

OPTIMIZING THE USE OF FINANCIAL RESOURCES IN HIGHER EDUCATION  
INSTITUTIONS

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**Abstract**

Higher education institutions (HEIs) face persistent pressure to deliver high-quality teaching, research, and community services while operating under tightening public budgets, volatile tuition revenue, and rising input costs. This article proposes and demonstrates a practical framework for optimizing the use of financial resources in HEIs by combining cost transparency, performance alignment, and efficiency benchmarking. Using an IMRAD structure, we integrate (i) activity-based costing to map how resources are consumed across core and support processes; (ii) performance-based budgeting to connect spending with measurable outcomes; and (iii) efficiency analysis to compare units and identify realistic improvement targets. The approach is illustrated with a stylized multi-campus dataset that mirrors common university expenditure patterns (personnel, facilities, student services, and administration) and outcome indicators (graduates, research outputs, retention, and student satisfaction). Results from the worked example show that reallocating 3–7% of operating expenditure from low-impact activities to high-impact teaching support, procurement consolidation, and energy management can reduce cost per graduate while maintaining or improving quality metrics. The discussion translates the findings into actionable governance recommendations: strengthen internal controls, adopt transparent allocation rules, invest in digital financial management, and use incentives that reward both efficiency and equity. The framework is intended for university leaders and policymakers seeking evidence-informed budgeting decisions and sustainable financial resilience.

**Keywords**

higher education finance; resource allocation; activity-based costing; performance-based budgeting; efficiency benchmarking; data envelopment analysis; cost-effectiveness; governance; equity; financial sustainability.

**INTRODUCTION**

Universities and other higher education institutions (HEIs) operate at the intersection of public mission and competitive service delivery. They are expected to expand access, raise educational quality, produce internationally visible research, and contribute to regional innovation—often simultaneously. Yet the financial base that supports these expectations is increasingly constrained. Public funding in many systems is becoming more performance-conditioned, tuition income is sensitive to demographic shifts and policy changes, and philanthropic and project-based revenues are uncertain and frequently earmarked. At the same time, cost drivers such as academic salaries, digital infrastructure, laboratory equipment, compliance requirements, and energy expenses continue to rise. In this environment, “optimizing financial resources” is not a narrow exercise in cutting budgets; it is a managerial and governance task of allocating scarce resources to activities that create the highest educational and societal value while preserving equity and long-term institutional capacity.

Optimization in HEIs is challenging for several reasons. First, university outputs are multi-dimensional and partially intangible. A single monetary metric rarely captures learning gains, research quality, civic engagement, or reputational capital. Second, universities are loosely coupled organizations: faculties, departments, and administrative units may have different objectives and information sets, which can create fragmented budgeting practices and duplicated support services. Third, a significant share of spending is structurally “sticky.” Personnel costs dominate operating budgets, and many costs are tied to long-term commitments such as tenure systems, collective agreements, facility maintenance, and multi-year research projects. Fourth, decision-making is often shaped by collegial governance and political oversight; therefore, reforms must be transparent, defensible, and consistent with academic values.

Despite these constraints, HEIs typically have meaningful room to improve the productivity of their spending. Common sources of inefficiency include opaque internal transfers, historical incremental budgeting that replicates past allocations regardless of current demand, underutilized facilities, fragmented procurement, misaligned incentives between central administration and academic units, and weak links between spending and outcomes. Importantly, efficiency improvements do not necessarily require reducing educational services. In many cases, better information, clearer accountability, and targeted investments (for example, in digital workflows or energy management) enable cost savings that can be reinvested in teaching quality, student support, or research capability.

This article addresses a practical question: how can HEIs systematically optimize their financial resources while protecting quality and equity? The contribution is threefold. First, it synthesizes three complementary management tools into one coherent workflow: activity-based costing (to reveal the true cost of activities and services), performance-based budgeting (to align resources with strategic objectives and measurable results), and efficiency benchmarking (to identify best-practice frontiers and realistic improvement targets). Second, it operationalizes “optimization” as a portfolio problem: reallocating funds from low-impact or duplicative activities toward high-impact activities, while enforcing constraints related to service levels, regulatory requirements, and equity commitments. Third, it demonstrates the approach with a stylized dataset that resembles the financial and performance profiles of multi-campus universities. The worked example is not intended to claim universal numeric results; rather, it shows how managers can move from raw financial statements to actionable decisions.

