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Original Research Article

Cost Optimization (FinOps) for Large-Scale Public Cloud Adoption: Budgeting Controls, Chargeback/Showback, and Usage Forecasting (Public Sector and Enterprises)

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Abstract: FinOps, or the technology operating model that links engineering decisions to accountable spend, has played a vital role in navigating this expenditure variability challenge, albeit as a concept, where such contemporary ideas are discussed as scattered narratives incorporated in scientific, managerial, and practitioner literatures. This systematic review of literature seeks to consolidate literature published between 2020 and 2025 on three core dimensions of FinOps that are currently able to influence cloud economics stability, including budgeting controls, chargeback and showback approaches, and spend forecasting methods. In applying and adapting PRISMA eligibility screening protocols set in January 2020, as well as thematic synthesis, we are able to develop an understanding of mechanisms, measures, as well as commonly identifiable failures, recognizing influences such as those of public sector appropriation, audit, procurement, as well as data sovereignty imperatives, alongside organizational-level product-centric delivery realities. In summary, cloud technology adoption on national and organizational scales has catalyzed a transition of focus of technology spending from capital-heavy projects to flexible operating expenditure, thereby spawning a governance dimension that can be regarded as both financial, organizational, and behavior-oriented. Through FinOps, it has been found that Ministries of Communications, as well as large-scale organizations, can better adopt and institutionalize a reference FinOps model that links tagging, allocation strategy, budgeting, as well as spend optimization, while also benefitting from evaluation frameworks along with associated key performance indicators for purposes of replicable studies that can be applicable in the field or enterprise environment. Overall, FinOps, as found, can be regarded as a control, such that without transparency, allocation, or forecasting, activity will neither change behavior, raise disputes, nor allow for preventative decisions, respectively.

Keywords: FinOps, Cloud Financial Management, Budgeting Controls, Chargeback, Showback, Cost Allocation, Forecasting, Public Sector Cloud, Governance, KPI, Auditability, Multi-Cloud.

1. INTRODUCTION

Large public cloud infrastructures, despite all the advantages of agility, speed, and flexibility being provided, bring forth their own cost model, which is sharply different from traditional data centers based on their variability in spending due to consumption models and architectural designs, along with several "cost decision points" based on activity in these platforms. Therefore, for public sector engagements, the spending variability will interact unfavorably with appropriation, procurement, audit trails, and accountability drivers. For commercial business engagements, spending variability will interact unfavorably with product delivery models, appropriation of cross-functional values, and

business outcome drivers. The result is another of the more significant and commonly occurring trends noticed across a variety of literature from the period between 2020 and 2025—that cloud engagements operate well, but the costs are variable due to the lack of integration of financial models during the engineering activities.

This phenomenon has led to a call for FinOps. Rather than emphasizing cost management as an accounting event, FinOps provides a model to operate that facilitates finance, engineering, purchasing, and leadership to work together as a team in making decisions. A notable characteristic of several practitioner models and relatively current research reports referring to cost optimization and cost management in big public sectors is the implication that cost optimization is composed of three vital asset groups, including budgets to manage spending to provide constraints and interventions, allocation of shared consumption using showback and chargeback, and utilization of forecasts that include telemetry components. Though these three concepts have been discussed frequently, they have yet to be integrated as an operating model in big public sector organizations. The context in which this review is written is specifically aimed to address the Ministry of Communications and organizations which operate with multiple business organizations within their multifaceted cloud computing needs. Specifically, the context within which the Ministry operates highlights the need for transparency, auditability, and comparison between organizations. It also points to "cost surprises" in relation to business service continuity, trust, and deadlines related to digital transformation initiatives. This paper is aimed to specifically focus on the context of budget controls, chargebacks/showbacks, and forecasting as part of a whole solution and not in isolation.

2. Aim, Objectives, and Research Questions

Aim: The aim is to critically synthesize the latest evidence available till 2020-2025, specifically related to mechanisms of cloud expenditure management provided with FinOps, with special reference to budgeting controls, chargebacks/showbacks, and forecasts of usage in public sector organizations/entities.

