Research Article

Evaluating cloud migration approaches and strategies for successful cloud migration projects for transitioning legacy systems

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ABSTRACT

A cloud migration strategy is the process of transforming existing on-premises applications or on-premise servers to the cloud [1]. Migrating legacy systems to the cloud presents significant challenges and benefits, leading to extensive academic research and numerous industrial application [2]. With more than 70% of businesses utilizing two or more public cloud platforms, a carefully crafted migration plan will help reduce risks and ensure a smooth transition to the cloud [1]. In today's digital age, harnessing the power of the cloud has become essential for success as more organizations migrate to the cloud to fuel growth. By 2024, over 45% of IT spending will transition from traditional technologies and solutions to the cloud [1]. The global shift towards cloud computing is clear, with 94% of companies utilizing cloud services by 2024. However, migrating to the cloud is not an easy task. Many cloud initiatives fall short, and organizations fail to fully capitalize on their cloud investments if the migration is poorly executed or lacks a systematic approach [2]. Also, transitioning to the cloud is complex, often hindered by technical challenges and misalignment with business strategies. To navigate this, developing a comprehensive cloud migration strategy is essential. This strategy acts as a roadmap, outlining each step from initial evaluation to the final transition, ensuring a seamless move to cloud computing. The key to successful cloud transformation is carefully planning and choosing the right migration strategy for your IT assets. This article will help you better understand various cloud migration strategies, guide you in creating a clear migration path, and ensure a smooth transition to the cloud.

Key words: Cloud computing, Cloud services, cloud transformation, global shift

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INTRODUCTION

A well-planned cloud migration strategy is essential for organizations to fully capitalize on the advantages of cloud adoption, such as increased scalability, flexibility, improved collaboration, and enhanced accessibility. Research indicates that businesses transitioning more than half of their operations to the cloud can achieve annual profit growth of up to 11.2%. Despite these potential benefits, many organizations face significant challenges during migration. Key challenges include security and compliance risks, which 56% of CIOs have identified as significant concerns, and difficulties aligning migration strategies with specific business objectives. Companies may encounter data loss, downtime, budget overruns, and missed deadlines without a clear and well-defined strategy. To address these challenges, implementing a strategic cloud adoption framework is crucial. This approach facilitates a smoother transition from legacy systems to a cloud-based infrastructure by helping

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organizations identify and execute the most efficient, cost-effective, and least disruptive migration path. This framework ensures a successful and seamless transition to cloud computing by minimizing potential issues.

LITERATURE REVIEW

A. Introduction

The A comprehensive cloud migration strategy:

• **Risk Migration:** Reduces risks linked to the migration process, including possible cloud outages, data loss, or security breaches

• **Resource Optimization:** Optimizes cloud resource usage, ensuring you only incur costs for what you utilize

• **Team Empowerment:** Equips your team with the necessary tools and flexibility to innovate and quickly adapt to market demands

An effective migration strategy can bring several benefits to the organization, such as the platform for growth and allowing your business to excel in the cloud era. The following key benefits are presented in Fig. 2.0:
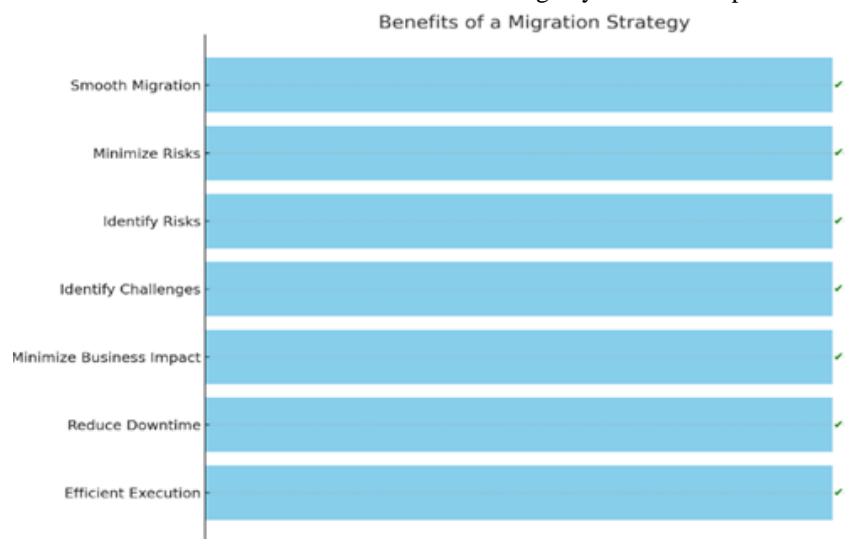

