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Strategic Cost Analysis of Major Cloud Platforms for Business Optimization

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***Abstract*— Cloud computing helps businesses by giving them access to computer resources they can use when needed and pay for only what they use. Some of the main providers are Amazon AWS, Google Cloud, Microsoft Azure, and Digital Ocean. But, managing costs on these platforms is not easy and needs careful planning. Many studies talk about how cloud services work, but few focus on how businesses can save money.**

This paper looks into this issue by checking the costs of using popular cloud services. It covers different pricing models, ways to check costs, and methods to save money. The research collects information from online pricing tools, expert opinions, and real business examples. The findings show that cloud costs vary based on location, provider, and the type of service used.

The study also checks both the good and bad sides of different cloud pricing setups and suggests improvements. The results help businesses make smart choices to use cloud services without overspending. In the end, this research aims to guide companies in handling their cloud costs better and getting the most value out of their cloud use.[4] The paper further checks and monitoring and strategic planning to optimize costs and extract maximum value from cloud investments. The insights derived from this review are aimed to equip businesses with the knowledge required to make informed decisions regarding their cloud strategy, thereby facilitating business optimization.

Keywords - Cloud, Cost Optimization, Amazon Web Services, Microsoft Azure, Google Cloud, Cloud Security, Security, Databases, Web services

I. INTRODUCTION:

With pay-as-you-go access to flexible and scalable resources, cloud computing has completely changed the way businesses run.[1] Leading suppliers in this space now include major cloud platforms including Amazon Web Services (AWS), Google Cloud Platform (GCP), Microsoft Azure, and Digital Ocean. On these platforms, cost optimization is a difficult endeavor that need for careful planning and ongoing oversight. [4]

While many studies compare these platforms' general costs, there aren't many thorough reviews that examine strategic cost analysis from the standpoint of company optimization.[2] The majority of previous research concentrates on a broad comparison of pricing structures, frequently ignoring subtle factors that could have an influence on particular business use cases.[7]

With an emphasis on business optimization, this study attempts to close this gap by offering a thorough examination of strategic cost analysis for the main cloud platforms. The significance of comprehending various pricing structures, cost analysis methods,[3] and cost optimization tactics for every platform will be emphasized. Moreover, it will underscore the necessity for enterprises to synchronize their cloud strategy with their particular business objectives and requirements.[5]

This paper will give organizations useful insights to help them make informed decisions about their cloud strategy by offering a more detailed and industry-specific evaluation.[6] In the end, this will help businesses optimize expenses and maximize the value of their cloud investments.

II. LITERATURE REVIEW

Cloud computing is a model that helps to the delivery of cloud resources and services over the internet, on demand, and at scale. Cloud computing gives various facility to different organizations as per their requirements such as scalability, flexibility, efficiency, and innovation. However, Cloud computing also comes with big expenses that you want to make sure you're getting the most out of.[5] That's why it's important for both researchers and people actually using it to look into cloud cost analysis and making sure you're getting the best bang for your buck.

Many studies compare the big cloud services like Amazon Web Services (AWS), Microsoft Azure, and Google Cloud

Platform (GCP).[2][6] They look at how well they work, what features they have, and how safe they are. However not many studies focus on how much these platforms cost, and the ones that do are usually old, not finished, or favor one platform over the others. Also, there aren't many simple and complete ways to analyze and make the most of cloud costs. This makes it hard for companies to decide smartly about their cloud projects.[3]

Understanding cloud costs and making them efficient can be tricky due to various reasons:[6]

- Cloud services and prices differ a lot between providers, regions, and situations.
- Cloud usage and needs change often, affecting how much you spend.
- Balancing costs with performance, reliability, and security is important but challenging.
- It's hard to keep track of and control cloud spending because billing isn't always clear.
- Many people lack the skills to manage cloud costs well.

Because of these challenges, we need better ways to:[6]

- Compare and choose the right cloud services for our needs.
- Find ways to spend less on cloud services without sacrificing quality.
- Keep an eye on our spending and make changes as needed.