Objectives

O1: To identify the budget control mechanisms, i.e., budgets, alerts, guardrails, approvals, and enforcement, which are invariably associated with reduced variance and increased spend predictability.
O2: Discuss and compare the different methods of showbacks and chargebacks, including the cost allocation bases of tagging standards, account/subscription models, shared cost models, and unallocated cost models.
O3: Synthesize the methods used in cloud usage and spending forecasts, including statistical methods, machine learning methodologies, and hybrid approaches, as well as the decision situations for scenario planning, commitment purchasing, and portfolio prioritization.
O4: Design reference model of FinOps suitable for the Ministry of Communications and large entities, such as those related to governance, audit, controls, and KPI.
O5: Determine gaps in the evidence and establish the research agenda according to high-quality assessments as measured by Scopus and Q1 journals that pertain to the fields of logistics and operations.

Research Questions

RQ1: What are the most appropriate budget control practices that could reduce expenditure and variance?
RQ2: What allocation techniques guarantee showbacks/chargebacks to be credible with the least amount of disputes/administrations?
RQ3: What is the form or shape of the different methods of forecasting that relate to effective controls such as budget policy, commitment planning, and optimization?
RQ4: What type of public sector restrictions affect FinOps decisions, and what patterns of FinOps eliminate such issues while promoting flexibility?

3. METHODOLOGY

Review of the Design & Protocol: The current study has adopted a systematic review & thematic synthesis, following a protocol for systematic reviews and thematic synthesis as per the PRISMA protocol of 2020. The literature search for the current study is for literature published between 2020 and 2025. The focus of the literature search areas is based on the application of FinOps/efficient principles of cloud financial management, as well as literature focused on areas such as budgeting controls, showbacks/chargebacks, forecasting, etc. However, owing to the studies undertaken based on technical evaluation reports, case studies, surveys, practitioners, approaches, etc., for subject areas, it is not feasible to undertake a study based on meta-analysis; hence, it has been undertaken as a thematic study. Search strategy and sources: The steps can be achieved through the academic indexer websites and individual publisher websites (IEEE, ACM, Springer, Elsevier, etc.). Accordingly, based on the availability of individual websites for industries and standardization bodies impacting the domain, cloud provider documentation, features offered by the FinOps Foundation, and results of analyst/audit reports, the terms related to the domain/industry mechanism and context can be applied. In effect, chaining of references to good review websites and definitions of practitioner definitions of capability

sets applies here. Inclusion/Exclusion Criteria: For the included resources, the inclusion criteria described them as being written between 2020 and 2025, discussing cost governance mechanisms in public cloud and/or discussing FinOps mechanisms, being useful in terms of information obtained from an operational perspective, including control design, allocation, forecasting, and results, and finally, having proposed sufficient information so as to be able to obtain results. On the other hand, the excluded resources had data that was consistent with one or more of the following criteria: resources written after 2020, being conceptual in nature with no mechanisms presented, and lastly, having limited description and information obtained from cloud providers. Screening and quality appraisal: The screening process mainly involved title/abstract screening and full-text screening. Moreover, within the realm of quality evaluation, key aspects taken into consideration were the pertinence of the study within a realistic decision-making situation, description of the mechanism, reproducibility of the control process, and the quality of the evidence, such as before/after with normalization, and, above all, KPI. With emphasis on public sector usage, particular relevance was given to audit, segregation, and traceability of the allocation mechanism. Data extraction and synthesis: Extraction of data has been carried out on aspects such as organizational context, public sector/enterprise scope, single cloud, multi cloud, budgeting control, selection of allocation methods/tag model, forecasting approach/evaluation, and results/outcomes. Data synthesis has been carried out under the following major themes, i.e., T1 - Budgeting controls, T2 - Allocation/showback/chargeback, T3 - Forecasting planning, and one cross-cutting theme, which is related to governance constraints in public sector enterprises.

4. Graphical Representation

4. Graphical Representation: Reference Operating Model

Figure 1 below depicts the reference model of the concept of FinOps as it is. Specifically, it is the result of the process of synthesizing various literature sources published between 2020 and 2025. It has been broken down into three sections related to trusted attribution with control, the transformation of trusted attribution into behavior, optimization actions, which describe the capability of FinOps for creating the necessary impact, and finally, the audit trail of optimization actions, the separation of duties, and the standardization of rules for approval of budget policies.