Fig. 1: Benefits of Migration Strategy

1) Time and Cost Savings:

Cloud migration can be complex and time-consuming, often taking months or even years, especially when dealing with multiple sources and diverse destination platforms. However, with an effective strategy, automation can streamline the migration, ensuring consistent operations and smooth transitions without downtime.

A well-designed migration strategy facilitates a seamless transition and helps enterprises identify significant cost-saving opportunities. Organizations can avoid unnecessary licensing, maintenance, and operational costs by optimizing cloud resource usage. This strategic approach ensures that companies only pay for the resources they use, thereby maximizing cost efficiency.

The benefits of cloud migration extend beyond just cost savings. For instance, moving applications and data storage to the cloud can significantly reduce infrastructure expenses as organizations eliminate costs associated with hardware maintenance and upgrades [1]. Cloud providers often offer pay-as-you-go pricing models, allowing businesses to pay only for the resources they utilize rather than over-provisioning on-premises servers.

Moreover, cloud migration enhances flexibility and scalability, enabling organizations to quickly adjust to changing business needs and respond effectively to high demand or sudden growth [1]. This adaptability, combined with the ability to streamline IT management by consolidating systems into a single platform, further contributes to cost savings and operational efficiency [3].

Overall, a strategic approach to cloud migration can lead to substantial cost and time savings while providing a growth platform. The below diagram illustrates the cost and time benefits of migrating to the cloud compared to maintaining on-premises infrastructure [4].
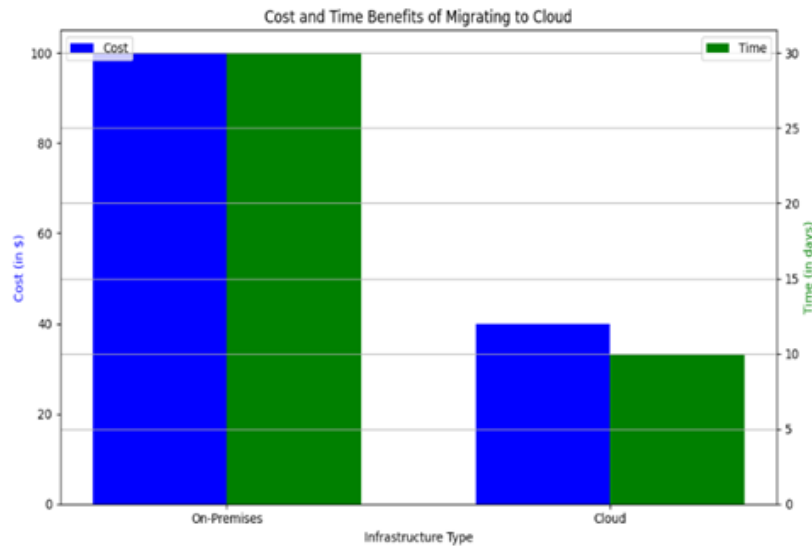
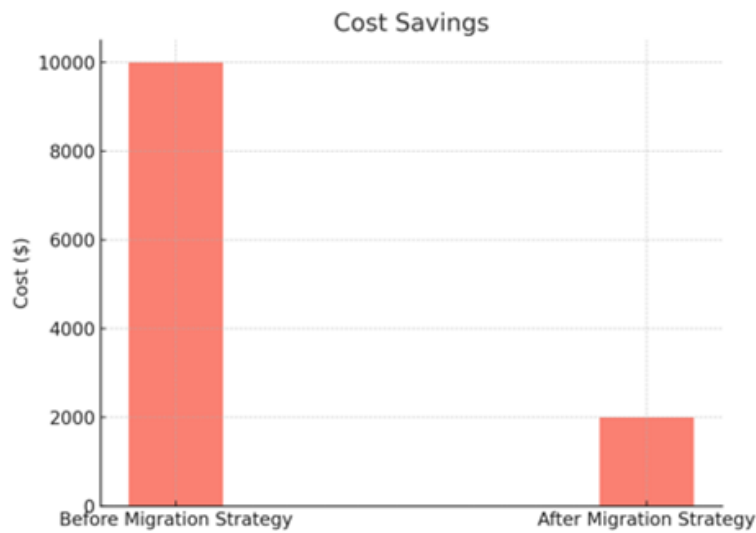**Fig. 2:** *Cost and Time Benefits of Migrating to cloud*

