations team, Cloud Business Office, CFM or FinOps team, or AWS Services Path Partner). The central function is also responsible for defining and completing a cost management tooling strategy (procurement versus build), defining and deploying financial guardrails in conjunction with organizational requirements, and implementing mechanisms to drive organizational cost awareness. Executive sponsorship of the CFM program, and cost-related organizational goals ensure that technology teams prioritize cost alongside feature development, while maintaining agility.

Application portfolio management

Manage and optimize your application portfolio in support of your business strategy.

Applications underpin your business capabilities and link them to the associated resources. An accurate and complete application inventory will help you identify opportunities for rationalization, migration, and modernization. An effective application portfolio management capability will help you minimize application sprawl, facilitate application lifecycle planning, and ensure ongoing alignment with your cloud transformation strategy.

Start

- **Define your organizations overarching business capabilities** — Applications underpin your business capabilities and shared services underpin applications. Having a coherent and complete view of how technology supports the business enables more thoughtful cloud transformation decisions and provides levers for technology and data synergies. For example, applications supporting the same business capabilities will often have integration or data inter-dependencies, and efficiencies can be gained from co-migration. Applications supporting critical business capabilities will often be seen as strategic and might require rapid feature creation or enhancements.

  Consistent hosting strategy for applications supporting a business capability affords leaders additional de-risking, efficiency and cost savings levers. For example, a business capability fully hosted in the cloud can be isolated into its own organizational zone in preparation for divestiture, within hours or days. This can greatly de-risk an organization and reduce transitional service agreement (TSA) costs. The reverse of this can be done in the event of a merger or acquisition, where an organizational zone can be used for acquired business capability application ecosystems. This approach enables security postures to be put in place quickly and allows for strategic integration decisions to be made over time.
- **Align applications to business capabilities** — Define applications in terms of the overarching business capabilities. Assign business-related metadata, such as business criticality, business purpose, and business owner. Assign data-related metadata, such as data sensitivity (personally identifiable information (PII)), compliance (The Health Insurance Portability and Accountability Act (HIPAA)), and data classification (internal, public, and confidential). In addition to business-driven requirements for rapid innovation or opportunity for operational cost reduction, data

(often coupled with business capability) is a significant input into the cloud migration calculus and must be considered during a migration.

- **Map applications to the underpinning software products and associated resources** — Build a complete picture of each application by sourcing data from related enterprise systems, such as enterprise architecture, IT service management (ITSM), and project and portfolio management. Identify a technology owner that will be responsible to periodically enrich and validate application metadata in collaboration with a business owner. Key metadata might include application type (such as WebApp, SaaS, mainframe, database), application architecture (such as monolith, distributed), disaster recovery options (such as backup and restore, pilot light, warm standby, multi-site active/active), licensing costs, estimated annual costs for infrastructure, inter-dependencies, and so on.

  For non-cloud-native applications, analyze in the context of the seven common migration strategies (7 Rs) for moving applications to the AWS Cloud (retain, retire, rehost, re-platform, repurchase, refactor, relocate). Add the most applicable "R" to the inventory for each non-cloud-native application. At this point, there is a fact-based, comprehensive Application Inventory. An accurate and complete application inventory will help you identify opportunities for rationalization, migration, and modernization.

Advance

Assess the health of your application portfolio on a regular basis with a view to maximizing the value that your organization derives from its application investments. Cloud based applications offer a multitude of benefits that not only include cost reduction but can also be a source of revenue generation.

Consider the following sample questions when assessing your application portfolio.

- Is the application strategic and does it require rapid experimentation, innovation, and feature additions?
- Is the application in a steady-state and a candidate for cloud migration?
- Does the application have disproportionately high infrastructure costs or licensing fees?
- Does the application perform the same business function (such as financial reporting) that other applications support? Are there opportunities for consolidation and economies of scale?
- Is the application mission critical and does it require high availability?
- Is the application experiencing functionality sprawl? Is there an opportunity to rearchitect?

A recurring assessment cadence ensures ongoing alignment with your cloud transformation strategy, and helps determine where potential cloud services could help you become more competitive, address optimization needs, and reduce costs.

Excel

Shared services and databases are systems that support the business specific applications. As these types of systems are migrated to the cloud, plan to integrate with consuming applications in a simple and repeatable manner. The completed application inventory will articulate the volume of consuming applications and vision for each. Having insight to move a foundational database that supports multiple consuming services that will individually be replaced, refactored, repurchased, re-platformed or relocated to the cloud first can save a lot of integration time and effort in the future.

Automate application portfolio intelligence by using tools such as Service Catalog AppRegistry and your existing ITSM tools. AppRegistry allows you to create a repository of your applications and associated cloud resources. This allows the technical context of your applications and resources across your environments to evolve and stay up-to-date with limited manual intervention.

These capabilities enable enterprise stakeholders to obtain the information they require for informed strategic and tactical decisions about cloud resources. For example, AppRegistry enables senior leadership to get a full view of cloud deployments, the CCoE team to understand the full set of applications and resources provisioned, security team to identify resources involved in security events, and the risk and compliance team to obtain a view of all resources within an application that currently meet specific compliance certifications.

