

# Development of a Strategic Management Model for Effective Procurement Internal Control of Hubei Engineering University, China

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## Abstract

The objectives of this research were: 1) To investigate the needs and expectations of faculty, staff, and administrative staff towards effective procurement internal control of Hubei Engineering University, China. 2) To construct strategic management model based on PDCA Cycle for effective procurement internal control of Hubei Engineering University, China, and 3) To evaluate the effectiveness of strategic management model based on PDCA Cycle for effective procurement internal control of Hubei Engineering University, China. The samples were 284 faculty staffs and 179 administrative staffs of Hubei Engineering University using the Yamane (1967)'s formula. The research instrument used in this research were questionnaire and interview methods, and the questionnaire contained 55 questions, and interview contained 20 questions. The research methodology included population and samples, research instruments, data collection, data analysis, each had 3 phase: Investigate the needs; The focus group meeting; and model evaluation. A five-point scale was used to evaluate the needs and expectations of effective procurement internal control of Hubei Engineering University. Subsequently, this study used questionnaire survey and interview methods to survey 284 teachers and 179 administrative staff of Hubei Engineering University as samples. The questionnaire was verified by 5 experts, using the PDCA management model, and setting four dimensions of planning, doing, checking, and acting. The data were analyzed and by frequency, percentage, mean, and standard deviation etc.

The results of this research showed that: 1) The needs and expectations of the faculty staff and administrative staff of Hubei Engineering University regarding procurement internal control were collected. The expectations were at a relatively high level. 2) A strategic management model for effective procurement internal control of Hubei Engineering University was constructed. The strategic management model was based on the PDCA cycle and can be continuously improved and perfected through internal control measures. 3) The strategic management model was evaluated by 5 experts through SWOT analysis, COSO framework and PESTLE analysis. The scores were 3, 2, 3, 3; 3, 3, 2, 3; and 3, 3, 2, 3 respectively. The evaluation values indicate a relatively high level. Practical application shows that this management model has played a significant role in improving the procurement efficiency of Hubei Engineering University, strengthening procurement internal control, and preventing and controlling procurement risks.

**Keywords:** Strategic Management Model, PDCA Cycle, Effective Procurement, Internal Control

## Introduction

Arai (2013, p. 9) argues that government procurement should strictly require the professional competence of the procurement staff in their positions, and process management of the procurement staff to improve the quality of procurement and ensure the fair use of funds. Panda & Sahu (2015) argue that electronic informationization of government procurement facilitates efficient communication between purchasers and bidders and makes it easier to achieve the objectives of the procurement. Sharifah (2016, pp. 24-27) optimized the government procurement workflow with examples to be able to improve procurement efficiency.

The construction of internal control in our country began in the 1990s of the last century and was initially carried out in the country mainly through the form of policies and regulations. The first law reflecting the requirements of internal control is the Accounting Law promulgated in October 1999, which clearly states in article 27: "Each unit shall establish and improve its internal accounting supervision system." After nearly 20 years of development, our administrative organs and enterprises and institutions have basically established the relevant system of internal control. The implementation of the Internal Control Standards for Administrative Institutions (Trial) in 2014 has put forward new and more specific requirements for the internal control of administrative institutions. In 1996, China implemented government procurement on a pilot basis in Shanghai. In 2003, the "Government Procurement Law of the People's Republic of China" was officially promulgated and implemented, which marked the basic establishment of China's government procurement legal framework with procurement law as the core, which played an irreplaceable role in strengthening expenditure management, standardizing budget preparation, and strengthening the construction of an honest government in administrative organs and public institutions. The scale of government procurement in our country is growing rapidly, and the types of procurement business are increasing rapidly. However, it is undeniable that with the rapid expansion of procurement business, some problems are gradually exposed.

As a special public institution, the government procurement of colleges and universities has the characteristics of long cycle and complex demand parameters. With the increase of national investment in higher education, the procurement demand of colleges and universities continues to expand, facing problems such as low professional level, complex procurement process and corruption risk. Therefore, it is necessary to study the needs and expectations of internal control of college procurement, and how to develop an effective procurement internal control management model.