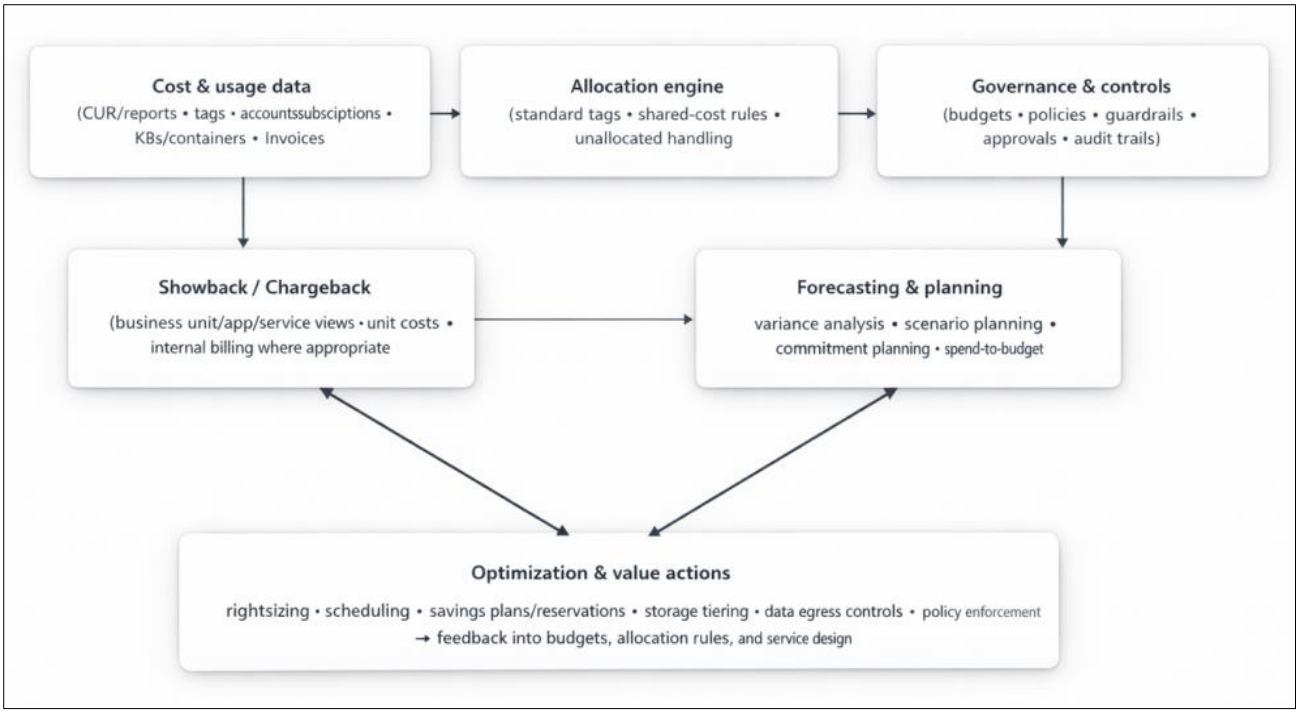

Figure 1: FinOps operating model for budgeting controls, allocation (showback/chargeback), and forecasting (public sector and enterprises; 2020-2025 synthesis)

5. Thematic Synthesis

5.1 Budgeting Controls as Enforceable Guardrails

The common consensus that has emerged according to all literature on effective budgets, which is all published between 2020 and 2025 is that the most effective form of implementation of budgets is controls rather than planning. As such, controls involve "the presence of at least one of the following:

(i) 'definition of terms such as account, subscription, project, product or agency,' (ii) 'thresholds and variances,' and (iii) 'definitions of who needs to take action and when.' Definitions of 'provider tools' and FinOps' capabilities all converge on the relevance of 'budgets along with automated alerts and policy enforcers to avoid uncontrolled scale-out.' New FinOps implementations tend to place greater emphasis on 'shift-left' cost controls to approve cost impact before deployment and using infrastructure-as-code to avoid surprises come month-end." As pertains to implementation, "the relevance of budget controls here is to prevent wastage of spend allocations by coupling ownership or else vain error messages when allocations and ownership fail to materialize." As far as public sector programs are concerned, it is stated that appropriation constraints may pose a limitation on the budgeting approach since it "has the potential for limiting re-allocations in the cost centers." There is also the "potential for 'use it or lose it' issues given the proximity to the end of the year." The necessity for the application of budgets in public sector programs may perhaps be answered in the following manner based on some sources: "A two-level approach may answer the question of necessity." As far as the application of budgets in the program is concerned, some of the "habits of successful budgeting" tend to encompass the notion of "budget exception governance" which is "necessity to approve mission workloads in excess of thresholds."

