From the Perspective of Internal Control: Evaluating and Optimizing the Efficiency of the Online Financial Approval Model in Universities

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Abstract: *With the development of the economy in universities and changes in society, many financial operations have been conducted online now, and we have started to use online financial approval. There is still a problem of a high rejection rate, weak risk control, and no link with the internal control system. Based on the three-dimensional collaborative theoretical framework of "Internal Control - Technology Empowerment - Dynamic Assessment", this paper will study the internal coupling mechanism of the five elements of internal control and the digital approval process. Generally speaking, there are problems in the process, the balance of risk control, system reliability and user experience that need to be corrected to ensure fairness in the evaluation under the new policies. At the same time, it has also put forward some joint-optimisation methods, such as dynamic node optimisation, modular embedded design, full-cycle risk iteration and technology-empowered innovation. The above paths aim to promote the development of an intelligent and risk-adaptive online approval model by moving away from the old fixed-process type and provide theoretical support and practical solutions for the modernisation of financial governance in universities.*

Keywords: *University Finance, Online Approval, Internal Control, Effectiveness Evaluation, Process Improvement*

Introduction

Although the online financial approval model at the university has increased the speed of processing, there are still problems of a high rejection rate and multiple rounds of revision. The Foundation of the Optimisation Method Should Be Good Internal Organisational Governance and Risk Management. The last assessment only had one efficiency index and did not systematically cover the risk management ability and regulatory compliance of the approval process. Therefore, the optimisation measures are too scattered and fail to achieve the goals of efficiency and risk control.

Therefore, by learning about the basic ideas of the online approval model in detail from the perspective of internal control theory, building an effective evaluation system for it, and finding ways to improve it in line with the goals of internal control, this method can promote the integration of internal control theory and intelligent technology to offer a replicable solution for universities to enhance the transparency of approval and reduce the rejection rate. Therefore, we will be able to promote the digitalisation of financial governance in this way.

1. Coupling Mechanism of Internal Control Theory and the Online Financial Approval Model in Universities

1.1 The Internal Relationship Among Elements of Internal Control and the Financial Approval Process

The first few modules of the internal control system will be used to organise and regularise the company's financial approval process. The control environment sets the tone for distributing approval powers and responsibilities, as well as the level of internal control awareness among all staff in the company; it provides the cultural and institutional foundation for the operation of the process. At the design stage of the approval process, one should be aware of any business risks or compliance deficiencies in advance and set up corresponding risk-response mechanisms at all links. Control

activities refer to authorisation, verification and inspection, division of duties in the approval process, etc., which ensure that economic transactions are properly checked and limited at all times.

With the start of digital approval, information and communication have been used to quickly spread instructions, documents and other status updates of the approval process in an organised way. Supervision is continuous observation and evaluation of the efficiency, compliance and completeness of the approval process to provide a basis for revision. Therefore, the financial approval process is in fact a particular application and explicit expression of internal control at the business unit level, and the quality of its design directly shows how far the concept of internal control has been realised and how well these elements work together[1].

1.2 The Main Structure and Operating Characteristics of the Online Financial Approval Model in Universities

In general, the system for online financial approval at universities is based on the model of a business rules engine, workflow engine and intelligent technology. Organise the rules for institutional approval in an orderly manner and establish a system to recognise and apply them; thus, strict limits will be placed on the approval path, node authority and verification regulations. The workflow engine will automatically distribute the approval document according to the preset path, and at any time, we will be notified of the current stage it is in, whether it has been approved, and so on[2].

The above model can use technology to integrate the flow of business, approval and information, collect and use data assets in the platform, such as budget information, procurement contracts and original voucher images; thus, it will provide a data foundation for further process analysis, risk warning and decision support.

1.3 Theoretical Integration Based on "Internal Control-Technology Empowerment-Dynamic Assessment"

Risk-oriented internal control theory is based on risk management, so the control activities of a company should be in line with and address the main risks faced by the company. With the addition of intelligent technology and dynamic evaluation now, the Design Logic of the online approval model is "risk identification - intelligent response - continuous optimisation". Based on the assessment results of the inherent and residual risks in business affairs now, the trigger conditions, branch paths and review points for the approval process will be determined directly. All of the above are good ways to deal with the problem of risk control. For example, if the procured goods are high-risk, they will be automatically added to the approval path, require more supporting documents, or need to be reviewed by experts. Activate the blockchain-based evidence preservation mode, take pictures of all the approval steps, ensure that these pictures have not been altered and are traceable. RPA can be employed to automate the repetitive tasks of filling out forms and the first round of review to reduce manual labour and errors[2].

