

# Research on Optimization of Internal Control in Colleges and Universities under the Background of Integration of Fiscal Budget Management

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**Abstract:** *The integration of fiscal budget management, through mandatory technical rules and process reengineering, reshapes the governance ecology of colleges and universities, thereby imposing systematic adaptation requirements on traditional internal control systems. Based on the practice of integrating operational and financial processes in higher education institutions, this study systematically analyzes the mechanism through which integration affects internal control and identifies practical tensions across three dimensions: business process integration, risk management, and information interaction. Building on this analysis, a comprehensive optimization framework for internal control is constructed, centered on "budget as the main thread, process embedding as the core, and data-driven support." Practical approaches are proposed, including strengthening end-to-end process control and establishing mechanisms for dynamic risk assessment and coordinated resource allocation. The research findings have achieved initial results in pilot applications at universities, providing theoretical reference and practical guidance for similar institutions to promote deep integration of budget and internal control, enhance resource allocation efficiency, and strengthen governance resilience.*

**Keywords:** *Integration of fiscal budget management; Internal control in colleges and universities; Budget as the main thread; Process control; dynamic risk assessment; Coordinated resource allocation*

## Introduction

As fiscal management evolves into a new phase characterized by standardization, integration, and digitization-collectively referred to as the integration stage-internal control systems in colleges and universities face mounting pressure for systemic transformation. Integration represents not merely an upgrade of technological tools but a profound transformation of institutional logic and governance structures. The traditional internal control model, which predominantly emphasizes functional division and ex-post review, demonstrates multiple inadequacies in its philosophy, mechanisms, and effectiveness. The necessity for exploring the optimization of internal control under this integrated background stems from two primary aspects: firstly, under the pressure of rigid institutional requirements, internal control must transition from merely ensuring compliance to actively creating value; secondly, within the context of technology-enabled empowerment, the integration of internal control with business processes now possesses unprecedented implementation conditions. Existing research often focuses on singular dimensional analyses, lacking in-depth exploration that treats integration as a systemic institutional context, deconstructs its impact mechanisms, and constructs a comprehensive framework. Therefore, this study aims to provide theoretical reference and practical guidance for enhancing the strategic effectiveness and operational reliability of resource allocation in higher education institutions by clarifying the intrinsic relationship between integration and internal control, diagnosing operational barriers, and constructing forward-looking pathways<sup>[1]</sup>.

## **1. Theoretical Correlation Analysis between Integrated Fiscal Budget Management and Internal Control in Colleges and Universities**

### ***1.1 Institutional Connotation and Core Characteristics of Integrated Fiscal Budget Management***

#### ***1.1.1 Process Reengineering Core Based on a Standardized Rule System***

The integrated system is not a mere transplant of informatization; its essence lies in constructing a unified set of business norms and data standards with mandatory binding force. This standard system covers the complete chain from project repository establishment, budget formulation, quota breakdown, fund disbursement, to accounting. It integrates originally decentralized budgetary activities across various functional departments into an irreversible, traceable, data-driven pipeline. The digital reengineering of processes eliminates space for human manipulation and information lag, compelling the compliance requirements of budget execution to be rigidly embedded into each specific business operation through system logic.

#### ***1.1.2 Technical Governance Characteristics of Data Centralization and Penetration Monitoring***

The integrated platform establishes a comprehensive, centrally stored budget management database, achieving homogeneity and real-time nature in the information flow of fiscal fund movements. This data architecture enables management to penetrate original organizational hierarchies and functional barriers, allowing for panoramic and real-time monitoring of budget execution progress, structure, and compliance status. The characteristics of technical governance manifest as a shift in control nodes from human-based to technology-based prevention, a forward movement of risk warnings from post-event to in-process, and a transformation in decision support from experiential judgment to data-driven insight. This fundamentally enhances the transparency and controllability of budget management.