5.2 Chargeback/Showback and Principles of Cost Allocation

Both showback and chargeback are discussed as behavioral mechanisms where decisions are done in a consistent way based on demonstrated changes in visibility. Based on the underlying factors listed below, a stable base is developed for the purpose of allocation.

i. Strategies concerning tagging or labeling,
ii. Organisation or Subscription Structures,
iii. Apportionment of joint cost,
iv. Unidentified cost allocation.

Such a foundation is necessary to avoid disputes over showback. In its absence, chargeback enables delays in its use. It is pretty evident from the guidance for implementing the FinOps capability that showback and chargeback are organisational decisions, not maturity steps. There are certain environments, such as those within public settings, which would want showback along with governance, while public sector agencies may enable chargeback to defray the cost. There are further complexities in allocation as shared platforms grow in scope-identity, observability, and data lakes-and container orchestration complexities arise. Recent sources indicate a sharing of Kubernetes expenses and resources via telemetry and allocation rules to help eliminate platform tax concerns and drive team product responsibility. Another frequent allocation scenario when discussing allocation is adhering to service catalogs, since allocation needs to be done in accordance with what is being offered internally, including cost to serve analysis of products, such as API gateways and data platforms. Especially for Ministries of Communications and cross-agency clouds, the allocation scenarios provide for transparent and predictable models, since shared service expenses are Gerente via pre-determined pricing models on consumption, and agencies can apply showback to forecast expenses.

5.3 "Usage and Spend Forecasting for Planning and Early Intervention"

Forecasting is treated in the 2020-2025 literature in the same vein as it represents an important link between telemetry and budgetary governance. That includes "forecasts as representing (i) early detection of potential overspend risk, (ii) scenario planning for new digital services under development, and (iii) commitment planning for reserved capacity or savings plans as relevant." As for the procedures behind the forecasting, "while traditional statistical time series techniques may be employed for stable workload behaviors, we would employ machine learning techniques when workloads demonstrate nonlinear behaviors, or when multiple drivers of demand need to be modeled." Even more, "while forecast accuracy is important, we find that forecast 'actionability' is critical-a concept defined by the amount of time before a forecast is acted upon."

In public sector scenarios, this also means integration with reporting. For example, month-to-month invoice closure is from an analytical perspective too late to use for prevention. There's also a case where two-week forecast-to-budget types of dashboards are in use, and where notifications happen when forecasted costs exceed the budget. More accurate forecasting will be achieved when attribution is more mature. In owner-level forecasting, the attribution is already present. Furthermore, multi-cloud systems will require the normalization of cost types. Multi-cloud systems will require consistent service-to-internal-taxonomy mappings.

5.4 Cross-Cutting Governance: Operating Model, Controls, and Audit

Regardless of which theme, the single most important determinant for FinOps success is governance-clear ownership. Governance success requires that data ownership should be clear-tag standards and allocation, controls ownership-clear about budgets and exceptions, and activity

ownership-optimization backlogs and commitment are clearly owned. Segregation of Duties, applicable for Public Sector organizations, can be achieved by designing FinOps in such a way that engineering owns optimization, policy is the property of finance, FinOps owns allocation, and trade-offs belong to leadership. Improvements to auditability commendations recognize that allocation can be version-controlled, approval can be stored, and/or dashboard can be rebuilt from exportable cost and usage data. In a nutshell, it addresses the need to match the Public Sector accountability model, as well as the Cloud Native model of continuous improvement.