All the above theories can be used to build a good system of internal control. Based on the above data and rules, a first-level risk check will be carried out on the uploaded content, and any problems will be reported to the managers. At the same time, by continuously collecting data on the rate of rejection, processing delay and frequency of exceptional approvals, it is possible to determine the effectiveness of the current risk control measures, find out the reasons for the occurrence of risks, and build a closed-loop optimisation cycle of "design-implementation-monitoring-learning". Therefore, the purpose of internal control is to protect the business process in all circumstances and to be adjusted according to changes in risk.

2. Construction of an Effectiveness Evaluation System for the Online Financial Approval Model in Universities

2.1 Design of Multi-dimensional Indicator System Based on the AHP-Entropy Method Dynamic Weight Allocation Model

To know if the new online approval model is good, set all kinds of goals in advance. The goals of all the plans for internal control are to improve operating efficiency, stay informed of risks, build a reliable system, and increase the confidence of all parties. Given that the policies have been altered frequently, we have constructed an AHP-entropy dynamic weight-allocation model to deal with the

problem of evaluation adaptation.

Evaluation Dimension	Core Indicator	Indicator Description
Operational Effectiveness Dimension	Average approval cycle duration, node processing delay, process automation rate, rejection rate, etc.	Capture the Timeliness of Approval Tasks, Resource Consumption and Process Smoothness
Risk Control Dimension	Budget compliance verification pass rate, approval step bypass rate, completeness of key field completion, high-risk transaction detection rate, accuracy of tiered authorization, etc	Assess the Effect of Institutional Rigid Constraints on the Accuracy of Risk Prevention and Control in This System.
System Reliability Dimension	Mean time to failure, repair time, concurrent operating capacity, completeness of data evidence preservation, etc.	Assess the System's Technical Support Capabilities and Data Accuracy.
User Experience Dimension	User Operation Complexity Score, Intelligent Customer Service Response Satisfaction, Mobile Adaptability, Technology Anxiety Incidence Rate, etc.	Reflection on User Acceptance of the System and Ease of Use.

The weight distribution is based on a combination of AHP and entropy; first, subjective weights for the indicators are obtained through AHP based on expert knowledge, reflecting the direction of the internal control policy and objectives. According to objective data in the approval log and other places, entropy is used to obtain objective weights that reflect the actual operating conditions of the process. Finally, the subjective and objective weights are combined in an adjustable way to form a variable-weight system that can be changed according to changes in policy and circumstances; thus, this evaluation will have a scientific basis and be adaptable. The various indicators are related, and according to the purpose of the control, they will be weighted differently to reflect the general state of the approval model.

2.2 Measurement of the Balance Between Approval Process Efficiency and Risk Control

There is often an intrinsic conflict between improving the efficiency of the approval process and strengthening risk control; therefore, one of the main issues in the evaluation system is how to balance the two. Efficiency measurement can introduce the idea of process entropy by observing the degree of variation in approval paths and node redundancy. The process should be reasonably organised, decisions made promptly, and entropy should be low. Determine the range and precision of the density for the risk control measurement, specify how many essential control points have been covered, confirm whether there are complete automatic verification rules in the system, and verify that the supporting information for approval decisions is adequate[3].

Equilibrium measurement is not just the comparison of efficiency and risk; it also considers the marginal substitution relationship between the two and the general state of fit. One can construct a two-dimensional "efficiency-risk" scatter plot of the process samples for this end. Select a sample of the approval process over a certain period, let the horizontal axis be the efficiency entropy value and the vertical axis be the risk control strength score, then draw a scatter plot and divide it into four quadrants. Ideally, the sample points should be in the "high efficiency, low risk" or "moderate efficiency, controlled risk" zones. If the sample points are spread out in the "low efficiency, high risk" and "high efficiency, high risk" quadrants, there will be a deficiency in the system.

Structural equation modelling can be used to find out why there is a mismatch and whether it is due to a poor process design, excessively general risk-judgment rules or a lack of technological application.

