

THE ANATOMY OF SUCCESSFUL CLOUD ADOPTION

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2.1 EXECUTIVE SUMMARY

2.1.1 Overview

The worldwide public cloud market is continuously in a growth mode, and the growth trends are only going to be upwards soon. Be it IaaS, PaaS, or SaaS – Cloud has seen phenomenal growth, and with it, a massive market for the partner eco-system to assist customers in achieving their digitization goals.

The fastest-growing segment of the market is cloud system infrastructure services (Infrastructure-As-A-Service or IaaS), which is forecast to grow 27.6 percent in 2019 to reach USD 39.5 billion, up from USD 31 billion in 2018. Enterprises will migrate entirely away from on-premises data centers with the current trend of moving workloads to colocation, hosting, and the cloud leading them to shut down their traditional data center.

These trends indicate that, unlike a few years back, cloud adoption is no longer a hype but a necessity for all organizations looking for cost optimization, scale, and speed for their IT product development and deployment. Some customers are very mature in their cloud journey with a deep understanding of requirements, limitations, and workarounds. They drive the cloud strategy themselves and have the in-house talent available. At the same time, some customers depend on partners to carve out their cloud journey and approach.

Many scholarly articles focus on strategy on cloud adoption. This document does not focus on what customers see as the benefits of a successful cloud adoption program. The document's focus is on how a partner like LTIMindtree, should run a cloud adoption program by focusing on the key areas and what pitfalls must be avoided.

2.2 A SUCCESSFUL CLOUD MIGRATION

2.2.1 Overview & Focus Areas

An organization embarks on a cloud journey with a strategic goal supported by business drivers. These could range from but are not limited to Cost, Scale, Speed, or Agility. Other factors that could be driving are EOL (End of Life) infrastructure, legacy applications, or contractual obligations like separation of the business.

The strategy and business drivers, along with technical considerations and limitations, determine the nature of the cloud adoption model IaaS, PaaS, SaaS, Multi-Cloud, and Hybrid. Once the business case and strategy are finalized, the cloud adoption/migration program will focus on the following areas:

Discovery – Deep dive into the landscape, applications, dependencies, security, compliance, network, connectivity, projects, and risk register. This will involve a combination of tools and manual discovery and is the most critical and detrimental to the success of the project. It is also an opportunity to revisit parked issues, that might have been open since the cloud adoption program was signed off and to create a feasibility report.

Planning – Planning takes in all the inputs from the discovery phase. Project/Program Governance must be accounted for in the planning phase, and precise communication method and plan should be highlighted.