We recommend that the application portfolio vision be a collaborative ongoing assessment by the technology and business leadership. Having an automated approach to assemble the technical metadata allows for accelerated and effective decision making.

Data governance

Exercise authority and control over your data to meet stakeholder expectations.

Your digital transformation efforts depend on accurate, complete, timely, and relevant data. Data governance focuses on ensuring that data are treated as a strategic asset and on developing competences to put that strategic asset to effective use. An effective data governance capability will help you reduce data duplication and sprawl, improve data quality and decision-making, drive organizational efficiencies, and accelerate your business outcomes on your way to becoming a data-driven organization.

Start

Define key data governance roles and responsibilities, such as data owners, stewards, and custodians. While taking segregation of duties into account, assign key roles to appropriate individuals in your organization. Data owners should be recognized at an organizational level that includes both technology and business representatives and data stewardship should be a responsibility of all data-facing business personnel. Ensure that individual goals are aligned with data governance objectives and that relevant KPIs are defined, measured, and reported.

Specify standards, including data dictionaries, taxonomies, and business glossaries. Identify what data sets need to be mastered and model the relationships between master data entities. Ensure that data policies are defined, documented, and communicated within your organization. Define, document, and communicate data classification, purging, archiving, retention, encryption, and protection policies. Monitor and enforce compliance and acceptable use of data.

Define a data access request process, ensure that it is approved by the security teams, data owners, and data stewards, and that it is adopted across your organization. Prioritize your data quality efforts in line with your strategic and operational data needs. Establish data quality standards: identify key quality attributes, business rules, metrics, and targets.

Make sure that your data governance strategy is documented, aligned to your business goals, and effectively communicated across your organization. Define KPIs to measure the associated business value. Define your data organization structure, identify the required skills based on the data governance strategy, and obtained leadership sponsorship.

Advance

Start enforcing common data standards and practices while updating them as needed. Define key components of your data governance operating model. For example, you might wish to establish data governance councils/committees to help enforce critical data governance principles.

- Develop data lifecycle policies, and implement continuous compliance monitoring.
- Define and start implementing role-based data access processes.
- Define a process for identifying critical data products.
- Store data quality metrics in a common repository and ensure that trending analysis is available and actioned by data quality stakeholders.
- Make sure that each line of business has data quality tool and methodologies and that they are consistently used within each line of business.
- Start capturing data lineage metadata and conducing data profiling and data cleansing.
- Develop data quality identification and remediation processes and begin to remediate data issues upstream. Implement data quality dashboards for critical data products.
- Start measuring the effectiveness/business impact of data quality assessment and analyze trends to demonstrate progress over time.
- Start developing automated, repeatable processes to ensure that all data are adherent to the policies. Start implementing automations (preventative, detective, and corrective controls) to help identify and remediate data-related violations.
- Develop and implement measurements to enhance data lifecycle process quality.

One of the most important aspects of a modern data architecture is the ability to authorize, manage, and audit access to data. This can be challenging because managing security, access control, and audit trails across all of the data stores in your organization is complex and time-consuming. AWS gives you the governance capability to manage access to all your data across your data lake and purpose-built data stores from a single place. Develop uniform access control for enterprise-wide data sharing by using AWS Lake Formation to centrally define and manage security, governance, and auditing policies.

Excel

- Ensure that all data management processes are documented and automated.

- Define data quality thresholds and implement continuous quality evaluation of critical data products.
- Promote common data quality tools, methodology, and a business rules engine across the organization while continuously evaluating their effectiveness and evolving them as needed.
- Ensure that data quality issues are remediated at the source.
- Implement data quality alerting within operational dashboards and integrate those into your metadata repository/data catalog.
- Enable data consumers to access data quality metrics for each data asset.
- Enable product teams to define data quality rules and implemented them within data pipelines.

Data curation

Collect, organize, access, and enrich metadata and use it to organize an inventory of data products in a data catalog.

A data catalog is an organized inventory of technical and business metadata. Technical metadata deals with structural aspects of data products, describing how data elements are organized within rows, columns, tables, and the like. It tells data professionals if they can work with data as is or if they need to transform them for analysis or integration.

The AWS Glue Data Catalog is your persistent technical metadata store in the AWS Cloud. use the Data Catalog together with AWS Identity and Access Management (IAM) policies and AWS Lake Formation to control access to the tables and databases. By doing this, you can allow different teams to safely publish data to the wider organization while protecting sensitive data in a highly granular fashion. The Data Catalog, along with CloudTrail and Lake Formation, also provides you with comprehensive audit and governance capabilities, with schema change tracking and data access controls. This helps ensure that data is not inappropriately modified or inadvertently shared.

Business metadata deals with the business value and fitness for use of data products. It facilitates communication and data exchange between technical and business stakeholders. When organized within a taxonomy and made available through search tools, catalogs help data consumers to find the data that they need.