Fig. 3: *Cost Saving chart*

Key Points:

a) Cost Savings:

• **On-Premises:** High costs due to hardware, maintenance, and upgrades.

• **Cloud:** Significantly reduced expenses as you pay only for what you use.

b) Time Savings:

• **On-Premises:** Longer deployment times due to setup and configuration.

• **Cloud:** Faster deployment, allowing quicker adaptation to business needs.

This visual demonstrates how cloud migration can lead to cost efficiency and time savings, facilitating business growth and agility.

2) Reduced Downtime:

A well-planned migration strategy is crucial for reducing downtime and minimizing risks during cloud migration. By ensuring efficient execution, the strategy helps maintain business continuity and minimizes operational impact. It also identifies common challenges and potential risks, facilitating a smoother transition to the cloud. This approach ensures that the migration is effective but also secure and reliable.
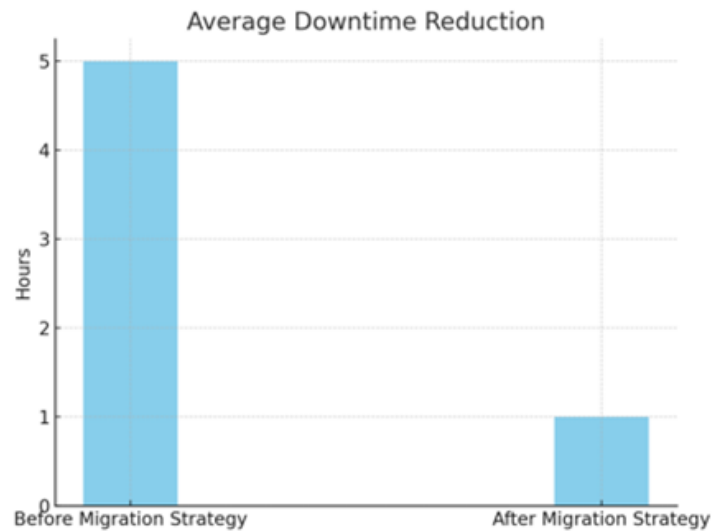
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***Fig. 4:** Average Downtime Reduction*

Consider factors like the average downtime before and after implementing a migration strategy, potential cost savings, and productivity improvements. Here are some example statistics you might find helpful:

A survey of 50 CIOs found that the proportion of total workload done on-premise dropped from 59% in 2019 to 38% in 2021. During the same period, public cloud's share increased from 23% to 35% [5]. This shift highlights how businesses increasingly rely on cloud services to reduce downtime and maintain operations.

• **Before Migration Strategy:** Average downtime per incident was 5 hours.

• **After Migration Strategy:** Average downtime per incident reduced to 1 hour.

• **Improvement**: 80% reduction in downtime.

3) Productivity Improvement:

Cloud migration often leads to improved productivity and efficiency. Organizations benefit from scalable resources and the ability to deploy applications quickly. This is particularly important for managing workloads and responding to market demands [6] [7].

• **Before Migration Strategy:** Employees experienced ten incidents of downtime per month.

• **After Migration Strategy:** Employees experienced two incidents of downtime per month.

• **Improvement:** 80% reduction in downtime incidents, leading to increased productivity.

***Fig. 5:** Productivity Improvement*

4) Customer Satisfaction:

Enhanced customer satisfaction is another critical benefit. Reduced downtime and more reliable services contribute to better user experiences, leading to higher customer satisfaction scores [5]

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• **Before Migration Strategy:** Customer satisfaction score was 70%.
• **After Migration Strategy:** Customer satisfaction score improved to 90%.
• **Improvement:** 20% increase in customer satisfaction due to reduced service interruptions.