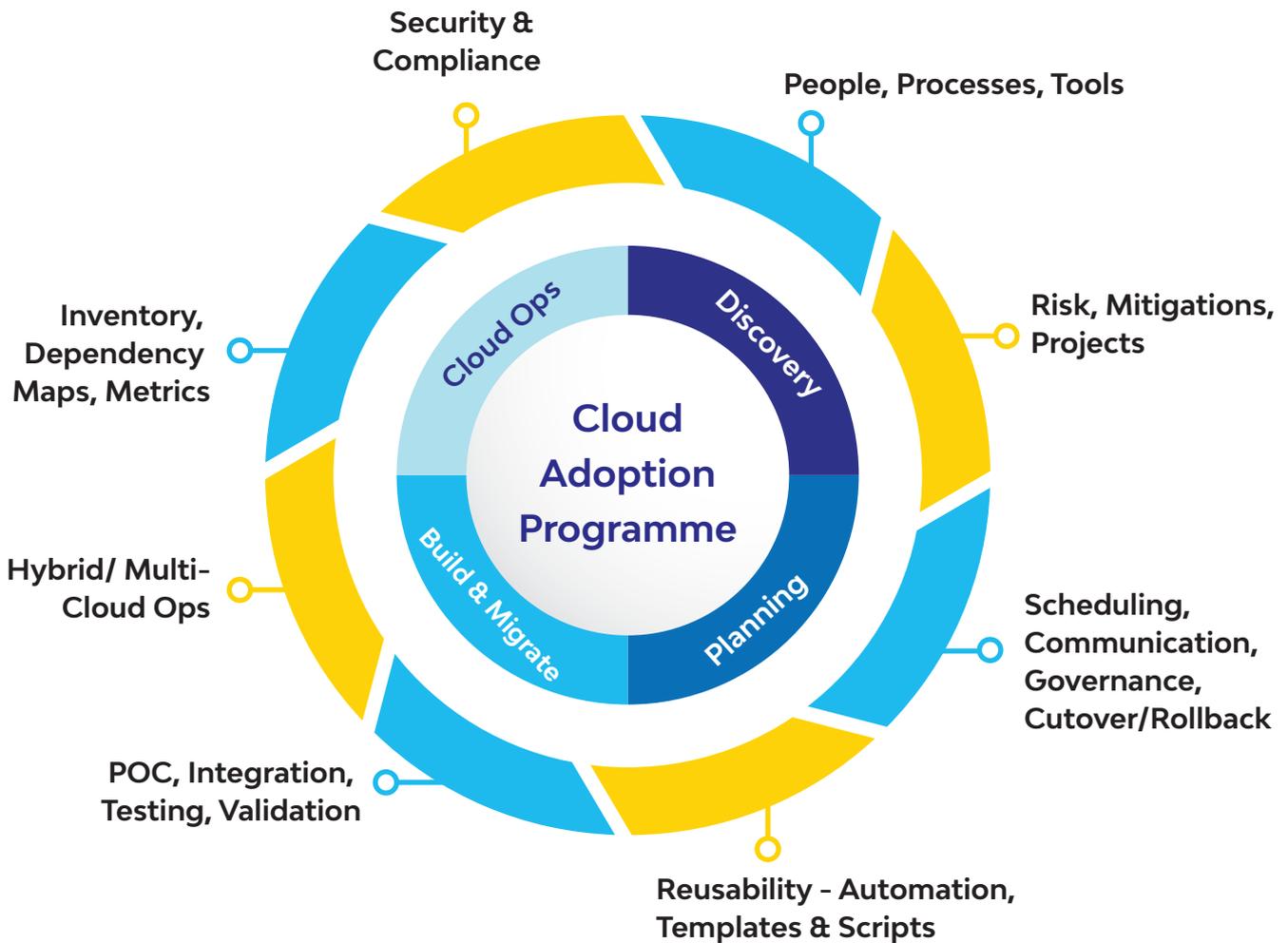
Build & Migrate – This is the execution phase of the project, which will have multiple iterations for proof of concepts, various environments, and testing. While the target architecture would be finalized in the earlier phases, this phase needs particular focus to ensure that the Quality of build meets the overall business objective. The build and execution would also perform integration with the monitoring and security infrastructure in the IaaS deployment model as well as with the ITSM toolset. These requirements must be identified in the discovery phase.

Hypercare – Hypercare is the phase where dedicated or enhanced support from the project team is provided after go-live of a system, either in a big-bang approach or phase-wise approach. Hypercare is vital from "a lessons-learned" perspective, and every attempt must be made, not to repeat any mistakes during the earlier wave or migration environment, This phase is iterative if multiple wave groups go live on different milestones.

Cloud Operations

The complexity of cloud operations depends on the deployment model – Hybrid, Multi-Cloud, IaaS, PaaS, or SaaS. Ideally, the planning for Cloud Operations must begin in the Discovery phase or even before that in the Strategy phase. How will a hybrid-cloud/multi-cloud environment be managed? What tool sets? What processes must continue or be discontinued? How will the cost of the Cloud Ops Governance tool be absorbed? And, how will the project team transition to the managed services of the steady state support team? What options/features does the tool provide for reporting, optimization? What are the automation use cases for orchestration and DevOps?

While these are some pertinent questions, there will be more that will determine the choice of the tool and the process for Cloud Operations and Governance. The figure (Figure 1) depicts the details of the various phases and the focus areas in these phases.