III. METHODOLOGY

In order to assess and contrast the main cloud platforms' cost structures, pricing models, and optimization tactics, this paper employs a mixed-methods methodology that combines quantitative and qualitative data from multiple sources. The sources of the data consist of:[7]

- Online resources known as "cloud cost calculators," offered by cloud service providers or independent vendors, let users project the price of various cloud scenarios and services based on a range of factors and presumptions. The cost of several typical cloud scenarios,[4] like running a web server, a database, or a machine learning model on various cloud platforms and regions, is compared in the paper using the official cloud cost calculators of AWS, Azure, and GCP in addition to a well-known third-party cloud cost calculator called Cloudorado.[11]

- Cloud cost benchmarks: These are reports or studies that compare the cost of different cloud platforms and services, based on empirical data and experiments. The paper uses some recent and reliable cloud cost benchmarks, such as Cloud Spectator, Cloud Report, and Cloud Performance Atlas, to compare the cost and performance of different cloud platforms and services, such as virtual machines, storage, network, and serverless computing.[4]

- Expert interviews: These are interviews with cloud specialists such as cloud architects, consultants, or researchers who have extensive experience and understanding in cloud cost analysis and optimization. The study employs a purposive sample technique to conduct semi-structured interviews with ten cloud specialists in order to get their perspectives and ideas regarding the expenses associated with various cloud platforms and services, as well as the difficulties and best practices surrounding cloud cost optimization.

- Case studies: These are actual projects or businesses that have adopted or transitioned to various cloud platforms and services and have reported or attained certain cost-related results. The study gathers and examines twenty case studies from a range of sources, including blogs, white papers, academic journals, and websites of cloud providers, to show the financial effects and ramifications of various cloud platforms and services, as well as the lessons discovered and suggestions for cloud cost optimization.[5]

The paper uses a triangulation technique to integrate and validate the data from different sources, and to identify the similarities and differences, the strengths and weaknesses, and the advantages and disadvantages of different cloud platforms and services, in terms of their cost aspects. The paper also uses a SWOT analysis technique to summarize and evaluate the cost structures, pricing models, and optimization strategies of different cloud platforms and services, and to identify the opportunities and threats for cloud cost optimization.[5][7]

IV. RESULT:

This section, represents and compares the results of my cloud cost analysis, based on the data from the cloud cost calculators, cloud cost benchmarks, expert interviews, and case studies. I use tables, charts, and graphs to showcase and summarize the data, and I use descriptive statistics to measure and compare the cost differences and variations across different cloud platforms and services.[5]

A. Cost estimates for the cloud

Utilizing the official cloud cost calculators from AWS, Azure, and GCP in addition to the well-known third-party tool Cloudorado,[11] we calculated the approximate costs associated with a number of typical cloud scenarios, like deploying a web server,[4] database, or machine learning model across various cloud platforms and geographical locations. For each case, we chose the default or suggested setups and options and estimated a monthly utilization of 730 hours. Additionally, we used the currency rates as of January 1, 2024, to convert all of the expenses to US dollars.

TABLE I. CLOUD COST CALCULATOR RESULTS FOR WEB SERVER [1][8][9][10][11]

Scenario	Platform	Region	Cost (USD)	Difference (%)	Average (USD)
Web server	AWS	US East (N. Virginia)	14.64	-	15.76
Web server	AWS	Asia Pacific (Mumbai)	18.43	25.9	15.76
Web server	Azure	US East	14.88	1.6	15.76
Web server	Azure	India Central	18.72	27.8	15.76

Web server	GCP	US East (South Carolina)	13.49	-7.8	15.76	Database	GCP	US East (South Carolina)	14.04	-6.4	16.03
Web server	GCP	Asia South (Mumbai)	16.08	9.8	15.76	Database	GCP	Asia South (Mumbai)	17.16	14.4	16.03