Hubei Engineering University has established a procurement and bidding work leading group led by the president, which is responsible for the implementation of government procurement policies and decision-making on major procurement matters. In recent years, the school has faced problems such as insufficient scientific procurement budget preparation, procurement demand is not scientific and reasonable, insufficient procurement personnel, and heavy workload, which have affected the efficiency of procurement management.

The purpose of this study is to establish an effective strategic management model of procurement internal control based on PDCA cycle for Hubei Engineering University, provide data support for the school's procurement internal control, and evaluate the effectiveness of the strategic management model. The effective implementation of this management model in Hubei Engineering University plays an important role in establishing and perfecting a

scientific and effective internal restriction mechanism, effectively preventing the risk of integrity in school procurement activities and promoting the high-quality development of school undertakings.

### Research Objectives

1. To investigate the needs and expectations of faculty staff and administrative staff towards effective procurement internal control of Hubei Engineering University, China.
2. To construct strategic management model based on PDCA Cycle for effective procurement internal control of Hubei Engineering University, China.
3. To evaluate the effectiveness of strategic management model based on PDCA Cycle for effective procurement internal control of Hubei Engineering University, China.

### Literature review and Profile of the Case Study

#### 1. Concepts and Related Theories:

Key concepts include Strategic Management, Procurement, government procurement, and Internal Control.

Analytical frameworks like SWOT, PESTLE, and TOWS Matrix are discussed to assess procurement strengths, opportunities, and risks.

The PDCA Cycle (Plan-Do-Check-Act) is highlighted for continuous improvement in procurement and internal control systems.

#### 2. Profile of the Case Study:

##### 2.1 The internal control management system

Hubei Engineering University had established an internal control model tailored to the principles and scope of internal control in colleges, aligned with the characteristics of provincial university economic activities. The model should focus on five main goals, incorporate unit-level (control environment, information system) and business-level (budget, revenue/expenditure, procurement, assets, infrastructure, contracts) control elements. Risk assessment and supervision should be integrated throughout economic activities to ensure effective internal control. The university has 13 internal control systems at the school level focusing on procurement, budgeting, asset management, and financial supervision. At the departmental level, there are 12 systems addressing procurement processes, selection of experts, and project approval.

##### 2.2 Audit and Finance Departments in Hubei Engineering University

**Audit Department:** Conducts audits on university projects, financial management, and procurement processes to ensure compliance and improve fund usage efficiency.

**Finance Department:** Manages university finances, including budgeting, accounting, and financial reporting. It also oversees financial risk management and resource allocation.

##### 2.3 Challenges in Procurement

Lack of awareness of government procurement policies among university staff, affecting efficiency.

Insufficient foresight in procurement project planning and budgeting, leading to unnecessary or repetitive procurement.

Difficulty in drafting reasonable procurement requirements, especially for specialized equipment, which can lead to corruption and collusion between requisitioning units and suppliers.

#### 2.4 Related Research:

Strategic Management: Focuses on setting goals and implementing strategies to meet organizational objectives.

PDCA Cycle: Emphasizes continuous improvement in processes.

Internal Control: Ensures asset protection, financial accuracy, and reduces risks.

Effective Procurement: Involves obtaining goods/services efficiently to meet organizational needs.

Improving Internal Control: Effective internal control in public university procurement is essential for legality, transparency, and efficiency. Common problems include lack of responsibility, insufficient supervision, and poor supplier management. The solutions proposed include clearer procurement policies, stronger internal audits, and leveraging technology.

This literature review underscores the importance of strategic management, internal control systems, and effective procurement practices to improve efficiency and reduce risks, especially in public universities.

### Research Methodology

#### Population

In this research project, Hubei Engineering University will be used as a case study. The population in this research will be divided into 2 groups, namely: 1) 976 faculty staff; 2) 324 administrative staff.

#### Samples

In part 1 to investigate the needs and expectations of faculty staffs and administrative staffs towards effective procurement internal control of Hubei Engineering University. The sample in this study will be divided into 2 groups: namely, 1) 284 faculty staffs, and 2) 179 administrative staffs (Yamane, 1967, pp. 887). Sampling method was stratified by random sampling method.

In part 2 to develop a strategic management model based on PDCA cycle for effective procurement internal control of Hubei Engineering University, Collect the questionnaire data, conduct statistical analysis on the data using SPSS, identify the variables with high scores, construct the key processes of the university 's procurement internal control, and put them into practice.