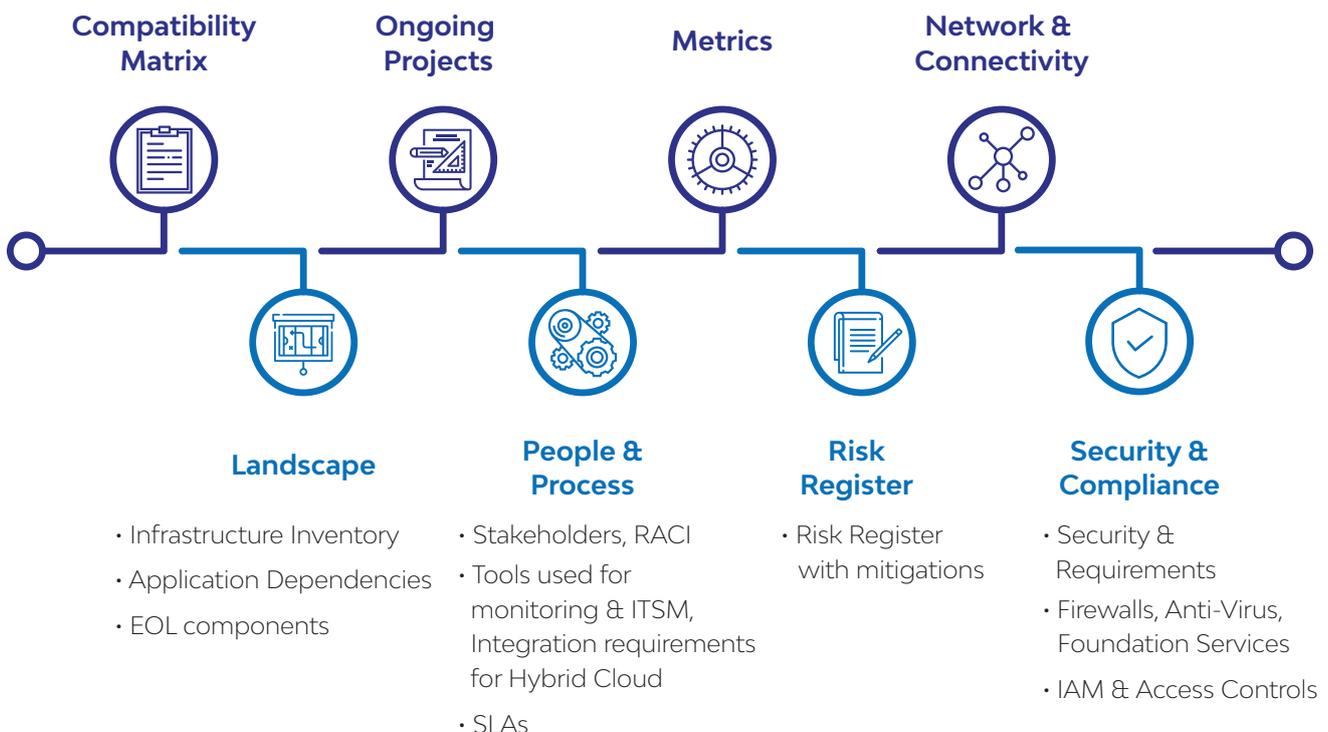
2.2.2 Discovery

The discovery phase is a detrimental phase which can make or break the journey to cloud. Figure 2 represents the key focus areas during the discovery phase and these, when done to perfection, will enable a flawless Cloud Adoption Program.

While there are excellent tools that create an application topology, depict dependencies, and even recommend migration wave groups, - it must be remembered that there could be a single script that runs once a month connecting to some critical servers, internally or externally, and is not discovered by the tool. Common knowledge might prove beneficial even when there is no specific documentation available for such configurations.

The focus should be to be forward-looking and not just look for a lift-and-shift migration unless there are strict timelines. A clear roadmap from IaaS to PaaS and onwards must be part of the strategy based on the discovery.

- Compatibility Matrix of O/S, Application, Versions, SKU/Model, Features
- Work arounds, best-fit solutions
- Projects that are on-going, impact on scheduling
- Risks & Mitigations due to overlap
- Performance Metrics for post migration analysis
- Operational Metrics – RPO, RTO, SLAs
- Userbase, Bandwidth Requirements
- Connectivity Types, redundancy



Landscape – Discovery will capture topology, and source workload details like compute-storage-network, application dependency map, prevalent SLAs, DR/BCP configuration, and application stack details, amongst other things. This can be tool-based for the majority of the part, and manual-based on interviews with SMEs to identify some inventory that cannot be discovered by tools by virtue of being legacy systems. Analysis of the inventory can be done to finalize the R-factor on the target cloud platform.

Compatibility Matrix – This matrix needs to be created to identify every application and the underlying infrastructure components to be compatible with the target cloud platform. This will significantly impact applications that were classified as lift-and-shift and will need to be addressed by either choosing and deploying a compatible version or moving it to other buckets.

People & Processes – The stakeholder matrix is essential to create a validated and updated RACI matrix. Impact of the change management and other processes should be incorporated into the project/program plan as tasks. The owners of the applications and developers will aid in the manual discovery process where automated discovery is not possible.

On-going Projects – It is essential to identify the on-going projects, the nature of these projects (minor, major, simple, complex), and the impact these projects would have on the schedule, the grouping of the waves, and overall timelines and complexity of the migration.