The research is guided by four questions: (RQ1) Which expenditure categories and processes in HEIs exhibit the greatest potential for efficiency gains without harming core academic outputs? (RQ2) How can universities improve cost transparency so that decision-makers understand the resource implications of academic and support activities? (RQ3) What allocation rules and incentive mechanisms help translate efficiency findings into budget decisions that are consistent with institutional strategy? (RQ4) What magnitude of savings or performance improvements can be realistically expected from a coordinated optimization program?

The remainder of the paper follows the IMRAD structure. The Methods section specifies the conceptual model, the measurement approach, and the analytic techniques used in the worked example. The Results section reports efficiency and cost-effectiveness patterns across units and simulates the impact of selected optimization interventions (procurement consolidation, workload redesign, space utilization, and energy efficiency). The Discussion section interprets the findings, highlights governance implications, and proposes an implementation roadmap, including risk management and safeguards for educational quality. By presenting optimization as

an evidence-based, values-consistent process rather than a one-time austerity exercise, the article aims to support financially resilient universities that can sustain their academic mission in uncertain funding environments.

A critical aspect of financial optimization is equity. Resource reallocation can unintentionally disadvantage small disciplines or campuses serving rural regions if decisions rely only on short-term cost ratios. Therefore, the framework treats equity as an explicit constraint: minimum service standards (library access, advising capacity, disability support) and targeted funding for high-need student groups are protected while efficiency measures are pursued elsewhere. Digital transformation is also framed as an enabling investment: ERP, e-procurement, and learning analytics can reduce administrative burden and improve decisions, but only if governance ensures data integrity and responsible use.

The study is designed as an applied, decision-oriented demonstration. Rather than reporting results from a single country or institution, it develops an optimization workflow that can be replicated with local financial and performance data. The conceptual model assumes that an HEI seeks to maximize mission value (quality, access, and research performance) subject to a budget constraint, regulatory requirements, and minimum service standards. “Mission value” is operationalized through a small set of outcome indicators that are commonly available to university managers: (1) number of graduates (or credit completions), (2) first-year retention, (3) student satisfaction with learning support, and (4) research outputs (publications or grant income). The model treats cost efficiency and outcome performance as jointly important and avoids single-metric optimization.

To illustrate the workflow, we construct a stylized dataset representing 12 academic units (faculties or campuses) over three fiscal years. The dataset mirrors typical HEI expenditure categories: personnel (academic and professional staff), facilities (utilities, maintenance, security), student services (advising, counseling, career services), instructional support (libraries, learning platforms, laboratories), and central administration (finance, HR, IT, legal). Outcome indicators include graduates, retention, satisfaction, and research outputs. Inputs and outputs are scaled by student headcount to enable comparability across units. The dataset is intended as a “template”: in real applications, the same structure can be filled with audited financial statements, payroll records, space utilization logs, and institutional research dashboards.

The first analytic step is to create a cost map using activity-based costing (ABC). Indirect costs from support units are traced to final activities through cost drivers. For example, IT costs are allocated using number of devices and service tickets; library costs using student usage and course enrollments; facility costs using square meters and opening hours; and HR/finance costs using number of employees and transactions. The ABC model produces unit costs (e.g., cost per advising session, cost per laboratory hour, cost per procurement transaction) and clarifies how overhead is generated. This improves transparency compared with traditional line-item budgets, which often mask the operational causes of cost growth.

The second step links budgets to strategy via performance-based budgeting (PBB). A results framework is defined with (a) strategic objectives (student success, research competitiveness, digital learning, inclusion), (b) measurable indicators, and (c) target ranges. Budget envelopes for each academic unit are then decomposed into: a stable “base” component (to protect continuity and fixed commitments), an “activity” component (driven by enrollment, credit hours, or service volumes), and an “incentive” component (tied to outcomes such as retention gains or research

performance). To protect equity, the incentive component is capped and complemented with a needs-based adjustment (e.g., additional support for units enrolling higher proportions of low-income or academically underprepared students).

The third step estimates relative efficiency across units. We use an input-oriented efficiency perspective because managers often have greater control over costs than immediate outcomes. Efficiency is computed with a frontier approach (e.g., data envelopment analysis) where each unit's outputs (graduates, retention, satisfaction, research) are compared to its inputs (total expenditure and key sub-categories). The resulting efficiency scores identify "peers" for each unit and quantify potential input reductions to reach the efficient frontier while holding outputs constant. Because HEI outputs are heterogeneous, sensitivity checks are performed by varying output weights and by running separate frontiers for teaching-focused and research-intensive units.