### ***1.2 Theoretical Foundation and Constituent Elements of the Internal Control System in Colleges and Universities***

#### ***1.2.1 A Composite Theoretical Foundation Integrating Risk Management and Organizational Governance***

The theoretical underpinning of this system is not singular; rather, it integrates the essence of principal-agent theory, stakeholder theory, and the comprehensive risk management framework. Principal-agent theory explains the necessity of establishing mechanisms for checks, balances, and supervision. Stakeholder theory broadens the scope of control objectives, requiring the accommodation of multiple value demands. Meanwhile, the comprehensive risk management framework provides a systematic methodology, elevating internal control from a fragmented set of regulations to a coherent process spanning strategy and operations. Collectively, these theories point to a core tenet: reducing uncertainty through systematic institutional arrangements to ensure the effective utilization of organizational resources and the reliable achievement of strategic objectives<sup>[2]</sup>.

#### ***1.2.2 The Coupling of Static and Dynamic Elements: Environment, Process, and Monitoring***

The composition of internal control in colleges and universities manifests as a coupling of static elements and dynamic processes. Statically, it encompasses five key elements: the control environment, risk assessment, control activities, information and communication, and internal monitoring. Among these, the control environment serves as the "bedrock" for system operation, determining the fundamental tone and style of control. Risk assessment functions as the "guidance system," identifying and prioritizing the response to risks. Control activities are the specific "operational tools." Information and communication constitute the "neural network." And monitoring acts as the system's "immune mechanism." Dynamically, these elements interact within key business processes such as budget management, procurement and payment, and asset allocation, forming a continuously cyclical and ever-improving management closed-loop.

### ***1.3 The Mechanism of Action of Integrated Budget Management on Internal Control in Colleges and Universities***

#### ***1.3.1 Reshaping the Control Environment towards Rigidification and Transparency Enhancement***

The integrated system, as an exogenous, mandatory technological and institutional environment, is directly embedded into the operational foundation of colleges and universities. It transforms external

fiscal discipline and compliance requirements into impersonal operational rules inherent within the information system. This embedding significantly strengthens the formality and rigidity of the control environment, weakening the interference of informal practices or personal authority on control effectiveness. Concurrently, the comprehensive digitalization of business processes and financial data substantially enhances the transparency of organizational economic activities, providing the material foundation for fostering an internal control culture that values rules and is driven by data.

### ***1.3.2 Deep Coupling of Operational and Financial Processes with Real-Time Risk Control Mechanisms***

The core of integration lies in breaking down the process barriers and data silos between business operations and finance, achieving "integration of operational and financial processes." The initiation, approval, payment, and recording of each economic transaction are synchronized in real-time within the same logical chain. This transforms internal control activities from independent, ex-post review checkpoints into continuous, process controls that accompany and synchronize with the business flow. For example, the system can perform automatic validation and interception at the point of payment initiation based on pre-set budget indicators, contract terms, and expenditure standards, thereby achieving real-time prevention of risks such as over-budget, non-contractual, or non-compliant payments. This significantly enhances the timeliness and reliability of control activities. Such deep coupling transforms internal control from a "firewall" into an "embedded navigator," guiding business operations along compliant tracks<sup>[3]</sup>.

## **2. A Practical Examination of Internal Control in Colleges and Universities within the Process of Integrated Budget Management**

### ***2.1 Analysis of the Current State of Business Process Integration and Its Interface with Internal Control***

#### ***2.1.1 The Compatibility Contradiction between Standardized Processes and Complex Business Realities***

There exists a structural tension between the linear, standardized process logic predefined by the integrated system and the inherently non-standardized, flexible nature of certain economic activities within universities. This is typically evident in areas such as the management of indirect costs for research projects, the execution of multi-year rolling budgets, and the approval pathways for special types of procurement. The rigid rules of the system may not fully map onto the diversity of real-world business operations. This can result in economic activities being forced into simplified or fragmented processes to comply with the system, or conversely, the system failing to accommodate them properly. This compatibility contradiction means that the object of internal control activities—namely, the digitally transformed business flow—may carry representational deviations from the original, real-world economic activities it models. Consequently, the informational foundation upon which control activities rely faces potential risks of distortion at its source, which impairs the accuracy of risk identification and assessment.