5.5 KPI and Measurement Framework for Budget, Allocation, and Forecasting Maturity, Operationalizing the Evaluation

One noticeable trend in the body of evidence for 2020-2025 is that FinOps efforts are frequently described in terms of the tools deployed or the savings achieved, and, as a result, measurement is sometimes seen as merely a second-order reporting initiative. However, such is not the case; in fact, as mentioned, measurement is part and parcel of the operating model as part of FinOps, as it offers a holistic approach to evaluation. In effect, there are only three levers available: budget controls, allocation, and forecasting. A simple slate of metrics would include: i) identifying overspending; ii) identifying accountability courtesy of solid attribution; and iii) verifying value via affirmation. Budget Controls: "A simple slate of metrics: budget variance (actual vs. approved budget), alert to action ratio, time to intervention, and exception governance. "Conveyance in metrics surrounding allocation and show-back/charge-backs" should aim at "completeness of allocation and reduction of dispute". Other metrics that will be included will be, for instance, "tag coverage and correctness as they relate to percent allocated, unallocated spend ratio, dispute rate, as well as, for shared platform, platform tax visibility - that is, the extent to which cost of sharing is systematically dispersed or absorbed without any visibility or understanding of its doing so". It also needs to track the success of the metrics in forecasting, as they will not be effective simply because they are accurate. The error metrics are naturally informative, including "but not limited to, MAPE, Operating metrics surrounding 'Forecast Lead time to intervention', Forecast to budget variance trend, commitment efficiency - savings plan/reservation utilization and coverage, as well as, ultimately, decision cycle time as it relates to set scenarios that are based on known conditions". These metrics will serve as a form of "trace" as they go from telemetry -> attribution -> control -> action -> verified outcome, allowing for replicable design to reach evaluation, as would be desired within a Ministry of Communications as well as any large entity corporate body.

6. Evidence Map Table

Table 1 emphasizes a summary of the evidence map that connects the capabilities of FinOps to the results of operation, elements of data inputs, and considerations of the public sector or enterprise domains. This evidence map aims to underpin the determination of "what matters operationally" and, importantly, in a manner that is readily understandable and supportive of worthy research in rigorous evaluation.

Table 1: Evidence map linking FinOps capabilities to cost governance outcomes (2020–2025).

FinOps capability	Operational outcome pathway	Key data inputs	Public sector vs enterprise considerations	Representative 2020–2025 sources
Budgeting controls & guardrails	Reduced budget variance; faster interventions	Budgets, alerts, deployment approvals, cost exports	Public: appropriation cycles, audit trails; Enterprise: product budgets & OKRs	FinOps Foundation (2024); Microsoft (2024); ABACUS (2025)
Showback reporting	Cost transparency; behavior change without internal billing	Tags/labels, account structure, shared-cost rules	Public: transparency across agencies; Enterprise: product-level unit costs	FinOps Foundation (2024); AWS (2020, 2023)
Chargeback / internal billing	Cost recovery; demand shaping via price signals	Allocation logic, service catalog, invoicing integration	Public: optional, depends on policy; Enterprise: common for shared platforms	FinOps Foundation (2024); Alcoforado *et al*., (2025)
Forecasting & scenario planning	Early overspend detection; commitment planning	Time series of usage/spend, seasonality, releases	Public: weekly forecast-to-budget cadence; Enterprise: roadmap-driven scenarios	FinOps Foundation (2024); Putta & Rao (2023); Salb *et al*., (2024)
Optimization actions & feedback loop	Verified savings; improved utilization and unit economics	Rightsizing signals, reservations, scheduling, anomaly flags	Public: traceability for audits; Enterprise: KPI-driven optimization backlogs	Rathore *et al*., (2025); AWS (2022); Oracle (2022)

6.1 Implementation Roadmap for Ministries of Communications

A phased roadmap is a practical implementation of the reference FinOps model and will account for various constraints related to the public sector domain, such as appropriation measures per annum, contracting, auditing, and joint responsibility. The entire range from enforcement of attribution integrity to decision-making including forecast and validation optimization will be addressed.

Phase 1: Foundation - Attribution, Standards

Finally, it is to be hoped that showback will occur in a stable and credible form. In this phase, the tagging/taxonomy mandate, as well as account/subscription structures and governance of shared and unallocated costs, including "ownership thereof," will also occur. Governance artifacts will be the primary output in this phase, showbacks and/or dashboard creation being optional.

Phase 2: Controls – "Budget 'guardrails'" and Exception Also, the phase changes the budgets from being planning tools to enforceability tools, including thresholds, alert routes, approvals, and intervention playbooks. Lastly, it needs to be action-based and not notification-based to include features such as approval for deploying cost-impact changes, quota policies, policy as code, and other constraint types. A weekly cycle is recommended for this phase and needs to exclude potential issues associated with overspending before the invoices close. In addition, exception handling needs to be included for purposes of auditing and workloads of missions where thresholds have been broken.

Phase 3: Forecasting and commitment planning. Inclusion of this phase with scenario planning and commitment purchasing improves and increases preventive controls. For example, aspects of savings plans/reservations can be included. This phase needs to include workforce classifications such as stable, varying, event-driven, and an alignment of the forecasting horizon. In addition, entry criteria, utilization targets, and mitigation of commitment under-utilization need to be included. Finally, provider service mappings to internal taxonomy have to be included to cater to scenarios where environments are multi-cloud to ensure unit economics for purposes of reporting and aggregation at the agency level.