2.3 Technical Analysis of System Reliability and Data Integrity

The foundation of the good operation of the online approval model is system reliability and data integrity. The two kinds of assessments are static structure and dynamic operation. The purpose of the static architecture analysis is to find any redundant parts in the main system, increase the capacity for data storage and backup, improve the disaster recovery plan, strengthen security for authentication and

encryption of system interfaces, and determine an appropriate distributed deployment scheme for the blockchain-based evidence preservation nodes. The problems of the system are the lack of external and internal resistance mentioned above. Dynamic Operation Assessment is the service performance of a system, and the indicators used are mean time to failure, recovery time and maximum concurrent processing capacity.

Technical assessment of data integrity refers to all the stages in the life cycle of data generation, transmission, storage and use. At the input stage, it checks whether the format of the data, the logic and rules of the system are correct, etc. At this time, it will check whether the state management mechanism of the workflow engine has good version control and operability. At the storage stage, one should control database access, ensure the completeness of operation audit logs, verify the verifiability of data backup and recovery, and guarantee the immutability and traceability of blockchain-based evidence preservation[5].

Finally, technical analysis will be carried out to ensure that the system can form a stable closed-loop; thus, it will be guaranteed that the electronic approval data in the entire chain, from business start-up to financial archiving, is authentic, correct and tamper-proof.

3. Collaborative Optimisation Pathways for the Online Financial Approval Model in Universities

3.1 Dynamic Approval Optimisation Strategies Based on Process Node Control

The first reason to improve the control of process nodes is to make them more dynamic rather than fixed. The old fixed-process cannot be adjusted to changes in the scale and complexity of business in real time, nor can it meet the collaboration demands of multi-campus environments; it lacks the ability to detect and respond to changes in the external environment and internal conditions.

The first three are to build a model of the node's attribute, find the process bottleneck, and then change the path dynamically.

3.1.1 Node Attribute Modeling

According to all the attributes of the nodes, such as processing capacity, professional areas, historical approval behaviour patterns and collaboration network topology, a library of node characteristics has been created.

3.1.2 Process Bottleneck Identification

Process mining technology was used to analyse the old approval process, and then, with the help of Python clustering, it was discovered that there was a high rejection rate, unnecessary serial dependencies and redundant permission configurations; data-driven support was provided for process restructuring[4].

3.1.3 Dynamic Path Adaptation

The intelligent rules engine will be connected to the live monitoring data of the process, and at any time, it will consider the basic attributes of the pending item (such as amount, type and compliance sensitivity) as well as changes in external factors (such as the degree of budget utilisation, performance results of related contracts and modifications to the external compliance environment) to dynamically adjust the approval path.

RPA will automatically approve the low-risk, standardised transactions, such as small-amount travel expense reimbursements, and then carry out the approval. For high-risk or very complex transactions, such as large-scale expenditures for research funds, dynamic addition of approval nodes can be carried out; this may include parallel counter-signatures or special review meetings, and the authority level of the final approval node can also be increased temporarily.

The main idea of this way is to change the approval path from a fixed "railway track" to a variable "navigation route" and distribute the limited approval resources according to the distribution of risk.

3.2 Modular Augmentation of Embedded Internal Control in System Logic

Embed the requirements for internal control in the system logic, use modular Design based on the principle of "high cohesion and low coupling", and thus avoid the rigidity and maintenance problems of hard-coding bindings for control logic and business processes in traditional integrated approval systems.

The first is to divide the general content of the internal control rules into various modules of services. The Modules are loosely coupled with the main workflow engine and use the standard interface[5]. The particular division design is as follows:

Core Module	Functional Description	Internal Control Objective Mapping
Budget Quota Real-Time Control Module	Log in to the budget management system and, at the same time, verify the budget quota for the item being approved.	Ensure the stability of budget implementation and avoid the risk of exceeding the budget.
Intelligent Matching Module for Expenditure Standards	There is a standard library of expense rules for travel and labour fees that will automatically detect the type and amount of the transaction for verification.	Standardizing expenditure behavior and reducing compliance risks
Dynamic Verification Module for Supplier Qualifications	Link to the supplier information database and obtain the current qualification and credit status of the supplier.	Preventing partnership risks and safeguarding funds
Automatic Auditing Module for Invoice Compliance	An NLP model will be used to check if the invoice data is accurate and complete, and whether it matches the actual business conditions.	Identify fake invoices and verify that the financial data are correct.
Flexible Authorization Engine Module	According to the model of dynamic permission allocation, an approver will be automatically selected based on the type of fund, amount and risk.	Establish Tiered Permissions and Clarify Approval Responsibilities.
Blockchain-Based Evidence Preservation Module	Collect distributed evidence of all documents and operating records in the approval process, ensure that the data is unaltered and traceable.	Expand the Scope of Supervision and Audit to prevent the problem of data falsification.