Prevalent Metrics– Capture all prevalent performance metrics which would involve performance metrics (like average CPU/Memory/IOPS) consumed. These would be required as baselines for benchmarking once the migration is completed. Operational metrics would help in designing the target architecture to meet these SLAs or to improve upon them.

Risk Register – Risk register must be maintained for all kinds of risks, with plausible mitigations. Monitoring the risk register and implementing the mitigations where available, should be part of the governance meetings and communication plans

Security & Compliance – This is one of the most critical data sets that needs to be captured. It is important to understand different layers of security components and how those would map/function in the Cloud environment, especially in a hybrid cloud environment. Understand the existing implementation of security compliance standards like Hi-Trust, PCI/DSS, and plan for requirements on the cloud platform. From an infrastructure security components perspective, understand how the Firewalls, and Protection Software like Anti-Virus are configured as well as patching policy and frequency.

Few examples to watch out for in the discovery phase:

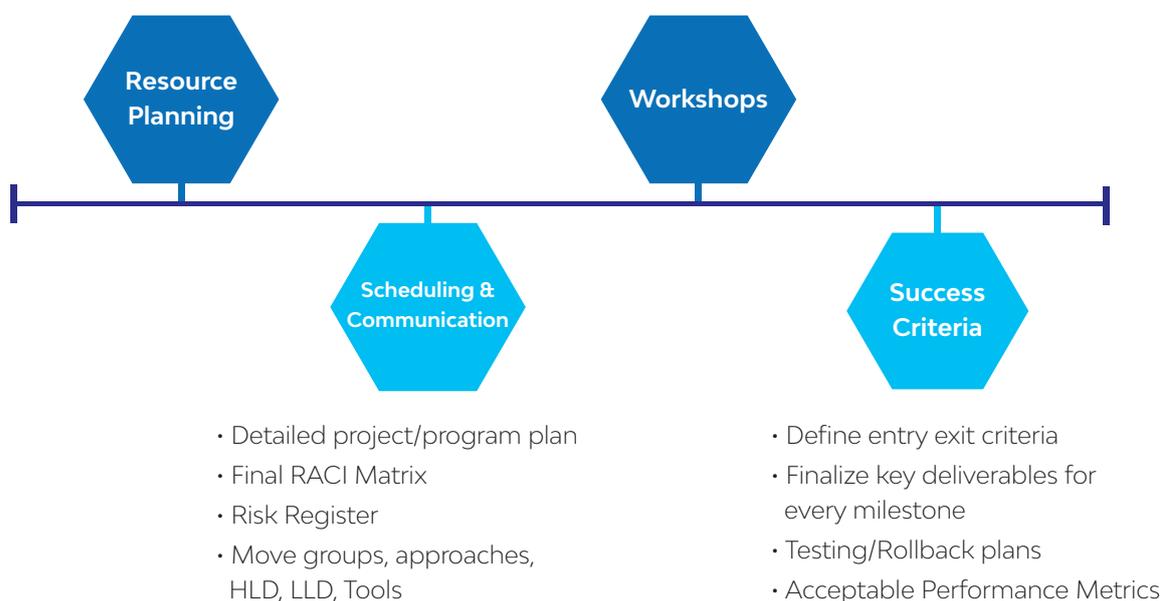
- Create a detailed RACI matrix (a tabular representation of who is Responsible, Accountable, Consulted and Informed for the entire duration of the project/program) which calls out the roles and responsibility of each member of the program team and ensure that this RACI is built into the SOW. This allows for clear accountability and avoidance of project delays.
- Ensure that all features (Cloud Provider service offerings) that are a must for the migration are available in both the primary and the BCP regions. Lead times for these can delay the project significantly. For example, availability of a compute configuration in a region or allocation of quota for those units may take weeks.
- Identify tools that could be used for Active Migration or even for BCP. Understand the limitations of these tools. These must be identified at an earlier stage and communicated with the client along with alternate solutions and details of costs associated, if any.

- Create the compatibility matrix and sign off on the target O/S, VM Model for the application stack. For example, the SAP version must be certified on both the O/S and on AWS. In case it is not, the efforts needed (efforts to deploy a compatible version, testing/validation of the same) must be calculated. Fixing or creating solutions for incompatible versions can take significant effort.
- Ensure that Reference Architectures are used as baselines or for validation. These are easily available with AWS for domain and industry-specific use cases.
- Design and plan for IaaS and template-based provisioning and automation from the beginning. You do not want your cloud environment to turn into a glorified version of your on-premise, with absolutely no control and manual provisioning and configuration.