#### ***2.1.2 Insufficient Depth of Integration between Control Activities and Business Processes***

Currently, the integration of internal control activities with integrated processes mostly remains at the level of "electronic embedding" at key nodes, such as the automatic validation of budget indicators during the payment stage. However, there is still a notable lack of deep involvement by control activities in more upstream risk points within the business process—such as the alignment between contract terms and budget indicators, or the justification for the rationality of procurement needs—as well as in more downstream performance observation points, such as the correlation between project phase outcomes and fund expenditures. The control logic has not yet fully transitioned from independent, discrete verification points into a continuous monitoring and dynamic adjustment mechanism that runs through the entire business chain and deeply integrates with business logic. This insufficiency in integration depth means internal control largely still functions as a "post-event referee" or a "gatekeeper" for business processes, rather than an "embedded navigator," thereby limiting its role in proactively preventing risks and enhancing overall operational effectiveness.

## ***2.2 Assessment of Internal Risk Management Capabilities under Rigid Budgetary Constraints***

### ***2.2.1 Structural Tendency of Strengthened Compliance Risk Control Coupled with Insufficient Attention to Performance Risk***

Under the hard constraints imposed by the system, the capability to control compliance risks-such as adherence to reimbursement invoice regulations and proper alignment with budget line items-has been significantly enhanced through technical means. However, this may lead to an excessive concentration of risk management resources and attention on compliance risks at the execution stage, potentially weakening the identification and assessment of performance risks and allocation risks, which carry greater strategic impact. For instance, systematic and routine assessment mechanisms and analytical tools are often lacking for evaluating risks associated with the scientific rigor and adequacy of budget project approval justifications, the alignment between resource allocation and strategic priorities, as well as the economy, efficiency, and effectiveness of fund utilization-namely, the performance objectives. This results in a structural tendency within risk management that "prioritizes compliance over performance," thereby hindering the full realization of its ultimate function: safeguarding the achievement of the organization's strategic objectives.

### ***2.2.2 Coverage Gaps in Risk Management Activities Across the Entire Budget Cycle***

Effective risk management should encompass the entire lifecycle of budget management. The current situation shows that risk management efforts are heavily concentrated in the budget execution and payment stages. However, its involvement is weak or even absent in the front-end phases-such as target setting, project reserving, and performance indicator planning prior to budget formulation-and in the back-end phases, including performance evaluation, result feedback, and the application of accountability mechanisms following budget execution. The absence of risk management at the front end may lead to inherent deficiencies in resource allocation from the outset. Conversely, the lack of risk management at the back end prevents the effective tracing, analysis, and utilization of performance deviations for improved decision-making. Such gaps in coverage prevent risk management from forming a complete closed-loop process from objective setting to outcome application, thereby weakening its ability to enhance the organization's overall resource management efficacy through continuous improvement.

## ***2.3 Constraints of Information Interaction Barriers on the Effectiveness of Internal Control***

### ***2.3.1 The Coexistence of Technical Data Centralization and Business Semantic Barriers***

Although data such as financial payment information and budget indicator figures are centralized, there is a lack of standardized mapping and association rules between this data and the "semantic information" describing the substantive nature of business activities-such as the progress stage of a research project, the specific content of teaching activities, or the actual usage status of assets. The phenomenon of centralized data yet fragmented information persists. If internal control activities, particularly monitoring and risk assessment, rely solely on superficial financial flow data and cannot penetrate to correlate with deeper business flow information, then their analysis and judgment will be partial and lagging. This semantic barrier hinders the internal control system from constructing a panoramic, operationally and financially integrated "risk-control" information view, thereby limiting its capacity for complex analysis and forward-looking prediction.