In part 3 to evaluate the effectiveness of the strategic management of procurement internal control in Hubei Engineering University, we will invite all personnel involved in the department and experts in the field of procurement internal control of the university to evaluate the effectiveness of the strategic management through focus group meetings.

Literature Research: Focuses on understanding key issues related to procurement, internal control, strategic management, and public universities by reviewing domestic and international literature over the past five years.

Questionnaire Survey: Primary research method, targeting stakeholders at Hubei Engineering University (faculty, administrative staff, procurement, finance, and audit departments).

Sample size calculated using Taro Yamane's formula for 95% confidence, with 284 teacher respondents and 179 administrative staff respondents required for reliable results.

Interview Method: Involves interviews with senior university leaders and heads of internal control departments, government procurement review experts, and procurement



bidding agency staff to understand the needs and issues related to procurement internal control.

Focus Group meeting: A qualitative approach involving group discussions with key personnel (procurement, finance, audit leaders, and experts) to explore the development of an effective procurement internal control model.

Quantitative Data Analysis: Statistical techniques including percentage, mean, standard deviation, t-tests, ANOVA, and reliability and validity testing are used to analyze questionnaire data.

This mixed-methods approach integrates qualitative and quantitative techniques to assess the procurement internal control system at Hubei Engineering University.

## Research Result

### 1. Strategic Management Model (PDCA Cycle):

Through questionnaire surveys, focus meetings, face-to-face interviews, the needs and expectations of effective procurement internal control in Hubei Engineering University were statistically analyzed using SPSS software, and the variable factors with higher scores were identified as follows:

**Table 1** The important variables related to the effective procurement internal control

PDCA	Variable	$\bar{x}$	S.D.
PLAN	When determining the procurement requirements, the university will fully solicit the opinions and suggestions of relevant departments and stakeholders to ensure the comprehensiveness and rationality of the procurement requirements.	4.31	0.79
	The university takes into account financial budget and resource allocation constraints when developing procurement strategies and plans.	4.99	0.93
	The university has set up a procurement and bidding work leading group, has a relatively perfect procurement decision-making mechanism.	4.02	0.91
	The university has established a communication and coordination mechanism between departments or positions such as budget preparation, government procurement and asset management to strengthen the management of government procurement budgets and plans.	4.30	0.77
	When allocating procurement resources and budget, the university will fully consider the actual needs of various departments and make reasonable allocation according to strategic objectives and development plans.	4.30	0.76

PDCA	Variable	$\bar{x}$	S.D.
DO	When implementing the procurement plan, the university will fully follow the relevant procurement processes and procedures to ensure that the procurement activities are legal, compliant, open and transparent.	3.97	0.89
	In the selection and evaluation of suppliers, the supplier's service level and after-sales support capability will be fully considered to ensure the guarantee of follow-up services.	4.30	0.79
	The university openly and transparently releases procurement information, including bidding announcements, procurement results, etc., for the supervision and participation of suppliers and the public.	4.31	0.79
	The audit department participates in the whole process of government procurement, so that the bidding and procurement work in the university runs under supervision.	4.31	0.80
CHECK	The university Regularly check the implementation of procurement, timely find and solve the problems and risks in the procurement process, to ensure the smooth progress of procurement activities.	4.30	0.79
	In terms of improving the efficiency and quality of procurement execution, it will actively learn from the successful experience and practices of other universities to enhance the level and effect of procurement execution.	4.30	0.77
ACT	Based on the results of the inspection phase, the university will actively take measures to improve the procurement process to improve the efficiency and quality of procurement.	4.30	0.79
	When the procurement improvement measures are developed, the relevant departments and stakeholders are fully communicated and consulted to ensure the effectiveness and feasibility of the improvement measures.	4.31	0.75
	When adjusting and optimizing the procurement process, it will actively adopt information means and technical support to improve the level of automation and digital management capabilities.	4.30	0.77