Data curation is the process of organizing and integrating relevant metadata into the data catalogue. The catalog enables organizations to facilitate data monetization, regulatory compliance, and self-service analytics by helping data consumers quickly locate relevant data assets as well as understand their context, such as data source, business/technical definitions, and quality.

Start

Effective data curation starts with the definition of several prerequisites, including data domains, a data taxonomy, and connectors that will be used to ingest the metadata.

- **Data domains** — Define the primary data domains (such as customer, product, policy, or patient) that you will use to organize your data assets. These domains serve to support the structure of your data catalog and might be used to organize the construction of your data governance organization.

- **Data taxonomy** — Organize relevant business terminology into a hierarchy. Define each term and establish relationships between associated terms. Doing so will help you help you effectively tag each data asset, enabling data consumers to more easily find what they need.
- **Metadata connectors** — Being able to use connectors to automatically ingest data from a wide range of systems and tools, including databases, extract, transform, and load (ETL) tools, and reporting systems is another key concern when implementing a data catalog. Many data catalogs have a robust set of connectors, but it would be wise to understand the breadth of your toolset that is supported when beginning your efforts. It is important to consider how you will ingest business glossaries as these are frequently maintained in spreadsheets or web pages. If business definitions have not yet been documented, you should review your tool of choice for the best way to ingest relevant business metadata. It could very well be that your catalogue tool has the ability to support the entry, review, and approval of those definitions.

Advance

As the information contained in the catalog expands, the catalog's role will often expand as well. Increasingly, catalogs are enabling curation features such a commenting on data sets, ratings by analysts using the data, and ingestion/serving for corporate policies and procedures.

At this point, one of the key value propositions of a data catalog begins: supporting regulatory compliance efforts. The data stores that were previously ingested can now be reviewed and tagged as to which compliance framework they fall under. Typically, this is a joint effort between the regulatory compliance team and the application teams that understand the data in the original stores that were ingested into the catalog.

Many of the more advanced catalog tools have begun to use artificial intelligence to automatically suggest compliance tagging when the data is ingested. For example, data in the format NNN-NN-NNNN might be identified as a Social Security Number and tagged as needing to be address as PII.

The user experience of navigating the catalog is also important to consider as the use expands. For example, it is anticipated that data analyst might use the catalog to understand all the reports that have already been created and how they are being used. Similarly, ETL developers might use the repository as a tool when undertaking data sourcing/data lineage investigations. These and other user experience scenarios should be explored in order to realize the maximum value from your organization's investments.

Excel

As the collection of data in the catalog becomes more valuable, it will become increasingly important that the business-focused data governance team be involved the maintenance of the catalog platform. In turn, a data catalog can often support that data governance organization by serving as the platform to manage relevant data governance policies, data procedures, and associated standards.

Consider incorporating additional types of metadata; for example, you might define and view data science algorithms in the data catalog. There is a myriad of different ways in which the data catalog and the curation efforts can benefit your organization; we have touched on just a few here. The more consistent and well understood an organizations data is, the more time and energy collectively it has to focus on driving value.

Conclusion

Governance is a critical ingredient of successful cloud transformation efforts. Effective governance will help you accelerate and orchestrate your cloud initiatives while maximizing organizational benefits and minimizing transformation-related risks. Implementing the seven capabilities described in this paper will help you identify and remove blockers, reach alignment on goals, progress, and achievements, and ultimately accelerate organizational change.

AWS CAF perspectives and foundational capabilities

Business

- Strategy Management
- Portfolio Management
- Innovation Management
- Product Management
- Strategic Partnership
- Data Monetization
- Business Insight
- Data Science

People

- Culture Evolution
- Transformational Leadership
- Cloud Fluency
- Workforce Transformation
- Change Acceleration
- Organization Design
- Organizational Alignment

Governance

- Program and Project Management
- Benefits Management
- Risk Management
- Cloud Financial Management
- Application Portfolio Management
- Data Governance
- Data Curation

Platform

- Platform Architecture
- Data Architecture
- Platform Engineering
- Data Engineering
- Provisioning and Orchestration
- Modern Application Development
- Continuous Integration and Continuous Delivery

Security

- Security Governance
- Security Assurance
- Identity and Access Management
- Threat Detection
- Vulnerability Management
- Infrastructure Protection
- Data Protection
- Application Security
- Incident Response

Operations

- Observability
- Event Management (AIOps)
- Incident and Problem Management
- Change and Release Management
- Performance and Capacity Management
- Configuration Management
- Patch Management
- Availability and Continuity Management
- Application Management

AWS CAF perspectives and foundational capabilities

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Further reading

- For additional information, see:
- AWS Architecture Center
- AWS Case Studies
- AWS Cloud Adoption Framework
- AWS Cloud Adoption Framework (eBook)
- AWS General Reference
- AWS Knowledge Center
- AWS Prescriptive Guidance
- AWS Quick Starts
- AWS Security Documentation
- AWS Solutions Library
- AWS Training and Certification
- AWS Well-Architected
- AWS Whitepapers & Guides
- Getting Started with AWS
- Overview of Amazon Web Services

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AWS Glossary

For the latest AWS terminology, see the AWS glossary in the *AWS Glossary Reference*.