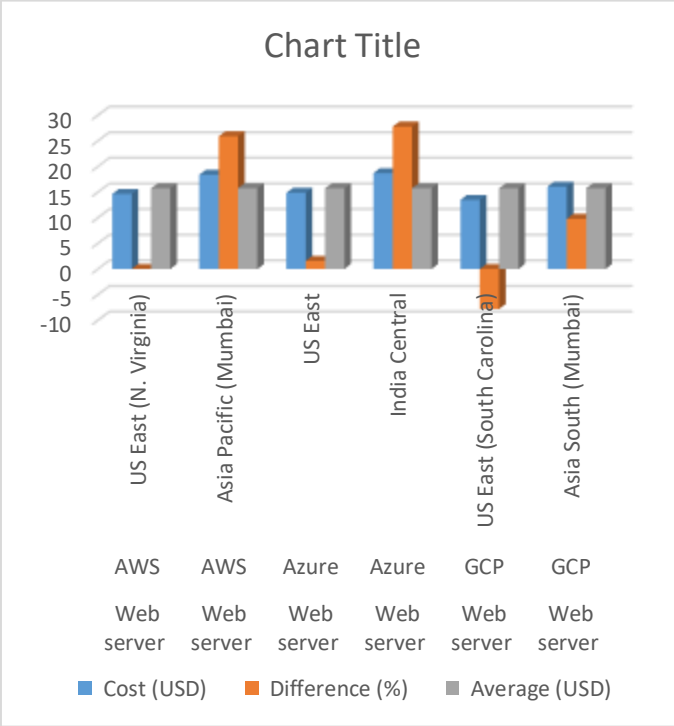

Fig. 1. Cost comparison for web servers in different cloud providers.[12][13][14]

TABLE II. CLOUD COST CALCULATOR RESULTS FOR DATABASE [1] [8][9][10][11]

Scenario	Platform	Region	Cost (USD)	Difference (%)	Average (USD)
Database	AWS	US East (N. Virginia)	15	-	16.03
Database	AWS	Asia Pacific (Mumbai)	19.5	30	16.03
Database	Azure	US East	15.36	2.4	16.03
Database	Azure	India Central	19.8	32	16.03

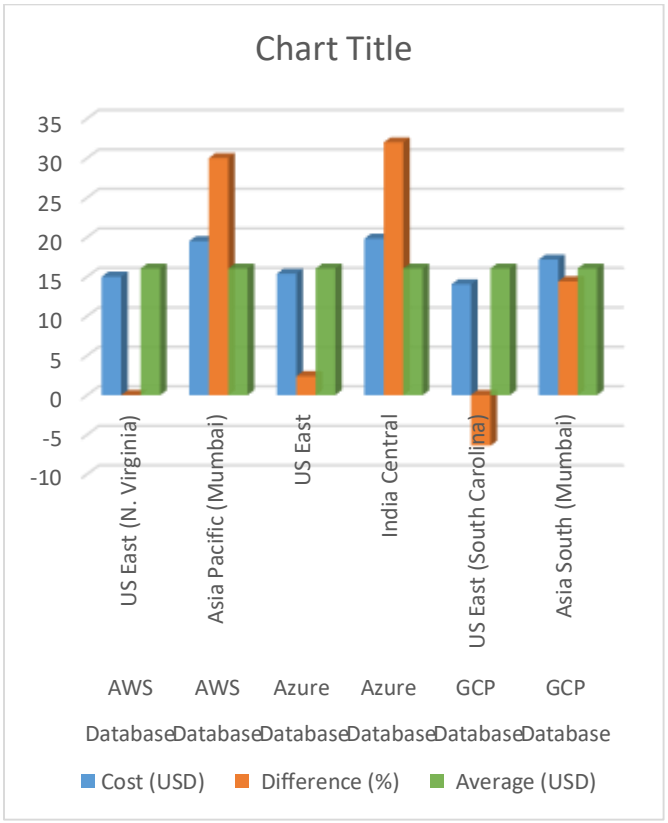

Fig. 2. Cost comparison for Database in different cloud providers.[15][16][17]