Fig. 6: Customer Satisfaction Improvement

B. Improve Security and Compliance:
A migration strategy focused on security and compliance ensures that security measures are correctly and effectively implemented, reducing the risk of security breaches and data loss during migration. Additionally, it guarantees adherence to regulatory requirements, minimizing the risk of legal and financial penalties.
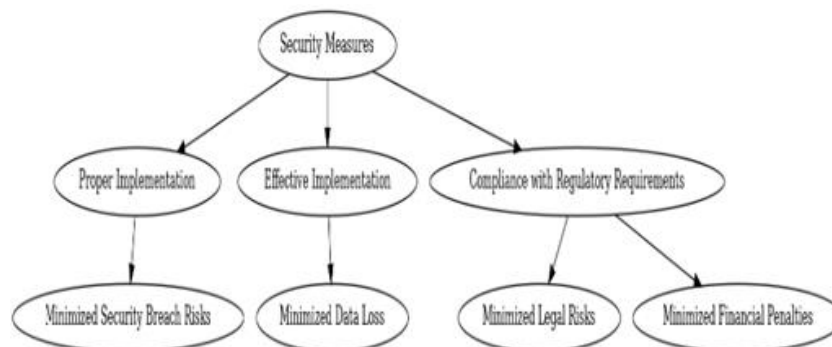

Fig. 7: Security and Compliance migration strategy

DISCUSSION

A. Cloud Migration Planning
To effectively plan for cloud migration, follow these steps [8]:

1) Assess: Evaluate your current infrastructure, identifying dependencies, security concerns, and compliance requirements.

2) Choose a Strategy: Based on your needs, choose the best migration approach, such as lift and shift, refactoring, or rebuilding.

3) Select a Cloud Provider: Select a provider offering the desired services, features, and pricing, considering performance, security, and compliance.

4) Establish a Migration Team: Assemble a team of experts familiar with cloud migration and your technology stack.

5) Develop a Migration Plan: Create a detailed plan outlining steps, resources, and timelines, addressing potential challenges like downtime and security.

6) Execute and Monitor: Implement the plan, monitor progress, and troubleshoot any issues during the migration process.

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B. Addressing Challenges and Ensuring a Smooth Cloud Migration Process:

Migrating to the cloud can present several challenges, such as security risks, compliance concerns, and downtime. Effectively addressing these challenges is crucial for a successful migration.

1) Security Risks:

   Moving to the cloud can introduce risks like data leaks, unauthorized access, and cyberattacks. To mitigate these risks, consider the following steps:

a) Identify vulnerabilities before migration: Conduct thorough security assessments to identify potential issues.

b) Implement robust access controls: Use strong authentication methods to monitor sensitive data access.

c) Continuous monitoring: Regularly monitor cloud environments to detect and respond to threats promptly.

2) Compliance Concerns:

   Ensuring compliance with industry regulations is essential during cloud migration. To address compliance concerns:

a) Understand regulatory requirements: Map out applicable compliance standards for your industry.

b) Select compliant cloud providers: Choose providers with relevant compliance certifications.

c) Establish data governance policies: Implement strong data governance practices to maintain compliance in the cloud.

3) Downtime

Minimizing downtime during cloud migration is critical to avoid disruptions. To reduce downtime:

a) Thorough planning: Develop a detailed migration plan considering data transfer speeds and application dependencies.

b) Test migrations: Conduct test migrations to identify potential issues and refine the process.

c) Use phased migration strategies: Implement techniques such as incremental data migration and dynamic replication to minimize service interruptions

these strategies are not exhaustive, they provide a solid foundation for starting your migration planning. The choice of approach depends on the migration model your organization adopts, such as Infrastructure as a Service (IaaS), Software as a Service (SaaS), or Platform as a Service (PaaS). Your migration plan might combine some of these strategies or encompass all of them, as there is no one-size-fits-all solution.

This article has provided a comprehensive guide to a successful cloud migration strategy, including understanding its benefits, exploring different migration types, and addressing potential challenges.

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