PDCA	Variable	$\bar{x}$	S.D.
	In the process of adjusting and optimizing the procurement process, we believe that universities should strengthen the training and awareness raising of relevant personnel.	5.33	0.77
	The university has formulated policies and procedures for procurement risk management and defined responsible departments and management responsibilities.	4.30	0.76
	In the process of adjusting and optimizing the procurement process, we believe that universities should strengthen the training and awareness raising of relevant personnel.	4.31	0.77
	The staff of the procurement department actively participate in the government procurement training organized by the superior competent department to improve the policy level and implementation ability.	4.32	0.76
	Effective procurement of internal controls play a significant role in promoting the university's teaching, research and social services.	4.30	0.79
	Developing effective procurement internal control management model is very important for improving university governance ability.	4.34	0.76

According to the supervision and inspection of the internal control of government procurement in Hubei Engineering University, combined with focus meeting, face-to-face interview etc., the main risk points and preventive measures of the internal control of procurement are obtained as follows:

**Table2** The main risk points and prevention and control measures of effective procurement internal control in Hubei Engineering University

Internal control matters	Key risk point	Prevention and control measure
Preparation of procurement budget	The budget preparation is not scientific and reasonable, and the budget is too high or too low	Establish a communication and coordination mechanism among departments of budget preparation, government procurement and asset management, and fully consider the actual needs of each department when allocating procurement budgets, and allocate budgets

Internal control matters	Key risk point	Prevention and control measure
		reasonably according to strategic objectives and development plans
Formulation of purchasing requirements	The procurement demand is not scientific and reasonable, and the technical parameters are tendentious or exclusive	Fully consult relevant departments and stakeholders when formulating procurement requirements; On the basis of market research, determine the technical parameters and quality standards of products to ensure that the quality of purchased goods or services meets the requirements
Review expert assignment	The appointment of Review expert was not entirely open and fair	Before bid evaluation, put forward disciplinary requirements to the evaluation experts dispatched by the project management unit; Try to establish a review expert database and randomly select review experts
Determination of bid evaluation methods	Bid evaluation methods are not scientific and rigorous enough or there is a negative list of illegal government procurement	Adopt a variety of evaluation indicators and methods in supplier evaluation; Hold regular meetings of the procurement and bidding leading group, and conduct collective discussions on bid evaluation methods
Supervision of the bid evaluation process	The bid evaluation process was not strictly supervised, and the evaluation experts did not follow the principles of objectivity, fairness and seeking truth from facts	The audit department participates in the whole process of government procurement, so that the bidding and procurement work in the university runs under supervision; The audit department and the procurement department shall review the bid evaluation results and correct the errors in the evaluation in a timely manner
Signing of purchase contract	The technical parameters and service standards of the goods or services in the	Set up internal control posts reasonably, clarify the authorization, approval and signing authority of procurement contracts, and properly keep and use the special seal for

Internal control matters	Key risk point	Prevention and control measure
	procurement contract are inconsistent with the procurement documents, or violate the relevant laws and regulations	contracts; Conduct regular evaluation and feedback on contract execution to continuously improve the efficiency and quality of contract execution

In summary, an effective procurement internal control management model can be established for Hubei Engineering University:

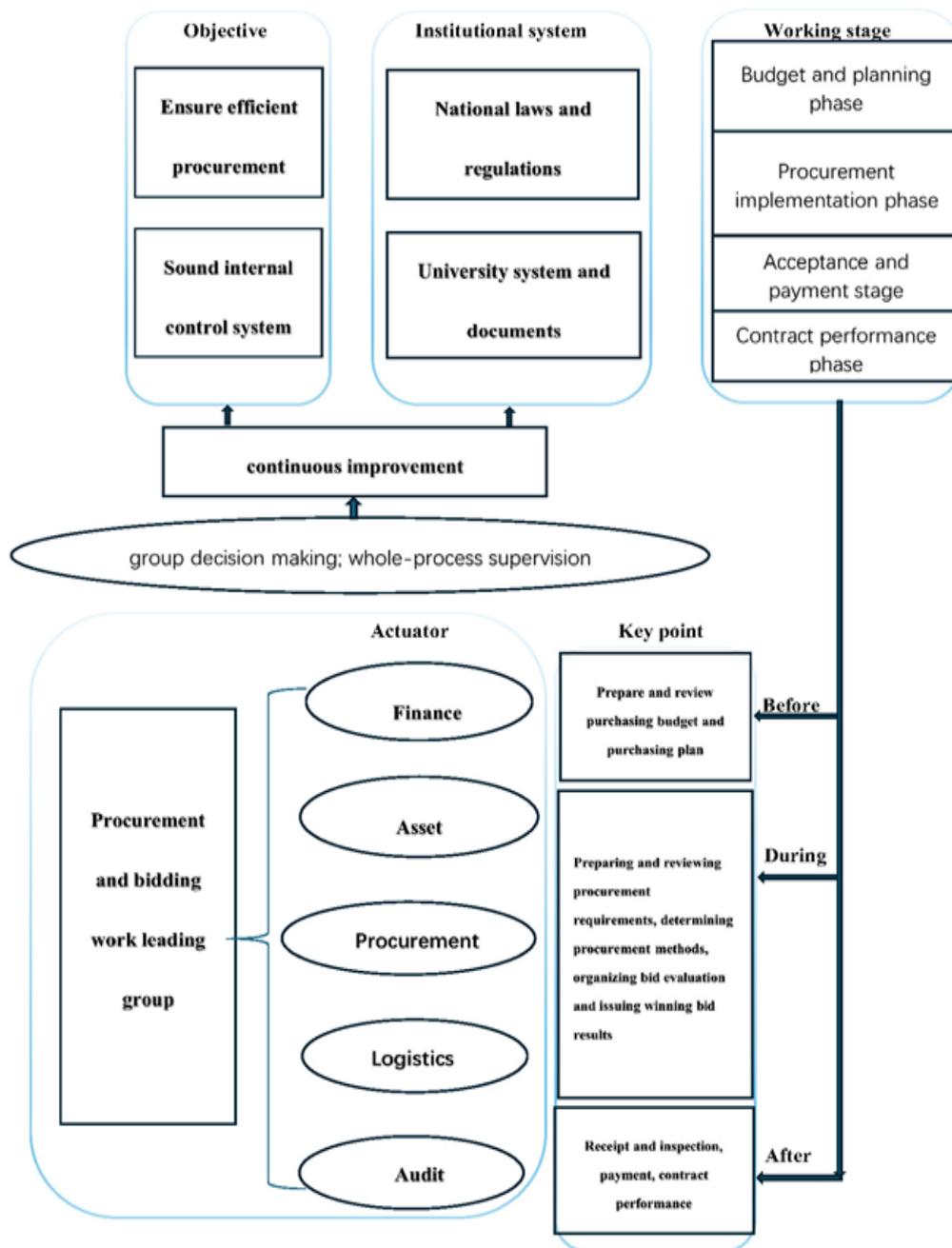


Figure 2 Strategic Management Model for Effective Procurement of Hubei Engineering University

**Table 3** The IOC of the five units in terms of strategic management model for effective procurement internal control of Hubei Engineering University

Topics/Contents	IOC
Unit 1 Management System and Department Setup for Procurement Internal Control	
Passage 1: Management System for Procurement Internal Control	0.66
Passage 2: Department Setup for Procurement Internal Control	0.66
Unit 2 The Main Risk Point, Prevention and Control Measures of effective Procurement Internal Control	
Passage 1: The Main Risk Point of effective Procurement Internal Control	0.66
Passage 2: The Prevention and Control Measures of effective Procurement Internal Control	1.0
Unit 3 The effective procurement internal control system compilation of Hubei Engineering University	
Passage 1: The effective procurement internal control system at school level	1.0
Passage 2: The effective procurement internal control system at department level	1.0
Unit 4 Procurement procedures and relevant regulations of Hubei Engineering University	
Passage 1: Procurement and bidding procedures	1.0
Passage 2: Bidding platform operating rules	1.0
Passage 3: Government procurement main procurement methods and legal time limits	0.66
Unit 5 Procurement frequently asked questions guideline of Hubei Institute of Engineering	
Passage 1: Government procurement policy explanation	1.0
Passage 2: Frequently asked questions on government procurement	0.66
Passage 3: Compilation of typical cases of government procurement	0.66

Table 3 shows the IOC scores of the 5 units assessed in terms of content correctness and suitability by the three specialists. All of the 5 units possessed IOC scores ranging from

0.66 to 1.0. It can be assumed that these strategic management model, can be used as a tool to develop the level of effective procurement internal control of Hubei Engineering University.