2.2.3 Planning & Validation

With all inputs from the discovery phase gathered and analyzed, the planning phase will entail creating a detailed plan for the project/program execution. Figure 3 represents the key focus areas during the planning phase. The data gathered in the discovery phase will be validated.

- Planning for resource on-boarding
- Planning availability of right skilled resources
- Optimal use of resources for project
- Workshops to validate project plan with all critical stakeholders
- Validate and finalize project/program plan



- **Scheduling & Communication** – With the Discovery phase completion, the high-level project plan created during SOW discussions can further be detailed. Finalization of HLD, LLD, move groups, and migration approaches for each application need to be completed. Other tasks, such as tools deployment plan, DR/BCP configuration, timelines, integration steps (application as well as infrastructure), and backups amongst others will also need to be finalized.
- **Resource Readiness** – This task does not necessarily start in this phase, and most organizations scout for talent and resources even before the SOW is signed. However, this phase allows relooking at any additional skill requirements that might have been captured in the discovery phase. For example, if there is a particular tool or product that is not common and was only discovered during the assessment phase, this needs to be considered in the resource loading.
- **Success Criteria** – Success criteria for each phase is defined at a high level in the initial stages of the project/program. However, in this phase, it is essential to detail these parameters and the desired/acceptable end state. The deliverables for each milestone and acceptance criteria are also defined.
- **Workshops** – Workshops are an effective way of walking the project/program plan with the critical stakeholders, also get sign-off from them before proceeding with the build and migrate phase.

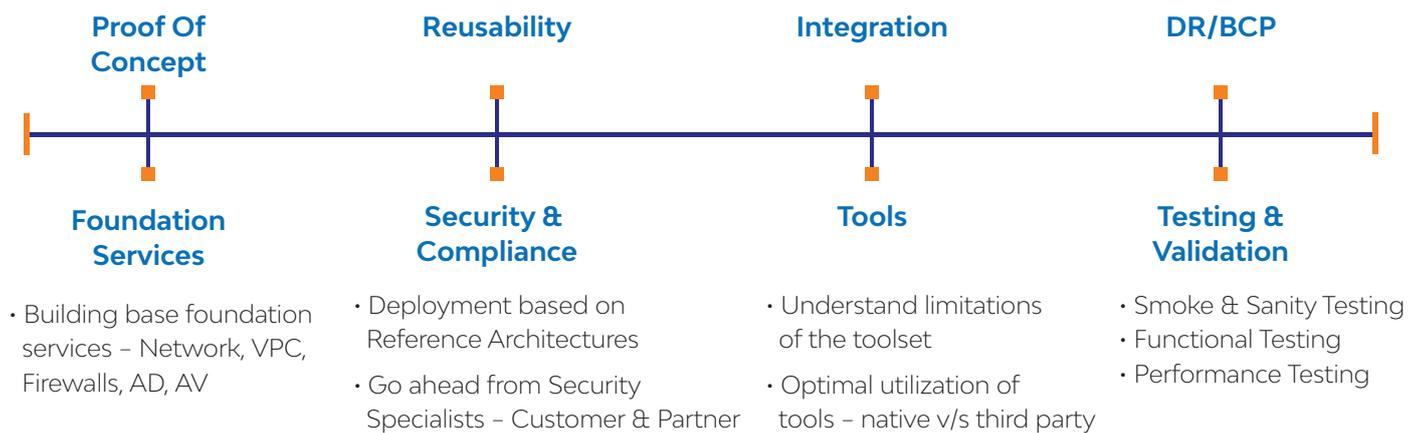
Few examples to watch out for in the planning phase.

- Ensure that all data gathered in the discovery phase is analyzed.
- Plan ahead for tasks/procurement that will take time for realization, for example, Direct Connect between AWS and customer's datacenters.
- Ensure the design is scalable and is designed based on a well-architected framework. It must use applicable features for scalability and reliability and security compliance. These could be application-specific but should have a uniform core foundation service layer.

2.2.4 Build & Migrate

With all inputs from the discovery phase gathered and analyzed, the planning phase will entail creating a detailed plan for the project/program execution. Figure 4 represents the key focus areas during the planning phase. The data gathered in the discovery phase will be validated.