Finally, the framework translates diagnostics into resource decisions through scenario analysis. Four intervention packages are specified: (P1) procurement consolidation and contract management, (P2) space and timetable optimization to increase classroom utilization, (P3) digital workflow automation in finance and HR, and (P4) energy and facilities efficiency (lighting, heating controls, preventive maintenance). For each package, expected savings are estimated using ABC unit costs and benchmark gaps; quality safeguards are defined (e.g., advising capacity not below a minimum ratio; library opening hours preserved). A simple portfolio rule is used: prioritize interventions with (i) high savings potential, (ii) low risk to student outcomes, and (iii) short payback periods, while ensuring that at least a defined share of savings is reinvested into teaching support and equity programs.

Although the worked example is stylized, the methods emphasize replicability: all steps rely on data types commonly available in HEIs and on transparent allocation and benchmarking assumptions. The framework also highlights governance requirements—data stewardship, stakeholder review of cost drivers, and periodic recalibration—because financial optimization in universities is as much an institutional process as a technical exercise. In implementation, qualitative validation is recommended: brief workshops with deans, finance officers, and student representatives verify activity definitions, interpret efficiency gaps, and agree on safeguards before budgets are adjusted in practice.

In the worked example, personnel costs dominate operating expenditure (62–74% across units). Facilities account for 9–15%, student services 5–10%, instructional support 6–12%, and central administration 6–11%. ABC allocation reveals large variation in the unit cost of similar services. The cost per procurement transaction differs by a factor of about 2, driven mainly by manual processing and a fragmented supplier base. Facilities operating cost per square meter varies by roughly 1.5–2.0 depending on building condition, heating controls, and opening hours. Cost tracing also changes how "overhead" is perceived. Some units with modest departmental budgets rely heavily on centrally provided services (IT, HR, legal), so their fully loaded costs are higher than line-item accounting suggests. Conversely, a few units with larger local budgets internalize support functions efficiently and therefore draw less from central overhead pools. This matters because optimization decisions based only on departmental totals can misidentify where costs are actually generated.

Input-oriented frontier benchmarking yields efficiency scores from 0.71 to 1.00 (1.00 indicates frontier performance). Four units sit on or near the frontier. Lower-scoring units

combine relatively high administrative and facilities costs with only average outcomes. Peer comparisons imply that the median unit could reduce inputs by about 6% while maintaining outputs, whereas the bottom quartile shows improvement potential in the 9–12% range. Sensitivity checks that increase the weight of retention and satisfaction slightly adjust rankings but preserve the main pattern: inefficiency is more strongly associated with administrative process costs and underutilized space than with core teaching personnel. A gap decomposition links the largest savings opportunities to (i) procurement and contract management, (ii) facilities and energy management, and (iii) finance/HR processing. The analysis does not indicate large “easy” savings in academic salaries without risking outputs; instead, it points to better workload planning (reducing low-enrollment duplication) and shifting staff time from manual administration toward student support.

Scenario analysis applies four intervention packages under explicit safeguards (e.g., advising capacity not below a minimum ratio; library access preserved). Package P1 (procurement consolidation) standardizes suppliers, aggregates demand, and uses e-procurement, generating recurring savings of 1.2–2.0% of operating expenditure. Package P2 (space and timetable optimization) improves room assignment and smooths peak hours, producing 0.8–1.5% savings, especially where utilization is low. Package P3 (digital workflow automation) shifts routine HR/finance transactions to self-service with audit trails, generating 0.7–1.2% savings and faster cycle times. Package P4 (energy and preventive maintenance) combines lighting retrofits, heating controls, and maintenance scheduling, producing 0.9–1.8% savings depending on building conditions. When combined as a portfolio (prioritizing high-payoff, low-risk packages first), total recurring savings range from 3.1% to 7.0% across units, with the largest gains in the least efficient units. In the illustration, savings are purposefully split: 50% reinvested into teaching support (tutoring, digital learning resources, advising), 20% into equity programs (needs-based support and accessibility), and 30% used to rebuild reserves and co-finance capital renewal.

After reallocation, cost per graduate declines in all units (median reduction: 4.5%). Outcomes are maintained or modestly improved because reinvestment targets student success bottlenecks. The clearest gains appear in first-year retention (median +1.2 percentage points) and student satisfaction (median +0.15 on a five-point scale) in units that previously underspent on advising relative to enrollment. Research outputs remain stable in teaching-focused units and increase slightly in research-intensive units when procurement savings are redirected to shared equipment maintenance and grant support services. Overall, the worked example suggests that financial optimization is most effective when it improves the productivity of support processes and facilities and then reinvests part of the gains to protect quality and equity.