#### 4. Model Evaluation:

The strategic management model was evaluated by 5 experts through SWOT analysis, COSO framework and PESTLE analysis. The scores were 3, 2, 3, 3; 3, 3, 2, 3; and 3, 3, 2, 3 respectively. The evaluation values indicate a relatively high level. Practical application shows that this management model has played a significant role in improving the procurement efficiency of Hubei Engineering University, strengthening procurement internal control, and preventing and controlling procurement risks. The research suggests integrating the model outcomes into the organizational structure, job positions, and process systems of school procurement management. In the future, efforts should be made to standardize the management model and promote its application in provincial universities, in order to enhance procurement control levels and prevent corruption risks. Through the implementation of the model, Hubei Engineering University has formulated an internal control construction implementation method, revised the school's procurement management methods, adjusted the procurement limit standards, introduced an online bidding procurement platform, further expanded the autonomy of middle-level units in the school's procurement, improved procurement efficiency, and significantly increased the satisfaction of faculty and staff with the procurement work. The government procurement supervision department of Hubei Province has conducted supervision and inspection of the school's procurement work, and the evaluation results were satisfactory.

## Discussion

### Objective 1: Expectations for Procurement Internal Control

The findings for the first research objective revealed that the faculty and administrative staff at Hubei Engineering University hold relatively high expectations regarding procurement internal control. As illustrated in Table 4, the overall expectation among faculty members was high ( $M = 4.23$ ,  $SD = 0.66$ ), with each PDCA dimension—Plan ( $M = 4.20$ ,  $SD = 0.67$ ), Do ( $M = 4.24$ ,  $SD = 0.69$ ), Check ( $M = 4.23$ ,  $SD = 0.69$ ), and Act ( $M = 4.26$ ,  $SD = 0.70$ )—also rated at a high level. These results are consistent with prior studies emphasizing the importance of structured control systems and continuous improvement within organizational operations (Isniah, Purba, & Debora, 2020; COSO, 1992). The findings suggest that staff members are aware of and supportive toward the establishment of a systematic internal control mechanism that aligns with the PDCA framework to ensure effective procurement governance.

**Table 4** Expectation of Faculty Staffs (What Should Be?)

Items	Mean	S.D.	Level of Expectation
Plan	4.2	0.67	High
Do	4.24	0.69	High
Check	4.23	0.69	High
Act	4.26	0.7	High
<b>Total</b>	<b>4.23</b>	<b>0.66</b>	<b>High</b>

### **Objective 2: Development of a Strategic Management Model**

The second research objective focused on constructing a strategic management model for effective procurement internal control at Hubei Engineering University. The resulting model was developed based on the PDCA cycle, which provides a dynamic and iterative framework for continuous improvement (Isniah et al., 2020). The model integrates goal orientation, institutional systems, and procedural stages (before, during, and after control). Through this comprehensive structure, it aims to enhance procurement efficiency while effectively mitigating risks, consistent with the principles outlined in the COSO Internal Control–Integrated Framework (COSO, 1992) and supported by empirical research on procurement system improvement (Panda & Sahu, 2015). The strategic model emphasizes that institutionalized procedures and feedback loops can lead to more effective resource utilization and accountability in public sector procurement (Arai, 2013).

### **Objective 3: Evaluation of Model Effectiveness**

The third research objective evaluated the effectiveness of the proposed model through expert review. Five experts assessed the model using SWOT analysis, the COSO framework, and PESTLE analysis. The evaluation scores (3, 2, 3, 3; 3, 3, 2, 3; and 3, 3, 2, 3, respectively) indicated an overall high level of agreement regarding the model's feasibility and practical applicability. These evaluations reinforce the argument that systematic control mechanisms and structured management models are essential for effective public procurement (Robert & Roger, 1995; Sharifah & Norkhazimah, 2016).

In practice, the application of this strategic management model has resulted in improved procurement efficiency, enhanced internal control mechanisms, and strengthened prevention and control of procurement risks at Hubei Engineering University. These findings align with the broader literature emphasizing the integration of strategic management principles, internal control systems, and continuous improvement cycles to ensure institutional effectiveness and sustainability (Yamane, 1967; Surface, 1971).