Phase 4: Optimization at scale – Backlog, verification, and feedback. This phase involves the optimization of institutionalization. This implies that the optimization will take place using engineering/product-owned backlog. In this case, the finance department will take charge while the leadership will take charge. The validation will take care of outcomes, which can also be in the form of evidence trails such as before/after normalization. In addition, reports, etc. These include, but are not limited to, controls by design, which also include controls repacked in the form of dashboards. Implications take the form of a loop comprising telemetry, attribution, controls, actions, and outcomes.

7. DISCUSSION AND FUTURE OUTLOOK

This synthesis also seems to indicate that the three major capabilities-budget control, allocation, and forecasting-are actually just different dimensions of only one control feature, and that without allocation, budget control is impossible, without standardization and simplification of governance-related issues, allocation is impossible, and that without connection to both budget policies and action playbooks, forecasting is either ineffective or preventative. For a ministry of communications, FinOps has to be a real program of control and decision-making and cannot simply be relegated to being used as reporting tools. From the existing literature, the most glaring research gaps with high levels of salience are as follows: Three gaps are outstanding. First, some studies realize cost savings without adequately normalizing demand growth, policy changes, service extensiveness: stronger quasi-experimental designs-such as before and after, rollouts, and difference-in-difference designs-can be more effective in isolating the effects of FinOps. Secondly, there is the gap in forecasting literature where accuracy is achieved without assessing decisional impacts-in much-needed studies to assess operational impacts such as lead times to interventions, variance reduction, and commitment efficiency. Thirdly-and most relevant in the public sector context-are chargeback models between agencies and their impacts on equity and outcomes: interdisciplinary studies are needed to integrate public finance and operations research. One of the new trends that has been featured within the literature released in 2024 and 2025 is policy-as-code cost controls to prevent non-compliant usage, explainable anomaly detection that helps accelerate diagnosis, and carbon optimization that takes it into account like another constraint variable alongside cost. These new trends showcase the pivotal conclusion that was realized: maturity within FinOps is defined by the level where processes related to budgeting, allocation, and forecasting continue to be active to inform decision-making, particularly for inter-agency programs that avoid escalation or procure new demand or continue to support operations during surges.

8. CONCLUSION AND RECOMMENDATIONS

This review examined the evidence for FinOps practices that make cost optimization possible. This evidence is from the period extending from 2020 to 2025. This synthesis showcases the importance of the integration of three essential mechanisms to ensure cost optimization. These include budgets that actually control spend, showback and chargeback mechanisms that are considered legitimate using a method of standardization, and ultimately forecasting mechanisms to ensure forward-looking interventions and commitments. For the MoC, it implies developing a FinOps strategy that acts as an audit-ready control. The practical recommendations would entail: (1) implementing a tagging and account/subscription standard across government sectors with unallocated cost policies; (2) using showback dashboards and implementing chargeback more selectively when cost recovery is necessary; (3) using operationalization of budget through a weekly forecast to budget review and pre-approved mitigation playbooks; (4) combining allocation and forecasting results with financial reporting systems for more informed decisions on portfolios; and (5) obtaining and monitoring a minimal set of KPIs such as budget variance, percentage allocated, unallocated cost, forecast lead time, unit cost of key services, and verified savings to demonstrate governance performance and build trust. Consumption visibility is connected to policies and forecasts to help reduce waste, increase predictability, and hasten digital services through various processes while meeting the needs of citizens through governments.

