AWS COST OPTIMIZATION ANALYSIS: A DATA-DRIVEN APPROACH TO CLOUD INFRASTRUCTURE COST MANAGEMENT

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ABSTRACT

Purpose: This comprehensive analysis of AWS cloud infrastructure costs aims to identify significant optimization opportunities within a multi-service, multi-regional deployment.

Methodology: The study analyzes 218 data points across 5 AWS services and 3 geographic regions using descriptive, predictive, and prescriptive analytics. Data was sourced from AWS billing and usage records spanning 1057 days.

Findings: The total expenditure analyzed was ₹48,040, with ₹15,787 (32.9%) identified as idle or wasted cost. Relational Database Service (RDS) instances showed the highest optimization potential with 50.1% idle cost, while EC2 instances were the most efficient with 84.1% average utilization.

Practical Implications: The analysis identifies immediate cost savings of ₹15,787, with potential annual savings of ₹1,89,452 through the implementation of automated scaling, resource consolidation, and enhanced governance policies.

Originality/Value: This report provides a data-driven framework for cloud financial management, offering actionable strategies to reduce cloud spending while maintaining operational efficiency and performance standards.

Keywords: Cloud Cost Optimization, AWS, Business Analytics, Data-Driven Decision Making, Cloud Governance, FinOps.

1. INTRODUCTION AND PROBLEM STATEMENT

Background

Cloud computing has become the backbone of modern business operations, with Amazon Web Services (AWS) leading the market. However, organizations often struggle with cloud cost management, with studies indicating that 30-35% of cloud spending is wasted due to poor resource optimization. This project addresses the critical need for data-driven cost optimization in AWS environments through a comprehensive analysis of usage

patterns, resource utilization, and spending trends across multiple services and geographic regions.

Problem Statement

Organizations face significant challenges in optimizing AWS cloud costs due to complexity in multi-service architectures, dynamic pricing models, resource sprawl from rapid deployment, and a lack of data-driven insights for optimization decisions.

Research Question

How can systematic data analysis of AWS usage patterns and costs enable evidence-based optimization strategies that reduce cloud spending while maintaining operational efficiency?

2. LITERATURE REVIEW

Recent research highlights the critical importance of strategic cloud cost management. According to Gartner (2024), organizations waste an average of 32% of their cloud spending, primarily due to rightsizing failures and idle resources. This figure aligns closely with this report's findings of 32.9% in idle costs within the analyzed environment. Studies by the MIT Sloan School of Management (2023) demonstrate that organizations using data analytics for cloud cost management achieve 25-40% greater cost reductions compared to those relying on manual approaches. Furthermore, academic research from the Stanford Graduate School of Business (2024) emphasizes the importance of regional cost analysis in global cloud deployments, noting significant variations in pricing and performance across geographic regions that can be exploited for optimization. The business value is substantial; the McKinsey Global Institute (2024) reports that systematic cloud cost optimization contributes 15-25% to overall IT budget efficiency, making it a critical capability for digital transformation.

3. RESEARCH GAPS, OBJECTIVES, SCOPE, AND LIMITATIONS

Research Gaps

While existing literature extensively covers cloud cost optimization frameworks, there is a gap in applied research demonstrating a systematic, data-driven approach across a multi-service and multi-regional AWS environment. Many studies focus on a single service (like EC2) or lack a prescriptive analytical framework that translates findings into an actionable implementation roadmap. This study addresses that gap by applying a comprehensive analytical methodology to a real-world dataset.

Research Objectives

Primary Objectives:

- To analyze AWS cost and usage patterns across EC2, RDS, S3, Lambda, and ECS services in the ap-south-1, us-west-2, and eu-central-1 regions.
- To identify and quantify underutilized resources and their associated idle costs.
- To develop data-driven cost optimization strategies and actionable business recommendations.

Secondary Objectives:

- To establish baseline metrics for ongoing cloud cost management.
- To forecast future cost trends using time series analysis.
- To design a phased implementation roadmap for optimization initiatives.

Scope and Limitations

Scope:

- The scope of this research is confined to the analysis of a dataset containing 218 records spanning 1057 days. The analysis covers five specific AWS services (EC2, RDS, S3, Lambda, ECS) across three geographic regions (ap-south-1, us-west-2, eu-central-1). The recommendations are based solely on the quantitative data provided in the usage and billing records.

Limitations:

- The study's limitations include its reliance on a single dataset, which may not be generalizable to all organizations. The analysis does not include business context or qualitative data regarding workload criticality, which could influence optimization decisions. Furthermore, the study is limited to AWS and does not explore multi-cloud cost arbitrage strategies.