Beyond financial totals, the portfolio improves operational performance. In units adopting e-procurement and standardized catalogs, the requisition-to-purchase-order cycle time drops by about 20–30%, and “maverick” purchases (outside framework contracts) decline. Workflow automation reduces duplicate data entry and raises the share of transactions with complete audit trails, lowering the number of end-of-year corrections. Space optimization increases weekly utilization of teaching rooms and allows some lightly used areas to be closed or repurposed, reducing cleaning and security hours without reducing teaching capacity.

Robustness checks indicate that conclusions are not driven by a single indicator. When research output is excluded for teaching-focused units, efficiency rankings shift slightly but administrative processes and facilities remain the dominant sources of improvement potential.

When higher weight is placed on retention, the reinvestment mix moves toward advising, while savings packages remain unchanged. Overall, effects are practically meaningful.

The worked example supports a central proposition: HEIs can improve financial sustainability primarily by increasing the productivity of support processes and facilities, then deliberately reinvesting part of the gains into student-centered services that safeguard educational quality and equity. This interpretation matters because optimization debates in universities often become polarized—either framed as “cuts” that threaten academic values or as technical efficiency projects that ignore institutional culture. The framework presented here treats optimization as a balanced, evidence-guided reallocation problem with explicit constraints and transparent decision rules.

Across the scenarios, the largest recurring savings arise from procurement, energy management, space utilization, and administrative processing. These areas share three features: they are process-intensive, they have clear unit costs that can be measured and benchmarked, and they often suffer from fragmentation. Universities frequently allow units to purchase independently, schedule rooms independently, or manage workflows with local spreadsheets and emails. Such autonomy can be academically valuable, but it also creates duplicated effort and inconsistent controls. By contrast, “core” academic labor is less elastic in the short run and is tightly coupled to quality. Attempts to reduce academic staffing without redesigning curricula and workload patterns tend to create hidden costs: larger class sizes without support, lower retention, and delayed graduation. Therefore, the most defensible early wins come from standardizing and digitizing support processes while protecting academic and student support capacity.

Technical tools alone do not deliver optimization; governance does. ABC models can be rejected if cost drivers are perceived as unfair, and efficiency scores can trigger defensive behavior if they are used for punitive ranking. A practical governance design includes (1) a participatory review of activity definitions and cost drivers, (2) a clear distinction between diagnostic benchmarking and budget consequences, and (3) a “rules of the game” document that explains how base, activity, and incentive funding interact. Incentives should be strong enough to motivate improvement but not so large that they destabilize programs or disadvantage high-need student populations. Equity constraints—minimum advising ratios, protected accessibility services, and needs-based adjustments—should be embedded in the funding model, not added as afterthoughts.

An optimization program can be staged in three phases. Phase 1 (0–6 months) focuses on data readiness and quick wins: clean chart-of-accounts mapping, establish cost centers, define standard cost drivers, and pilot e-procurement and energy monitoring in a subset of units. Phase 2 (6–18 months) scales process redesign: consolidate contracts, automate routine finance/HR transactions, and integrate space management with timetabling. During this phase, a reinvestment rule (for example, “at least half of recurring savings returns to teaching and student support”) helps maintain trust and prevents optimization from being perceived as austerity. Phase 3 (18–36 months) institutionalizes performance budgeting and continuous improvement: annual frontier benchmarking, periodic recalibration of output indicators, and targeted capital renewal funded partly from efficiency gains.

Optimization can fail in predictable ways. First, overly aggressive cost targets can reduce service quality, especially in student advising and IT support, where demand is variable and peak

periods matter. Safeguards should include service-level indicators and stress testing (e.g., whether help-desk response time remains within acceptable bounds). Second, process automation can create compliance risks if controls are weakened or if staff are not trained to use new systems. Strong audit trails and role-based access are essential. Third, space optimization can create equity concerns if students on particular campuses lose access to study areas or specialized facilities. Decisions about closures or repurposing should be assessed through an inclusion lens and paired with alternatives (extended library hours, shared labs, or transport support).

Because the article uses a stylized dataset, the numeric magnitudes should be interpreted as illustrative rather than predictive. Real HEIs differ in labor contracts, energy prices, campus geography, and funding formulas. Future empirical work should test the framework with multi-institution datasets, examine long-term dynamic effects (such as how efficiency gains influence staff workload and retention), and evaluate which incentive designs best balance efficiency with academic freedom and equity. Another promising direction is integrating learning analytics with financial data to measure cost-per-learning-gain rather than cost-per-graduate.

Change management should be treated as a capability. Training for financial literacy, unit-level dashboards, and regular communication with faculty senates and student unions help translate numbers into shared priorities and reduce resistance to necessary reallocations.

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