REFERENCES

- Amazon Web Services. (2023). AWS Well-Architected Framework (whitepaper). https://docs.aws.amazon.com/pdfs/wellarchitected/2023-10-03/framework/wellarchitected-framework-2023-10-03.pdf
- Amazon Web Services. (2024). Cost Optimization Pillar — AWS Well-Architected Framework (whitepaper). https://docs.aws.amazon.com/pdfs/wellarchitected/latest/cost-optimization-pillar/wellarchitected-cost-optimization-pillar.pdf
- Amazon Web Services. (2024). Organizing and tracking costs using AWS cost allocation tags (AWS Billing and Cost Management documentation). https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/cost-alloc-tags.html
- CERRE. (2024). Competition and regulation of cloud computing services. https://cerre.eu/wp-content/uploads/2024/02/REPORT.CERRE_.FEB24.CLOUDS.pdf
- European Commission. (2022). Commission decision on a cloud-first approach for the European Commission's IT infrastructure (C(2022) 4388 final). https://commission.europa.eu/system/files/2022-06/c_2022_4388_1_en_act.pdf
- FinOps Foundation. (2024). FinOps Framework overview. https://www.finops.org/framework/
- FinOps Foundation. (2025). FinOps Framework (English edition). https://www.finops.org/wp-content/uploads/2025/05/English-FinOps-Framework-2025.pdf
- Google Cloud. (2024). Well-Architected Framework: Cost optimization pillar. https://docs.cloud.google.com/architecture/framework/cost-optimization
- International Organization for Standardization. (2022). ISO/IEC 27001:2022 — Information security, cybersecurity and privacy protection — Information security management systems — Requirements.
- International Organization for Standardization. (2022). ISO/IEC 27002:2022 — Information security, cybersecurity and privacy protection — Information security controls.
- Kayalvili, S., (et al.). (2025). An optimized resource allocation in cloud using prediction-enabled cloud resource allocation framework. Scientific Reports, 15, 19927. https://doi.org/10.1038/s41598-025-19927-2
- Liu, M., Pan, L., & (et al.). (2023). Cost optimization for cloud storage from user perspectives: Recent advances, taxonomy, and survey. ACM Computing Surveys, 55(12). https://doi.org/10.1145/3582883
- Microsoft. (2024). Azure Well-Architected Framework: Cost optimization. https://learn.microsoft.com/en-us/azure/well-architected/cost-optimization/
- National Institute of Standards and Technology. (2020). Security and Privacy Controls for Information Systems and Organizations (NIST SP 800-53 Rev. 5). https://doi.org/10.6028/NIST.SP.800-53r5
- Nawrocki, P., & Smendowski, M. (2024). FinOps-driven optimization of cloud resource usage for high-performance computing using machine learning. Journal of Computational Science, 79, 102292. https://doi.org/10.1016/j.jocs.2024.102292
- Nawrocki, P., & Sus, W. (2022). Anomaly detection in the context of long-term cloud resource usage planning. Knowledge and Information Systems, 64, 2689–2711. https://doi.org/10.1007/s10115-022-01721-5
- Organisation for Economic Co-operation and Development. (2020). The OECD Digital Government Policy Framework.

https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/10/the-oecd-digital-government-policy-framework_11dd6aa8/f64fed2a-en.pdf

- Organisation for Economic Co-operation and Development. (2025). Effectively managing investments in digital government. https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/06/effectively-managing-investments-in-digital-government_2fc9fbbf/5c324e91-en.pdf
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, n71. https://doi.org/10.1136/bmj.n71
- Qu, Z., Dawande, M., & Janakiraman, G. (2024). Technical Note—Cloud cost optimization: Model, bounds, and asymptotics. Operations Research, 72(1), 132–150. https://doi.org/10.1287/opre.2022.0362
- Salb, M., Jovanovic, L., Elsadai, A., Bacanin, N., Simic, V., Pamucar, D., & Zivkovic, M. (2024). Cloud spot instance price forecasting: Multi-headed models tuned using modified PSO. Journal of King Saud University – Science, 36(11), 103473. https://doi.org/10.1016/j.jksus.2024.103473
- Smendowski, M., & Nawrocki, J. (2024). Optimizing multi-time series forecasting for enhanced cloud resource reservation planning: A FinOps-driven qualitative and quantitative assessment of dynamic reservation plans. Knowledge-Based Systems, 303, 112489. https://doi.org/10.1016/j.knosys.2024.112489
- World Bank. (2021). Government migration to cloud ecosystems. https://documents1.worldbank.org/curated/en/099530106102227954/pdf/P17303207ce6cf0420bcd006737c2750450.pdf
- World Bank. (2023). Institutional and procurement practice note on cloud computing: Cloud assessment framework and evaluation methodology. https://openknowledge.worldbank.org/items/7baff007-7bb9-4623-b229-b105cbf47284
- Zhang, J., (et al.). (2021). CDBTune+: An efficient deep reinforcement learning-based automatic cloud database tuning system. The VLDB Journal, 30, 525–548. https://doi.org/10.1007/s00778-021-00670-9