- Proof Of Concept to validate migration
- Can be done for simple or complex application as per requirement
- Automation of deployment through templates, scripts
- Prevent Ad-Hoc deployment
- Integration with ITSM, Monitoring and Security Software/Configuration
- Application Integration - Interfaces
- Approach/Toolsets (Active DR, Passive DR, Replication)
- Deployment phase (Post Go-Live or parallel)



- Foundation Services – With the Discovery phase completion, the high-level project plan created during SOW discussions can further be detailed. Finalization of HLD, LLD, move groups, and migration approaches for each application needs to be completed. Other tasks such as, tools deployment plan, DR/BCP configuration, timelines, integration steps (application as well as infrastructure), and backups amongst others will also need to be finalized. Understand that there are templates available from AWS for these services and ensure that they adhere to best practices from AWS.

- Proof Of Concept – This task does not necessarily start in this phase, and most organizations scout for talent and resources even before the SOW is signed. However, this phase allows relooking at any additional skill requirements that might have been captured in the discovery phase. For example, if there is a particular tool or product that is not common, and was only discovered during the assessment phase, this needs to be considered in the resource loading.

Security & Compliance – Success criteria for each phase is defined at a high level in the initial stages of the project/program. However, in this phase, it is essential to detail these parameters and the desired/acceptable end state. The deliverables for each milestone and acceptance criteria is also defined

Reusability – Workshops are an effective way of walking the project/program plan with the critical stakeholders and to get sign off from them before proceeding with the build and migrate phase

Tools – Leverage the wide range of tools available within either AWS partner pool, or your own alliances and even look at tools provided by AWS. These tools have a cost and must justify the suitability

Integration, Testing & Validation – This is more of a functional aspect of the application. However, as part of the migration project, the administrators should be able to help the application teams during integration, testing & validation

Disaster Recovery/BCP – It is extremely critical to focus on the DR/BCP requirements, from the beginning of the project. Whether it should be an active DR or a passive DR and what tools can be used for the DR/BCP setup, configuration, and monitoring should be finalized at the beginning of the project.

Few examples to watch out for in the build & migrate phase:

- The team must be well-versed in the migration tools to be used.
- Domain and technology-specific skillsets must be included in the migration team.
- All builds must adhere to a well-architected framework.
- All builds must be templated and ensure all configuration and deployment is script based. Manual builds may result in human errors, for example Public IP being assigned to a server that does not require one.

2.2.5 Hypercare & Cloud Operations

Post migration, there are critical acceptance criteria, based on which the migration is considered to be successful or unsuccessful. One of the crucial aspects of ensuring that the migration goes smoothly, and post-migration hiccups are minimized is to have a robust hyper-care strategy which involves:

- A SWAT team of people who were part of the project, in addition to SMEs and the BAU support team.
- Communication lines for resolving all issues related to migration. Not all issues can be anticipated, and you should expect low to high-severity issues.
- Focused on the availability of Services and Quality of Service
- Team to resolve Functional and domain issues.
- Security & Compliance monitoring – using Cloud native tools (usage advisor, security advisor) to ensure that there are no red flags in the environment.

The hyper-care phase is also the time when the operations/BAU team is also on-boarded to support the environment. The Cloud operations are not in scope for this discussion. However, the complexities of operations like the below (few factors) are key design factors for the migration project and must be included as part of the discovery.

- Monitoring and ITSM tools
- Multi-Cloud/Hybrid Governance (Tools for Cloud Brokerage Platform)
- Cost & Security Governance
- Automation – IaaS, tools for IaaS (Cloudformation, Terraform, etc.)
- DevOps – How will this be enabled? What tools should be deployed? Is it the best-fit use case?

It is crucial that the migration project considers all these phases and the Operations Phase in detail to avoid issues later, even after migration onto the cloud.

Conclusion

Organizations embark on a cloud adoption journey with a lot of expectations. Sometimes, these are based on incorrect or partial knowledge about products, services, prices, and features. As a partner, it is imperative to look at the cloud adoption or migration project, from multiple viewpoints – Business and Technical. It is the primary responsibility of the partner to ensuring that the overall goals of the customer for cloud adoption are met and to guide the customer in the right direction, avoiding pitfalls and ensure successful completion of the migration.

About the Author



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Ramesh has more than 21 years of diversified IT experience, ranging from Systems Programming, Database Management, and Cloud Computing, specializing in Cloud Adoption & Strategy for customers across all cloud platforms. He is an AWS CSA at professional level. His focus area revolves around enabling customers achieve their goals in Enterprise Cloud Adoption programs like SAP on AWS, Azure.

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