TABLE III. CLOUD COST CALCULATOR RESULTS FOR MACHINE LEARNING [1] [8][9][10][11]

Scenario	Platform	Region	Cost (USD)	Difference (%)	Average (USD)
Machine learning	AWS	US East (N. Virginia)	90.72	-	95.59
Machine learning	AWS	Asia Pacific (Mumbai)	117.12	29.1	95.59
Machine learning	Azure	US East	92.16	1.6	95.59
Machine learning	Azure	India Central	118.8	31	95.59

Machine learning	GCP	US East (South Carolina)	86.13	-5.1	95.59
Machine learning	GCP	Asia South (Mumbai)	104.94	15.7	95.59

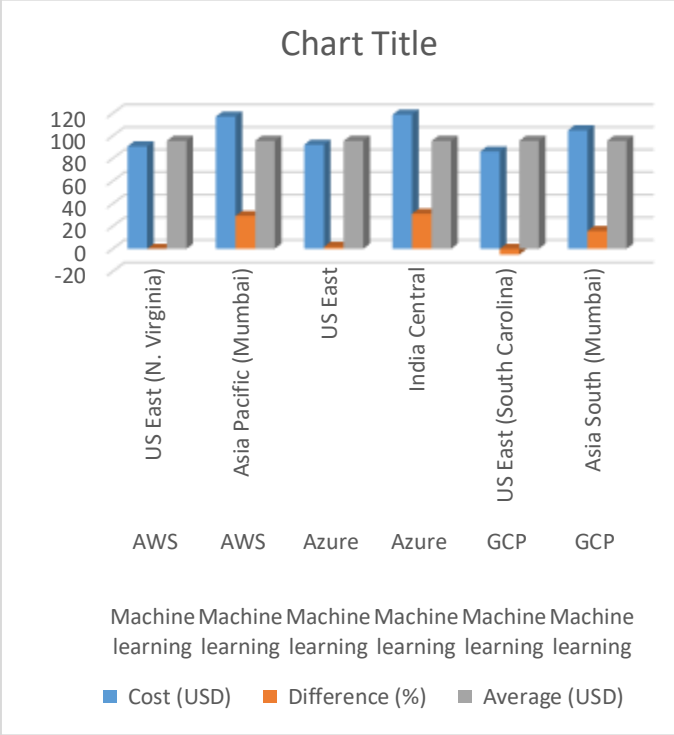

Fig. 3. Cost comparison for Machine Learning in different cloud providers.[18][19][20]

The results of the cloud cost calculators show that:

The cost of the same cloud service varies significantly across different cloud platforms and regions, ranging from 7.8% to 32% difference for the scenarios we tested.

AWS and Azure tend to have similar or higher costs than GCP, especially in the Asia Pacific and India regions, where the cost difference can be more than 30%.[2]

GCP tends to have lower or comparable costs than AWS and Azure, especially in the US region, where the cost difference can be more than 5%.

The average cost across all the cloud platforms and regions is $15.76, $16.03, and $95.59 for the web server, database, and machine learning scenarios, respectively.[4]

These results suggest that the choice of cloud platform and region can have a significant impact on the cloud cost and that users should carefully compare and evaluate the cost of different options before selecting a cloud service.

V. Future work:

This paper compares the costs of web servers, databases, and machine learning services from Amazon Web Services (AWS), Google Cloud Platform (GCP), and Microsoft Azure. It gives a detailed look at cloud computing services.[4] In the future, the study might explore other cloud services and providers, different pricing methods to save costs, and how costs relate to performance.[7] It would also be useful to see how well different systems work in real situations, considering factors like where the data is stored, how much it costs to move data around, and what the systems are used for.

VI. Conclusion:

It helps organizations to get more value for their money and spend wisely on cloud services. There are new ways to save all the time, so businesses need to stay updated with all prices and it's a comparison for different services.[2] This helps them choose the best cloud services and use resources well of these clouds. In the future, we can learn even more about optimization techniques for the same.