### ***2.3.2 The Constraining Effect of Information Fragmentation on the Formation of a Control Closed Loop***

A complete and effective internal control system relies on an information closed loop encompassing "business occurrence-control execution-monitoring feedback-decision optimization." Currently, the flow of information between different functional departments and across various system modules still encounters blockages. The feedback mechanism for returning information-such as audit findings, performance evaluation results, and risk warning signals-to the front-end business processes and decision-making stages remains inefficient. Information fragmentation makes it difficult to systematically trace problems identified by monitoring activities back to their source processes for fundamental improvement. Similarly, conclusions drawn from risk assessments struggle to be transformed into direct bases for optimizing control activities and resource allocation. The failure of information flow to form an effective closed loop causes the internal control system to exhibit, to a certain extent, characteristics of being static and fragmented. This constrains its mechanisms for self-learning, dynamic optimization, and continuous improvement.

### **3. Optimization Pathways for Internal Control in Colleges and Universities Oriented towards Integrated Budget Management**

#### ***3.1 Constructing an Integrated Internal Control Framework with Budget as the Main Line***

##### ***3.1.1 Conceptual Transformation: From Discrete Control to Process Embedding***

Optimization first necessitates a fundamental conceptual shift, where internal control is no longer perceived as a series of inspection and approval systems independent of business processes. Instead, it should be regarded as an indispensable component of the business logic itself, deeply embedded within the main workflow of budget management. This implies that the design starting point for internal control is the value stream of budget projects, with control objectives directly linked to the performance targets of these projects. Control activities are then predetermined and deployed based on the key decision points and risk points at each stage of a project's lifecycle—from justification and approval to execution, evaluation, and closure. Such embedding transforms control into an "intrinsic stabilizer" that safeguards the realization of process value, rather than an "external corrector" that rectifies deviations after the fact. This achieves synchronization and alignment between control activities and the value creation process.

##### ***3.1.2 Restructuring of Internal Control Elements with Budget as the Central Axis***

Under this concept, the five elements of internal control must be reorganized and focused around the central thread of budget management. The development of the control environment should focus on shaping a culture that respects "the budget as law" and a decision-making culture driven by data. Risk assessment needs to be conducted systematically on a per-budget-project basis, evaluating risks related to strategic alignment, resource allocation, execution deviation, and performance failure. Control activities should be systematically configured according to the key nodes of the budget process—such as reserving into the project pool, indicator allocation, contract association, payment triggering, and performance reporting—forming an interlinked control chain. The information and communication system must ensure the real-time generation, seamless flow, and transparent sharing of budget performance information throughout the entire project lifecycle. Monitoring activities, in turn, must cover the complete closed loop from the rationality of budget formulation to the final achievement of performance, ensuring the effective operation and continuous improvement of the integrated framework.

#### ***3.2 Strengthening Process Control and Supervision in Key Links of Budget Execution***

##### ***3.2.1 Deployment of In-depth Control Nodes Based on Operational Substance***

Strengthening control requires extending beyond the existing payment validation process to deploy control measures in-depth towards both the front-end and back-end of business operations. Front-end control emphasizes the mandatory linkage and logical validation between the allocation of budget indicators and specific business activities, such as procurement needs and research project proposals. This ensures that the justification for expenditures possesses both a budgetary basis and a reasonable core from the very source. At the payment initiation stage, the system's control rules should integrate budget indicators, contract terms, asset information, acceptance certificates, and stage-based performance data. This integration enables multi-dimensional, automated compliance and reasonableness reviews grounded in the substantive nature of the business. Furthermore, it is necessary to establish a dynamic comparison mechanism between budget execution progress and pre-defined performance milestones. Management alerts should be set for instances of execution lag or performance deviation, thereby extending the focus of control from mere compliance verification to the proactive management of performance progress.