The first is that this architecture will be relatively easy to change when there are new internal audit regulations. When there are changes in the internal management system or external financial regulations, only the corresponding control module needs to be updated; the core business process code will not be changed, so there will be no risk or cost of system maintenance. At the same time, the modules can also be combined and used independently. The same compliance verification logic can be applied to all the above business processes, such as procurement reimbursements, loan repayments and contract payments. At the level of technology evolution, one can apply the concept of microservices or Domain-Driven Design to achieve strong modularisation. Help the internal control expert and the technology developer use the same language to translate the institutional regulations into executable, testable and monitorable digital control rules. Thus, it can be guaranteed that the Design Purpose of internal control is fully and correctly realised in the information system.

3.3 Full-Cycle Risk Management and User Experience Optimisation

3.3.1 Iteration of the Approval Model in a Full-Cycle Risk Management Framework

The whole life risk management system is a closed-loop system, and online approval mode will be employed to cover all links in the chain of risk identification, assessment, response, monitoring and reporting. The whole chain of "risk identification - intelligent response - monitoring and evaluation - optimisation and iteration" has been built, and at the risk identification stage, Python is employed to carry out cluster analysis on the data of approval and rejection logs to find high-frequency risk hotspots. According to the level of risk at that time, a control plan will be developed to prevent or reduce harm in an organised way. At the same time, some indicators will be regularly released to monitor the progress and results of the risk-control work in real time, and the actual benefits will be judged according to the cost-benefit analysis. Based on the results of the course-by-course monitoring and evaluation, adjustments and improvements will be made to the model in cycles of "pilot implementation - data analysis - solution optimisation - full-scale promotion" for the model of risk identification, control rules and system modules. Machine learning will be used to find new patterns in the big data of the system for risk and control deficiencies, and this data will be used in the next update. Analyze the effect and cost of each round, and after deployment, compare the actual results with the indices[6]. Therefore, there will be no sudden drop in the efficiency of the process or other risks; it will no longer be a "machine" that operates according to fixed instructions but rather an "organism" that can continuously adjust to risks and self-optimise.

3.3.2 Optimisation of User Experience

The Aim of Improving User Experience is to Reduce the Operating Threshold and Enhance Service Convenience. Reduce the number of items that need to be entered and simplify the operation process by adding a single-click upload and intelligent prefill function. It will build an intelligent guidance and feedback system and use digital human intelligent customer service and operation guidance pop-ups to answer users' questions in real time, etc. A real-time approval-status push-notification system will be added to inform users of the reasons for rejection and required revisions in an understandable way so that they can carry out the work efficiently. At the same time, based on the feedback from users, we will continue to improve the system and collect keywords from frequently asked questions.

Conclusion

According to the three-dimensional collaborative theoretical framework of "Internal Control - Technology Empowerment - Dynamic Assessment", this paper will systematically study the effectiveness evaluation and optimisation path of the online financial approval model in universities. To ensure the efficiency and security of digital operations, some elements of internal control should be added to the approval process in line with the research above. According to all the attributes of operating efficiency, risk control, system stability, user experience, etc., determine the current operating level of the model in light of the multi-dimensional effectiveness evaluation system powered by the dynamic weight allocation model of AHP-Entropy. Collaborative Optimisation Paths include dynamic node optimisation, modular embedded design, full-cycle risk iteration, technology empowerment and innovation, etc., to advance the construction of the approval model from a fixed process to an intelligent risk-adaptive one. Some theoretical ideas and practical suggestions for modernising the financial governance of universities will be provided in this paper.

Fund Projects

Sponsored by Zhejiang Provincial Education Accounting Society, Evaluating and Optimizing the Efficiency of the Online Financial Approval Model in Universities from the Perspective of Internal Control (+ZJKJ25125A)

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