### **New knowledge from research**

The research has constructed an effective internal control management model for procurement at Hubei Engineering University. The innovation of this model lies in its ability to continuously improve procurement work through the PDCA cycle. The contribution of this model to the procurement practice at Hubei Engineering University is as follows: Through the implementation of this model, Hubei Engineering University has formulated an internal control construction implementation regulation, revised the school's procurement management regulations, adjusted the procurement limit standards, introduced an online bidding procurement platform, further expanded the autonomy of middle-level units in procurement within the school, improved procurement efficiency, and significantly increased the satisfaction of faculty and staff with the procurement work. The government procurement supervision department of Hubei Province has conducted supervision and inspection of the school's procurement work, and the assessment results are satisfactory. The research suggests

integrating the achievements of this model into the organizational structure, job settings, and process system of the school's procurement management. In the future, efforts should be made to standardize this management model and promote its application in provincial universities to improve procurement internal control levels and prevent corruption risks.

## Conclusion

Objective 1: The faculty staff and administrative staff of Hubei Engineering University generally acknowledge a solid foundation in procurement internal controls. However, improvements are urgently needed in risk management, demand transparency, and performance evaluation. Developing and continuously optimizing an effective internal control management model is crucial to enhancing oversight and mitigating corruption risks.

Objective 2: Based on the PDCA (Plan-Do-Check-Act) cycle, the research has established the procurement internal control management model of Hubei Engineering University. The practical application shows that this management model has played a significant role in improving the procurement efficiency of Hubei Engineering University, strengthening procurement internal control, and preventing and controlling procurement risks.

Objective 3: The evaluation results indicate a high-performing strategic management model that has significantly improved procurement efficiency, internal control, and risk prevention at Hubei Engineering University. It is recommended to integrate the model into the organizational structure, processes, and job design of procurement management, and promote its standardized application across provincial universities to enhance oversight and reduce corruption risks.

## Recommendation

Based on the research results, the researchers make the following recommendations:

### 1. Recommendations for Implementing the Research Results

The results of the research objective 1 revealed that: The sample for this research needs investigation consisted of faculty staff and administrative staff from Hubei Engineering University, and it has certain limitations.

Therefore, relevant agencies should take the following actions: It is suggested that the sample size be expanded to include faculty staff and administrative staff from other universities in Hubei Province, in order to further enhance the accuracy, reliability and credibility of the research.

The results of the research objective 2 revealed that The implementation of the model was carried out at Hubei Engineering University, which was in line with the research background and management system of the institution. It was not promoted and applied in other universities in Hubei Province, and thus could not form a replicable successful case.

Therefore, relevant agencies should take the following actions: It is suggested that the model be tested in other similar universities in Hubei Province. Through analogy, verification

and integration, the validity of the model can be further confirmed, and a replicable and solidified management model can be formed.

The results of the research objective 3 revealed that the evaluation of the model involved IOC testing and expert scoring. Although it showed a relatively high level, it was still somewhat subjective, and its objectivity and accuracy need to be further verified.

Therefore, relevant agencies should take the following actions: Subsequent research can employ regression analysis or the pretest-posttest design approach to evaluate the validity of the model.

## 2. Recommendations for Further Research

This research has yielded important findings (knowledge) of develop a management model for internal control of university procurement, namely, Development of Strategic Management Model for Effective Procurement Internal Control of Hubei Engineering University, China can be applied to Improve the procurement internal control level at Hubei Engineering University, with emphasis on continuously improving the internal control level of procurement through the PDCA cycle. For future research, research should focus on: Internal control of university procurement aims to comprehensively improve the transparency, compliance and efficiency of university procurement through in-depth analysis from multiple angles such as information technology, risk management, audit supervision, and supply chain management. On this basis, combined with the actual situation of universities, management countermeasures with strong adaptability and high operability are proposed to promote the innovation and optimization of university procurement management models. In the next step, researchers can combine the current job financial management to study the relationship between procurement internal control and financial management, and how to further optimize procurement internal control procedures through budget management, performance management, audit management, etc., to prevent and resolve various risks in the economic activities of Hubei Engineering University.

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