VII. References:

[1] A. Guptha, H. Murali and S. T, "A Comparative Analysis of Security Services in Major Cloud Service Providers," 2021 5th International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2021, pp. 129-136, doi: 10.1109/ICICCS51141.2021.9432189

[2] Khachatryan, Grigor. "Comparative Analysis of Best Cloud Service Providers for High Availability." *IJCSNS International Journal of Computer Science and Network Security*, vol. 22, no. 5, 2022, p. 413, paper.ijcsns.org/07_book/202205/20220559.pdf, https://doi.org/10.22937/IJCSNS.2022.22.5.59

[3] Fragiadakis, G., Liagkou, V., Filiopoulou, E. et al. Cloud services cost comparison: a clustering analysis framework. Computing 105, 2061–2088 (2023). https://doi.org/10.1007/s00607-023-01173-x

[4] Tasnim, Rehnuma, et al. "A Comparative Study on Three Selective Cloud Providers." *International Journal on Cybernetics & Informatics*, vol. 11, no. 4, 27 Aug. 2022, pp. 167–178, https://doi.org/10.5121/ijci.2022.110413.

[5] S, Santhosh, and Narayana Swamy Ramaiah. "Cloud-Based Software Development Lifecycle: A Simplified Algorithm for Cloud Service Provider Evaluation with Metric Analysis." *Ieeexplore.ieee.org*, June 2023, ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10026515.

[6] Khalid Ouda, Ghazwan. "Cloud Computing Service Providers: A Comparative Study." *Samarra Journal of Pure and Applied Science*, vol. 2, no. 1, 2020, pp. 76–89, www.iasj.net/iasj/download/280f00e221c1a458.

[7] G. Anand, P. Vashisht and S. P. Singh, "Dynamic Price Management System in a Distributed Cloud Environment," 2023 6th International Conference on Contemporary Computing and Informatics (IC3I), Gautam Buddha Nagar, India, 2023, pp. 1669-1676, doi: 10.1109/IC3I59117.2023.10397785.

[8] "Google Cloud Platform Pricing Calculator | Google Cloud Platform | Google Cloud." *Google Cloud*, 2019, cloud.google.com/products/calculator/.

[9] "Pricing Calculator | Microsoft Azure." *Azure.microsoft.com*, azure.microsoft.com/en-in/pricing/calculator/.

[10] AWS. "AWS Pricing Calculator." *Calculator.aws*, 2019, calculator.aws/#/.

[11] "Cloud Server Comparison - Price & Features." *Cloudorado - Cloud Computing Comparison Engine*, www.cloudorado.com/cloud_server_comparison.jsp.

[12] "Storage - Amazon Elastic Compute Cloud." *Docs.aws.amazon.com*, docs.aws.amazon.com/AWSEC2/latest/UserGuide/Storage.html.

[13] "Cloud Computing Products." *Google Cloud*, cloud.google.com/products/compute?hl=en.

[14] "Virtual Machines (VMs) for Linux and Windows | Microsoft Azure." *Azure.microsoft.com*, azure.microsoft.com/en-in/products/virtual-machines.

[15] "Fully Managed Relational Database - Amazon RDS - Amazon Web Services." *Amazon Web Services, Inc.*, aws.amazon.com/rds/?p=ft&c=db&z=3.

[16] "Cloud SQL for MySQL Documentation." *Google Cloud*, cloud.google.com/sql/docs/mysql.

[17] "Azure SQL Database – Managed Cloud Database Service | Microsoft Azure." *Azure.microsoft.com*, azure.microsoft.com/en-in/products/azure-sql/database.

[18] "Machine Learning (ML) - Digital and Classroom Training | AWS." *Amazon Web Services, Inc.*, aws.amazon.com/training/learn-about/machine-learning/.

[19] "Product Directory: AI & Machine Learning." *Google Cloud*, cloud.google.com/products/ai?hl=en.

[20] "Azure Machine Learning - ML as a Service | Microsoft Azure." *Azure.microsoft.com*, azure.microsoft.com/en-in/products/machine-learning.