##### ***3.2.2 Continuous Monitoring and Feedback Improvement Driven by Data***

The optimization direction for the monitoring mechanism is to shift from periodic sampling checks to continuous monitoring based on the integrated data platform. By constructing data analysis models that cover the entire chain of budget execution, real-time monitoring and correlation analysis can be conducted on payment trails, contract execution progress, and asset registration status. This enables the automatic identification of anomalous patterns, such as payments without preceding contracts, frequent small-value split procurements, or abnormal project expenditure progress. This data-driven monitoring not only detects potential issues more efficiently but also, through the analysis of vast execution data, evaluates the effectiveness of established control activities and identifies redundant or weak links in

processes. Findings from monitoring should be translated into structured feedback, which directly informs the optimization of control rules, decisions on budget adjustments, and the accountability and improvement measures for relevant responsible entities. This process forms a self-reinforcing closed loop of "monitoring-analysis-feedback-optimization."

### ***3.3 Establishing a Dynamic Risk Assessment and Coordinated Resource Allocation Mechanism***

#### ***3.3.1 A Dynamic Risk Assessment Model Spanning the Entire Budget Cycle***

The core of establishing a dynamic risk assessment model lies in achieving continuous scanning and quantitative evaluation of risks associated with budget projects. This model needs to integrate financial data, business process data from the integrated system, and external environmental information. By utilizing risk indicators and predictive algorithms, it conducts regular and ad-hoc reassessments of risks at various stages: the assumption risks during project initiation, the schedule and cost risks during execution, and the performance attainment risks upon completion. Risk assessment thus transitions from a one-time activity into a dynamic process that accompanies the project's entire lifecycle. Its output is a dynamic profile and warning level of the project's risk status, providing management with real-time, quantified risk intelligence for decision-making.

#### ***3.3.2 A Coordinated Resource Allocation and Dynamic Adjustment Mechanism Based on Risk Intelligence***

The output of dynamic risk assessment must be linked to resource allocation decisions. The optimized internal control system should incorporate an elastic resource coordination and allocation mechanism based on predefined rules and authorization levels. This mechanism can be triggered when the dynamic risk assessment model indicates that a specific project faces significant performance risks or when new strategic opportunities emerge. Under the strict safeguards of internal control procedures, it initiates cross-departmental and cross-project resource review and coordination processes. This may involve the reallocation of budget funds across projects, the replanning of execution schedules, or adaptive adjustments to performance objectives. This mechanism enables colleges and universities to enhance the agility and precision of budget resources in responding to internal and external changes while ensuring overall control effectiveness. Thus, internal control becomes a key governance tool for safeguarding the organization's strategic resilience rather than perpetuating rigid proceduralism.

## **Conclusion**

This study systematically explores the optimization of internal control in colleges and universities within the context of integrated fiscal budget management. The research finds that integration, through its standardized process reengineering and data penetration capabilities, structurally reshapes the internal control system in aspects such as the control environment, its mechanisms of action, and the information foundation. However, a practical examination reveals existing tensions in the convergence of the two, including contradictions in business process adaptation, biases in risk management capability orientation, and barriers to information interaction. To address these issues, this study proposes a systematic optimization pathway centered on the management and allocation of budgetary resources: achieving conceptual transformation and element reorganization by constructing an integrated internal control framework; enhancing the effectiveness of process control by strengthening in-depth control at key stages of budget execution and implementing data-driven monitoring; and increasing the strategic agility and continuous improvement capacity of the internal control system by establishing a dynamic risk assessment model that spans the entire budget cycle and a corresponding resource coordination and allocation mechanism. The core contribution of this research lies in constructing an integrated analytical framework that internalizes the integration of budget management as a driving force for internal control optimization. Future research could further explore differentiated implementation strategies for this optimization pathway across various types of higher education institutions and delve deeper into innovative application models for intelligent technology within risk assessment and control systems, thereby promoting the synergistic development of theory and practice in university internal control.

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